ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN, PALANI

(AUTONOMOUS)

RE-ACCREDITED WITH B^{++} GRADE BY NAAC

(Affiliated to Mother Teresa Women's University, Kodaikanal)

DEPARTMENT OF CHEMISTRY

CURRICULUM FRAMEWORK AND SYLLABUS FOR OUTCOME BASED EDUCATION

IN

B.Sc., (CHEMISTRY)

&

EXTRA-CREDIT COURSES

UNDER

CHOICE BASED CREDIT SYSTEM

2019-2022

Preamble:

The Department of Chemistry is one of the earliest to be established by Arulmigu Palaniandavar Arts College for Women. The Department has carefully and thoughtfully planned its course content in order to offer students the best possible curricular experience and to offer upright, sensitive and intelligent citizens to society. Every subsequent curriculum revision has been premised on the assumption that society requires students who will serve as its mind, heart and future. Further, one of the major objectives of every curriculum designed by the Department has been the employability of the students upon their successful completion of the programme.

Bloom's Taxonomy in fixing the Learning Objectives:

Since the Academic year 2019 – 2020, the curriculum of B.Sc., (Chemistry) has been designed and the learning objectives and outcomes of the programmes are set, following the Bloom's Taxonomy Cognitive Domain. Accordingly, it is broken into six levels of learning objectives of each course. They are -

K1 / Knowledge = Remember

K2 / Comprehension = Understand

K3 / Application = Apply

K4 / Analysis = Analyze

K5 / Evaluation = Evaluate

K6 / Synthesis = Create

Bloom's Taxonomy Action Verbs:

K1 / Knowledge: Arrange, Define, Describe, Duplicate, Identify, Label, List, Match, Memorize, Name, Order, Outline, Recognize, Relate, Recall, Repeat, Reproduce, Select, State

K2 / Comprehension: Classify, Convert, Defend, Describe, Discuss, Distinguish, Estimate, Explain, Express, Extend, Generalize, Give example(s), Identify, Indicate, Infer, Locate, Paraphrase, Predict, Recognize, Rewrite, Review, Select, Summarize, Translate

K3 / Application: Apply, Change, Choose, Compute, Demonstrate, Discover, Dramatize, Employ, Illustrate, Interpret, Manipulate, Modify, Operate, Practice, Predict,
Prepare, Produce, Relate, Schedule, Show, Sketch, Solve, Use, Write

K4 / Analysis: Analyze, Appraise, Breakdown, Calculate, Categorize, Compare, Contrast,

Criticize, Diagram, Differentiate, Discriminate, Distinguish, Examine, Experiment, Identify, Illustrate, Infer, Model, Outline, Point out, Question, Relate, Select, Separate, Subdivide, Test

K5 / Evaluation: Appraise, Argue, Assess, Attach, Choose, Compare, Conclude, Contrast, Defend, Describe, Discriminate, Estimate, Evaluate, Explain, Judge, Justify, Interpret, Relate, Predict, Rate, Select, Summarize, Support, Value

K6 / Synthesis: Arrange, Assemble, Categorize, Collect, Combine, Comply, Compose, Construct, Create, Design, Develop, Devise, Explain, Formulate, Generate, Plan, Prepare, Rearrange, Reconstruct, Relate, Reorganize, Revise, Rewrite, Set up, Summarize, Synthesize, Tell, Write

Mapping COs with POs:

For the B.Sc., (Chemistry) programme, the Educational objectives and the Specific objectives are specified. The programme outcomes are designed according to the curriculum, teaching, learning and evaluation process. For each course, the definite outcomes are set, giving challenge to the cognitive domain. The course outcomes are mapped with the programme outcomes. The performance of the stakeholders is assessed and the attainment rate is fixed, by using the measurements ‘high’, ‘medium’ and ‘low’. The restructuring of the curriculum is done based on the rate of attainment.

Institutional Objectives:

- Women Education
- Women Empowerment
- Self-reliance and
- Making Model Citizens.

Programme Educational Objectives:

- PEO1: To provide the students with the basic foundation in Chemistry, the scientific method (especially the interplay of theory and experiment) and to motivate scientific enthusiasm and curiosity and the joy of learning.
- PEO2: To develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools.
- PEO3: To provide students with the tools needed to analyze problems, apply mathematical formalism and experimentation, and synthesize ideas.
- PEO4: To provide the students with employment and technical skills necessary for successful careers in Chemistry and related fields.

- PEO5: To expertise the students in scientific or technical quantitative reasoning abilities.

Programme Specific Objectives:

- Students will demonstrate an understanding of concepts of Chemistry
- Students will understand the interplay between theory and experiment
- Students will exhibit curiosity and enthusiasm for learning science
- Students will demonstrate an ability to analyze problems
- Student will successfully carry out experiments to arrive at scientific results
- Students will successfully apply computing tools to problems
- Students will communicate well orally and in writing in scientific context
- Students will be able to use laboratory devices in scientific applications.

Programme Outcomes:

On completion of the B.Sc., (Chemistry) programme, certain outcomes are expected.

- **PO1:** Students will demonstrate an understanding of core knowledge in Chemistry.
- **PO2:** Students will show that they have learned laboratory skills, enabling them to do experiments in laboratory.
- PO3: Students will demonstrate written and oral communication skills in communicating Chemistry-related topics.
- PO4: Students will pursue their higher studies and undertake research work.
- PO5: Students will take up future academic carrier and establish themselves in global scenario.

Mapping PEOs with IOs:

Programme Educational Objectives	Institutional Objectives			
B.Sc., (Chemistry)	**1**	**2**	**3**	**4**
PEO1: To provide the students with the basic foundation in Chemistry, the scientific method (especially the interplay of theory and experiment) and to motivate scientific enthusiasm and curiosity and the joy of learning.	*			
PEO2: To develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools.		*		
PEO3: To provide students with the tools needed to analyze problems, apply mathematical formalism and experimentation, and synthesize ideas.			*	
PEO4: To provide the students with employment and technical				

skills necessary for successful careers in Chemistry and related fields.				*
PEO5: To expertise the students in scientific or technical quantitative reasoning abilities.				*

COMMON ACADEMIC STRUCTURE

B.Sc., (Chemistry) / 2019 - 2022

Title of the Course	Hours		Marks			Credits
	Theory	Practical	CIE	CE	Total	
SEMESTER – I						
Part-I Tamil-I	6		25	75	100	3
Part-II English-I	6		25	75	100	3
Part-III: Core – I: General Chemistry – I	4		25	75	100	4
Core II: Organic Chemistry- I	4		25	75	100	4
Core Practical – I: Semi Micro Qualitative Analysis		2				
Ancillary – I: Mathematics Paper I / Zoology	5		25	75	100	5
Part-IV: SBC – I: Paper & Pulp Technology	2		25	75	100	2
Part – V: VBE: Yoga & Meditation (Theory &Practical)	1		25	75	100	2
Total	**28**	**2**			**700**	**23**
SEMESTER – II						
Part-I Tamil	6		25	75	100	3
Part-II English	6		25	75	100	3
Part-III: Core III: General Chemistry – II	8		25	75	100	4
Core Practical-I: Semi Micro Qualitative Analysis		3	40	60	100	4
Ancillary – II: Mathematics Paper II/ Zoology	5		25	75	100	5
Part-IV SBC: Dairy Chemistry (Field Trip)	2		25	75	100	2
Total	**27**	**3**			**600**	**21**
SEMESTER – III						
Part I-Tamil	6		25	75	100	3
Part II-English	6		25	75	100	3
Part – III: Core IV- Physical Chemistry - I	4		25	75	100	4
Core V – Organic, Inorganic & Analytical Chemistry	4					4

Core Practical – II: Volumetric and Organic Compound Analysis		2				
Ancillary – I: Physics: Theory Paper I(T-2;P-2)	4		25	75	100	3
Part-IV: SBC: Textile Chemistry (Field Trip)	2		25	75	100	2
Part-IV: NME – I: Modern Cosmetics	2		25	75	100	2
Total	**25**	**5**			**600**	**21**
SEMESTER – IV						
Part-I-Tamil	6		25	75	100	3
Part-II-English	6		25	75	100	3
Part-III: Core-VI: Inorganic Chemistry - I	8		25	75	100	5
Core Practical-II: Volumetric and Organic Compound Analysis		3	40	60	100	5
Ancillary – II: Physics: Theory Paper II	3		25	75	100	3
Ancillary Practical		2	40	60	100	4
Part-IV: SBC: Forensic Chemistry	2		25	75	100	2
PART V: Extension Activities					100	1
Total	**25**	**5**			**900**	**26**
SEMESTER – V						
Part – III: Core –VII: Organic Chemistry – II	6		25	75	100	5
Core – VIII: Inorganic Chemistry – II	6		25	75	100	4
Core Practical – III: Gravimetric Analysis & Organic Compound Preparations		3				
Core Practical – IV: Physical Chemistry Practicals		3				
Major Elective: I: Analytical Chemistry & Elements of Organic Spectroscopy (or) Polymer Chemistry	5		25	75	100	4
Major Elective: II: Pharmaceutical Chemistry or Nanotechnology and Green Chemistry	5		25	75	100	4
Part-IV: SBC: Leather Technology	2		25	75	100	2
Total	**22**	**8**			**500**	**19**
SEMESTER – VI						
Part-III: Core – IX: Organic Chemistry – III	6		25	75	100	5
Core – X: Physical Chemistry – II	6		25	75	100	5

Core Practical – III: Gravimetric Analysis & Organic Compound Preparations		3	40	60	100	5
Core Practical – IV: Physical Chemistry Practical		3	40	60	100	5
Major Elective: III: Industrial Chemistry (or)Applied Chemistry	6		25	75	100	4
Part – IV: SBC: Project		2	75	25	100	2
Part-IV: NME – II: Chemistry for all Competitive Examinations	2		25	75	100	2
Part – V: Environmental Studies	2		25	75	100	2
Total	**22**	**8**			**800**	**30**

Total Credits - 140

EXTRA-CREDIT COURSES

S.No	Title of the Course	Internal Marks	Credits
1	Course- I: Food Chemistry	100	2
2	Course -II: Chemistry in Day-to-day Life	100	2
3	Course - III: Forensic Science and Crime Investigation	100	2

SEMESTER – I

CORE PAPER -I - GENERAL CHEMISTRY-1

Hours: 4 **Credits: 5** **Max Marks: 75 (Ext); 25 (Int)**

Course Outcomes:

- To understand the Periodic table and Periodic properties
- To gain insight into valence bond theory, molecular orbital theory and the concept of hybridization
- To describe different types of catalysis and their kinetic study focus with special Focus on enzyme catalysis
- To explain the rate of chemical reaction
- To Explain the theory of electrolytic conductors

COURSE CONTENT

Unit – I: Atomic Structure and Periodicity

Atomic orbital-Quantum numbers –Principal, azimuthal, magnetic and spin quantum numbers and their significance-shapes of atomic orbital-g and u character of atomic orbital-nodal points and nodal planes-Principles governing the occupancy of electrons in various quantum levels-Pauli's exclusion principle-Hund's rule of maximum multiplicity-Aufbau principle,(n+1) rule-writing practice for electronic configuration of vital elements in s,p,d & f block elements-stability of half and fully filled orbital with suitable examples.

Long form of the periodic table-characteristics-classification of elements on the basis of electronic configuration-periodicity of properties-cause of periodicity-explanation of atomic radii, ionic radii, electron affinity, ionization energy, electro negativity-factors affecting their magnitudes.

Unit – II: Chemical Bonding

Types of chemical bonds – ionic, covalent, co-ordinate covalent, hydrogen (inter and intra)and metallic bonds with few suitable examples - comparison between them .

Chemical Bonding – valence bond approach-VB theory- types of overlapping and orbital diagrams- sigma and pi bonds-concept of hybridisation and geometry of molecules- sp,sp^2,sp^3,sp^3d and sp^3d^2 with suitable examples- $BeCl_2$,$SiCl_4$,PCl_5,SF_6,IF_7 - VSEPR theory-shapes of some simple inorganic molecules NH_3, and H_2O.

Molecular Orbital Theory-bonding and antibonding molecular orbital-relative order of energies of molecular orbital-MO theory applied to Homolonuclear molecules-Hydrogen, Helium, Nitrogen, Oxygen-Hetero nuclear molecules-HF and CO.

Unit III: Surface Chemistry

Adsorption- classification of adsorption of gases on solids- types of adsorption – differences between them – factors affecting adsorption.

Catalysis- general characteristics- types of catalytic reactions, enzyme catalysis(Michaelis – Menton equation with derivation), types of catalysts- promoters-catalytic poison – theories of catalysis-application of catalysis.

Unit – IV: Chemical Kinetics

Scope of chemical kinetics- rate of chemical reaction – factors influencing reaction rates-rate law- rate constant – order and molecularity of the reaction – differences between them-

classification of rates based on the order of the reaction- half life period ,simple and complex reactions-differences between them – types of complex reactions.

Unit-V: Electro Chemistry - I:

Conductors, insulators and semi conductors-definition with examples-theory of electrolytic conductors- Ostwald's dilution law for weak electrolytes-Faraday's laws of electrolysis-conductance- specific resistance- specific conductance-equivalent conductance- molar conductance-variation of equivalent conductance with concentration- Kohlrauch's Law-statement and application(any one)- common ion effect-buffer solutions-Henderson equation-pH indicators-theories of pH indicators.

Text Books:

- A Text book of inorganic chemistry by – Puri , Sharma, kalia and Kaushal.
- A Text book of inorganic chemistry by- P.L.Soni.
- A Text Book of Physical Chemistry – Puri ,Shama and Pathania

References Books:

- Modern Inorganic Chemistry by R.D. Madan, S. Chand & Company LTD, Ram Nagar, New Delhi, Edition 2007.
- Essentials of Physical chemistry by Arun Bahl and B.S. Bahl, G.D.Tuli S. Chand & Company Ltd, Edition 2006.

CORE PAPER- II / ORGANIC CHEMISTRY- I

Hrs: 4/Hrs Per Week **Credits: 4** **Max Marks: 75(Ext); 25(Int)**

Course Outcomes:

- To discuss the IUPAC Nomenclature of organic Compounds, Detection, Estimation and Purification techniques of organic compounds.
- To identify electrophiles and Nucleophiles and the chemical reactions involving these reagents.
- To interpret the preparations, properties of alkanes and alkenes.
- To Illustrate the types of isomerism and Preparations , properties of dienes and alkynes
- To explain the mechanism of different types of organic reactions.

COURSE CONTENT

Unit-I Fundamental Concepts-I

Introduction to Organic Chemistry - Sources and classification of Organic compounds.
Nomenclature of Organic compounds - Functional groups : Definition – various functional groups – common and IUPAC system of naming- Aliphatic and Aromatic hydrocarbons up to 10 carbon atom systems and other functional derivatives.
Detection and estimation of elements: Lassaigne's test and Beilstein test- Estimation of nitrogen by Kjeldahl's method -Halogens and Sulphur by Carius method.
Purification techniques: Fractional distillation, sublimation and crystallization.
Determination of Molecular weight of Organic acids and bases-Silver salt method for acids, Platinic chloride method for bases. Problems in determining empirical and molecular formulae - differences between them.

Unit- II Fundamental Concepts-II

Tetrahedral arrangement of valencies of carbon atoms. Cleavage of bond: Homolytic and Heterolytic Cleavages of Carbon bond. Electrophiles and Nucleophiles - Definition and examples. Electronic effects: Inductive, Electromeric, Resonance effects and hyper conjugation.
Reaction intermediates: Free radicals, Carbonium ion, (carbocation) Carbanions and Carbenes- generation and their stability.

Unit-III : Aliphatic Hydrocarbons-I

Alkanes: Introduction- Sources- Preparation by wurtz synthesis, decarboxylation and using Grignard reagents- reactions- halogenations-free radical mechanism of halogenations of alkanes- Cracking and Pyrolysis – Octane number- flash point- synthetic petrol, natural gas.

Alkenes: Introduction- classification of alkenes, Preparation by dehydrohalogenation of Rx- dehydration of alcohols & by heating quaternary ammonium salts- Hoffmann's rule and Saytzeff rule with examples. Reactions of alkenes- Electrophillic addition of Br_2 and HBr- Markownikoff's rule with examples- Peroxide effect with examples.

Unit-IV Aliphatic Hydrocarbons-II

Dienes: Classification-isolated-cumulated and conjugated double bond systems-Diels- Alder reactions-1,2 and 1,4- addition mechanism in butadiene- Geometrical isomerism of dienes.

Alkynes: Introduction-preparation of alkynes - acidity of alkynes –Chemical properties-substitution, Hydrogenation, Ozonolysis and combustion reactions of alkynes(Mechanism not necessary)

Isomerism- Structural, chain, position, functional isomerism-Tautomerism and Metamerism-Explanation with examples.

Unit – V:Types of Organic Reactions:

Mechanism of aliphatic nucleophillic substitution reactions- SN^1 ,SN^2 , SN^i reactions.

Mechanism of aliphatic elimination reactions: E^1,E^2,E_{ICB} reactions-substitution Vs elimination – polymerization reaction - types- explanation with suitable illustrations.

Rearrangement reactions involving alkanes, alkenes and alkynes.

Reference Books:

- A text book of Organic Chemistry by B.S. Bahl and Arun Bahl. S. Chand & Company LTD, Ram Nagar, New Delhi.20th Revised Edition-2011
- A Text Book of Organic Chemistry by P.L. Soni.
- A Text Book of Organic Chemistry by M.K Jain & S.C. Sharma.

CORE PRACTICAL – I / SEMI MICRO QUALITATIVE ANALYSIS

Hrs: 3 **Credits: 4** **Max Marks: 75(Ext); 25(Int)**

Objectives:

To analyse the given inorganic mixture containing two anions (one interfering and one simple anion) and two of the following cations Pb, Cu, Bi, Fe, Ni, Co, Zn, Mn, Ba, Sr, Ca, Mg and NH_4^+

Cations:

Lead,copper,cadmium,bismuth,iron,aluminium,Zinc,manganese,cobalt,nickel,barium,strontium, calcium,magnesium and ammonium.

Anions:

Carbonate, sulphate, nitrate, chloride, oxalate,borate, phosphate, chromate and fluoride.

Text Books:

- Vogel - A Text Book of qualitative inorganic Analysis.

Reference Books:

- Basic Principles of Practical Chemistry by V.Venkateswaran , R. Veeraswamy & A.R.Kulandaivelu

PART – IV / SBC- PAPER AND PULP TECHNOLOGY

Hours : 2 **Credits : 2** **Max Marks: 75(Ext); 25(Int)**

Course Outcomes:

- To discuss the manufacture of pulp and the process involved
- To describe the types of pulp
- To Illustrate various steps involved in the manufacture of paper
- To explain the uses of paper
- To identify paper Industries in India

COURSE CONTENT

Unit 1: Introduction – Raw material – Manufacture of Pulp- Mechanical process – Chemical Process.

Unit II: Types of Pulp -Sulphite Pulp , Soda Pulp and Rag Pulp.

Unit III: Manufacture of Paper- Various steps in the manufacture of paper -Bleaching ,Beating , Refining , Filling, Sizing ,Calendaring and Colouring of Paper**.**

Unit IV: Uses of Paper

Unit V: Preparation of Heavy Paper – Paper industries in India.

(Industrial Visit & Submission of report is mandatory) (5 Marks- Internal)

Reference Book :

- *Industrial Chemistry* by B.K .Sharma.

SEMESTER – II

CORE PAPER – III / GENERAL CHEMISTRY – II

Hrs: 7/Hrs **Credits: 5** **Max Marks: 75(Ext); 25(Int)**

Course Outcomes:

- To know the Structure and Compound Identification in the Solid State.
- To explain the experimental method of determination of interplanar spacing
- To understand the concept of various steps involved in metallurgical Process
- To gain knowledge and develop an understand of the kinetic theory of gases
- To compare the penetrating power of alpha, beta, neutron, and gamma radiation

COURSE CONTENT

UNIT – I : Solid State – I

Lattice Energy- ionic crystals, Nacl and CsCl crystal structure – determination of lattice energy using Born-Haber cycle-factors affecting crystal lattice energy-properties of ionic crystals(higher melting point, hardness, electrical conductivity in molten condition and in solution)- Polarisation and Polarising ability- Fajans Rule-Vander Waals forces-ion-ion, ion-dipole interactions.

Types of Crystals – ionic, molecular, covalent and metallic crystals.

1. Ionic Crystals : Analysis of KCl.
2. Molecular crystals – Water and Ammonia.
3. Covalent crystals – Diamond and Graphite.
4. Metallic crystals : Metallic bond in metals
5. Defects in Crystals - Frankel and Schotty defects.

UNIT -II - Solid State – II

Isotropy and anisotropy- point groups space lattice unit cell-Bravais lattice-seven crystal systems-laws of crystallography-law of constancy of interfacial angle- law of rational indices-miller indices-symmetry elements in crystal systems-X-Ray diffraction-Bragg's equation-experimental method of determination of interplanar spacing(Single crystal method and powder method) -calculations involving interplanar spacing in crystal systems.

UNIT – III : Metallurgy

Occurrence of metals –minerals and ores-mineral wealth in India-steps involved in metallurgical process-concentration-calcination- roasting-reduction to free metal-electrometallurgy- hydrometallurgy- refining of metals-electrolytic refining-Van Arkel process. Metallurgy of Aluminium, Iron,Titanium,Tungsten and Uranium and their uses.

UNIT – IV – Kinetic Theory of Gases

Postulates of kinetic theory of gases- Derivation of ideal gas laws from the expressions on the basis of kinetic theory of gases-deviation-Vander waals equation-Equation of state-Clausius,Berthelot and Dieterici equations of state- Boyle and inversion temperatures of gases.

Maxwell-Boltzmann law of distribution of velocities (Derivation not necessary) -graphical representation-effect of temperature on various velocities-comparison of RMS, average and most probable velocities. Mean free path-viscosity of gases-collision diameter, frequency and cross section -Loschmidt number-principle of equipartition of energy.

UNIT –V : Nuclear Chemistry

Constitution of nuclei – stable and unstable nuclei-Their relationship to a n/p ratio-magic

number-mass defect and binding energy-whole number rule-packing fraction-mass energy relationship. Nuclear fission and fusion -Theories of fission-Application of fission- principles of atom bomb-nuclear fusion- stellar energy and hydrogen bomb. Natural and Artificial Radioactivity - Definition - Detection and measurement of radioactivity-Soddy's group displacement law. Application of Radioactivity Application in medicine-in agriculture- industry-as trace elements in the elucidation of structure and in the investigation of reaction mechanism in analytical chemistry - carbon dating. Particle acceleerator-Linear accelerator – cyclotron and synchrotron Nuclear Reactors : Nuclear reactor –nuclear fuel- FBR-moderators- Coolants-

Text Books:

- A Text Book of Physical Chemistry – P.L Soni.
- A Text Book of Physical Chemistry – Puri & Sharma
- A Text Book of Inorganic Chemistry – R.D. Madhan
- A Text Book of Inorganic Chemistry – P.L Soni.

Reference Books:

- Modern Inorganic Chemistry by R.D. Madhan,,S. Chand & Company LTD, Ram Nagar, New Delhi, Edition 2007.
- Essentials of Physical Chemistry by B.S. Bahl and Arun Bahl G. D.Tuli S. Chand & Company Ltd, Edition 2006.

SKILL BASED COURSE / DAIRY CHEMISTRY

Hrs: 2 Per Week Credits: 2 Max Marks: 75(Ext); 25(Int)

Course Outcomes:

- To know the general composition and factors affecting milk.
- To gain knowledge on milk lipids, milk proteins and milk carbohydrates.
- To study the definition and composition of creams and butter.
- To know the processes involved in milk powder and ice cream making.
- To understand the classification and washing procedures of dairy detergents

COURSE CONTENT

Unit I:

Milk: General composition of milk - factors affecting the gross composition of milk , physico – chemical change taking place in milk due to processing parameters - boiling pasteurization – sterlilzation and homogenization .

Unit II

Milk lipids – terminology and definitions .

Milk proteins : Physical properties of milk proteins with formaldehyde and ninhydrin .

Milk carbohydrate – Lactose . Estimation of lactose in milk .

Milk vitamins – water soluble vitamins .

Unit III

a.Creams: Definition – composition – chemistry of creaming process .

b.Butter : Definition - % composition – manufacture . Estimation of fat acidity , salt and moisture content Desi butter .

UNIT IV

a.Milk powder : Definition need for making power – drying process spraying , drum drying , jet drying and foam drying – principle involed in each .

b.Ice cream: Definition percentage composition – types – ingredients needed manufacture of ice – cream stabilizers – emulsifiers and their role .

Unit V

Dairy Detergents : Definition – charecteristics- classification – washing procedure (modern method) sterilization – chloramines – T and hypochlorite solution .

Text Books :

- Dairy Chemistry By Harry Synder, published by Trieste, 2018

Reference Books:

- Outlines of Dairy Technology Sukumar De .
- Principles of Dairy Chemistry – Robert Jenness & S.Patorn .
- Indian Diary products K.S.Rangappa and K.T Achaya .

SEMESTER – III

CORE PAPER – V -PHYSICAL CHEMISTRY – I

Hour : 4 **Credits : 5** **Max Marks: 75(Ext); 25(Int)**

Course Outcomes:

- Understand the basic concepts of phase rule.
- Know the terms involve in thermodynamics and zeroth law of thermodynamics.
- Gain knowledge on thermochemistry and chemical equilibrium.
- Gain knowledge on laws of solution and on colligative properties of solutions.
- Know the laws of photochemistry and concepts of fluorescence, phosphorescence and chemiluminescence.

Unit – I : Phase Rule

Definition of terms – Gibb's phase rule-one component system-water, carbon- di-oxide-polymorphism-two component system-reduced phase rule-simple eutectic system-Pb-Ag system, KI-Water system-system involving compound formation with congruent and incongruent melting point-Zn-Mg system-$CuSO_4.5H_2O$ dehydration phase diagram.

Partially Miscible liquid system-CST-completely immiscible liquid system

Unit – II :Thermodynamics – I :

Introduction : Types of systems-state of a system-thermodynamic or state variables –extensive and intensive properties-state and path functions-exact and inexact differentials-thermodynamic process-reversible and irreversible processes- work,heat and energy.Zeroth law of thermodynamics and its significance.

Statement-mathematical formulation-internal energy- enthalpy or heat content-heat changes at constant volume and at constant pressure-relationship between Cp and Cv –work done ,heat change and enthalpy change for reversible isothermal expansion and compression of an ideal gas –calculation of q,w,E,H for adiabatic expansion of an ideal gas-relation between T,V and P of an ideal gas undergoing adiabatic reversible expansion. Comparison of work done in isothermal and adiabatic reversible expansion of an ideal gas-application of I law to non ideal gas undergoing reversible isothermal and adiabatic expansion-Joule Thomson effect-Joule Thomson co-efficient in the case of ideal gas and real gases-inversion temperature.

Unit – III : Thermochemistry and Chemical Equilibrium

Thermochemistry : Significance of Hess's law of constant heat of summation-Kirchoff's equation-bond enthalpies and energies.

Chemical Equilibrium

Law of mass action-Relation between Kc and Kp-Lechatlier principle and its application to Haber's process-common-ion effect in ionic equilibria.

Unit – IV : Solutions and Colligative Properties

Definition – concentration terms involved – mole fraction,weight percentage,mole percentage ,parts per million- Dissolution of substances-Temperature and solubility-solubility of gases in liquids- Gaseous solutions- solutions of gases in liquids –Henry's law-ideal solutions-Raoult's law of ideal solutions-Solutions of liquids in liquids in liquids-relation between the mole fractions of the components in the liquid &vapour phases –non-idael solutions-Activity co-efficients-Definition of melting point,boiling point,elevation in boiling point,depression in

freezing point-ebulioscopic and cryoscopic constant.

Unit – V : Photochemistry

Definition of various terms – Consequence of light absorption - The Jablonski Diagram –light absorption by solutions- Beer-Lambert law – limitations of Beer-Lambert law – laws of photochemistry—Quantum yield-Experimental determination of quantum yields-photochemical rate law-kinetics of photochemical reactions (only for Hydrogen-Chlorine reaction). –Energy transfer in photochemical reactions-photosensitisation and Quenching- Quenching of Fluorescence –Chemiluminescence.

Text Books:

- Text book of Physical Chemistry by P.L.Soni and O.P.Dharmarha ,published by Sultan Chand & Sons,New Delhi,2005
- Principles of Physical Chemistry by Puri, Sharma and Pathania, Vishal Publishing Co.,Jalandar,2013.

Reference Books:

- Principles of Physical Chemistry by Abhijit Mallick,Viva Books Private Limited,01.01.2018.
- Physical Chemistry by Peter Atkins,Julio de Paula and James Keeler,Oxford University Press, 2018

CORE PAPER –VI -ORGANIC, INORGANIC AND ANALYTICAL CHEMISTRY

4 Hrs/Week Credit : 4 Max Marks: 75(Ext); 25(Int)

Course Outcomes:

- To describe the preparation, Properties and uses of alcohols, thioalcohols, ethers, thioethers.
- To discuss the preparation, properties of polyhalogen derivatives.
- To Illustrate the anomalous behaviour of Li, Be and the comparison of IA group elements with II A group elements.
- To discuss the chemistry of p- block elements.
- To explain the principles of volumetric analysis and types of Titrations.

COURSE CONTENT

Unit I: Alcohols , Ethers, Thiols and Thio ethers

Alcohol: Preparation by hydroboration, reduction of carbonyl compounds-oxymercuration and demercuration, acids and esters by using Grignard reagents. Reaction with metals. Mechanism and reactivity towards HX, dehydration- Ascending and descending the alcohol series. Rectified spirit- absolute alcohol, methylated , spirit, power alcohol-estimation of number of hydroxyl groups.

Ethers: Mechanism of Williamson's synthesis mechanism of cleavage by HX-estimation of methoxy group by Zeisel's method.

Thio alcohols and Thio ethers: Definition with examples. Preparation and properties of Sulphonol and Mustard Gas- Mechanism of Wittig reaction.

Unit II: Polyhalogen Derivatives:

Polyhalogen derivatives: Chlorofluoro carbons –westron and Freon-Preparation and applications. Preparation and properties of $CHCl_3$, CHI_3 and CCl_4.
Halogen derivatives of unsaturated hydrocarbons: vinyl chloride and Allyl chloride-Preparation & reactivity. Polymerisation reaction of vinyl chloride.

Organo Metallic Compounds: Grignard reagents-preparation, structure and synthetic applications, Organozinc - preparation & synthetic applications.

Unit III: Chemistry of s-block elements:

Elements of group IA-General discussion of elements of group IA-Diagonal relationship of Li with Mg- Anomalous behaviour of lithium- extraction of lithium- properties and uses of Li.

Elements of group IB- general discussion –position in the periodic table, Resemblance among Cu, Ag, Au –Gradation in their properties – Resemblance between coinage metals and the VIII group elements. Elements of group IIA – Group discussion –diagonal relationship between Be and Al – Anomalous behaviour of Be – comparison

of group IA and group IIA elements.

Unit IV: Chemistry of p-block elements:

General discussion of group IV elements – Preparation properties and uses of carbonyl chloride – lead monoxide – red lead – white lead.

General discussion of group V elements – active nitrogen – preparation and properties of hydrazine, hydrazoic acid and

hydroxyl amine – Marsh test for arsenic.

Peracids and their salts – definition – peracids of carbon – per mono and perdicarbonic acid – permono carbonates and perdicarbonates – peracids of sulphur – permono and perdisulphuric acid.

Unit V: Theory of volumetric Analysis : Principles of volumetric Analysis – concentration units –standard solution-requirements of a primary standard solution-indicator-type of titrations & indicators- neutralization, redox, precipitation & complex formation reactions-choice of indicators in acid base titrations-complexometric titrations, EDTA Titrations-determination of hardness of water

Reference Books:

- A Text book of Organic Chemistry by P.L. Soni.
- A Text book of Organic Chemistry by M.K Jain & S.C. Sharma
- A Text book of InOrganic Chemistry by R.D.Madhan

ANCILLARY - I CHEMISTRY

INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

Hours : 3 Per Week **Credit :4** **Max.Marks.75(Ext) ;25(Int)**

Course Outcomes:

- To explain how to respond to common emergencies that could occur in laboratories, such as fires , explosions, chemical exposures, injuries and chemical spills.
- To gain insight in to valence bond theory molecular orbital theory and the concept of hybridization.
- To recognise many functional groups and their reactivity.
- To explain common and long – term side effects of Chemotherapy Drugs.
- To understand the different theories of Catalysis.

COURSE CONTENT

Unit I : Laboratory hygiene and safety :

Storage and handling of chemicals, handling of ethers. Toxic and poisonous chemicals. General precautions for avoiding accidents, first aid techniques- acid and alkali on eye , acid and alkali burn – Bromine burns – cut by glasses – Heat burns- Inhalation of toxic vapours- poisoning- Treatment for specific poisons- acids, alkalies, acetone, arsenic and copper compounds, cyanides.

Unit –II: Chemical Bonding

Introduction : Octet rule – Types of Chemical Bonds – Ionic, Covalent, co ordinate, hydrogen (inter and intra) and metallic bonds with few suitable Examples. Comparison between ionic and covalent bonded compounds.

Chemical bonding: Valency bond approach- types of overlapping and orbital diagrams – σ and π bonds. VSEPR theory as applied to $BeCl_2$, BF_3, CCl_4, PF_5 and SF_6.

(Sp,Sp^2, Sp^3, Sp^3d and Sp^3d^2).

Molecular orbital theory: Bonding and anti-bonding molecular orbitals - MO theory applied to molecules- Hydrogen, Helium, nitrogen and oxygen.

Unit –III Fundamental Concepts of Organic chemistry:

Tetrahedral arrangement of valencies of carbon atoms- Electrophilles and Nucleophilles - Definition and examples- Cleavage of bond: Homolytic and Heterolytic Cleavages of Carbon bond- Electronic effects: Inductive, Electrometric, Resonance effects and hyper conjugation- Concept of hybridization - Geometry of Organic Molecules involving hybridizations sp, sp^2 & sp^3 (eg :methane, ethylene, acetylene only).

Unit –IV Chemotherapy (Preparation and uses only)

Sulpha drugs- sulpha diazine- antimalarials –quinine. Antibiotics**:** definition –penicillin-tetracycline.

Carbohydrates:

Introduction and classification – preparation and uses of monosaccharides - glucose and fructose, Disaccharides –sucrose, polysaccharides – starch and cellulose. Conversion of Glucose to fructose only.

Aminoacids and Proteins

Aminoacids – Definition, classification.

Proteins –Definition, classifications, colour reactions and denaturation of proteins(an elementary idea only).

Unit –V:

Adsorption - Definition of various terms-adsorption of gases on solids-characteristics of adsorption of gases on solids- physical and chemical adsorptions-factors influencing adsorption. Catalysis : Definition –characteristics- theories of catalysis- types of catalysis – promoters – poisons – enzyme catalysis – applications of catalysis.

Colloidal State: Colloids definition – various types- classification – preparation by dispersion and condensation methods . Berdig's arc method- Lyophilic and Lyophobic Colloids – differences between them – purification of colloids (electro dialysis method only) – applications of colloids.

Text Books:

- PL. Soni, Text books of Inorganic Chemistry, S. Chand & Co., New Delhi,(2006).

Reference Books:

- Principles of physical Chemistry (23rd edition)Puri B.R., Sharma L.R., Pathania, M.S., New Delhi, ShobanLal, Nagin Chand &Co., (1993).
- Text books of Inorganic Chemistry PL. Sony, S. Chand& Co., New Delhi,(2006).
- Principles of Inorganic Chemistry B.R.Puri, Sharma,L.R. and Kalia, New Delhi (2002).
- Text book of Organic Chemistry P.L.Soni and Mohan Kstyal , Sulthan Chand & Sons Educational Publishers, 20th edition 2007.

SBC -TEXTILE CHEMISTRY

Hours : 2 Per Week **Credits : 2** **Max.Marks : 75(Ext); 25(Int)**

Course Outcomes:

- To understand the classification of natural fibres as vegetable fibres and animal fibres and their physical and chemical properties.

- To know about different synthetic fibres , their manufacture and properties.
- To acquire knowledge about scouring and desizing processes.
- To acquire knowledge about principles of dyeing.
- To know the principles of dyeing.

COURSE CONTENT

Unit 1: Vegetable Fibres and Animal Fibres

Definition – Classification of textile fibres – essential and desirable properties of textile fibres - Cotton fibre - Physical and Chemical properties, Jute – Purification; physical and chemical properties of jute, silk and wool.

Unit 2: Regenerated and Synthetic Fibres

Rayon – Sources and different types of rayon, Manufacture and properties of viscose rayon and acetate rayon. Manufacture, properties and uses of polyamides- polyester – polypropylene and polyacrylonitrile.

Unit 3: Preparatory Process Prior to Dyeing

Scouring – objectives of scouring – process of caustic scouring on open kier and closed kier machine with sine diagram , scouring with NaOH and Na_2CO_3 – Precautions to be taken before scouring. Desizing using malt extract – merits and demerits of acid and enzyme desizing. Sigeing – objectives and precautions to be taken during sigeing.

Unit 4: Principles of Bleaching

Principles of wetting and mechanism of detergency – synthetic detergents – surface active agents- bleaching processes – bleaching agents – H_2O_2, NaOCL bleaching powder and biobleaching and their properties – bleaching of cottn, rayon , wool and synthetic fibres.

Unit – 5: Principles of Dyeing

Colour and constituents – Chromophore and auxochromes – natural and synthetic dyes – dyes – classification , synthesis of dyestuff – congored, bismark brown an derifstal violet. Theories of dyeing – effect of temperature and salt on dyeing – of wool,, silk and poly – esters.

Text Books :

- Industrial Chemistry by B.K .Sharma

Reference Books :

- Shenai V.A., Textile fibres (Vol 1). Mahajan publishers , Ahmedabad.
- Shennai V.A., Technology of bleaching , Mahahan publishers, Ahmedabad.
- Shennai V.A., Chemistry of dyes and principles of dyeing Vol., II., Mahahjan publishers , ahmedabad.
- Gopalakrishnan R. 1988 , Textile Fibre , SSM , institute of Textile Technology komaraplayam , Namakkal District , Mahahan publishers , Ahmedabad.

NME- MODERN COSMETICS

Hours : 2 **Credits : 2** **Max. Marks : 75(Ext); 25(Int)**

Course Outcomes:

- To gain knowledge of deodorants and antiperspirants, bath preparations, dental

preparations.

- To know about depilatories, hair care preparations and hair colourants.
- To know the formulation and preparation of lipsticks and manicure preparations.
- To gain knowledge on man's toiletries and rouges and eye cosmetics.
- To understand about skin care preparations, toilet powders and perfumes, pigments and preservatives.

COURSE CONTENT

Unit I: Deodorants and Antiperspirants: Distinction between astringents and deodorants. Formulation of antiperspirant lotions and creams and sticks, deodorant powders.

Bath preparations: Bath salts, Bath powders, Bath Oils and Essences, water softeners, surface active agents.

Dental preparations: Tooth Pastes – ingredients, their characteristics and functions, mouth washes.

Unit II: Depilatories: Sulphide Cream and Pastes, Depilatory Wax, Thioglycollates diathermy (epilaiotn).

Hair Care Preparations: Hair structure , Permanent hair waving, cold waving, special additives in cold wave preparations, shampoos different types and formulations, hair conditioners and setting lotions.

Hair colourants: Hair ligheners and bleaches, Temporary colourants, Semi – Permanent colurants, Permanetn colourants- vegetables dyes, Oxidation dyes and modifiers.

Unit III: Lip Sticks: Classification of ingredients and formulation.

Manicure preparations: Cuticle creams, cuticle removers and nail bleach, Nail polishers, nail enamel, enamel removers.

Unit IV: Man's Toiletries: Hair lotions and tonics, hair creams greasy and non – greasy, shaving creams, after shave preparations.

Rouges and eye cosmetics: Rouge creams eye make up; eye brow pencils, eye shadow mascara.

Unit V: Skin care preparations: Structure of skin, Emulsin system, cold creams, cleansing lotions, foundation creams, moistening creams, skin foods, vitamin creams, all purpose creams, skin tonics.

Toilet powders: Face powder, Talcum powder.

Perfumes, Pigments and Preservatives.

Text Books:

- Textbook of cosmetics by M.Vimaladevi, CBS, 2015.

Reference Books:

- Cosmetics and Soaps by Poucher, W.A., Perfumes, Vol III , Modern Cosmetics
- Chemistry and the beauty business by Simons, J.V..
- Engineering Chemistry by B.K. Sharma,.

SEMESTER – IV

CORE PAPER -VII - INORGANIC CHEMISTRY - I

Hours : 8 Credits : 5 Max.100 Marks (Ext: 75 & Int: 25)

Course Outcomes:

- To describe the difference between strong acids/ bases and weak acids/ bases.
- To recognise which types of Isomerism are possible for a given Complex.
- To understand the key features of co-ordination compounds Including the variety of

structure co-ordination Numerism regards and cholates etc.

- To apply to write electronic configuration of given Atomic number.
- To explain the structure of metallic carbonlys and metallic nytrosyls.

COURSE CONTENT

Unit-1 : Modern concept of Acids and Bases: Arrhenius, Lewis, Bronsted-Lowry concepts-Dual behavior water – Relative strengths of Acids and Bases – Dissociation constant of Acids and Bases – Levelling effect of water. Hard and soft acids and bases (HSAB) –General theory of solvent systems-Usanovich Concept- Lux-flood concept- Lewis Concept.

Oxidation and Reduction Reactions: Classical and Modern concept of Oxidation and Reuduction-Oxidation Number- Difference between Oxidation number and valency- Calculation of oxidation number – Equivalent weight of oxidizing and reducing agents.

Unit II : Co-ordination Chemistry –I :

Double salts –complex compounds –complex ion and co-ordination number - Types of ligands - IUPAC nomenclature – Chelates and their uses. Isomerism – Ionization, hydrate, ligand linkage, co-ordination position, geometrical and optical isomerism.

Unit-III : Co-Ordination Chemistry -II

Theories of coordination compounds – Werner's theory- Sidgewick's electronic interpretation-EAN concept, Valence bond theory-outer and inner orbital complexes-limitations of VBT, Crystal field Theory-crystal field splitting in Tetra hedral complexes –high spin and low spin complexes

Unit- IV: Metallic carbonyls and metallic nitrosyls

Metallic carbonyls and metallic nitrosyls-metallic carbonyls-General methods of preparation, general properties, structure and nature of metal-carbonyl bonding in carbonyls. Effective atomic number rule(EAN) as applied to metallic carbonyls. Eighteen electron rule as applied to metallic carbonyls. some examples of metallic carbonyls-nickel tetra carbonyl, iron penta carbonyl, chromium hexa carbonyl and cobalt carbonyl.

Metallic nitrosyls : Effective atomic number rule(EAN) as applied to metallic nitrosyls-some metallic nitrosyls.

Unit – V: d and f-Block Elements :d- block elements - General characteristics- electronic configuration, atomic radii, ionic radii, atomic volume, metallic character ,ionization energy, reactivity, oxidation state, tendency to form complexes, reducing property, colour and magnetic properties. Lanthanides and actinides – electronic structure- oxidation states, colour and magnetic properties, Lanthanide contraction and its consequences. Separation of Lanthanide elements by ion exchange method. Comparison of Lanthanides and Actinides.

Text Books:

- A Text Book of Inorganic Chemistry by – R.D.Madhan , P.L. Soni
- A Text Book of Inorganic Chemistry by – P.L.Soni
- A Text Book of Inorganic Chemistry by – Puri & Sharma

Reference Books:

- Modern Inorganic Chemistry by R.D. Madhan, S. Chand & Company LTD, Ram Nagar, New Delhi, Edition 2007.

CORE PAPER - VIII

MAJOR PRACTICAL – II – VOLUMETRIC AND ORGANIC COMPOUND ANALYSIS

Hours : 3 Credit :5 Max.Marks.60(Ext) ;40(Int)

Course Outcome:

- Gaining practical knowledge in volumetric analysis and qualitative analysis.

Volumetric Analysis :

1. Preparation of standard solutions of various normality.
2. Acidimetry – Estimation of HCl / H_2SO4
3. Alkalimetry – Estimation of Na_2 Co_3/ NaOH.
4. Permanganometry – Estimation of Oxalic acid , Fe^{2+}
5. Estimation of ferrous ion by external indicator.
6. Dichrometry – Estimation of $CuSO_4$ (Demo only).

Organic Qualitative Analysis:

1. Carboxylic aicds (Monocarboxylic - Benzoic acid,dicarboxylic- Phthalic acaid)
2. Ketones (benzophenone), Aldehydes - Benzaldehyde), Amines- Primary Aromatic amine – Aniline, Amides (Aliphatic – Urea,Aromatic mono amide-Benzamide), Monohydric phenols- phenol.
3. Bifunctional groups – Salicylic acid.
4. Carbohydrates – Glucose and Sucrose.
5. Preparation of solid derivatives

Reference Book:

- Basic Principles of Practical Chemistry by – V.Venkateswaran, R.Veeraswamy , and A.R. Kulandaivelu

ANCILLARY CHEMISTRY – IV
INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

Hours : 5 **Credit :4** **Max.Marks.75(Ext) ;25(Int)**

Course Outcomes:

- To identify the different unit operations used for the preparation of coal for its utilization in thermal power plants and cove overns.

- To understand the concept of various steps involved in metallungical process.
- To describe the properties of polymer chemistry.
- To understand the applications of soaps and detergents.
- To derive an expression for thermodynamic work at the moving boundary of a simple compressible system.

COURSE CONTENT

Unit –I: Industrial Chemistry

Fuel Gases:- Preparation and uses of Natural Gas ,Water gas, Producer gas, Semi- water gas, Carbonated water gas & oil gas.

Fertilizers:- Manufacture and uses of Urea - Ammonium sulphate, Ammonium nitrate, Super phosphate of lime- Triple super phosphate and potassium nitrate.

Silicones **:-** Definition-Types-Preparation, properties and uses.

Unit II : Metallurgy:

Occurrence of metals- minerals and ores- steps involved in metallurgical process- concentration – calcinations – roasting – reduction to free metal—refining of metals- electrolytic refining- Van Arkel process.

Titanium – Ores – Extraction of titanium from Rutile Ore and from ilmenite Ore. Uses of titanium.

Vanadium – Ores - Extraction of vanadium from carnotite Ore and from venodinite ore. Uses of vanadium- Tungsten – Ores- Extraction of Tungsten from wolframite Ore- uses of Tungsten.

Unit –III :

Organo metallic compounds – Grignard reagents – preparation - properties- structure and synthetic uses of Grignard reagents- Limitations of Grignard Synthesis.

Polymer Chemistry:

Introduction – Types of Polymerisation – Plastics- definition - types – difference between thermoplastics and thermosetting Plastics- preparation and uses of polyethylene, PVC, PVA and Nylon - 66.

Unit –IV: Soaps and Detergents:

Soap- Definition – Saponification - manufacture of soap – Hot and Cold process - Difference between toilet soap and laundry soap- Types of Soaps - Cleaning action of Soap- Synthetic Detergents – composition of a common Detergent and Types- Differences between soaps and detergents.

Unit V: Physical Chemistry:

Thermodynamics:-System-types of system-Work and Heat-Spontaneous and Non-Spontaneous changes, Reversible and Irreversible changes, Isothermal and Adiabatic changes-Statement and Mathematical expression of first law of thermodynamics-Statement of second law of thermodynamics.

Photo Chemistry**:-**Definition –Grotthus -Draper's law –Law of photochemical equivalence-Quantum yield-Photo chemical reactions-Photo sensitisation –Chemiluminescence-Fluorescence, Phosphorescence.

Reference Books:

- A Text Book of Organic Chemistry by - M.K Jain & S.C.Sharma
- A Text Book of Inorganic Chemistry by - R.D. Madhan
- A Text Book of Physical Chemistry by - P.L. Soni

SBC - FORENSIC CHEMISTRY

Hours : 2 **Credits : 2** **Max.100 Marks (Ext: 75 & Int: 25)**

Course Outcomes:

- To learn crime investigation through diagnosis of poisoning and post-mortem.
- To acquire knowledge about explosions, the causes (gelatin sticks, TDX etc) and the security measures.
- To understand the methods of detecting Forgery in bank and educational records.

- To acquire a comprehensive knowledge about tracks and traces.
- To understand the chemical methods used in crime investigation (Medical aspects).

COURSE CONTENT

Unit 1: Poisons

Poisons – types and classification – diagnosis of poisons in the living and the dead – clinical symptoms- postmortem appearances. Heavy metal contamination (Hg, Pb, Pd) of sea foods – use of neutron activation analysis in detecting Arsenic in human hair. Treatment in cases of poisoning–use of antidotes for common poisons.

Unit 2: Crime Detection

Accidental explosion during manufacture of matches and fire works (as in Sivakasi). Human bombs- possible explosives (gelatin sticks and RDX) – metal defector devices and other security measured for VVIP – composition of bullets and detecting powder burne . Analysis of incendiary and timed bombs- spill of toxic and corrosive chemicals from tankers.

Unit 3 Forgery And Counterfeiting

Documents – different types of forged signature – simulated and traced forgeries – inherent signs of forgery methods – writing deliberately modified – uses of ultraviolet rays – comparison of type written letter – checking silver line water mark in currency notes- alloy analysis using AAS to detect counterfeit coins- detection of gold purity in 22 carat ornaments – detecting gold plated jewels.

Unit 4: Tracks And Traces

Tracks and traces- small tracks and police dogs – foot prints – costing of foot prints – residue prints- residue prints, walking pattern or tyre marks – miscellaneous traces and tracks – glass fracture – tool marks- paints – fibres – analysis of biological substances – blood, semen, saliva, urine and hair – Cranial analysis (head and teeth) DWA Finger printing for tissue identification in dismembered bodies- detecting steroid consumption in athletes and race horses.

Unit 5 Medical Aspects

Aids- Causes and prevention - misuse of scheduled drugs – burns and their treatment by plastic sugery . Metabolite analysis using mass spectrum- gas chromatography. Arson – natural fires and arson – burning characteristics and chemistry of combustible materials – nature of combustion. Ballistic – Classification - internal and terminal ballistics – small arms- laboratory examination of barrel washing and detection of powder residue by chemical test.

Text Book:

- Forensic Science Principles and applications by Dr.Nishant Singh,Ancient Publishing House,01.01.2011.

Reference Books:

- T.H. James, Forensic Sciences , Stanley Thornes Ltd.,
- Richard, Criminalistics – An introduction to Forensic Science (College Version), 8th Edition Sofestein , Printice Hall.,

SEMESTER – V

CORE PAPER- IX - ORGANIC CHEMISTRY – II

Hours : 6 **Credits : 5** **Max.100 Marks (Ext: 75 & Int: 25)**

Course Outcomes:

- To discuss Bayer's Strain theory and the structure of naphthalene.
- To arrange the acidity of Substituted Phenols with phenol.
- To describe the Preparation and properties of aromatic substituted acids.

- To examine the configuration of geometrical isomers and optical isomers.
- To compare the conformational isomerism with Configurational isomerism.

COURSE CONTENT

Unit – I:

Alicylic compounds:

General methods of preparation and properties of Cycloparaffines- Baeyer's strain theory and its modification

Poly nuclear hydrocarbons and their Derivatives:

Isolated Systems- Preparation and properties of Biphenyl , biphenyl methane and triphenyl methane.

Condensed systems: Preparation, properties, uses and structural elucidation of Naphthalene and Anthracene, preparation , properties and uses of Naphthylamines and Naphthols.

Uses of reagents in organic synthesis :SeO_2 , OsO_4 N – bromo succinimide, Lead tetra acetate and raney Ni.

Unit – II Aromatic compounds (Aldehydes and phenols)

Aromatic aldehydes: Benzaldehyde – mechanism of Cannizaro, Perkin, Claisen reaction and Benzoin condensation .

Preparation & properties of cinnamaldehyde and vannilin.

Phenols: Acidity of Phenols – effect of substitutents on the acidity of phenol , mechanism of Kolbe's reaction. Reimer –Tiemann reaction . Test for phenol – estimation of Phenol.

Unit – III Aromatic Acids

Effective of substituents on acidic character.

Substituted acids : Preparation , properties of salicylic acid and anthranilic acid.

Dicarboxylic acids : Isomers of Phthalic acid, preparation , properties of phthalic acid – derivatives of phthalic acid- phthalic anhydride & phthalimide. Preparation, properties and uses.

Preparation & Properties of Phenylacetic acid, Mandelic acid, cinnamic acid and coumarin.

Aromatic sulphonic acids: Preparation and uses of benzene suphonic acid, saccharin - chloramine - T & dichloramine – T.

Unit – IV Stereoisomerism:

Geometrical isomerism:

Definition – geometrical isomerism of maleic and fumaric acids- aldoximes and ketoximes- determination of configuration of geometrical isomerism – E, Z notations.

Optical isomerism **:** Definition - Optical activity – Chirality – Enantiomers, diastereoisomers – elements of symmetry – Plane of symmetry , axis of symmetry and centre of symmetry – specific rotation and its polarimetric determination.

Optical isomerism of compounds containing asymmetric carbon atom recemisation and resolution of racemic mixtures – Walden inversion – asymmertric synthesis – specification of absolute configuration by R and S notations.

Optical activity of elements other than carbon atoms. Quaternary ammonium compounds and tertiary amine oxides.

Unit – V: Conformational Isomerism:

Differences between configuration and conformation . Fischer, Saw- horse and Newmann projection formulae – conformational analysis of ethane, n – butane and Cyclohexane.

Tautomerism : Definition – condition of tautomerism - prototropy and differences between Tautomerism and Resonance – types of tautomerism.
Keto – Enol & Nitro – acinitro Tautomerism.

Reference Books:

- A Text Book of Organic Chemistry By – M.K. Jain and S. C.Sharma
- A Text Book of Organic Chemistry By – P.L. Soni
- A Text Book of Organic Chemistry By – K.S.Tewari

CORE PAPER – X- INORGANIC CHEMISTRY – III

Hours : 6 Per Week **Credits : 5** **Max.100 Marks (Ext: 75 & Int: 25)**

Course Outcomes:

- To describe the Classification of Solvents and the Chemical reactions that Occur in Liquid Ammonia.
- To explain the oxides and oxyacids of bromine, interhalogen compounds &

Pseudohalogens.

- To discuss the structure of diborane, preparation , Properties , structure and uses of borazoles.
- To illustrate Synthesis – Properties and uses of fluorocarbons.
- To interpret the food adulteration, classification of adulteration and food laws and standards.

COURSE CONTENT

Unit – I : Non aqueous Solvents

Classification of solvents –liquid ammonia as solvent-chemical reaction that occur in liquid ammonia .

Liquid sulphur dioxide as solvent –solubility of inorganic materials in liquid sulphur dioxide – solubility of organic compounds in liquid sulphur dioxide –chemical reaction that can occur in liquid sulphur dioxide.

Unit – II : Halogens

Position of halogen in the periodic table –anomalous behaviour of fluorine –difficulties in the isolation of fluorine –modern method of isolation of fluorine –estimation of available chlorine in bleaching powder –structure –properties and uses of perchloric acid –potassium perchlorates .

Oxides and oxyacids of bromine –brominating mixture –periodic acid –preparation –properties – uses –inter halogen compounds –polyhalides –pseudohalogens –basic iodine –comparative study of halogens.

Unit – III: Chemistry of Boron Family

Group discussion –electron acceptor behavior and Electron deficiency of Boron hydrides bonding in diboranes. $NaBH_4$, $LiBH_4$ – Preparation - properties, structure and uses of Borozoles.

Comparison between Carbon & Silicon - hydrides of silicon and silicates structure.

Classification of silicates and its applications (elementary study only)

Unit – IV: Fluorocarbons

Flurocarbons- Definition – Synthesis – Properties and uses of fluorocarbons. Inert gases – occurrence- isolation of rare gases from dry air and from liquid air – uses of inert gases.

Clathrates: Types – preparation and uses.

Unit – V: Consumer Chemistry

Food adulteration – Types of adulteration – intentional adulteration – metallic contamination – incidental adulteration – food laws and standards.

Beverages and appetizers – Classification - carbonated non – alcoholic beverages – miscellaneous beverages – alcoholic beverages.

Text Books:

- A Text Book of Inorganic Chemistry by – R.D.Madhan , P.L. Soni
- A Text Book of Inorganic Chemistry by – P.L.Soni
- A Text Book of Inorganic Chemistry by – Puri & Sharma

Reference Books:

- Modern Inorganic Chemistry by R.D. Madhan, S. Chand & Company LTD, Ram Nagar, New Delhi, Edition 2007.

MAJOR ELECTIVE - I

ANALYTICAL CHEMISTRY AND ELEMENTS OF ORGANIC SPECTROSCOPY

Hours : 5 Credits : 4 Max.100 Marks (Ext: 75 & Int: 25)

Course Outcomes:

- To explain the importance of Analytical methods in qualitative and quantitative analysis.
- To analyse the purity of samples and precipitates.
- To interpret uV, IR, Spectra and their applications.
- To illustrate NMR, Mass and Raman spectra with their applications.
- To apply different types of chrometrographic techniques in separation of mixtures.

COURSE CONTENT

Unit –I: Introduction to Analytical Chemistry:

Types of analytical methods : Importance of analytical methods is Qualitative and Quantitative analysis - chemical and instrumental methods - advantages and limitations of chemical and instrumental methods

Simple First Aid procedure for accidents involving acids , alkalis , bromine, burns and cut by glass. Carcinogenic chemicals – toxic and poisonous chemicals-First Aid Technique for poisoning – methods of expressing precision waste disposal – fume disposal- methods only.

Evaluation of Analytical data : Idea of significant figures- its importance. Accuracy - methods of expressing accuracy. Error analysis – types of errors – minimizing errors.

Precision – methods of expressing precision Mean, Median, Mean deviation, standard deviation and confidence limit.

Unit – II: Quantitative analysis:

Estimations of commercial samples- Determination of percentage purity of samples – pyrolusite –Iron ore – washing soda and Bleaching powder estimation of glucose and phenol. Gravimetric analysis – Principle – Theories precipitation – solubility product and precipitation – conditions of precipitations – Types pf Precipitation – purity of precipitates – Co-precipitation – Post Precipitation – precipitation from homogeneous solution – use of sequestering agents

Unit – III: Spectroscopy - I

UV spectra: Allowed electronic transitions – conditions for a molecule to be UV active – absorption maxima (max) – applications of Uv spectra.

IR spectra – spectral range – conditions for a molecule to be IR active – mode of vibrations – calculations of IR bands for water and carbon - di- oxide molecule. Finger print region – IR frequency range of functional groups like aldehydes, ketones , acids, acidamide and primary amines only.

NMR spectra – conditions for a molecule to be NMR active equivalent and non-equivalent protons – splitting of NMR signals – detailed study of NMR spectrum of ethanol – importance of reference compound TMS (Tetra methyl silane) – applications of NMR spectra.

Unit – IV: Spectroscopy - II

Mass spectroscopy – Base peak, molecular ion peak and isotopic peak. Spectrum of neopentane , benzene and ethyl bromide Raman spectra – theory of Raman Spectra –stoke and anti-stoke lines – conditions for a molecule to be Raman active – comparison of Raman and IR spectra. Applications of Raman spectra only in structural equilibria and mechanism of tautomerism.

ESR spectra – conditions for a molecule to be ESR active – ESR spectrum of methyl radical and naphthalene ion – application of ESR

Unit – V: Chromatography Techniques :

Column/chromatography- principle, types of absorbents, preparation of the column, elution , recovery of substances and applications. Thin layer chromatography – principle, choice of adsorbent and solvent, preparation of chromatoplates , Rf – valuesPaper chromatography- principle, solvents used ,Development of chromatogram, ascending and decending paper chromatography. Gas chromatography – principles ,Experimental techniques. High pressure Liquid chromatography – (HPLC)- principles – Experimental techniques.

Reference Books:

- Douglas A.Skoog and Donald M.West, F.J. Holler, Fundamentals of Analytical Chemistry,7th edition , Harcourt College publishers.
- Mendham J.,Denney R.C.,Bames J.D.,Thomas M., Vogel's Text book of Quantative Chemical Analysis 6th edition, Pearson education.
- Sharma B.K.,Instrumental methods of chemical Analysis , Coel publishing House, Merrut.(1997)
- Gopalan R.,Subramaniam , P.S and Rengaraj k., Elements of Analytical Chemistry, Sultan Chand and Sons.
- Usharani S., Analytical Chemistry, Macmillon.

MAJOR ELECTIVE: I

POLYMER CHEMISTRY (OPTIONAL)

Hours : 5 **Credits : 4** **Max.100 Marks (Ext: 75 & Int: 25)**

Course Outcomes:

- To explain the basic concepts of polymers.
- To discuss the types of polymerizations.
- To illustrate the properties of polymer.
- To describe various methods used to determine the molecular weight of polymers.
- To explain preparation and uses of various polymers.

COURSE CONTENT

.**Unit – I :**

Basic Concept: Monomers, Polymers , Polymerization , Degree of Polymerization , Classification of polymers

Plastics :Definition – Thermoplastic , Thermosetting plastics , Reinforced Plastic.

Elastomer : Definition – Natural & synthetic rubber –smoked rubber Reclaimed rubber – Foam rubbers – Spongy rubber – Laminate rubber

Adhesives : Definition – thermosetting – Thermo resins

Fibers**:** Definition – Natural and synthetic , Classification comfort safety - Industrial fibers

Unit II:

Ionic Polymerization **:** Anionic and Cationic Polymerizations . Step growth polymerisation (Condensation polymerisation)

Co-Polimerisation : Random – Alternating Block and Graft copolymers

Unit III:

Stereo Regular Polymers **:** Isotatic , syndiotactic & Atactic Geometrical isomers .

Ziegler- Natta catalysis - Bi metallic and Mono metallic mechanisms,

Thermal property of polymers: Tg and Tm . Determination of Tg by differential scanning calorimeter . Tg of copolimers

Unit IV:

Molecular weight of polymers **:** Number –Average , Weight – Average Average & Viscosity – Average molecular weights . Molecular weight distribution GPC method –Average molecular weight and Degree of polymerisation . Determination of Average molecular weight Light Scattering method , Viscosity method .

Unit V:

Polymer processing techniques: Calendering , film casting , injection moulding.

Preparation and uses of the following polymers. Polyethylene (LDPE & HDPE),P.V.C, polystyrene , Nylon-6 , Nylon -6,6, Polyester , Phenol formaldehyde resins and Polycarbonates

MAJOR ELECTIVE – II / PHARMACEUTICAL CHEMISTRY

Hours: 5 Credits: 4 Max.100 Marks (Ext: 75 & Int: 25)

Course Outcomes:

- To know the terminologies used in pharmaceutical chemistry.
- To understand various traditional practice.

- To gain knowledge about analgesics, antiseptics &disinfectors.
- To know the uses of various anesthetics.
- To gain knowledge about different types of medicines to cure various diseases.

COURSE CONTENT

Unit I: Terminologies used in pharmaceutical chemistry-pharmacology-pharmacognosy-pharmacy-pharmocodynamics-therapeutics-toxicology-chemotherapy-pharmacopoeia-national-formulary(BNF,NF of india british pharmaceutical codes AMA drug evaluation),therapeutic index,$LD_{50,}$ $ED_{50,}$grams test, bacteria, virus, immunity, vaccines and toxoids . pharmacophore, antimetabolite.

Unit II: Traditional practice –sidda , ayurveda and unani.Medicinally important compounds of Al, P,As, Hg and Fe and its uses

Blood-blood grouping –Rh factor-buffers in blood, maintenance of pH of blood-composition of blood-clotting mechanism-blood pressure(normal, high and low and control of B.P)

Unit III:Analgesics: Definition classification ,action of analgesics-narcotice analgesics (morphine and its derivatives with reference to SAR) synthetic analgesics- preparation, assay and uses of pethidines and methadones. Antipyretic analgesics-salicylic as it derivatives,indole derivatives &p-amino phenol derivatives.

Antiseptics and disinfectants-Definition and distinction, standartization of disinfectants. Use of phenols,dyes, chloramines, dequalinium chloride, formaldehyde and cationic surface active agent

Unit IV: Anaesthetics : Definition and classification.

Uses of volatile anaesthetics –ethers, halohytrocarbons – chloroform ,halothane ,try chloroethylene , ferguson principle.

Gaseous anaesthetics:Cyclopropane,N_2O- preparation ,advantages, adverse, effect and assay of N_2O.

Non volatile anaesthetics:Intravenous anesthetics-preparation of thiopental sodium and methohexitone.

local anesthetics**:** Classification, structure, preparation and uses of procaine, derivatives of procaine, benzocaine and cocaine.

Unit V:Transquilisers - classification in detail.

Sedatives and hypnotics-distinction, definition, classification of hypnotics-structure and uses of barbiturates and non barbiturates

Haematological agent: Anticoagulants and coagulants drugs

Antianaemic Drugs: iron,vitamin-B_{12} and folic acid

Cardiovascular drugs-examples and uses.

Aids: causes,prevention and treatment

MAJOR ELECTIVE – II / NANOTECHNOLOGY AND GREEN CHEMISTRY

Hours : 5 Credits : 4 Max.100 Marks (Ext: 75 & Int: 25)

Course Outcomes:

- To illustrate the preparation of different types of nano particles.

- To know the preparations of nano materials.
- To discuss the applications of nano technology in nano cosmetics, textile, nano sensors, cancer therapy.
- To study Solvent free microwave- assisted organic synthesis.
- To study the synthesis of Ionic liquids,advantages and applications of Super critical Carbondioxide.

COURSE CONTENT

Unit-I: Nanotechnology:

Introduction-meaning of 'nano'-history of nano materials-Moore's law-nano science the multidisciplinary science.Nano materials: Top-down-and bottom-up approach-examples of thebottom-up approach-different types of nano materials: one dimensional materials-carbon nano tubes-types of carbon nano tubes SWNT & MWNT-two dimensional nano materials. Properties of nano materials:Different types of nano materials & their sizes –M.pt-quantum effects-size dependent properties of cdse carbon nano tubes & grapheme

Unit-II: Nanotechnology -II:

Preparations of nano materials:

Different methods of preparing nano materials- hydro thermal and salvo thermal methods-salvothermal reaction- inorganic nano tubes- assembling nano materials- preparation of metals nano particles, grapheme, gold nano particles, ZnO nano wires, carbon nano tubes and copper sulphide nano films.

Analysis of nano particles: Study of nano materials under TEM, SEM, STM & AFM-working of TEM, STM & AFM

Unit-III: Nanotechnology – III:

Defintion of nanotechnology- nano biotechnology- definition and explanation Applications: applications of nano technology in nano cosmetics, textile, nano sensors, cancer therapy, silver nano particles and water purification ,nano computers, MRI with magnetic nano particles and nano materials for energy

Unit-IV: Green Chemistry –I:

Introduction – definition- green chemistry- need of the day- twelve principles of green chemistry- atom economy.

Solvent free microwave- assisted organic synthesis: Introduction- solvent – free techniques-microwave activation- benefits and limitations of microwave assisted synthesis.

Non- traditional (greener alternatives to functional group transformation, condensation, oxidation and reduction reaction (one example each).

Unit-V: Green Chemistry –II:

Ionic liquids : definition- examples- synthesis- tuneable physical properties- application in organic synthesis- hydroformylation of olefins, carbonylation, aryl halides, dimerisation of butadiene, Diels Alder reaction and total synthesis of pravadoline. General uses of liquids.

Super critical fluids: definition- basic principle of SFE (super critical fluid extraction)- choice of solvent for SFE- advantages of SFE technology- applications of SFE. (super critical fluid extraction)- choice of solvent for SFE- advantages of SFE technology- applications of SFE.

Super critical Carbondioxide.

CO_2 as super critical fluid- features of technique for using super critical CO_2. Advantages and applications of super critical CO_2.

Reference Books:

- Nano world- "An introduction to nano science & technology" – CNR RAO third edn.2013.Nava Karnataka Publication Pvt. Ltd.
- Green chemistry- environment friendly alternatives- editiors: Rashmisanghi. MM. Sri vasta fourth re-print 2009. Norosa publishing house pvt. Ltd.

SBC - LEATHER TECHNOLOGY

Hours : 2 **Credits : 2** **Max.100 Marks (Ext: 75 & Int: 25)**

Course Outcomes:

- To explain the conventional tanning Process – Animal skin.
- To describe the manufacture of leather and Preparation of hides for tanning.

- To understand the various process of tanning- soaking , liming deliming deharing and batins.
- To illustrate the vegetable tanning, synthetic tanning & synthetic tanning & Chrome tanning.
- To identify the chemical reactions and charges in contaminats.

COURSE CONTENT

Unit I:

History of tanning industry in India - Conventional tanning process animal skin.

Unit II

Manufacture of leather , preparation of hides for tanning,use of various inorganic and organic chemicals for tanning process

Unit III

Various processes of tanning - soaking liming , deliming , deharing and bating

Unit IV

Vegetables tanning , type of tanning for soles ,belting and heavy leather.

Vegetable tanning – synthetic tanning , chrome tanning , finishing of leather.

Unit V: Environmental Pollution

Pollution problems caused by tanneries and its control treatment of tannery effluents by primary secondary and tertiary processes , Uses of reverse Osmosis system for the treatment of polluted water .

Text Books:

- Industrial chemistry including chemical engineering - B.K. Sharma – Goel Publishing House 13th Revised and Enlarged Edition.

Reference Books:

- Leather Technician's Hand Book – J.H Sharphous Leather Producers Association Northampton – 1971.
- Air Pollution and plant life, John Wiley and Sons – 1984.
- Environmental chemistry by Neil – Petero Blakcie Academic and Professional London 1998.

SEMESTER – VI

ORGANIC CHEMISTRY - III

Hours : 6 Per Week **Credits : 5** **Max.100 Marks (Ext: 75 & Int: 25)**

Course Outcomes:

- To understand the preparation , properties, reactions and importance of Alicycllic compounds , and poly nuclear hydrocarbons.
- To introduce the concept of conformational analysis.

- To study the different molecular rearrangement reactions.
- To study the preparation properties and uses of Terpenes , Nucleic acids and proteins.

COURSE CONTENT

Unit I: Carbohydrates :

a. Introduction and classification : Monosaccharide – preparation , properties and constitution of glucose – configuration – configuration structures – interconversion of glucose and fructose – descending and ascending of sugar series – Epimers and anomors – epimerization - mutarotation .
b. Disaccharides : preparation , properties constitution and configuration of sucrose .
c. Polysaccharides : A general study of starch and cellulose – uses of cellulose in industries .

Unit II:

a. Molecular rearrangements: Detailed mechanisms of the following : pinacol – pinacolone , Hofman , benzyl – benzilic acid , claisen , Beckmann and Fries arrangements .
b. Free radicals – Definition – preparation and reaction of short lived and long lived free radicals – stability of free radicals – detection of free radicals – Mechanism of stand Meyer reaction .

Unit III: Dyes :

i) Definition - theory of color and constitution – classification of dyes according to structure and applications .
ii) Azodyes - preparation of congo red and bismark brown.
Triphenyl methane dyes : Preparation of malachite green , rosaniline .
iii) Phthalein dyes: phenolphthalein , fluorescein preparation .
iv) Vat dyes – preparation of Indigo .

Unit IV

a. Heterocyclic compounds: preparation and properties of pyrazole , pyridine , quinoline and isoquinoline .
b. Alkaloids: Definition : Occurrence and extraction of aikaloids – general methods for determining the structure of alkaloids – classification of alkaloids – structure and synthesis of following alkaloids - conine ,piperine and papavarine (No structural elucidation)

Reference Books:

- A Text Book of Organic Chemistry By- M.K.Jain & S.C.Sharma
- A Text Book of Organic Chemistry By- P.L.Soni

CORE PAPER – XIII - PHYSICAL CHEMISTRY – II

Hours : 6 Credits : 5 Max.100 Marks (Ext: 75 & Int: 25)

Course Outcomes:

- To know the basic concepts of spectroscopy.
- To acquire knowledge on types of spectra ,diatomic molecule as harmonic and anharmonic oscillator and laser and maser.

- To study the basics of quantum mechanics.
- To study the reaction rates and their theories, preparation and purification of colloids.
- To acquire knowledge on liquid crystals, their types and their arrangements.

COURSE CONTENT

Unit – I Spectroscopy:

The Electromagnetic spectrum- Absorption Spectroscopy- Mechanism of interaction of Radiation with Materials- Molecular spectra – Molecular Rotation – Types of molecular Spectra – Rotational Spectra of Diatomic molecules (Microwave Spectra) Rigid Rotator – The intensities of spectral lines- the Effect of Isotopic Substitution – Non- rigid Rotator.

Unit – II:

Vibrational Spectra (Near infra red spectra) – Simultaneous Rotation and Vibration in molecules – Diatomic Vibrating Rotrator – Diatomic molecule as a Harmonic oscillator and Rigid Rotator– Diatomic molecule as Abharmonic oscillator and a Non – Rigid Rotator – Rotational Degree of freedom- Spectra and Vibrational modes- Analysis of Infra – red spectra on the Basis of modes of vibration- Electronic spectra – Light scattering and Raman Spectroscopy .The laser and the Maser, Comparison Of Raman Spectroscopy with IR spectroscopy.

Unit – III: Quantum Mechanics:

Failure of classical mechanics, black body radiation, photoelectric effect, Compton effect, Heisenberg uncertainty principle, Schrodinger wave equation , Eigen value and Eigen functions, Significance of wave function , postulates of quantum mechanics, energy and wave functions of particle in one dimensional box.

Unit IV: Chemical kinetics and Colloidal State

Chemical kinetics: Second order reactions – rate equation derivation – half life period derivation – examples. Third order reactions- rate equation derivation- example. Effect of temperature on reaction rates – Arrhenius equation – theories of reaction rates – collision theory andActivated complex theory of bimolecular gaseous reactions- Lindemann theory of unimolecular gaseous reactions.

Colloidal State: Colloidal systems – preparation of lyophilic colloids by dispersion and condensation methods – purificaiotn of colloids – properties – electrical , kinetic and optical – Determination of size of colloidal particules by ultra filters, Brownian movement and light scattering methods. Emulsion – types of emulsion – properties – Gels- preparation and application of colloids.

Unit V : Liquid Crystals:

Definition – types-nematic and smectic, the seven segment cell- classification of thermotrophic liquid crystals- Polmorphism in thermotrophic liquid crystals- pressure induced mesomorphism . Molecular arrangements in various states of liquid crystals.

Text Books:

- Text book of Physical Chemistry by P.L.Soni and O.P.Dharmarha ,published by Sultan Chand & Sons, New Delhi,2005
- Principles of Physical Chemistry by Puri, Sharma and Pathania, Vishal Publishing Co.,Jalandar,2013.

Reference Books:

- Basics of Spectroscopy by B.K. Sharma

- Advanced Sepctroscopy by Aluwalia
- Physical Chemistry by Bahl & Arun Bahl.
- Principles of Physical Chemistry by Abhijit Mallick,Viva Books Private Limited,01.01.2018.
- Physical Chemistry byPeter Atkins,Julio de Paula and James Keeler,Oxford \ University Press, 01.07.2018

SEMESTER – V & VI / PRACTICAL – III

GRAVIMETRIC ANALYSIS AND ORGANIC COMPOUND PREPARATION

Hours : 3+3 Credits : 5 Max.100 Marks (Ext: 75 & Int: 25)

Course Outcome:

- To gain practical skills on Gravimetric Analysis and in organic Compound Preparations.

Gravimetric Analysis:

1. Estimation of lead as lead Chromate.
2. Estimation of barium as Barium Chromate**.**

Organic Compound Preparation:

1. Preparation of benzoic acid from
   Benzamide (Amide Hydrolysis)
   Ethyl benzoate (Oxidation)
   Benzaldehyde (Oxidation)

2. Preparation of β – Naphthyl Benzoate from β – naphthol.

3. Preparation of Benzanilide form Aniline.

4. Preparation of Phenyl Benzoate form Phenol.

Reference Books:

- Basic Principles of Practical Chemistry By - V.Venkateswaran, R.Veeraswamy and A.R.Kulandaivelu.

PRACTICAL –III-PHYSICAL CHEMISTRY PRACTICALS

Hours : 3+3 Credits : 5 Max.100 Marks (Ext: 75 & Int: 25)

Course Outcome:

- To gain practical skills in physical chemistry experiments and also to apply this in various fields for their career.

List of Experiments:

1. Critical Solution Temperature (CST)
2. Effect of impurity on Critical solution Temperature
3. Transition Temperature (T.S.)
4. Rast Method –Determination of Molecular Weight
5. Phase Diagram (Simple eutectic system)
6. Kinetics of Ester Hydrolysis –Determination of Rate Constant
7. Conductometric Acid-Base Titration –Determination of Strength of an Acid/Base
8. Potentiometic Redox Titration –determination strength of $FeSO_4$ / Ferrous Ammonium Sulphate.

Application Oriented Experiments:

1. Determination of melting point of organic and inorganic solid substances.
2. Determination of boiling point of organic and inorganic liquidsubstances.
3. Estimation of hardness of water by EDTA titration method.
4. Estimation of TDS of water samples using TDS meter.

Scheme for External Evaluation-Record Note Book:10,Procedure with Formula:20,Performance of the Practicals:20,Result :10 Error Limit $\pm$10%

Reference Books:

- Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, II edition, New Delhi, Sultan Chand & sons (1997)
- Practical Chemistry, A.O. Thomas, Scientific Book Centre, Cannnore,1992.

MAJOR ELECTIVE : III - INDUSTRIAL CHEMISTRY

Hours : 5 Credits : 4 Max.100 Marks (Ext: 75 & Int: 25)

Course Outcomes:

- To describe the students well – grounded in the principles and through knowledge of scientific techniques of industrial chemistry.
- To explain the properties of paints and varnishes.
- To understand the applications of soaps and detergents.
- To describe the physical characteristics of Portland cement.
- To explain the various types of batteries.

COURSE CONTENT

Unit – I: Glass and Ceramics : Glass – General properties of glass – types of glasses – manufacture of glass – Ceramics – classification – clay products – white wares – chemical store wares - plasticity of clay – manufacture of white pottery, glazing, Earthen wares.

Refractories: Definition –classification, properties of refractories – manufacture of refractories, fire clay bricks manufacture, uses of fire clay refractories - High alumina refractories – uses – silicon carbide refractories - properties and use.

Unit – II: Paints and varnishes: Paint – definition – classification of paints based on their applications – constituents – Requisites of a good paint – emulsion paints Varnishes – Definition – constituents of varnish – characteristics of a good varnish – uses – japans varnish. Enamel - definition – Types, Ingredients and uses.

Pigments: Definition – composition, characteristics and uses of white lead, zinc oxide, Lithopone and TiO_2

Unit – III: Soap and Detergents: Soap – Definition – General consideration in soap making – manufacture of soap – Hot and Cold process – transparent soaps - properties. Detergents – Definition – classification of face active agents cleaning action of soap deference between soap & detergents. Silicones: Preparation & uses.

Unit – IV: Portland Cement: Introduction – types of cements composition manufacture & setting of cement.

Corrosion: Dry and Wet corrosion – Electrochemical theory of Corrosion- Mechanism – Galvanic corrosion, Concentration cell corrosion Waterline Attack – Pitting – passivity-stress corrosion – Corrosion control methods.

Unit – V: Fundamentals of Batteries – Classification of Batteries – types of Batteries - Primary Batteries Le' clanche Dry Cell – Magnesium Dry Cell - Secondary Batteries – Lead Acid Battery – Alkaline Storage -Batteries. Fuel cells(hydrogen- oxygen.

Text Book:

- Applied Chemistry and chemical engineering, by A.K.Haghi, Devrim Balkose,Omari V. Mukbaniani, Apple Academic Press, published on 20.03.2018.

Reference Books:

- J.C. Kuriacose, J. Rajaram – Chemistry in engineering and Technology – Vol-2 Tata McGraw – Hill Publishing Company Limited – New Delhi – 1979.
- P.C.Jain & Manika Jain – "Engineering Chemistry" 15th Ed., (2005), Dhanpath Raj publishing company, New Delhi.
- B.K.Sharma - "Industrial Chemistry", 1st Ed., (1984), Goel Publishing House – Meerut.
- P.L.Soni, H.M.Chawla – "Text Book of Organic Chemistry" (1994), Sultan Chand & Sons, New Delhi.

- Arun Bahl and B.S.Bahl - "Text Book of Organic Chemistry" 11th and 18th Ed., S.Chand, New Delhi.
- Krishnamoorthy, P.Vallinayagan & K.Jaya Subramanian – "Applied Chemistry", 2nd Ed., (1999-2001), Tata McGraw – Hill Publishing Co Ltd., New Delhi.

MAJOR ELECTIVE: III - APPLIED CHEMISTRY

Hours : 5 **Credits : 4** **Max.100 Marks (Ext: 75 & Int: 25)**

Course Outcomes:

- To know the systems of medicine.
- To acquire knowledge on chemotheraphy, harmones and vitamins and their functions an anaesthetics.
- To attain knowledge on preparation of rubber, polymerization and various values of oils and fats.
- To apprehend on fertilizers, insecticides and pesticides.
- To know cognizant on pyrotechniques and manufacture of cement, glass and ceramics.

COURSE CONTENT

Unit I: Medicinal Chemistry

Introduction to the different system of medicine; Ayurveda, Siddha, Homepathy and Allopathy-History of medicinal chemistry.

Analgesics and antibyretics; Narcotic analgesics- Morphine and derivatives.Totally synthetic analgesics – pethidine and methadones.(Medicinal uses and structure only)]Antipyretic analgesics-salicylic acid derivatives and P-amino phenol derivatives. (Medicinal uses and structure only) Diagnostic tests and estimation of sugar, salt(including lithium) and cholesterol in serum,urine etc.,

Unit II: Chemotherapy and application of a few drugs (Elementary study)

Sulpha drugs- Sulphadiazine, prontosil and prontosil S

Antimalarials - quinnie, plasmoquine

Arsenical drugs- salvarasan- 606 - Neosalvarasan.

Antibiotics: Definition, Penicillin- Tetracylline(Auromycin and Terramycin) streptomycin and chloromyceitin-structure and uses.

Hormones and Vitamins:

Definition and classification, Testosterone, Progesterone, Thyroxise, Vitamin C structure only (Structural elucidation not necessary)

Anaesthetics:

Gaseous anesthetics- Vinyl ether-Cyclopropane-Halohydrocabons-Chloroform-Halothane-Trichloroethylene-Intravenous anesthetics-Thio pentone-Local anesthetics-Cocaine and its derivatives.

Unit III: Rubber: Natural and synthetic rubbers- composition of natural rubber , Neoprene, Styrene- Butadiene rubber (SBR).

Polymer Chemistry: Types of polymerization – Addition and Condensation-Mechanism-Copolymer-Definition with Examples Homopolymer-Definitionof natural and synthetic fibres- natural and synthetic resins- distinction between plastics – classification of plastics-properties- Bakelite, Urea formaldehyde resins,Deflons,Nylon-66 and Dacron.

Oils and Fats:

Saponification value, iodine value Reichert-Meissan value, Acid value, Definition and their determination-Applications-Manufacture of soap-detergents-cleasning action of soap and detergents.

Unit IV:

Fertilizers: Definition- Nutrients for plants –Role of various elements in plant growth-natural and chemical fertilizers- classification of chemical fertilizers – Urea, super phosphate and potassium nitrate- mixed fertilizer- fertilizer industry in India.

Insecticides and pesticides:

Definition- classification- inorganic pesticides-preparation and application –Lead arsenate, paris green, lime sulphur, hydrocyanic acid, organic pesticides, natural and synthetic – fungicides - repellants. Preparation of domestically useful chemical products;

Washing powder, cleaning powder – phenols(white, black and colour)-shampoo, insence sticks, liquid blue, blue red and green inks, soap soil, face powder and pain balm.

Unit V: Match industry: Pyrotechnics and explosives- Raw materials needed for match industry- Manufacturing process- Pyrotechnics- Colored smokes explosives-Definition-Classification- Nitroglycerine, Dynamite, Cordite,TNT and Picric acid.

Silicate Industry:

Raw materials & Manufacture of cement, Glass&Ceremics. Paints and Lacquers:

Pigment- Paints- Ingredients in paints- Manufature- Lacquers- Varnishes.

Text Books:

- Applied Chemistry and Chemical Engineering, by A.K.Haghi, Devrim Balkose, Omari V..Mukbaniani, Apple Academic Press, published on 20.03.2018.

Reference Books:

- J.C. Kuriacose, J. Rajaram – Chemistry in engineering and Technology – Vol-2 Tata McGraw – Hill Publishing Company Limited – New Delhi – 1979.
- P.C.Jain & Manika Jain – "Engineering Chemistry" 15th Ed., (2005), Dhanpath Raj publishing company, New Delhi.
- B.K.Sharma - "Industrial Chemistry", 1st Ed., (1984), Goel Publishing House – Meerut.
- P.L.Soni, H.M.Chawla – "Text Book of Organic Chemistry" (1994), Sultan Chand & Sons, New Delhi.
- Arun Bahl and B.S.Bahl - "Text Book of Organic Chemistry" 11th and 18th Ed., S.Chand, New Delhi.
- Krishnamoorthy, P.Vallinayagan & K.Jaya Subramanian – "Applied Chemistry", 2nd Ed., (1999-2001), Tata McGraw – Hill Publishing Co Ltd., New Delhi.

NME – CHEMISTRY FOR COMPETITIVE EXAMINATIONS

Hours : 2 **Credits : 2** **Max.100 Marks (Ext: 75 & Int: 25)**

MCQ, one word answer questions competency questions for TNPSC, NET/SLET, UPSC Bank, Quality control, Department Entrance Examinations, various job interview and entrance exam questions will be focused and trained for the effective participation and successful attainment of a job.

EXTRA CREDIT COURSE – I / FOOD CHEMISTRY

Sem: I **Credits : 2** **CIA: 100**

Course Outcomes:

- To understand the chemistry of food adulteration and adulterants.
- To know the chemistry of food poisoning.
- To acquire knowledge about food additives.
- To understand the chemistry of beverages and soft drinks and to know the methods of preparing the soft drinks by field visits.
- To acquire knowledge about various edible oils and the processing techniques related to oils.

COURSE CONTENT

Unit 1 : Food Adulteration:

Sources of food, types, advantages and disadvantages, Food adulteration –contamination of Wheat, Rice, Alial, Milk, Butter etc. with clay stones, water and toxic chemicals –Common adulterants. Common adulterants Ghee adulterants and their detection. Detection of adultered Foods by simple analytic techniques. (10hrs Theory + 5hrs Practical).

Unit 2: Food Poison:

Food poisons –natural poisons (alkaloids –nephrotoxing) –pesticides, (DDT, BHC, and Malathion) - Chemical poisons and First aid for poison consumed victims. (15hrs).

Unit 3 : Food Additives:

Food additives –artificial sweetners-Saccharin-Cyclomater and aspartate. Food flavours –esters, aldehydes and heterocyclic compound. Food colors –restricted use –spurious colors –Emulsifying agents –preservatives learning agents. Baking powder yeast –taste makers –MSG vinegar. .

Unit 4 : Beverages :

Beverages –Soft drinks –soda –fruit juices –alcoholic beverages examples. Carbonation –addiction to alcohol –cirrhosis of liver and social problems.

Unit 5: Edible Oils:

Fats, Oils –Sources of oils –Production of Refined vegetables oils –Preservation. Saturated and unsaturated fatty acids –I_2 value, saponification values and their significance. Estimation of I_2 and RM values in Edible oils.

Books for Reference :

- Swaminathan M.Food Science and Experimental foods, Ganesh and Company.
- Jayashree Ghosh, Fundamental concepts of Applied chemistry, S.Chand & Co., Publishers.
- Thanlamma Jacob, Text Books of applied chemistry for Home Science and allied Sciences, Macmillan.

EXTRA CREDIT COURSE – II / FORENSIC CHEMISTRY

Sem: III **Credits : 2** **CIA: 100**

Course Outcomes:

- To learn crime investigation through diagnosis of poisoning and post-mortem.
- To acquire knowledge about explosions, the causes (gelatin sticks, TDX etc) and the security measures.
- To understand the methods of detecting Forgery in bank and educational records.
- To acquire a comprehensive knowledge about tracks and traces.
- To understand the chemical methods used in crime investigation (Medical aspects).

COURSE CONTENT

Unit 1: Poisons

Poisons – types and Classification – diagnosis of poisons in the living and the dead – clinical symptoms- postmortem appearances. Heavy metal contamination (Hg, Pb, Dd) of sea foods – use of neutron activation analysis in detecting Arsenic in human hair. Treatment in cases of poisoning – use of antidotes for common poisons.

Unit 2: Crime Detection

Accidental explosion during manufacture of matches and fire works (as in Sivakasi). Human bombs- possible explosives (gelatin sticks and RDX) – metal defector devices and other security measured for VVIP – composition of bullets and detecting powder burne . Analysis of incendiary and timed bombs- spill of toxic and corrosive chemicals from tankers.

Unit 3: Forgery And Counterfeiting

Documents – different types of forged signature – simulated and traced forgeries – inherent signs of forgery methods – writing deliberately modified – uses of ultraviolet rays – comparison of type written letter – checking silver line water mark in currency notes- alloy analysis using AAS to detect counterfeit coins- detection of gold purity in 22 carat ornaments – detecting gold plated jewels.

Unit 4: Tracks And Traces

Tracks and traces- small tracks and police dogs – foot prints – costing of foot prints – residue prints- residue prints, walking pattern or tyre marks – miscellaneous traces and tracks – glass fracture – tool marks- paints – fibres – analysis of biological substances – blood, semen, saliva, urine and hair – Cranial analysis (head and teeth) DWA Finger printing for tissue identification in dismembered bodies- detecting steroid consumption in athletes and race horses.

Unit 5: Medical Aspects

Aids- Causes and prevention - misuse of scheduled drugs – burns and their treatment by plastic sugery . Metabolite analysis using mass spectrum- gas chromatography. Arson – natural fires and arson – burning characteristics and chemistry of combustible materials – nature of combustion. Ballistic – Classification - internal and terminal ballistics – small arms- laboratory examination of barrel washing and detection of powder residue by chemical test.

Text Books:

- Forensic sciencePrinciples and applications by Dr.Nishant Singh,Ancient Publishing House,01.01.2011.

Reference Books:

- T.H. James, Forensic Sciences , Stanley Thornes Ltd.,
- Richard, Criminalistics – An introduction to Forensic Science College Version), 8th Edition Sofestein , Printice Hall.,

EXTRA CREDIT COURSE – III / CHEMISTRY IN DAY TODAY LIFE

Sem: V Credits : 2 CIA: 100

Course Outcomes:

- To learn the types of fabrics, fading, starching process.
- To acquire knowledge about types of soaps whiteners, stiffeners, flavouring agents.
- To understand soft and hard utensil cleaning liquid soaps.
- To acquire a comprehensive knowledge about floor cleaning agents and mosquito repellent machines.
- To understand the chemicals used in water purifiers and germicidal effect of uv radiation.

COURSE CONTENT

Unit – I : Textile Chemistry:

Brief introduction to types of fabrics-natural and synthetic fabrics (cotton, fur, jute, silk, polymeric metallic)-durability and maintenance of cloth, fading and introduction to natural and synthetic dyes for colouring textiles, starching process.

Unit – II: Soaps and detergents –types of soaps, surfactants-types, importance, fabric whiteners, stiffeners, flavouring agents, ultramarines ,brighteners, selection of cost effective washing powders-pleasant odours, flavouring liquids for fabrics-collar and surf dirty remover liquids.

Unit –III : Dishwashers-soft and hard utensil cleaning liquid soaps-brighteners. Efficient way of using and maintenance-significance in health hazards of corrosive chemicals used in manual cleaning of household vessels, awareness on healthy way of using cleaning chemicals in day today life.

Unit –IV:

Floor cleaning agents used in vacuum cleaners(lizol, phenoyl- sanifresh)deodorants, room air freshners.LPG stove top made of SS ,glass, GI, chromium alloys-cleaning liquids not affecting metals and glass. Anti mosquito repellant machines –evaporators-liquid, solids and gases.

Unit-V:

Chemicals used in water purifiers-germicidal effect of uv radiation exposure-nutrient elements-sedimentation alum-types of water purifiers-water borne diseases-health care awareness on purified drinking water.

References:

- Industrial Chemistry by B.K.Sharma, Goel Publishing House 1995
- Websites
- Manual of home appliances
- Healthcare printouts from the hospitals