PSG College of Arts & Science

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Since 1947

B.Sc. CHEMISTRY

2017 - 2020

BSc CHEMISTRY

Scheme of Examinations

(For students admitted in June 2014-15 & onwards)

CODE NO.	SUBJECT	EXAM DURA-TION (Hrs)	Max. Marks			Credit points
			CA	CE	Total	
First Semester						
	Part –I					
14LAU01 12LAU01 14LAU01	Tamil – I OR Hindi – I OR French-I	3	25	75	100	3
	Part –II					
14EU01	Communicative English - I- Interpersonal Communication	3	25	75	100	3
	Part –III					
14CHU01	General Chemistry– I	3	25	75	100	4
14CHU02	Analytical Chemistry	3	25	75	100	4
14CHU03	Mathematics-I(Allied - MA)	3	25	75	100	5
-	Chemistry Practical-I*	-	-	-	-	-
Second Semester						
	Part –I					
14LAU02 12LAU02 14LAU02	Tamil – II OR Hindi – II OR French-II	3	25	75	100	3

	Part –II					
14EU02	Communicative English II– Academic Communication	3	25	75	100	3
	Part –III					
14CHU04	General Chemistry – II	3	25	75	100	4
14CHU05	Industrial Chemistry	3	25	75	100	4
14CHU06	Mathematics–II(Allied - MA)	3	25	75	100	5
14CHU07	Chemistry Practical–I*	3	40	60	100	3
	Part –IV					
14VEU01	Value Education	-	100	-	100	2
Third Semester						
	Part –I					
14LAU03 12LAU03 14LAU03	Tamil – III OR Hindi – III OR French-III	3	25	75	100	3
	Part –II					
14EU03	Communicative English III- English for Career	3	25	75	100	3
	Part –III					
14CHU08	General Chemistry – III	3	25	75	100	4
14CHU09	Physics –I(Allied - PH)	3	25	75	100	4
-	Chemistry Practical – II*	-	-	-	-	-
-	Applied Chemistry Practical*	-	-	-	-	-
-	Physics Practical (Allied)*	-	-	-	-	-
	Part –IV					
14ESU01	Environmental Studies	--	100	--	100	2
Fourth Semester						

	Part –I					
14LAU04 12LAU04 14LAU04	Tamil – IV OR Hindi – IV OR French-IV	3	25	75	100	3
	Part –II					
14EU04	Communicative English- IV English Through Literature and Newspapers	3	25	75	100	3
	Part –III					
14CHU10	General Chemistry – IV	3	25	75	100	4
14CHU11	Physics –II (Allied - PH)	3	25	75	100	4
14CHU12	Chemistry Practical – II*	6	40	60	100	4
14CHU13	Applied Chemistry Practical*	3	40	60	100	2
14CHU14	Physics Practical(Allied - PH)*	3	40	60	100	2
	Part –IV					
14SBU01	**Skill Based Subject :** Internet Security	--	100	--	100	2

Two weeks industrial training in summer vacation

CODE NO.	SUBJECT	EXAM DURA-TION (Hrs)	Max. Marks			Credit Points
			CA	CE	Total	
Fifth Semester						
	Part –III					
14CHU15	Organic Chemistry–I	3	25	75	100	4
14CHU16	Inorganic Chemistry -I	3	25	75	100	4
14CHU17	Physical Chemistry –I	3	25	75	100	4
14CHU18	Nano and Green Chemistry	-	100	-	100	3
14CHU19A OR 14CHU19B	***Core Elective – I*** **:** Polymer Chemistry Dye Chemistry	3	25	75	100	4
-	Chemistry Practical–III*	-	-	-	-	-
14CHU20	Industrial Training**	-	40	60	100	6
	Part –IV					
14NME01	**Non-Major Elective (1) :** EDC	--	100	--	100	2
14NME02	**Non-Major Elective (2) :** General Awareness (On-line Test)	1½	--	100	100	2
Sixth Semester						
	Part –III					
14CHU21	Analytical Chemistry and Instrumental Methods of	3	25	75	100	4

	Analysis					
14CHU22	Organic Chemistry-II	3	25	75	100	4
14CHU23	Inorganic Chemistry -II	3	25	75	100	4
14CHU24	Physical Chemistry-II	3	25	75	100	4
14CHU25A 14CHU25B	***Core Elective – II*** **:** Pharmaceutical Chemistry OR Textile Chemistry	3	25	75	100	4
14CHU26	Chemistry Practical-III*	6	40	60	100	4
				TOTAL		**136**

PART-V			**Credits**
1.	**Extension Activity** : NSS / NCC / Sports / Department Activity	I – VI semesters	2
2.	**Competence Enhancement** : Add-on Course / Women's Studies / Extra paper	I – VI semesters	2
		Grand Total	**140**

14CHU01 **General Chemistry I (60 Hrs)** **Semester – I**

Objectives

- To develop a foundation in the concept and facts in major areas of chemistry
- To be familiar with the fundamental reactions involved in chemistry
- To create awareness for safe handling of chemicals and laboratory hygiene

Unit I **Atomic structure** **12 Hrs**

Bohr model of atom – its limitations and sommerfeld model. De Broglie theory and Heisenberg' s uncertainty principle. Dual nature of matter are electrons, Wave particle nature of matter, De Broglie concept of matter. De Broglie equation experimental verification, Probability, Concept of electron, Wave mechanical order of atom and as Schrodinger wave equation. Physical significance of ψ & ψ^2 – Quantum numbers – Pauli's exclusion principle, Aufbau principle and Hund's rule.

Unit II **Periodic properties** **12 Hrs**

Atomic and ionic radii, Ionization energy, Electron affinity and electronegativity-Definition, Methods of determination or evaluation, Trends in periodic table, Modern periodic table and applications predicting and explaining the chemical behaviors.

Electronegativity – Pauling and Mulliken electronegativity scales. Calculation of percentage of ionic characters.

Unit III **Chemical bonding-I** **12 Hrs**

Ionic, covalent and coordinate covalent bonds - General characteristics, types of ions. Characteristics of electrovalent compounds. Variable electrovalence. Inert pair effect. Radius ratio and its limitations. Lattice energy and its applications. Covalent bond- Polarity and polarizability - Fajan's rules. Born - Haber cycle-calculations. Hydrogen bond–The Vander Waal's attraction.

Unit IV **Chemical bonding-II** **12 Hrs**

The Valance bond approach, Energy changes during bond formation. Effectiveness of overlap, Bond length and bond energies. Correlation of bond energies and bond enthalpies. VB and MO theories in detail. Comparison between them. Bonding, antibonding and non bonding orbitals. Relationship between electronic configuration and molecular behavior -

Applications of MO theory. σ and π bonds. MO diagrams of the following molecules and their discussion: He_2, O_2, N_2, CO, NO, NO^+, O_2^-.

Unit V Structure and Bonding 12 Hrs

Hybridization, Bond lengths and angles, Bond energy, delocalization, vander Waal's interactions, Charge transfer complexes, Resonance, Hyperconjugation, Inductive, mesomeric and field effects, Hydrogen bonding. Hybridization and geometry of organic molecules. Methane, Ethylene and Acetylene.

Organic reactions

Homolytic and Heterolytic cleavage. Electrophiles and nucleopiles. Addition substitution and elimination reactions. Reactive intermediates-Carbo cations, Carbanions, Free radicals, Carbenes, Arynes and Nitrenes.

Reference Books

1. Principles of Physical Chemistry, B.R.Puri, L.R.Sharma and M.S.Pathania, Shoban Lal Nagin Chand and Company, Jalandhar, 27th Edition, 2011.
2. Organic Chemistry, R.T. Morrison and R.N. Boyd, Prentice Hall of India Private Limited, New Delhi, 7th Edition, 2011.
3. Text book of Inorganic Chemistry, P.L. Soni, Sultan Chand and Sons, New Delhi, 13th Edition, 2011.
4. Advanced Organic Chemistry, B.S. Bahl and Arun Bahl, Sultan Chand and company, 8th Edition, 1983.

14CHU02 Analytical Chemistry (60 Hours) Semester-I

Objective

- To create awareness for safe handling of chemicals and laboratory hygiene
- To be familiar with the fundamentals involved in qualitative and quantitative analysis
- To know the various purification techniques

Unit I Laboratory hygiene and safety 12 Hrs

Storage and Handling of Chemicals, Carcinogenic Chemicals, Handling of ethers, Toxic and poisonous chemicals, Safe limits of vapour Concentrations, Waste Disposal, Fume Disposal, General Precautions for Avoiding Accidents, First-Aid Techniques, Hazards in Laboratory, Poisoning, Laboratory Safety Measures.

Handling of Glassware

Cleansing methods, Test for Cleanliness, Cleaning and Maintenance of Burette, Interchangeable Ground Glass Joint Apparatus, Advantages of using standard joint Apparatus, Precautions in the Use of standard joint Apparatus, Calibration and Grading of Volumetric Apparatus, Temperature and Volumetric Glassware.

Unit II Principles and techniques of semi-micro methods 12 Hrs

Laboratory methods in Semi micro qualitative analysis, Filtration of precipitates, Washing of precipitates, Heating solutions, Evaporation, Transferring Residue, Common ion effect – solubility product. Methods of precipitating sulphides – Dry reactions – Precipitation reactions, Complexation reactions- Oxidation- Reduction reactions. Spot Test Analysis for Ni^{+2}, Mg^{2+}, Al^{3+}, NH_4^+, Cu^{2+}.(Equation not necessary) Preparation of Solution for Cation Testing on Semimicro Scale, Removal of interfering ions.

Unit III Principles of volumetric analysis 12 Hrs

Volumetric analysis: terminology – standard solution, titrant, analyte, end point, equivalence point and indicator. Primary and secondary standards – their characteristics and examples. Different ways of expressing concentrations – normality, molality and molarity. Types of titrations and indicators – acid-base, redox, complexometric and precipitation titrations.

Principle involved in acid-base titrations. Theory of acid-base indicators –titration involving strong acid strong base, strong acid-weak base and weak acid-strong base. Principle and theory involved in redox and complexometric titrations. Titration of Fe^{2+} with potassium dichromate using internal and external indicators. EDTA titrations involving Zn^{2+} and Ni^{2+} ions. Precipitation titrations for the estimation of Ag^+.

Unit IV Principles of gravimetric analysis 12 Hrs

Methods of obtaining the precipitate, Conditions of Precipitation, Choice of precipitants, Advantages and disadvantages of using organic precipitants, Types of organic precipitants, Specific and Selective precipitants, Sequestering Agents, Co-precipitation, Post-precipitation, Occlusion, Procedure to minimize Surface Adsorption, Effect of Digestion, Precipitation from homogeneous medium, Washing of precipitates, Drying of precipitate, Types, Care and Use of Crucibles. Estimation of nickel and lead.

Unit V Purification techniques 12 Hrs

Desiccants-Types of Desiccants- Regeneration of Desiccants- Choice of Desiccant- technique of drying- Drying of Solids, Distillation- Theory of Distillation, Technique of distillation, Fractional distillation, Steam distillation, Azeotropic distillation, Vacuum distillation, Recrystallisation, Sublimation. Criteria and tests for Purity - Melting Point, Boiling Point, Refractive Index, Density.

Reference Book

1. Elements of Analytical Chemistry by R. Gopalan, P. S. Subramanian and K. Rengarajan. S Chand and Sons, 3rd Edition, 2003.
2. D.A. Skoog and D.M. West, F.J.Holler and S.R. Grouch, Analytical Chemistry, 6th Edition, Sounders College Publishing, 1994. – an Introduction.
3. Chatwal Anand, Instrumental Methods of Analysis, 4th Edition, Bombay Himalaya Publishinh house, 1988.

14STU03 / 14PHU03 / 14CHU02

Mathematics I (Allied)
(For BSc Statistics, Physics and Chemistry)

Unit I

Theory of Equations: Relation Between Roots and Coefficients-Solving Equations When Roots are in A.P,G.P,H.P and When Relations Between Roots are Given With Simple Conditions-Diminishing the Roots by a Constant 'h'-Solving Reciprocal Equations.

Unit II

Curvature: Radius of Curvature, Centre of Curvature, Evolutes and Involutes (Cartesian Co-ordinates Only)

Unit III

Integral Calculus : Properties of Definite Integrals- Reduction Formulae - Beta and Gamma Functions.

Unit IV

Multiple Integrals: Double and Triple Integrals.

Unit V

Trigonometry: Expansions of sinnθ, cosnθ, tannθ, $\sin^n\theta$, $\cos^n\theta$-Infinite Series of sinθ, cosθ, tanθ in Powers of - Hyperbolic Functions.

Text Book:

"Ancillary Mathematics" Volume I and II by **S. Narayanan, R.Hanumantha Rao, and T.K. Manicavachagam Pillay,** S. Viswanathan Printers and Publishers. 2007

Unit I : Chapter 2 : (Volume I)

Unit II : Chapter 6 : Section 6.4 (Volume I)

Unit III : Chapter 1 : Sections 1.11 to 1.15 (Volume II)

Unit IV : Chapter 3 : (Volume II)

Unit V : Chapter 5 : Sections 5.1 to 5.3 (Volume I)

14CHU04 General Chemistry II (60 Hours) Semester - II

Objectives

- To develop a foundation in the concept and facts in major areas of chemistry
- To gain basic knowledge in organic, inorganic and physical chemistry

Unit I **12 Hrs**

S-Block and Zero Group Elements

Alkali metals - Similarities, physical properties and gradation in chemical properties. Diagonal relationship between Li and Mg. Anomalous behavior of Li. Extraction of Li and Mg. Alkaline earth metals - Extraction of Be and Ca. Anomalous behavior of Be. Comparison of IA and IIA elements. Chemistry of zero group elements - Position of noble gases in periodic table. Separation of noble gases.

Unit II

Thermodynamics – I **12 Hrs**

Terminology in thermodynamics. Types of systems, intensive and extensive properties. State and path functions. Thermodynamics process, Concept of heat and work. First law of Thermodynamics - statement, definition of internal energy and enthalpy. Heat capacity, heat capacity at constant volume and pressure and their relationship. Joule-Thomson coefficient and inversion temperature. Calculation of w, q, dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.

Thermochemistry - Standard state, standard enthalpy of formation – Hess's law of heat summation and its applications, Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralisation. Bond dissociation energy and its calculation form thermo-chemical data, temperature dependence of enthalpy. Kirtchoff's equation.

Unit III

Solid state chemistry **12 Hrs**

Classification of solids-amorphous, crystalline – Definition of space lattice and - unit cell. Laws of Crystallography - The Law of constancy of interfacial angles - Law of rational on indices - Law of symmetry-symmetry elements in crystals. Miller indices. X ray diffraction by the crystal. Derivation of Bragg's equation. Lattice types – elements of symmetry in cubic system – plane, axis and centre of symmetry. Discussion on crystal structures of NaCl, KCl and CsCl. Debye-scherrer method. Applications of X-ray diffraction.

Unit IV

Organic Chemistry **12 Hrs**

IUPAC Nomenclatures of alkanes. Alkyl group, classification of carbon atom in alkanes physical properties and chemical reaction of Alkanes.

Nomenclatures of Alkenes, methods of formation, mechanism of dehydration of alcohol and dehydrohalogenation of alkyl halides, Saytzeff and Hofmann rules in elimination, stabilities of alkenes. Chemical reactions of alkenes-mechanisms. Electrophilic and free radical additions. Markownikoff's rule, peroxide effect, Hydroboration, Epoxidation, ozonolysis, hydration, oxidation with $KMnO_4$. Polymerization of alkenes.

Nomenclatures and classification of dienes- Isolated, conjugated and cumulated dienes. Structures of alkenes and butadiene. methods of formation, polymerization, chemical reaction – 1,2 and 1,4 addition, Diels–Alder reaction.

Nomenclatures, Structure and bonding in alkynes, methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reaction, metal–ammonia reductions, oxidations and polymerization.

Unit V

Arenes and Aromaticity **12 Hrs**

Nomenclature of benzene derivatives, the aryl group, Aromatic nucleus and side chain. Structure of benzene - Molecular formula and Kekule structure. Huckel's Rule. Stability and carbon-carbon double bond lengths of benzene, resonance structure, MO picture. Aromatic electrophilic substitution - general pattern of the mechanism, role of σ –and Π - complexes. Mechanism of nitration, halogenations, sulphonation, mercuration and Friedel–Crafts reaction. Energy profile diagrams. Activating and deactivating substituents, orientation and *O-P* ratio. Side chain reactions of benzene derivatives.

Text Books

1. Advanced Organic Chemistry, B.S. Bahl and Arun Bahl, Sultan Chand and company,8th Edition, 1983.
2. Text Book of Organic Chemistry, P.L. Soni and S.M. Chawla, Sultan Chand and company, 12th Edition, 1987.
3. Organic Chemistry R.T. Morrison and R.W. Boyd, , 7th Edition, Prentice –Hall of India, New Delhi, 2011.
4. Principles of Physical Chemistry, B.R. Puri, L.R. Sharma and M.S. Pathania, Shoban Lal Nagin Chand and Company, Jalandhar, 27th Edition, 2011.
5. Organic Chemistry, R.T. Morrison and R.N. Boyd, Prentice Hall of India Private Limited, New Delhi, 6th Edition, 2004 .
6. Text book of Inorganic Chemistry, P.L. Soni, Sultan Chand and Sons, New Delhi, 13th Edition, 2011.

14CHU05 Industrial Chemistry (60 Hours) Semester-II

Objective

- To know the manufacture of Glass, Cement and Ceramics
- To develop the knowledge about fertilizers and their importance
- To create knowledge in the manufacture of paper and soap

Unit I **12 Hrs**

Chemistry of Glass and Cements

Physical and chemical properties of glass. Manufacture of glass-raw materials-methods of manufacturing. Choice of furnace- pot furnace and tank furnace. Formation of batch materials, shaping of plate glass- annealing – finishing. Special types of glass – lead glass-soda lime glass- coloured glass-glass wool-glass laminates. Indian glass industry.

Portland cement- composition of cement and types of Portland cement-raw materials for the manufacture of cement. Manufacture of cement- dry and wet process and various steps involved in the manufacture of cement. Chemistry of setting cement- functions of compounds-heat requirement – factors affecting quality. Cement industries in India.

Unit II **12 Hrs**

Fertilizers and Insecticides

Fertilizers – plant nutrients – nutrient functions – need for fertilizers – essential requirements fertility of soil – pH value of the soil. Classification of fertilizers – natural organic fertilizers – natural inorganic fertilizers. Artificial fertilizers- ammonium nitrate – ammonium sulfate – urea manufacturing process. Phosphate fertilizers – normal super phosphate- triple super phosphate – ammonium phosphate. Potassium fertilizers- nomenclature in fertilizer industry.

Insecticides – classification according to their mode of action-inorganic insecticides- lead arsenate, calcium arsenate – Paris green. Natural and Plant insecticides - nicotine.

Unit III **12 Hrs**

Chemistry of Paints, Pigments and Adhesives

Paints – constitutions of paints – extenders or fillers-film forming materials-driers-thinners or diluents-antiskinning agents – plasticizers – resins. Manufacture of paints – setting of the paint emulsion paints- constitution of emulsion paint – method of manufacture – advantages.

Pigments – white pigments – white lead, zinc oxide, lithopone. Blue pigment-ultramarine blue and iron bleu. Red pigments – red lead. Green pigments – chrome green. Reinmann's green.

Adhesives – Introduction – animal glue, other protein adhesives – starch adhesives- synthetic resin adhesives – rubber based adhesives – cellulose and silicate adhesives.

Unit IV **12 Hrs**

Sugar and Paper

Sugar – manufacture of sugar – extraction of juice. Defection – carbonation- sulphitation. Crystallization – separation of crystals drying-refining – recovering of sugar from molasses. Manufacture of sugar from beet-root. Sugar industries in India.

Fermentation – conditions favorable for fermentation. Enzymes-characteristics. Manufacture of spirit, wine and vinegar. Ethyl alcohol from molasses. Wash distillation-properties. Distilleries in India.

Paper and Pulp -Manufacture of pulp- chemical process – sulphate pulp, soda pulp, sulphite rage pulp. Various steps involved in the manufacture of paper. Calendaring paper, industry in India.

Unit V **12 Hrs**

Soap and detergents

Soaps- soaps and its manufacture. The hot and cold process-batch process- continuous process. Types of soaps-laundry soap-toilet soap – transparent soap-other soaps. Oils to be used in soaps-cleansing action of soaps. Recovery of glycerine from spent lye.

Detergents – introduction – principle groups of synthetic detergents. Classification of surface active agents – anionic detergents – oxo-process –alsol process – Waebsh process. Cationic detergents – nonionic detergents amphoteric detergents –fillers-additives –corrosion inhibitors.

Reference Books

1. B.K. Sharma, Industrial Chemistry, Goel Publications House, Meerut, 1995.
2. P.C.Jain and Monika Jain, Engineering Chemistry, Dhanpat Rai and Sons, New Delhi, 1988.
3. R.C. Praful, K. Goel and R.K. Gupta, Insecticides, pesticides and agro-based industries,

14STU06 / 14PHU06 /

14CHU05

Mathematics II (Allied)

(For BSc Statistics, Physics and Chemistry)

Unit I

Matrices: Evaluation of eigen values and eigen vectors – Cayley Hamilton Theorem – Diagonalization.

Unit II

Partial Differential Equations: Formation of Partial Differential Equations – General Integral, Particular Integral and Complete Integral – Standard Forms – Largrange's Form of Linear First Order Equations

Unit III

Fourier Series: Full Range and Half Range Series – Development in Cosine Series – Development in Sine Series (Except Harmonic Analysis).

Unit IV

The Laplace Transform: Inverse laplace transform – Solving ordinary differential equations by laplace transform.

Unit V

Solving Simultaneous Linear Equations by Gauss Elimination – Gauss Jordan – Gauss Jacobi – Gauss Seidal Method.

Text Book:

1."Ancillary Mathematics" Volume I and II by **S. Narayanan, R.Hanumantha Rao, and T.K. Manicavachagam Pillay,** S. Viswanathan Printers and Publishers. 2007
(For Units I, II, III & IV)
2."**Numerical Methods in Science and Engineering**" by **Dr.M.K.Venkataraman**. The National Publishing Company. Fifth Edition. August 2004.
(For Unit V)
Unit I : Chapter 3 : Sections 3.4, 3.5 (Volume I)

Unit II : Chapter 6 : Sections 6.1 to 6.6 (Volume II)

Unit III : Chapter 2 : Sections 2.1 to 2.5 (Volume II)

Unit IV : Chapter 7 : Sections 7.1 to 7.4 (Volume II)

Unit V : Chapter 4 : Sections 1 to 3, 6 (Text Book 2)

14CHU07 Chemistry Practical I (75 Hours) Semesters-I&II

Objectives

- To develop the knowledge and skill in regular inorganic analysis
- To enhance observation skills

Unit I

Analysis of simple anions (6 Hrs)

Analysis of anions - carbonate, sulphide, sulphate, nitrate, bromide and chloride.

Unit II

Analysis of Interfering Anions (9 Hrs)

Analysis and methods of elimination of interfering ions like fluoride, borate, phosphate, oxalate and chromate.

Unit III

Analysis of Cations (18 Hrs)

Analysis of cations like lead, copper, bismuth, cadmium, iron, aluminium, zinc, calcium, strontium, barium, magnesium and ammonium.

Unit IV

Analysis of Simple Salts (12 Hrs)

Analysis of simple salts without interfering ions (minimum 2 salts) and salts with interfering ions (minimum 3 salts).

Unit V

Analysis of Mixture Salts (30 Hrs)

Analysis of mixtures salts containing two anions and two cations, out of which one anion is interfering (minimum 5 mixtures).

Reference Books

1. Basic Principles of Practical Chemistry, V. Venkateswaran, R. Veeraswamy and A.R. Kulandaivelu,
2. Practical chemistry, A.O. Thomas, Scientific Book Centre, Cannanore –I, 7th edition 1999.

14CHU08 General Chemistry III (60 Hours) Semester-III

Objectives

- To develop a fundamental knowledge in inorganic quantitative analysis
- To enhance the knowledge in p-block elements and carbonyls
- To gain basic knowledge thermodynamics

Unit I Compounds of p-block elements (12 Hrs)

Chemistry of boron family – electron acceptor behaviour and electron deficiency of boron hydrides – bonding in diboranes, preparation, properties uses and structures of diborane and borazole. Preparation, properties and structures of silicones. Preparation, properties and uses of polymetaphosphate. Preparation, properties and structure of permono and perdisulphuric acids. Preparation, properties and structure of dithionous and dithionic acids. Interhalogen compounds – preparation, properties, uses and structure.

Unit II Carbonyl Compounds (12 Hrs)

Aldehydes and ketone - preparation, properties and uses of acrolein, crotonaldehyde, benzaldehyde and cinnamaldehyde. Preparation of salicylaldehyde, vanillin, acetophenone, benzophenone, glyoxal, succinaldehyde, diacetyl and acetonylacetone. Carboxylic acids – preparation and properties of acrylic acid, benzoic acid, salicyclic acid, cinnamic acid, tartaric acid, citric acid, phthalic acid.

Unit III Aliphatic halogens and Alcohols (12 Hrs)

Aliphatic halogen compounds, Nomenclature - classification-mono, di, tri and tetrahalide compounds-vicinal and geminal dihalides. Preparation, properties and uses of ethyl chloride, ethylene chloride, chloroform, carbon tetra chloride,1,2 dichloro ethane and 1,1 dichloro ethane.

Phenols – mono and di hydric phenols (resorcinol only) – preparation properties.

Alcohols - Mono, di and tri hydric alcohols preparation, properties and uses. Difference between primary, secondary and tertiary alcohols.

Unit IV Thermodynamics I (12 Hrs)

Second law of thermodynamics – limitations of first law and need for the second law. Various statements of second law. Spontaneous and reversible processes. Carnot cycle – efficiency, Carnot's theorem. Thermodynamics scale of temperature. Concept of entropy. Entropy changes in cyclic, reversible and irreversible processes and in physical transformations. Entropy changes of an ideal gas with changes in P, V and T. Entropy of mixing. Physical significance of entropy-entropy as a measure of disorder and probability Gibbs and Helmholtz free energy G and A. Free energy as s function of temperature and pressure. Criteria for equilibrium and spontaneity in terms of free energy change. Free energy change in an isothermal process. Gibbs-Helmholtz equation.

Unit V Thermodynamics II (12 Hrs)

Partial molar properties-chemical potential. Gibbs-Duhem equation. Variation of chemical potential with temperature and with pressure. Clapeyron-Clausius equation-integrated form-applications, Nernst heat theorem-third law of thermodynamics- exceptions to third law.

Thermodynamic derivation of law of equilibrium - Free energy and chemical equilibrium-Free energy of a spontaneous reaction, role of temperature in spontaneity of the reaction, standard free energy change. Chemical equilibrium – thermodynamic treatment of low of mass action, distinction between ΔG and ΔG^0. Relations between Kp, Kc and Kx. Homogeneous equilibria – temperature dependence of the equilibrium constant (van't Hoff-equation). Effect of pressure on equilibrium constant. Heterogeneous equilibria – Le-chatelier's principle and physical equlibria.

Text Books

1. P.L. Soni, Text Book of Organic chemistry, Sultan Chand, New Delhi,12th Edition, 2010.
2. R.D.Madan, Modern Inorganic Chemistry, Sultan Chand, New Delhi, 3th Edition, 2011.
3. B.K.Sharma, Elements of Analytical Chemistry, Shabanlal and co., New Delhi, 12th Edition, 2000.
4. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Shoban Lal Nagin Chand and Company, Jalandhar, 27th Edition, 2011.

Reference Book

1. B.S. Bahl and Arun Bahl, Advanced Organic Chemistry, Sultan Chand and company,8th Edition, 2010.
2. Essentials of physical Chemistry, B.S.Bahl, G.D.Tuli and Arun Bahl, Sultan Chand and company.
3. Text Book of Inorganic Chemistry, P.L. Soni, Sultan Chand and company.

14CHU09/14BCV11/14BCU11 PHYSICS - I

(for Chemistry and Biochemistry)

Semester III /52 Hrs

UNIT –I (10 Hrs)

GRAVITATION: Kepler's laws – determination of G by Boy's method – gravitational potential and field due to a solid sphere – acceleration due to gravity – variation of g due to altitude and depth – determination of g by compound pendulum – Kater's pendulum.

ELASTICITY: Bending of beams – bending moment – depression of cantilever – determination of Young's modulus by non-uniform and uniform bending – Torsion in a wire – twisting couple – torsional oscillations – determination of rigidity modulus.

UNIT – II (10 Hrs)

OPTICS: Newton's rings – determination of refractive index of a liquid – Michelson interferometer – determination of λ. $d\lambda$ and thickness of a mica sheet – polarization – production and analysis of circularly and elliptically polarized light – optical activity – specific rotation – half shade polarimeter – production and detection and simple applications of IR, UV and visible radiations.

UNIT – III (11 Hrs)

HEAT AND THERMODYNAMICS: Joule – Thomson effect – Boyle temperature – inversion temperature – liquefaction of Hydrogen and Helium – adiabatic demagnetization – measurement of low temperature – properties of liquid Helium I and II – super conductivity – Meissner effect.

SOLAR ENERGY: Measurement of radiation – pyreheliometer – solar energy utilization – flat plate collector – box type cooker – solar water heaters. Solar concentrators – solar cells – use of solar cell in street lighting in remote areas.

UNIT – IV(11 Hrs)

ELECTRICITY AND MAGNETISM: Ballistic galvanometer- theory – charge sensitiveness – use in measuring capacity of condenser – thermo emf – measurement of thermo emf by potentiometer – thermocouple – thermodynamics of thermo electric effect. Magnetic properties of materials – dia, para, ferro, magnetism. Qualitative explanation – Curie temperature and Neel temperature.

UN IT – V (10 Hrs)

RELATIVITY: Newtonian Relativity – Galilean transformation – instances of its limitations – Michelson and Morley experiment – explanation of negative results – Einstein's basic postulates – Lorentz transformations (no derivation)- length contraction – time dilation – addition of velocities – variation of mass with velocity – mass energy equivalence.

BOOKS FOR STUDY:

1.BSc Ancillary Physics Volume I – Dr.N.Jayaprakash.

2.A textbook of Ancillary Physics Volume I – Dr.R.Sabesan and Dr.A.Dhanalakshmi.

14CHU10 General Chemistry IV (60 Hours) Semester-IV

Objectives

- To develop indepth knowledge in separation techniques
- To know about the metallurgy of d-block elements.
- To provide basic knowledge in stereo chemistry of organic compounds and spectral techniques

Unit I - Separation Techniques (12 Hrs)

Solvent extraction, principles of solvent extraction. Extraction by chemically active solvents, continuous and counter-current extraction, soxhlet extraction. Chromatography-types – adsorption, partition and ion exchange. Theory and techniques of column, paper, thin layer, gas-liquid, high performance liquid chromatography and ion-exchange chromatography.

Unit II- Principles and processes of metallurgy (12 Hrs)

Occurrence – various steps of metallurgy –Ore, mineral – Grinding, Pulverizing, Concentration - Leaching – Calcinations - Roasting, Reduction - Alumino thermic method, Electrolytic reduction method. Bessermerisation, Methods of refining. Occurrence, extraction and metallurgy and uses of Fe, Ti, V, Mo and W.

Unit III - Organic compounds of nitrogen (12 Hrs)

Preparation of nitro alkanes and nitro arenes. Chemical reactions of nitro alkanes. Mechanism of nucleophillic substitution in nitro arenes and their reduction in acidic, neutral and alkaline media, picric acid. Structure and properties of amines. Separation of mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Preparation of alkyl and aryl amines. Chemistry and structure of diazonium salts. Preparation and properties of diazomethane and diazoacetic ester. Amine salts as phase transfer catalysts. Reductive amination of aldehydic and ketonic compounds.

Unit IV - Stereochemistry of organic compounds (12 Hrs)

Concept of isomerism. Types of isomerism-optical isomerism-elements of symmetry, molecular chirality, dissymmetric, asymmetric, chiral and achiral molecules with two stereogenic centres, Enantiomers-

optical activity, properties of enantiomers, diastereomers- properties, threo and erythro diastereomers, meso compounds, Racemization - resolution, Mechanism of racemization. Epimerization. Inversion- retention, Walden inversion, Asymmetric synthesis – with optically reagents, enzymes and circularly polarized light only.

Relative and absolute configuration. Sequence rules-R and S system of nomenclature. Geometrical isomerism, E and Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.

Optical activity due to restricted rotation – allenes, spirans and biphenyl systems.

Unit V -Liquid Fuels **(12 Hrs)**

Characteristics –petroleum-occurrence-composition, classification – distillation of crude petroleum. Flash point – determination – knocking – antiknock compounds – octane number, cetane number. Refining of crude petroleum –cracking – advantages of catalytic cracking over thermal cracking. Gases–chemistry of manufacture of water gas - carburated water gas-semi water gas, producer gas. Production of biogas- gobar gas and application. Oil gas, LPG-advantages and disadvantages of liquid fuels and gaseous fuels.

Reference Books

1. B.K.Sharma, Elements of Analytical Chemistry, Shabanlal and co., New Delhi, 12th Edition, 2000.
2. R.D.Madan, Modern Inorganic Chemistry, Sultan Chand, New Delhi, 3th Edition, 2011.
3. A.G.Sharpe, Inorganic Chemistry, Addision Wesley Publishers, London, 1999.
4. P.L. Soni, Text Book of Organic chemistry, Sultan Chand, New Delhi,12th Edition, 2010.
5. B.S. Bahl and Arun Bahl, Advanced Organic Chemistry, Sultan Chand and company,8th Edition, 2010.
6. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Shoban Lal Nagin Chand and Company, Jalandhar, 27th Edition, 2011.

14CHU11/14BCV15/

14BCU15 PHYSICS - II

(for BSc Chemistry & BSc Biochemistry)

Semester IV /52 Hrs

UNIT – I (11 Hrs)

MODERN PHYSICS: Photoelectric effect – Laws of photoelectric effect – Millikan's experimental verification – Photo emissive, photoconductive and photovoltaic cells – photo multiplier – Uses of photo cells – Production and properties of X-rays – X-ray spectrum – Moseley's law – Periodic table – Compton effect(no derivation)– X-ray diffraction – Bragg's law

UNIT – II (11 Hrs)

LASER PHYSICS: Purity of a spectral line – coherence length and coherence time – spontaneous and induced emission – Einstein's A and B coefficients – population inversion – metastable state – Helium-Neon laser - Uses of laser – Raman effect – Raman shift – Stoke's and Anti-Stoke's lines – Elementary theory of Raman effect – Laser Raman spectrometer – Molecular structure of linear, triatomic molecules.

UNIT – III (10 Hrs)

SPECTROSCOPY: Introduction – Types of spectra – Infra red spectroscopy – Ultra-Vilot spectroscopy-NMR spectroscopy-uses.

ULTRASONICS: Introduction - production method-Properties-Production by Piezo electric generator – application of ultrasonic waves-SONAR-NDT.

UNIT – IV (10 Hrs)

SEMICONDUCTOR DEVICES: Introduction – Types of semiconductors – Zener diode – V-I characteristics – applications – Transistor characteristics (CB and CE Configurations). Basic logic gates- OR, AND, NOT gates – NAND as universal gate – Demorgan's theorem-Half adder and Full adder.

UNIT – V (10 Hrs)

FIBRE OPTICS: Introduction-Principle of optic fibre – Propagation in optical fibres – Acceptance angle – Numerical aperture – structure of optical fibre- fibre optic materials – Sources and detectors – Classification of optical fibres – Applications – Communication-fibre endoscope – wave guide.

BOOKS FOR STUDY:

1. BSc Ancillary Physics – Volume II by N. Jayaprakash.
2. A textbook of waves and oscillations – Ashok.K. Ganguli(for ultrasonic in IIIrd unit).
3. Spectroscopy for Chemical Analysis – Chatwal Anand.
4. A textbook of ancillary physics – volume II by Dr.R.Sabeasan & Dr.A. Dhanalakshmi.
5. Physics I- V.Rajendran and A.Markani,Tata Mc.Graw Hill publishing company Ltd,2004.

14CHU12 Chemistry Practical - II (75 Hours) Semester-III&IV

Objectives

- To develop knowledge in the field of quantitative analysis
- To inculcate knowledge in qualitative organic analysis
- To apply several methods in organic preparations

Unit I Acid base and Redox titrations -I (15 Hrs)

Acid base titrations

Estimation of H_2SO_4 using standard oxalic acid

Estimation of NaOH using standard sodium carbonate

Permanganometry

Estimation of oxalic acid using standard Mohr's salt solution

Estimation of Mohr's salt using standard oxalic acid

Estimation of calcium by direct method

Unit II Redox titrations – II (15 Hrs)

Estimation of ferrous iron using internal indicator

Estimation of ferrous iron using external indicator

Iodometry

Estimation of potassium dichromate

Estimation of copper

Unit III Complexometric titrations (12 Hrs)

Estimation of Zinc, Magnesium and Calcium,

Internal Test I

Unit IV Organic Analysis (21 Hrs)

Preliminary tests- tests for aliphatic/aromatic, saturation/unsaturation, element tests. Tests for functional groups-carboxylic acid, phenol, aldehyde, ketone, carbohydrate, ester, aromatic primary and secondary amines, nitro compound, amide, diamide and anilide. Preparation of derivatives.

Unit V Preparations (12 Hrs)

Preparation of benzoic acid (oxidation),

Preparation of salicyclic acid (hydrolysis),

Preparation of acetanilide (acetylation),

Internal test II

Text Books

1. Practical chemistry, A.O. Thomas, Scientific Book Centre, Cannanore –I, 7th edition 1999.
2. V.Venkateswaran, R.Veeraswamy and A.R.Kulandaivelu, Basic Principles of Practical Chemistry, S Chand and sons, New Delhi, 2011.

14CHU13 Applied Chemistry Practical (50 Hours) Semester-III&IV

Objectives

- To develop knowledge in the field of quantitative analysis
- To inculcate knowledge in qualitative organic analysis
- To apply several methods in organic preparations

Pharmaceutical preparations

Preparation of aspirin

Preparation of paracetamol

Preparation of sulphanilamide

Isolation and Extraction

Isolation of casein from milk

Isolation of ascorbic acid from lemon

Estimations

Volumetry

Estimation of calcium from calcium tablet

Estimation of iron from iron tablet

Estimation of glycine

Estimation of formaldehyde

Estimation of Nickel (**Colorimetry / Spectrophotometry)**

Estimation of Ferric iron **(Colorimetry/ Spectrophotometry)**

Estimation of sodium and potassium **(Flame photometry)**

Estimation of dissolved oxygen(**Volumetry and instrumental analysis**)

Oil analysis

Saponification value of oil

Iodine value of oil.

Acid value of oil

Preparation of utility products

Preparation of Candles

Preparation of Phenoyl

Preparation of Soap powder

Preparation of Agarbathi

Identification of adulterants in food samples

References:

1. V.Venkateswaran, R.Veeraswamy and A.R.Kulandaivelu, Basic Principles of Practical Chemistry, S Chand and sons, New Delhi, 2011.

2. B.K. Sharma, Industrial Chemistry, Goel Publications House, Meerut, 1995.

14CHU14/14BCV16/

14BCU16 **PHYSICS PRACTICAL**

(for BSc (Biochemistry) and BSc (Chemistry))

ANY 16 EXPERIMENTS

Semester III and IV

1. Surface tension and interfacial ST-Drop weight method
2. Young's modulus – Uniform Bending –Pin and Microscope.
3. Young's modulus – cantilever scale and telescope
4. Rigidity modulus – Static Torsion –Scale and Telescope.
5. Torsional pendulum – Moment of inertia and Rigidity modulus.
6. Melde's experiment –Frequency of the tuning fork and Relative Density.
7. Specific heat of liquid by cooling.
8. Spectrometer –id curve
9. Spectrometer – λ by grating – normal incidence method..
10. Spectrometer-Refractive index of liquid-Hollow prism.
11. Radius of curvature of Len's surface- Newton's rings.
12. Thickness of insulations-Air wedge.
13. Potentiometer – Calibration of a low range voltmeter..
14. Potentiometer –Ammeter calibration
15. Field along the axis of a coil – Determination of B_H.
16. Junction diode characteristics.
17. Zener diode characteristics.
18. Verification of OR, AND, NOT, GATES using ICs.
19. Verification of De-Morgan's theorems.

- Subject to the availability of number of classes, equipments etc.,

14CHU15 Organic Chemistry –I (60 Hours) Semester-V

Objectives

- To gain indepth knowledge in natural products chemistry
- To develop knowledge in organic reactions

Unit I Carbohydrate Chemistry (12 Hrs)

Carbohydrates, classification, preparation and properties of glucose and fructose, constitution of glucose and fructose, mutarotation and its mechanism, cyclic structures-pyranose and furanose forms. Configuration of monosaccharides, epimerisation, chain lengthening and chain shortening of aldoses. Inter conversions of aldoses and ketoses. Disaccharides – reactions and structure elucidation of sucrose. Polysaccharides-structure of starch and cellulose. Applications of cellulose.

Unit II Alkaloids , Terpenoids and Vitamins (12 Hrs)

Alkaloids-general methods of structure determination. Structure elucidation, preparation and properties of coniine, piperine and nicotine.

Terpenes – classification-methods of isolation-preparation, properties and structure elucidation of α-pinene, geraniol and menthol.

Vitamins – structural elucidation of pyridoxine, ascorbic acid.

Unit III Tautomerism and Active Methylene Compounds (12 Hrs)

Keto-enol tautomerism, acid and base catalysed interconversion mechanisms, amido-imidol and diazo-amino. Nitro-acinitro, nitroso-oximino tautomerism.

Malonic and acetoacetic esters-characteristic reactions of active methylene group. Synthesis and uses of malonic and acetoacetic ester.

Unit IV Free Radicals and Reactions of Carbonyl Compounds (12 Hrs)

Free radicals-formation, detection and stability-mechanism of allylic bromination –Gomberg-Bachmann reaction - thermal fission of benzoyl peroxide. Carbonyl polarization - reactivity of carbonyl group, mechanism of aldol, benzoin, Claisen, Reformatsky, Wittig, Perkin, Knoevenegal and Cannizzaro reactions.

Unit V Dyes **(12 Hrs)**

Introduction - color and constitution. Classification of dyes-according to the mode of application and classification based on chemical constitution. Azodyes – acidic and basic, triphenylmethane dyes, phthalein dyes and xanthene dyes. Vat dyeing –Indigo and anthraquinone dyes.

Text Book

1. O.P.Agarwal, Vol I and Vol II, Chemistry of Natural Products, Meerut Goel publishing house, 1976.

Reference Books

1. C.K.Ingold, A Guide to Mechanism in Organic Chemistry, Cornell university, New York, 1953.

2. P.S.Kalsi, Stereochemistry Conformation and Mechanism, 4th Edition, Wiley Eastern Ltd, New Delhi,1998.

14CHU16 Inorganic Chemistry I (60 Hours) Semester-V

Objectives

- To develop indepth knowledge in the field of coordination chemistry
- To gain basic knowledge Bioinorganic chemistry

Unit I d- Block and Co-ordination compounds (12 Hrs)

d- Block elements – Elements of first transition series. General characteristics. Metallic character atomic and ionic radii - melting point and boiling point – ionization energies – oxidation state – reducing properties – colour – magnetic properties – tendency to form complexes.

Classification of ligands, nomenclature of coordination compounds. Coordination number and geometry.

Isomerisation- coordination, ionization, hydrate, linkage, ligand, polymerization isomer, geometrical isomerism in coordination number 4 and 6. Optical isomerism in coordination number 4 and Stability of complexes – factors affecting stability of complexes.

Chelate, applications of chelates- detection of complex formation.

Unit II Theories of Co-ordination -I (12 Hrs)

Werner's coordination theory – Sidwick effective atomic number rule. Applications of CFSE. Valence bond theory in octahedral, tetrahedral and square planner complexes. Limitations of VBT. Crystal field theory – splitting of d orbitals in octahedral, tetrahedral and square planer complexes. Factors affecting magnitude of crystal field splitting-spectrochemical series – distribution of d-electrons in t_{2g} and e_g orbitals in octahedral complexes. Crystal field stabilization energy.

Unit III Theories of Co-ordination -II ` (12 Hrs)

Tertragonal distortion in octahedral complexes –Jahn- Teller theorem- application of crystal field theory. Colour of transition metal complexes. Limitations of CFT. Comparison of CFT and VBT. Magnetic properties of transition metal complexes.

Ligand substitution reactions in square planar complexes – trans effect, trans effect series, electrostatic polarization theory and pi bonding theories of trans effect.

Unit IV Bio-inorganic Chemistry (12 Hrs)

Metalloporphyrins – porphyrin ring systems-chlorophyll, cytochromes. Oxygen transport and storage – haemoglobin, myoglobin. Iron-sulphur protein – ferridoxin and rubredoxin – occurrence and functions. Vitamin B_{12} and B_{12} coenzymes. The role of essential and trace elements in biological systems.

Distribution of alkali metals and active transport of Na and K across biomembranes.

Unit V pi -Acceptor complexes (12 Hrs)

Metal carbonyls-classification of structures, nature of bonding, preparation of $Ni(CO)_4$, $Fe(CO)_5$, $Cr(CO)_6$, $Fe_2(CO)_9$, $Fe_3(CO)_{12}$. Preparation and properties, nature of bonding of metallic nitrosyls – sodium nitroprusside, nitroso ferrous sulphate. Cyclopenta-diene complex – ferrocene- preparation, properties and structure.

Text books

1. Malik,Tuli and Madan, Selected topics in inorganic chemistry, S.Chand and Company, New Delhi, 1999.
2. R.D.Madan, Modern Inorganic Chemistry, Sultan Chand, New Delhi, 3th Edition, 1987.

Reference Books

1. F.A.Cotton and G.Willkinson, Advanced inorganic chemistry,2nd Edition, Wiley Eastern ltd, New Delhi, 1970.
2. P.L.Soni, Text Book of Inorganic Chemistry, Sultan Chand and Company, New Delhi, 13th Edition, 1982.
3. J.E.Huheey, E.A.Keiter and R.L.Keiter, Inorganic chemistry-Principles of structure and reactivity, Addision Wesley Publishers, London, 1972.
4. R.D.Madan, Modern Inorganic Chemistry, Sultan Chand, New Delhi, 3th Edition, 1987.

14CHU17 Physical Chemistry –I (60 Hours) Semester-V

Objectives

- To develop a foundation in the field of electrochemistry
- To gain basic knowledge Electroplating

Unit I Electrolytic Conductance I (12 Hrs)

Conductance – classification of conductance . Mechanism of electrolysis – Ohm's law – Faraday's law of electrolysis – conductance- molar conductance. Measurement of conductance – variation of conductance with concentration. Conductance ratio. Applications of conductivity – measurements. Kohlrausch law of independent migration of ions. Ionic mobility- discharge of ions on electrolysis – Hittorf's theoretical device. Transport number – definition- determination- Hittorf's method and moving boundary method.

Unit II Electrolytic Conductance II (12 Hrs)

Equivalent conductance – determination at infinite dilution of weak electrolytes – degree of dissociation – dissociation and association of solutes-factors influencing degree of dissociation - Ostwald dilution law – determination of dissociation constant.

Conductometric titrations – strong acid Vs strong base, strong acid Vs weak base and weak acid Vs strong base. Mixture of strong and weak acids with strong base-precipitation titrations.

Arrhenius theory of electrolytic dissociation – limitations. Factors in favour of Arrhenius theory. Debye-Huckel theory of strong electrolytes-asymmetric effect and electrophoretic effect. Debye-Huckel-Onsagar equation. Debye-Falkenhagen effect and Wein effect.

Unit III Ionic Equilibria (12 Hrs)

Acids and bases – Lowry and Bronsted, Lewis concepts– relative strength and structure – leveling effect- influence of solvent on base strength. Dissociation of weak acid and derivation of dissociation constant. Ionic product of water-pH scale-common ion effect – mixture of weak acid and its salt.

Buffer solutions – relation between pH and buffer and concentration of components of the buffer. Buffer capacity – applications of buffer solutions.

Salt hydrolysis – hydrolysis constant and degree of hydrolysis of salt of weak acid and strong base, salt of weak base and strong acid, salt of weak acid and weak base.

Unit IV Electrolytic Cells and Electromotive Force (12 Hrs)

Reversible electrode and their types. Gas electrodes (Hydrogen, Halogen and Oxygen) – metal–metal ion electrodes (Cu, Zn and Ag) – metal- metal insoluble salt electrodes (Silver-silver chloride electrode and calomel electrode) – redox electrode- quinhydrone electrode. Definition of electrolytic cell and galvanic cell – single electrode potential – standard hydrogen electrode- sign convention of electrode potential – standard electrode potential – effect of electrode concentration and electrode potential. Electrochemical series and its applications.

Electrochemical cells – conventional representations – EMF measurements – reversible and irreversible cells – relationship between ΔG, ΔH, ΔS and ΔE. polarization, over potential and hydrogen over voltage. Concentration cell with and without trasference, liquid junction potential. Applications of EMF measurements – determination of valency of doubtful cases – determination of solubility product of sparingly soluble salt- determination of activity coefficient – determinations of pH – potentiometric titrations (acid-base and redox titrations).

Unit V Electroplating (12 Hrs)

Electroplating – principles of electroplating – electroplating units and its basic components. Preplating steps – throwing power and covering power.

Electro deposition method – co-deposition galvanization of iron – chrome plating. Role of copper coating before Ni and Cr plating. Different kinds of plating – alloy plating, electrolysis plating, ion plating, electroforming. Coating processes-hot dip process, spraying, cladding, concentrating, cementing and electrophoretic methods. Types of coating – organic coating, inorganic coating, metallic coating, anodic coating and cathodic coating. Corrosion – definition- type -, corrosion monitoring techniques - corrosion control.

Text Book

1. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Shoban Lal Nagin Chand and Company, Jalandhar, 27th Edition, 1986.

Reference Books

1. Bahl and Arun Bahl, Essentials of Physical Chemistry, Sultan Chand and company, NewDelhi, 1999.
2. A.S. Nagi and Anand, A Text Book of Physical Chemistry, University of London Press, 1991.
3. Kundu and Jaws, Physical Chemistry
4. Conning, Handbook on Electroplating,19th Edition, WW Norton, New York, 1962.
5. Fredric A. Lowenneim, Modern Electroplating, 2nd Edition, John Willey and Sons, New York, 1974.

14CHU18 Nano and Green Chemistry (60 Hours) Semester-V

Objectives

- To enable the students to know the importance of nano and green chemistry
- To understand the reterosynthetic strategies in the synthesis of organic compounds

UNIT-I

Nanochemistry –I (12 Hrs)

Nanoparticles - characterization of nanomaterials -stability of colloidal solutions. Synthesis of metal nanoparticles – Physical methods – Laser ablation, physical vapour deposition (PVD) (evaporation and sputtering) and solvated metal atom dispersion (SMAD). Chemical methods – thermolysis, sonochemical approach, reduction of metal ions by various methods.

UNIT-II

Nanochemistry-II (12 Hrs)

Nanosized semiconductors-synthesis-precipitation methods, thermal decomposition of complex precursors, method for the fabrication of nanosized metal fluorides, synthesis in inverse or reverse micelles. Ceramics-physical methods of preparation-gas condensation and laser methods. Chemical methods – sol-gel- synthesis. preparation of nitrides and carbides. Properties of nanomaterials – optical, electrical and magnetic properties. Applications.

UNIT-III

Green Chemistry-I (12 Hrs)

Introduction – principles-methods employed to achieve the goals of green chemistry – solvent –free reactions. Thermal reactions – oxidation. Michael addition – Aldol addition – addition and coupling reactions of C_{60} – pericyclic reactions .

Photochemical reactions- Dimerization of cinnamic acid.

UNIT-IV

Green Chemistry II (12 Hrs)

Microwave assisted synthesis-Oxidation-Reduction-Condensation – Heck reaction. Pinacol-Pinacolone –Beckmann Rearrangements. Synthesis of heterocyclic compounds – conversion of oximes, semicarbazones and phenyl hydrazones to carbonyl compounds(Deprotection)

Self assembled monolayer on Gold surface – cleaner technology with supercritical liquids.Catalytic approach to green chemistryApplication of zeolites in green chemistry-Clay materials in green chemistry

Waste water treatment by oxidation technology at ambient condition – photochemical and photocatalytic oxidation – ozone/uv process – Sonophotocatalytic destruction of organic contaminants.

Remediation methods for textile effluents – biocatalytic reaction in green chemistry.

UNIT-V

Retro Synthesis –Goals and its Strategies (12 Hrs)

Organic synthesis –Goals and criteria for good synthesis – Types of synthesis- rational – irrational-total-partial and biological modes of synthesis – reterosynthetic analysis-terminology in reterosynthesis. Types of transforms – Reterosynthetic tree advantages of reterosynthetic analysis. Carbon-carbon bond disconnection, synthesis and synthetic equivalents-functional group interconversion.

Reference Books

1. Kenneth, J.Klabunde, Nanoscale Materials in Chemistry, Wiley inter science, 2001.
2. Furthhop, Penzlin, Organic Synthesis Concepts, Methods and Starting Materials, Varlag Chemie, 1983.
3. R.Sanghi and M.M.Srivcastva, Green Chemistry, Narosa, 2003.
4. M.M.Srivastava and R.Sanghi Chemistry for green environment, Narosa, 2003.
5. S.Delvin, Green Chemistry, IVY publishing House, 2006.
6. C.P.Jrand F.J.Ownes, Introduction to Nano Technology, John Wiley and sons, New Jersey, 2003.
7. H.S.Nalwa, Nanostructured Materials and Nanotechnology, Academic Press, Sandiego, 2000.
8. C.N.R. Rao, et al., "Metal Nano Particles and their Assemblies", Chem. Soc. Rev., 29, 27, 2000.
9. H.Weller, "Colloidal Semiconductor Q-Particles-Chemistry in the transition between solid state and molecules, Angrew. Chem. Int . Ed, 32,41,1993.
10. Stuart Warren, Organic Synthesis, The Disconnection Approach, John Wiley and sons, 1992.

14CHU19A CORE ELECTIVE - I

Polymer Chemistry (50 Hours) Semester-V

Objectives

- To develop basic knowledge in polymers.
- To gain basic knowledge in the preparation characterization and uses of polymers.

Unit I

Classification of Polymerisation Techniques (10 Hrs)

Classification of polymers - natural polymers-synthetic polymers- mechanism of polymerization –step reaction polymerization, chain polymerization, ionic, radical and coordination polymerization- Ziegler – Natta catalysts. Polymerization techniques – emulsion, bulk, suspension polymerization. Trade name of polymers. Polymer pyramid.

Unit II

Molecular Weight Determination of Polymers (10 Hrs)

Molecular weight determination by following methods-number average and weight average methods – osmometry (membrane), osmometry (vapour pressure) viscometry, light scattering method, ultra centrifugation, cryoscopy, ebullioscopy end group analysis. Mark-Howlink relationship.

Unit III

Structure and Properties (10 Hrs)

Structure property relationship. Mechanical properties - thermal stability - glass transition temperature, flame resistance chemical resistance and electrical conductivity. Primary and secondary bond forces in polymers – coherence energy.

Unit IV

Industrial and Natural Polymers (10 Hrs)

Importance of natural polymers – application and structures of starch – cellulose and cellulose derivatives. Important industrial polymers-preparation and application of polyethylene, polypropylene, polyamides, polyvinyl chloride, polymethyl methacrylate, polycarbonates, polyesters, polyurethanes, poly formaldehyde. Bio degradable polymers.

Unit V

Degradation and Kinetics of Polymerization and Stereo Chemistry (10 Hrs)

Degradation – degradation agents – mechanism of degradation – antioxidants – stabilizers – flame retardants – colourants – plasticizers – inhibitors – initiators. Kinetics of polymerization – kinetics of chain polymerization – kinetics of condensation polymerization. Stereo chemistry of polymers- Isotactic, atactic, syndiotactic polymers polyethylene, polypropylene – ring opening polymerization. Polymer pyramid and bio degradable plastics.

Text Books

1. F.W.Billmeyer, Text Book of Polymer Science, 3rd Edition, John Willey and Sons, New York, 1962.
2. V.R.Gowarikar, Polymer Science, University of London press, 2012.

Reference Book

1. A.Tager, Physical Chemistry of Polymers, MIR publications 1972.
2. R.H.Seymour and C.E.Charaher, Polymer Chemistry, 6th Edition, Marcel Dekker Inc., 2003.

14CHU19B **CORE ELECTIVE - I**

Dye Chemistry (50 Hours) **Semester-V**

Objectives

- To develop basic knowledge in dyes.
- To gain basic knowledge in the preparation characterization and uses of dyes.

Unit I **(10 Hrs)**

Electromagnetic spectrum: Various regions. Relationship of colour observed to wavelength of light absorbed. Complementary colours. Terms used in dye chemistry – Chromophores, Auxochrome, Bathochromic shift, Hypsochromic shift, hypochromic shift and hyperchromic shift.

Theories of colour and constitution: Witt's theory, Quinonoid theory and molecular orbital theory of various transitions.

Requisites of a true dye.: Classification of dyes according to their chemical constitution and classification according to their applications.

Unit II **(10 Hrs)**

Nitro dyes: Picric acid, Martius yellow , Napthal Yellow S – synthesis and applications.

Nitroso dyes: Fast green O, Napthol green Y – synthesis and applications

Azo dyes : Diaziotisation, effects of substiuents on diazotization, Methods of diazotization, Mechanism of diazotization. Diazo coupling and coupling with phenols and amines. Clasification of azo dyes as mono azo and bisazo dyes.

Synthesis and applications of important azo dyes: methyl Orange, Orange I, Orange II, Metanil yellow, eriochrome Black – T, Bismark brown and Congo red.

Unit III **(10 Hrs)**

Diphenyl Methane dyes: Auramine O and Auramine G- synthesis and uses.

Triphenyl methane dyes: Malachite green , Rosaniline, Para rosaniline, Crystal violet and aurine synthesis and uses.

Pthalien and Xanthene dyes: Phenolphthalein, Fluorescein, Eosin, Erythrosin and Rhodamine B – synthesis and uses.

Indigoid dyes: Indigotin – synthesis and application to fibre. Indigosol O – synthesis

Unit IV **(10 Hrs)**

Anthraquinone dyes.: Anthraquinone acid dyes – alizarin cyanine green and Solway ultra blue B, Mordant dyes – alizarin and alizarin Blue, Vat dyes – CI vat blue 43 and Carbazole and Disperse dyes – Disperse Red 15.

Organic Pigments: Characteristics of pigments, uses of pigments. Types of Pigments – Lakes, Toners. Ionic and non – ionic pigments. Pthalocyanines.

Fluorescent brightening agents. Classification and properties.

Unit V **(10 Hrs)**

Types of Textile fibres: Natural , semisynthetic and synthetic fibres – Cotton Wool, silk, Cellulose acetate, Viscose rayon, Polyamides, polyacrylonitrile, Polyester and polyolefin fibres.

Forces of dye- Fibres attachment: Ionic forces, H-Bonds, Van der Waals forces, Covalent bonds.

Selection of dyes for different fibre, fastness properties of dyes.

Process of dyeing : A simple treatment, Various methods of dyeing – Direct dyeing Mordant dyeing , Vat dyeing Disperse dyeing . Formation of dye on the fibre. Pollution problems in dyeing industry.

Non – textile uses of dyes: Uses of dyes in leather, paper, foods and drugs, colour photography and indicators.

Reference books

1. A text book of synthetic dyes – O.D Tyagi, Ist Edition 1990, Reprint 2001, Anmol publications Pvt. Ltd.
2. An introduction to synthetic Drugs and dyes – R.S. Rao, Dr. Vidhya Chawathe and S. J. Shah, 3rd Edition – 1997, Himalaya publishing House.
3. The Chemistry of synthetic dyes and Pigments – H.A. Lubs, Ist Edition – 1955, reprint 1977, Robert E. Krieger publishing company. House.
4. Advanced organic chemistry – B.S. Bahl and Arun Bahl, 3rd Edition -1989, S. Chand and Company
5. A Text book of synthetic dyes – M. G. Arora, 1st Edition-1996, Anmol publications Pvt Ltd.

14CHU21 Analytical Chemistry and Instrumental Methods of Analysis (60 Hours) Semester-VI

Objectives

- To develop a foundation in statistical analysis
- To gain basic knowedge in colorimetry
- To provide indepth knowledgte in the basics of spectroscopy
- To create awareness in the application part of thermal and electrochemical analysis

Unit I

Statistical analysis of analytical data (12 Hrs)

Precision and accuracy. Errors – classification and elementary treatment of errors – minimization of errors – rejection of data. Determination of the accuracy of methods in quantitative analysis- the significant figures and reporting the data – presentation of tabulated data and its advantages – Scatter diagrams and the methods of least squares – Correlation coefficient.

Thermo Analytical Methods

Introduction – principles of TGA and DTA - methods of obtaining thermograms – outline of instrumentation – block diagram only – precautions with regard to TGA – applications of TGA (with special reference to calcium oxalate mono hydrate)- application of DTA (with special reference to calcium acetate monohydrate) – thermometric titrations (principle, condition and advantages). Thermometric titrations of HCl Vs NaOH.

Unit II

IR and Raman Spectroscopy (12 Hrs)

Electromagnetic spectrum- introduction. IR Spectroscopy – principle- Vibrational spectrum-energy levels of simple harmonic oscillator, selection rules. Pure vibrational spectrum-determination of force constant. Relation between force constant and bond energy - basic instrumentation with block diagram (with special reference to double beam instrument). Fingerprint region- Applications (with special reference to structure determination, nature of metal-ligand bonding in carbonyl complexes, identification of hydrogen bonding).

Raman spectrum-concept of polarizability –stoke and antistoke lines - rule of mutual exclusion. Techniques and instrumentation. Comparison of Raman and IR.

Unit III

Colorimetric Analysis, UV-Visible Spectroscopy (12 Hrs)

Colorimetric analysis – laws of colorimetric analysis (Beer's law, Lambert's law, Beer-Lambert's law). Limitations of Beer –Lambert's law. Methods of colour measurements (standard series method, colorimetric titration, Duboseq colorimeter method.

UV- Spectroscopy- principle, types of electronic transitions, Frank–Condon principle, chromophore, auxochrome, bathochromic, hypsochromic, hyperchromic and hypochromic shift. Instrumentation with block diagram., Calculation of λ_{max} of simple molecules (Dienes). Applications (Quantitative, qualitative analysis, photometric titrations, kinetic studies, study of complex ions).

Unit IV

NMR and ESR Spectroscopy (12 Hrs)

NMR phenomenon- principle of NMR spectroscopy – chemical shift and its measurement — factors influencing chemical shift (local diamagnetic shielding and diamagnetic anisotrophic shielding by neighbouring groups) solvents used in NMR spectroscopy. Basic instrumentation with block diagram. Applications of NMR spectroscopy- (structural determination and kinetic studies).

ESR spectroscopy – introduction-Types of substance with unpaired electrons – basic principle of ESR – significance of 'g' factor – basic instrumentation with block diagram-hyperfine splitting. Applications of ESR (study of free radicals, structural determination of methyl radical, study of inorganic compounds).

Unit V

Electro Analytical Chemistry-Polarography (12 Hrs)

Introduction – polarography and polarogram. Basic principles – residual current – diffusion current, migration current, "supporting electrolytes" – polarographic waves – half wave potential. Instrumentation – indicator electrode or micro electrode. Dropping mercury electrode- advantages. Factors affecting current –voltage curves in poloragraphic studies – residual current, migration current, diffusion current and kinetic current and also definition of the above given terms. Ilkovic equation. Analytical applications of polarography. Organic polarography and pulse polarography.

Text Books

1. R. Gopalan, P.S. Subramanian and K. Rangarajan, Elements of Analytical Chemistry.
2. D.A. Skoog and D.M West, Principles of Instrumental Analysis, 3rd Edition, D.Van Nostrand Company. Inc, Princeton, New Jercy, 1958.
3. J. Bassette et al, Vogel's Text book of Quantitative Inorganic Analysis, 5th Edition, Longman Scientific and Technical Longman Gp, UK Ltd. 1989.
4. R.C. Kapoor and B.S.Agarwal, Principles of Polarography, Willey Eastern Hall, New Delhi, 1991.

Reference Books

1. D.A. Skoog and D.M. West, F.J.Holler and S.R. Grouch, Analytical Chemistry, 6th Edition, Sounders College Publishing, 1994. – an Introduction.
2. H.Willard, L.I. Merrit and I.J.A. Dean and F.A. Settle, Instrumental Methods of Analysis, 3rd Edition, D.Van Nostrand Company, New Jercy, 1958.
3. Chatwal Anand, Instrumental Methods of Analysis, 4th Edition, Bombay Himalaya Publishinh house, 1988.

14CHU22 Organic Chemistry II (60 Hours) Semester-VI

Objectives

- To provide indepth knowledge in mechanism of chemical reactions
- To develop a knowledge in heterocyclic chemistry
- To gain basic knowledge in biomolecules

Unit I

Heterocyclic Compounds and Organic Reagents (12 Hrs)

Aromaticity of heterocyclic compounds – preparation, properties of furan, thiophen, pyrrole, pyridine, indole, quinoline and isoquinoline.

Synthetic uses of organic reagents – NBS, OsO_4, SeO_2, periodic acid and lead tetraacetate.

Unit II

Amino Acids and Proteins (12 Hrs)

Amino acids- classification, essential and non-essential amino acids, preparation of amino acids, properties, peptide synthesis – end group analysis. Proteins – classification- primary and secondary structure of proteins. Denaturation of proteins. Nucleic acids – DNA and RNA (elementary analysis).

Unit III

Molecular Rearrangements and Reduction Reaction (12 Hrs)

Classification and mechanism – Pinacol – pinacolone, Beckmann, Benzidine Hoffman, Curtius, Benzilic acid, Claisen, Cope, Fries, Lossen,

Mechanism of reduction - MPV reduction, Wolf Kishnner reduction. Mechanism of oxidation – Oppenauer oxidation.

Unit IV

Substitution and Elimination (12 Hrs)

Aliphatic nucleophillic substitution – mechanisms of SN^1 and SN^2 reactions- Stereo chemistry - effect of solvent, leaving group, nucleophiles, structure of substrates. Elimination reactions – Hoffman and Saytzeff's eliminations. Mechanisms of E^1 and E^2 eliminations.

Aromatic nucleophillic substitution – benzyne mechanism – effect of substituents on reactivity.

Unit V

Cycloalkanes and Conformational Analysis (12 Hrs)

Cycloalkanes–preparation and properties–Baeyer strain theory and theory of strainless rings, orbital picture of angle strain Coulson and Moffit's concept. Cis- trans isomerism in substituted cycloalkanes.

Conformational analysis of ethane and n- butane cyclohexane. Axial – equatorial interconversion - conformations of mono and disubstituted cycloalkanes.

Text Books

1. B.S. Bahl and Arun Bahl, Advanced Organic Chemistry, Sultan Chand and company,8th Edition, 1983.
2. P.L. Soni and S.M. Chawla, Text Book of Organic Chemistry, Sultan Chand and company, 12th Edition, 1987.
3. S.M. Mukherjee, S.P. Singh, Reaction mechanism in Organic Chemistry, Macmillan, 3rd edition, 1999.
4. R.T. Morrison and R.W. Boyd, Organic Chemistry, 6th Edition, Prentice –Hall of India, New Delhi, 1992.
5. P.S.Kalsi, Stereochemistry of Organic Compounds, 4th Edition, Willey Eastern Limited, New Delhi, 1998.

Reference Books

1. I.L Finar, Organic Chemistry, Vol 1 and 2, Addision – Wesley Publishing, London, 1968.
2. P.H. Pine, Organic Chemistry, 5th Edition, Mc Graw Hill, New York, 2006..

14CHU23 Inorganic Chemistry II (60 Hours) Semester-VI

Objectives

- To enhance knowledge in the field of compounds of d- block elements
- To develop a fundamental knowledge f- block elements
- To gain knowledge in nuclear chemistry

Unit I f-Block elements – Lanthanindes (12 Hrs)

Classification of f-block elements- Lanthanides – position of lanthanides in periodic table – general characteristics of lanthanides – occurrence, electronic configuration, oxidation states - lanthanide contraction - causes and consequences -magnetic properties -formation of complexes. Extraction of lanthanides from Monozite sand. Separation of lanthanide elements. Uses of lanthanides and their compounds.

Unit II f- Block elements - Actinides (12 Hrs)

Position of Actinides in periodic table – general characteristics of Actinides – occurrence, electronic configuration, Oxidation states, actinide contraction, causes, colours of cations, formation of complexes, properties of actinides – comparison between lanthanides and actinides.Extraction properties and uses of uranium and thorium. Preparation of transuranic elements

Unit III Nuclear Chemistry (12 Hrs)

Radio activity – types – general properties (alpha, beta and gamma rays) Applications of radioactive radiation. Detection and measurements of radioactivity – Electroscope method, Wilson's cloud chamber method, Geiger Muller Counter method,

Radio active disintegration, Law's of radioactive disintegration – Radio active constant – Half life period, average life period. Theory of radioactive disintegration – group displacement law. Radio active series, Contributions of radio activity.

Unit IV Nuclear Chemistry (12 Hrs)

Representation of isotopes – structure – Isotopes of Hydrogen, Deuterium, Neon, Chlorine. Atomic mass of isotopes. Identification of isotopes – Aston's mass spectrographic – Dempster's mass spectrograph. Separation of Isotopes – gaseous diffusion method. Thermal diffusion method - Electro magnetic method. Structure of Isobars and isotones.

Unit V **(12 Hrs)**

Carbides – Classification – preparation, properties and uses of ionic, covalent and interstitial carbides. Hydrides-Classification - preparation, properties, uses and structure of $LIAlH_4$ and $NaBH_4$. Nitrides – Preparation – properties, uses of Ionic nitrides, covalent nitrides and interstitial nitrides. Non-aqueous solvents- types of solvents, reactions in non-aqueous solvents with reference to liquid ammonia.

Text Book

1. R.D. Madan, Modern inorganic Chemistry,2nd Edition, S.Chand and Company Ltd., 2002.

Reference Books

1. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Vallabh Publications, New Delhi.

14CHU24 Physical Chemistry II (60 Hours) Semester-VI

Objectives

- To develop a fundamental knowledge in kinetics
- To gain basic knowledge in photochemistry and phase rule

Unit I

Chemical Kinetics I (12 Hrs)

Rate of a reaction – Definition and unit for rate of a reaction. Rate constant - Definition, Unit for rate constant. Expressing rate of a reaction. Specific reaction rate – Definition - Factors influencing rate of a reaction. Temperature coefficient of a reaction.

Order and molecularity - definition, difference. Definition, Derivation of rate constant, Graphs, Units, Characteristics, Half life period and examples for zero, first, second and third order reaction. Pseudo unimolecular reactions - definition and examples.

Unit II

Chemical Kinetics II (12 Hrs)

Study of kinetic parameters using volumetry, polarimetry, conductometry and potentiometry. Typical examples for each technique.

Methods of determining order of a reaction, use of differential method, integral rate equation method, half life method, Graphical method & Ostwald's isolation method. Kinetics of H_2-Br_2 chain reactions. Characteristics of chain reactions.

Complex reactions - consecutive reactions, parallel reactions, reversible reactions and chain reactions – definitions and examples.

Unit III

Theories of Reaction Rates and Photochemistry (12 Hrs)

Activation energy, threshold energy, Arrhenius equation, effect of temperature on the rate of a reaction. Arrhenius parameters and its measurements. Collision theory of bimolecular reactions- derivation of rate constant of a bimolecular reaction. Failure of the theory. Theory of absolute reaction rate (ARRT). Derivation of rate constant for a bimolecular reaction from it.

Photochemistry- laws of photochemistry- Primary and secondary reactions. Quantum yield-definition-determination-classification of reactions based on quantum yield. Dark and

photochemical reactions-Kinetics of H_2-Br_2 photochemical reactions. Photophysical phenomena-Fluorescence, phosphorescence, luminescence, chemi- luminescence and thermo luminescence.

Unit IV

Dipole Moment and Magnetic Properties (12 Hrs)

Dipole moment-definition-determination-Clausius-Mosotti equation & Debye equation. Few applications of dipole moment.

Diamagnetism and paramagnetism, ferromagnetism, antiferromagnetism. Magnetic substances-definition, example and difference. Magnetic properties-magnetic permeability, magnetic susceptibility magnetic moment, magnetogyric ratio. Measurement of magnetic susceptibility-Guoy's method. Applications of magnetic susceptibility.

Unit V

Phase Rule (12 Hrs)

Definitions of phase, components, degrees of freedom. Derivation of Gibbs phase rule equation.

Phase diagram of one component system-water, carbondioxide and sulphur systems.

Two component system-types of two component systems-solid-liquid equilibria. Simple eutectic system-Thermal analysis-cooling curves-Pb-Ag system.

Two component system with compound formation. Compounds with congruent and incongruent melting points, example $FeCl_3$ system alone.

Reference Books

1. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Shoban Lal Nagin Chand and Company, Jalandhar, 27th Edition, 1986.
2. P.W.Atkins, The Elements of Physical Chemistry, 3rd Edition, Oxford university press, New Delhi, 2003.
3. Kundu and Jain, Physical Chemistry.
4. Essentials of Physical Chemistry, Bahl and Arun Bahl, Sultan Chand and Company, New Delhi, 1999.

14CHU25A **CORE ELECTIVE - II**

Pharmaceutical Chemistry (50 Hours) **Semester-VI**

Unit I Drugs for Common Diseases **(10 Hrs)**

Drug, Pharmacology, pharmacy, therapeutics, toxicology, chemotherapy. Routes of drug administration, a diagnostic test done method of estimation of sugar, protein and cholesterol in serum or urine. Food poisoning – causes and symptoms, botulism, mushroom and plant poisoning first – aid. Causes symptom and drugs used in treatment of anemia, diabetes, tuberculosis, asthma, jaundice, piles, leprosy, epilepsy, typhoid. Malaria, cholera and filaria.

Unit II Analgesics and Antibiotics **(10 Hrs)**

Definition, antipyretic Analgesics – paracetamol, phenacetain, analgin, ibuprofen, morphine, pethidine, methadone.

Antibiotics – definition, structure, uses of chloramphenicol, penicillin, streptomycin, tetracycline, cephalosporin, nystatin, griseofulvin, sulphonamide- mode of action, uses of sulphanilamide, sulphathiazole, sulphadiazine, sulphapyridine.

Unit III Antiseptic and Disinfectants **(10 Hrs)**

Phenolic compound, dyes, catonic surfanctants and chloro compound.

Tranquilizer – definition and examples. Sedative – barbiturates – bensodiazepins. Anesthetics – local intravenous and anti neoplastic drugs. Recent developments in modern cancer chemotherapy.

Unit IV Inorganic medicines and Pharmaceutical Aids **(10 Hrs)**

Medicinally important compounds of Al, P, As, Hg and Fe. Uses of milk of magnesia, $MgSO_4.7H_2O$, Al hydroxide gel, dihydroxyaluminium aminoacetate, ferrous gluconate, $FeSO_4$, ferrous fumarate.

Organic Pharmaceutical aids- definition, agents for kidney function (aminohippuric acid) liver function (sulphobrophthalein sodium). AIDS- cause HIV propagation, prevention and treatment.

Unit V Cardio Vascular drugs **(10 Hrs)**

Blood composition – grouping Rh factor buffers in blood, functions of plasma protein – clotting mechanism – blood pressure, coagulant and anti coagulants, examples,

cardiovascular drugs – classification, cardiac glycocoids, antihypertensive and hypotensive agent, anti-rhythemic agents.

Text Books

1. Bentley's Text book of Pharmaceutics, edited by E.A.Robius.
2. A text book of pharmaceutical Chemistry by Jayashree.
3. An Introduction to synthetic drugs by P.P. Singh and D. W. Rangnekar.

Reference Books

1. Medicinal Chemistry by A. Burger
2. A Text book of Organic medicinal, pharmaceutical chemistry by O. Wilson, O. Giswold and F. Gearge.
3. Bently and Driven T. B. of Pharmaceutical chemistry, revised by Arthenden
4. Pharmaceutical Chemistry by S. Lakshmi
5. Introduction to medicinal chemistry by A. Gringuage
6. An Introduction to drug design by S. S. Pandeya and I. R. Dimmock.

14CHU25B CORE ELECTIVE - II

Textile Chemistry (50 Hours) Semester-VI

Unit I (10 Hrs)

Fundamentals of Textile chemistry:

General definition of a textile fibre & a textile filament – yarn count – classification of fibres – natural regenerated & synthetic – basic structural formula of cotton, silk, wool, rayon, acetates, nylon, polyester, PAN, PET non acrylic fibres- degree of polymerization & its significance.

Fibre properties – crystallinity, tensile strength, tear strength, abrasion resistance, lusture & thermal properties.

Unit II (10 Hrs)

Textile Processing ; General sequence of processing by melt, dry & wet spinning or Textile fibres. Textile chemical processing: i. Sizing –desizing ii, Singeing iii, Scouring iv, Bleaching v. Mercerization (Principles, chemicals used, & Conditions of operations)

Unit III Color & constitution (10 Hrs)

Color & constitution : Dye molecule – chromophores – auxochromes – classification of dyes – Principles of textile materials dyeing; operation conditions, machinery & modern developments of acidic basic dyes, azoic dyes disperse dyes, direct dyes, sulfur dyes, mordant , vat & other natural dyes. Different fastness properties to washing, rubbing, light, perspiration & sublimation.

Unit IV Principles of Textile printing (10 Hrs)

Principles of Textile printing : conditions, machinery & modern developments involved in styles of printing, pigment printing, block printing, screen printing, roller printing & rotary printing methods. Textile finishes: mechanical & functional finishes & their importance – resin finishes soft, stiff, water repellant, soil repellant & flame retardants.

Unit V Textile treatment Processing (10 Hrs)

Textile treatment Processing: Physical & chemical properties of water for textile processing, requirement & estimation of the quality of water for textile processing – water softening –by chemical additions, ion exchange resins, demineralization. Importance of steam in textile dyeing processes – various types of boilers used in textile industries – nature of textile dye house effluents & their treatments.

Government specifications & Pollution Control on Textile industries

Text Books

1. Bernard T, Corbmen, Mc grow Hill, Textile fibre to fabric.
2. V.A. Shenai series, Textile Chemistry, Sevak Publications, Mumbai, 1999.
3. W.S.Murphy, Textile finishing, Abhishek Publication, Chandigarh, 2007.

14CHU26 Chemistry Practical III (150 hrs) Semester-V &VI

Objective

- To know about the basic experiments in physical chemistry
- To develop knowledge in the field of quantitative analysis
- To apply basic electrochemical experiments

Unit I

Determination of Physical Constants (09 Hrs)

Melting point determination – acetanilide, benzamide, benzoic acid, urea. Determination of boiling point- chlorobenzene, cyclohexane, MEK(methyl ethyl ketone), and toluene.

Unit II

Gravimetric Experiments (45 Hrs)

Estimation of lead as lead chromate.

Estimation of nickel as Ni-DMG.

Estimation of copper as cuprous thiocyante.

Estimation of barium as barium chromate.

Estimation of calcium as calcium oxalate.

Barium as barium sulphate (demonstration purpose only).

Calcium as calcium carbonate (demonstration purpose only).

Internal Test –I (3 Hrs)

Unit IV

Physical Chemistry Experiments I (36 Hrs)

Determination of CST of phenol-water system

Determination of effect of electrolyte on CST of phenol-water system

Determination of unknown concentration of electrolyte.

Determination of k_f and by molecular weight Rast method

Determination of rate constant of hydrolysis of an ester (methyl acetate).

Determination of T.T. of salt hydrate.

Phase diagram of naphthalene-biphenyl system.

Determination of distribution coefficient of iodine between CCl_4 and water

Flame photometry (demontration experiment)

Unit V

Physical Chemistry Experiments II **(39 Hrs)**

Determination of cell constant.

Determination of equivalent conductivity of strong electrolytes

Determination of equivalent conductivity of weak electrolytes

Conductometric titration-strong acid vs strong base

Determination of the P^H of the solution

Potentiometric titration-strong acid vs strong base

Internal Test –II **(3 Hrs)**

Text books

Practical chemistry, A.O. Thomas, Scientific Book Centre, Cannanore –I, 7th edition 1999.

Basic Principles of Practical Chemistry, V.Venkateswaran, R.Veeraswamy and A.R.Kulandaivelu, S Chand and sons, New Delhi, 1993.