

SRI KALISWARI COLLEGE, SIVAKASI
(An Autonomous Institution, Affiliated to Madurai Kamaraj University,
Reaccredited with 'A' Grade by NAAC with CGPA 3.30)

DEPARTMENT OF CHEMISTRY



Programme Scheme of Examinations and Syllabi
(with effect from June, 2015)

UG Programme – B.Sc. (CHEMISTRY)

Programme Outcome

Knowledge

PO 1: Well grounded knowledge in chosen subjects.

PO 2: Updated knowledge related to the subjects.

Skills

PO 1: Acquisition of cognitive skills

PO 2: Acquisition of Life Skills for Employment.

Attitude

PO 1: Holistic Personality Development through Self-directed and lifelong learning.

PO 2: Eco Sensitivity, inclusive culture, moral uprightless and social commitment.

Programme specific Outcome:

B.Sc Chemistry

- Understand the fundamental principles and concepts of organic, inorganic, physical and analytical chemistry
- Able to handle the chemicals with the safety measures through their theoretical knowledge on properties of organic and inorganic chemicals.
- Ability to apply chemical principles to formulate and analyze a wide range of analytical and synthetic chemical problems.
- Learn standard laboratory methods involved in synthetic, analytical and instrumental work.
- Boost the knowledge on industrial processes like paper and pulp technology, sugar technology, drug chemistry, polymer chemistry to enhance the opportunity on employability

Sri Kaliswari College (Autonomous)-Sivakasi
Department of Chemistry
Choice Base Credit System- Curriculum Pattern
UG Programme – B-Sc [Chemistry]
2015-2018

Part	Course Code	Course Name	Hours	Credits
Semester I				
I	15UTAL11	Tamil/ Hindi/ French-I	6	3
II	15UENL11	General English -I	6	3
III	15UCHC11	Core-I : Foundation course - Basic concepts of chemistry	3	3
	15UCHC12	Core-II : Organic, Analytical & Physical chemistry	5	4
	15UCHA11	Allied course –I : Mathematics-I	6	5
IV	15UCHN11	Non-major Elective course -I Industrial chemistry	2	1
	15UCHE11	Enrichment course-I Water Technology	2	1
		TOTAL	30	20
Semester II				
I	15UTAL21	Tamil/ Hindi/ French-II	6	3
II	15UENL21	General English -II	6	3
III	15UCHC21	Core-III : Organic, Inorganic & Physical chemistry	4	4
	15UCHC2P	Core-IV : Semi micro Inorganic qualitative analysis (Lab)	2	4
	15UCHA21	Allied course-I : Mathematics – II	6	5
IV	15UCHE21	Enrichment course-II : Basics of computer in Chemistry	2	1
	15UCHN21	Non-major Elective course–II : Applied Chemistry	2	1
		TOTAL	28	21
Semester III				
I	15UTAL31	Tamil/ Hindi/ French-III	6	3
II	15UENL31	General English -III	6	3
III	15UCHC31	Core-V : Organic Chemistry - I	4	4
	15UCHC32	Core-VI : Chemistry of metallic and nonmetallic compounds	4	4
	15UCHA31	Allied course-II : Physics- I	4	3
IV	15UCHS31	Skill Based Course –I : Paper And Pulp Technology	2	2
	15UCHV31	Value Based Course –I : Match industry	2	1
		TOTAL	28	20
Semester IV				
I	15UTAL41	Tamil/ Hindi/ French-IV	6	3
II	15UENL41	General English -IV	6	3
III	15UCHC41	Core-VII : Adsorption, chemical kinetics and solid state	4	4

	15UCHC4P	Core-VIII Volumetric Analysis & complex preparations(Lab)	2	4
	15UCHA41	Allied course -II : Physics- II	4	3
	15UCHA4P	Practical in Physics	2	4
		Optional Course - I	4	3
	15UCHO41	1. Green Chemistry		
	15UCHO42	2. Medicinal Chemistry		
V		Extension Activities	-	1
		TOTAL	30	25
Semester V				
III	15UCHC51	Core IX : Organic Chemistry - II	4	5
	15UCHC52	Core-X : Inorganic chemistry - I	4	5
	15UCHC53	Core-XI : Thermodynamics & Photo chemistry	4	5
		Optional Course – II	4	3
	15UCHO51	1. Perfume and sweetening		
	15UCHO52	2. Polymer chemistry		
IV	15UCHS51	Skill Based Course – I Nano Chemistry	2	1
	15UCHS52	Skill based course –III : Drug Chemistry	2	1
	15UVED51	Value Education	1	1
		TOTAL	21	21
Semester VI				
III	15UCHC61	Core-XV : Organic Chemistry – III	4	4
	15UCHC62	Core-XVI :Concept of Bio-inorganic, organometallic & Environmental chemistry	4	4
	15UCHC63	Core-XVII : Electrochemistry, Quantum mechanics & Phase rule	5	4
	15UCHC6P	Core-XII : Organic qualitative analysis & estimations(Lab)	4	4
	15UCHC6Q	Core-XIII : Physical chemistry Practicals (Lab)	4	4
	15UCHC6R	Core-XIV : Gravimetric & organic preparations (Lab)	4	4
		Optional / Elective Course – III	2	3
	15UCHO61	1. Chromatographic Techniques		
	15UCHO62	2. Analytical chemistry		
IV	15UCSS6P	Skill Based Course –IV : Sugar Chemistry	2	2
	15UCSV61	Value Based Course – II : Pyrotech	2	1
	12UESR61	Environmental Studies	2	1
		TOTAL	33	31

Semester	I	II	III	IV	V	VI	Total
Credits	20	21	20	25	21	31	140

Sri Kaliswari College (Autonomous) - Sivakasi
Choice based credit system
UG Programme - B.Sc (Chemistry) - 2015-2018
Semester-I

Core – I: Foundation Course - Basic Concepts of Chemistry-15UCHC11

Duration: 45 Hrs

Credits : 3

Aim and objective:

- To make a clear understanding about the basic concepts in chemistry.
- To create interest in our programme.
- To build a strong foundation to enrich the knowledge in the subsequent courses of our programme

Course Outcome :

- Understanding the basic concepts of co – ordination compounds.
- Skill to calculate the atomic weight, molecular weight, equivalent weight, normality and mole.
- Familiarity with periodicity in properties.
- Ability to write IUPAC nomenclature of compounds
- Understanding the basic concept of physical chemistry.
- Ability to understand the basic concept in organic chemistry.

Unit – I

(9 Hrs)

BASIC CONCEPTS IN INORGANIC CHEMISTRY - I:

Atom – molecule – number of neutron, proton, electrons – alpha, beta, gamma rays – atomic number – isotope – fission isotopes – fusion isotopes.

Simple salt – double salt – coordination compounds – ligand – coordination number – primary valency – secondary valency – IUPAC nomenclature of coordination compounds.

Unit – II

(9 Hrs)

BASIC CONCEPTS IN INORGANIC CHEMISTRY - II:

Atomicity – Atomic weight – Molecular weight – Mole – Avogadro's number – Electronic configuration – Valency – electronic concepts of oxidation and reduction, oxidizing agent and reducing agent.

Normality – Equivalent weight of element, acid, base, oxidizing agent, reducing agent – Periodicity in properties like atomic radii – ionic radius – electron affinity – electronegativity

Unit – III

(9 Hrs)

ATOMIC STRUCTURE:

Particle aspects – wave aspects – frequency – wavelength – energy – photoelectric effect – Compton effect – shape of orbital – s, p and d.

Rate of a reaction – order and molecularity of a reaction – catalyst – adsorption – absorption – system – surroundings – exothermic – endothermic – enthalpy – free energy change. Conductors – insulators – semiconductors. Acid – base – pH – buffer – common ion effect and solubility product (definition only)

Unit – IV**(9 Hrs)****BASIC CONCEPTS IN ORGANIC CHEMISTRY – I:**

Detection of elements like nitrogen, sulphur, halogen present in organic compounds – empirical and molecular formula (problem not included).

Characteristics of organic compounds -Types of organic reactions – addition – substitution – elimination – electrophilic and nucleophilic reactions-, E1, E2 – electrophile – nucleophile (define with one example)-Difference between these two

Unit – V**(9 Hrs)****BASIC CONCEPTS IN ORGANIC CHEMISTRY – II:**

IUPAC Nomenclature of organic compounds with mono functional group only.

Cleavage of bonds: homolytic and heterolytic cleavage – reaction intermediate: free radical, carbocation, carbanion, carbene and nitrene – S_N1 , S_N2 electromeric effect, inductive effect, resonance, hyperconjugation. (Explain with one example)

Reference:

1. Text book of physical chemistry by Puri & Sharma (latest edition 2008)
2. Text book of organic chemistry by P.L. Soni (Latest edition 2008)
3. Text book of inorganic chemistry by P.L. Soni (Latest edition 2008)

Sri Kaliswari College (Autonomous) - Sivakasi
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UG Programme - B.Sc (Chemistry) - 2015- 2018
Semester-I

Core – II: Organic, Analytical and physical chemistry - 15UCHC12
Duration -75 Hrs

Credits: 4

Aim and objective:

- To know the methods of preparation, characteristic properties and applications of organic compounds.
- To understand the techniques involved in the semi micro qualitative analysis.
- To know about the various theory and concept in gaseous state.

Course Outcome:

- Understand the preparation and properties of alkane and alkene
- Knowing the Concept of Ozone depleting compounds and allylating agent
- Role of common ion effect and solubility product in qualitative analysis
- Skill in balancing the various chemical equation in various medium
- Develop familiarity in vanderwaals equation and compressibility factor
- Understanding the behavior of gases at various conditions
- Knowing the Application of Brownian movement in the Avogadro's number calculations
- Concept understanding through pictorial and graphical representations of the properties of gases

Unit I

(15 Hrs)

Aliphatic Hydrocarbon - I

Alkane - Preparation by Wurtz, Kolbe methods - halogenation - Cracking and pyrolysis.

Alkene-preparation by dehydrohalogenation of alkyl halides - Saytzeff rule- dehydration of alcohols - thermal decomposition of quaternary ammonium hydroxide - Hofmann rule. E1 and E2 mechanism - Electrophilic addition of Br₂, HBr Markownikoff's rule - Peroxide effect - Hydroboration.

UNIT II

(15 Hrs)

Aliphatic Hydrocarbon - II

Alkyne: Preparation and properties of acetylene and Propylene

Alkyl halides:

- a. Mechanisms of S_N¹, S_N² reactions.
- b. Preparation and properties of chlorofluorocarbons – westron – Freon -CHCl₃- CHI₃-CCl₄- vinyl chloride - allyl chloride.

Unit III

(15 Hrs)

Analytical Chemistry

Principle and techniques of semi micro methods – Aims of semi micro qualitative analysis – Types of reactions involved in qualitative analysis - Dry reactions-Precipitation reactions - Removal of interfering ions in the analysis of cations - oxalate, tartarate, borate, fluoride, chromate, phosphate and arsenite- applications of solubility product

principle, common ion effect in qualitative analysis - Complexation - Oxidation and reduction reactions in qualitative analysis - Spot tests for cations

Calculation of oxidation number - redox reactions-Balancing ionic equations and redox reactions by electron transfer method.

Unit IV

(15 Hrs)

Gaseous State –I

Postulates of kinetic theory of gases – derivations of ideal gas laws from the expression on the basis of kinetic theory of gases – Deviations – van der Waals equation – Reduced equation of state – law of corresponding states – compressibility factors for gases – Boyle and inversion temperatures of gases.

Unit V

(15 Hrs)

Gaseous State - II

Maxwell- Boltzmann law of distribution of velocities (Derivation not necessary)
Graphical representation - Effect of temperature on various velocities - experimental verification of Maxwell's law. Mean free path – viscosity of gases – collision number – Brownian movement. Determination of Avogadro number by Brownian movement – Loschmidt number- principle of Equipartition of energy.

Reference:

1. Text book of physical chemistry by Puri & Sharma (latest edition 2008)
2. Text book of organic chemistry by P.L. Soni (Latest edition 2008)
3. Text book of inorganic chemistry by P.L. Soni (Latest edition 2008)

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Semester-I

Non – Major Elective Course -I: Industrial Chemistry – 15UCHN11
Duration -30 Hrs

Credits: 1

Aim and objective:

- To give a basic knowledge about the significance of chemistry involved in the various industries.
- To provide a basic idea about the significance of Dairy, polymer technology.
- To know about the quality of water
- To know about the manufacture of cement

Course Outcome:

- Understanding the various factor affecting the quality of milk and its products
- Knowing the concept of setting of cement and its quality affected by various conditions
- Learning the knowledge about the polymers, fibers and their role in day to-day life
- Create awareness on the water pollution and its purifications

Unit I

(6Hrs)

Dairy Technology

Milk and milk products industry: Composition of milk, flavour and aroma of milk – physical properties of milk – effect of heat on milk, milk products – cream, butter, ice cream, milk powder

Unit II

Cement industry

(6Hrs)

Introduction – types of cement – manufacture – raw materials – reaction in the kiln- mixing of additives in the cement – setting of cement – factors affecting the quality of cement

Unit III

Polymer Industry

(6Hrs)

Polymerization – definition – natural and synthetic polymers – natural polymer - rubber - synthetic polymers- preparation and applications of plastic – PVC - bakelite – Nylon 66 — terylene (Structure not necessary)

Unit IV

(6Hrs)

Fibers

Introduction – classification of fibers – preparation and properties: of Viscose Rayon, Nylon 66, Nylon 6 and Dacron

Unit V

(6Hrs)

Water Treatment

Introduction – characteristics imparted by impurities in water – hardness of water – units of hardness – determination of hardness - disadvantages of hard water – Desalination- reverse osmosis

References

1. Applied Chemistry by K. BagavathiSundari – MJP publisher Chennai – 2006.
2. Engineering Chemistry by Jain and Jain – DhanpatRai publishing company, NewDelhi – 14th edition 2004.
3. Industrial chemistry by B.K. Sharma – GOEL publishing house, Meerut- 14thedition- 2004.

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Choice based credit system
UG Programme - B.Sc (Chemistry) - 2015- 2018
Semester-II

Core – III: Organic, Inorganic and Physical Chemistry – 15UCHC21
Duration -60 Hrs

Credits: 4

Aim and objectives:

- To understand the basics and theory of various concepts
- To know the methods of preparation, characteristic properties and applications of organic compounds
- To know about the properties of liquids
- To give a basic knowledge about catalysis

Course Outcome:

- Gain knowledge about the Organometallic reagent and its role in synthetic chemistry
- Application of supramolecules and thiol compound importance in the synthesis
- Understanding periodicity of properties and its impact in the ionic and covalent compounds
- Learning of Molecular structure through the various bond theories
- Acquire knowledge for identifying structure of molecules using parachor, refractive index, viscosity and optical exaltation
- Getting more knowledge about the applications of liquid crystals due to its wide range of industrial applications.
- Deepening the ideas about catalysis, Types, Theory and applications owing to its scope on research in synthetic chemistry.

Unit – I

(12 Hrs)

Organometallic Compounds:

Grignard reagent- Preparation- Properties- Synthetic applications-Limitation- Organolithium compounds

Ethers:

Preparation and properties of ethers by Williamson's synthesis – preparation and applications of Crown ethers

Thioalcohols and Thioethers: Preparation, Properties of ethanethiol, diethylsulphide, sulphonal and mustard gas

Unit-II

(12 Hrs)

Periodicity of properties - cause of periodicity-atomic and ionic radii - electron affinity - ionization energy – electronegativity - Pauling and Mulliken scale - Alfred and Rochow's scale - factors affecting the magnitude of electronegativity - application of electronegativity

Unit-III

(12 Hrs)

Chemical bonding

Valence bond theory: Types of overlapping and orbital diagrams - sigma and pi bonds. Hybridization and geometry of molecules - sp, sp², sp³, sp³d and d²sp³ hybridization with

example. VSEPR theory - shapes of molecules - molecular orbital theory - Bonding and antibonding orbital - relative order of energies of molecular orbital - MO theory applied to homo nuclear molecules - H₂, O₂, F₂ and Cl₂ - heteronuclear molecules - HF, CO and NO - comparative study of VB and MO theories

Unit IV

(12 Hrs)

Liquid State:

Nature of cohesive forces in liquids – Trouton's rule and its significance Physical properties and chemical constitution Molar volume and its application - parachor –atomic and structural parachors - application. Viscosity- influence of temperature on viscosity - relation to chemical constitution - molecular viscosity- atomic and structural viscosity- Rheochor - Refraction - refractive index - specific refractive index - molar & atomic & structural refraction - applications-optical exaltation - liquid crystal-classification-swarm theory- applications

Unit V

(12Hrs)

Catalysis

Definition – Types of catalyst - characteristics – theories of catalysis - enzyme catalysis–Mechanism: Michaelis–Menton equation-acid – base catalysis and autocatalysis – catalytic promoters and catalytic poisons - application of catalysis.

Reference:

1. Text book of physical chemistry by Puri &Sharma (latest edition 2008).
2. Text book of organic chemistry by P.L. Soni (Latest edition 2008).
3. Text book of inorganic chemistry by Puri &Sharma (Latest edition 2008)

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Semester-II

Non – major elective course – II: Applied Chemistry-15UCHN21
Duration -30 Hrs

Credits: 1

Aim and objective of this course:

- To have a general knowledge about the preparation like Agarbathis, phenoyls, naphthalene balls, ink and shampoo
- To know the technical methods applied in the manufacture of soaps, paints and varnishes

Course Outcome:

- Knowing the manufacturing process of household materials like wax candles, shoe polish
- Skill to prepare cleaning powder, washing powder and phenoyls
- Gain knowledge about the composition of soap and detergents.
- Deepening the knowledge about paint and varnishes.

Unit - I **(6 Hrs)**
Household materials

Composition and uses of safety matches-Manufacturing process-Agarbathis, naphthalene balls, wax candles, shoe polish, chalk crayons and gum paste

Unit – II **(6 Hrs)**
Cleaners

Preparation of washing powder, cleaning powder, white, Black, yellow, Rose coloured phenoyls, tooth powder and liquid mouth wash.

Unit – III
Soap and Detergents

Manufacture of soap and detergents – cleaning action of soap – advantages of detergents over soap – liquid soap.

Unit IV **(6 Hrs)**
Cosmetics

Preparation of shampoo, liquid blue- preparation of blue, green and red inks, face powder, face cream, lipstick and nail polish

Unit – V **(6 Hrs)**
Paints and varnishes

Paints: Introduction –Ingredients in paints- manufacture – Varnishes: Introduction – types – manufacture – solvents and thinner – paint and varnish industry in India.

Reference :

1. B.K.Sharma, Industrial Chemistry, Goel Publishing House, 6th edition, 1994.
2. Applied Chemistry by K. BagavathiSundari – MJP publisher Chennai – 2006.

3. Engineering Chemistry by Jain and Jain – Dhanpat Rai publishing company, New Delhi – 14th edition 2004.

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U. G Programme - B.Sc Chemistry-2015- 2018

Semester-II

Enrichment course –I: Basics of computers in chemistry-15UCHE21

Duration-30 Hrs

Credits: 1

Aim and objective:

- To give a basic knowledge about computer.
- To provide a clear understanding about the usage of internet in the field of Chemistry.
- To draw chemical structure using software.
- To have a thorough knowledge in MS- word.

Course Outcome:

- Knowledge about history, development and components of computers
- Knowing the different types of computer and programming language
- Skill to use the internet and e-mail
- In-depth knowledge in MS-word

Unit - I

(6 Hrs)

Computer – definition – history of computer – the components of computer – input unit – CPU – output unit – secondary storage devices - Hard ware and software: system software – application software.

Unit – II

(6 Hrs)

Types of computers - programming languages – low level – high level languages – brief introduction to BASIC – FORTRAN – COBOL – PASCAL languages.

Unit – III

(6 Hrs)

Internet – definition – internet access- home page – search engine - E- mail sending and receiving mail through internet

Unit - IV

(6 Hrs)

MS-Word Introduction – Word for Windows – Creating and saving documents – Page setup – Print preview – Print - Edit – Redo, cut, copy, paste, find and replace.

Views – Normal, print layout, Ruler, Header and Footer. Insert – Page number.

Unit – V

(6 Hrs)

Picture, Text box, Word Art, Format fonts (size, colors and type), Bulleted numbering, border and shading, Columns and Change cases Tools – Spelling and Grammar mail merge. Table – draw insert, delete, select, split columns and rows.

Class work

1. Working in chem. Draw and chem. 3D Ultra

References :

1. Computers in Chemistry by K.V. Raman – Tata MC Graw – Hill publisher – fifth edition – 2003.
2. The Internet A User's Guide by K.L. James – Prentice Hall of India private Limited – New Delhi – 2003.

3. MS Office by S. David Laurence, First Edition August 2008
Publication: JDP, Rajapalayam.

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U. G Programme - B.Sc Chemistry-2015- 2018
Semester-III

Core Paper – V: Organic Chemistry – I-15UCHC31

Duration: 60 Hrs

Credits: 4

Aim and objectives:

- To know the preparation, structure, reactivity, mechanism and applications of various organic compounds.

Course Outcome:

- Knowing the various preparations of aldehyde
- Deliberating the various methods to prepare ketone
- Significant knowledge in carboxylic acids
- Understanding the stability and conformational analysis of cycloparaffins
- Gain knowledge in the separation and distinction of primary, secondary & tertiary amines
- Acquire ideas in preparation and properties of amino acids.
- Skill to identify the aromatic, anti-aromatic and non-aromatic compounds using Huckel's rule
- Deepening the knowledge of preparation and properties of substituted benzene

Unit – I

(12 Hrs)

Aldehydes & ketones

Preparation from fatty acids-1, 2-dialkyl lithium cuprate and Grignard reagent - Aldol condensation, Cannizaro reaction mechanism –Nucleophile addition to carbonyl compounds- Clemmenson reduction- Wolf-Kishner reduction.

Preparation, properties and uses of glyoxal, acetylacetone, acetonylacetone, biacetyl.

Unit – II

(12 Hrs)

Carboxylic acids

General method of preparation- properties of monocarboxylic acids - relative strength of aliphatic monocarboxylic acid and aromatic halogen substituted monocarboxylic acid.

Hydroxyacids- preparation, properties and uses of lactic, tartaric and malic acid - action of heat on α , β and γ - hydroxyacids.

Dicarboxylic acids - Preparation and properties of Succinic and adipic acids - action of heat on Dicarboxylic acids.

Synthetic applications of acetoacetic ester and malonic ester

Unit – III

(12 Hrs)

Alicyclic compounds

General methods of preparation and properties of cyclo paraffins-Baeyer's strain theory and its modification. Conformational analysis of cyclopentane & Cyclohexane - Civetone - Muscone.

Unit – IV

(12 Hrs)

Aliphatic nitrogen compounds

Amines: Separation and distinction of primary, secondary & tertiary amines
Phase Transfer Catalysts - TBAB – applications. Synthetic application of diazoacetic ester.

Urea: Manufacture-Properties-Uses and estimation.

Aminoacids: Preparation and properties of glycine and alanine, action of heat on α , β and γ -aminoacids.

Unit – V

(12 Hrs)

Aromatic compounds

Aromaticity- Huckel's rule- aromatic, anti aromatic and non aromatic compounds

Preparation and properties of toluene - xylene- ferrocene and azulene.

Preparation and properties of bromobenzene - benzyl bromide- ortho, para, meta nitrotoluene – ortho, para, meta nitro anilines and phenylene diamines.

Reference:

1. Text book of organic chemistry by P.L. Soni (Latest edition 2008)
2. R.T.Morrison and R.N.Boyd, Organic Chemistry, Prentice-Hall, 6th edn., 2001.
3. I.L.Finar, Organic Chemistry, Vol. I 5th edn., ELBS, 1975.

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U. G Programme - B.Sc Chemistry-2015- 2018
Semester-III

Core Paper– VI: Chemistry of metallic and nonmetallic compounds-15UCHC32
Duration: 75 Hrs **Credits: 4**

Aim and objectives:

- To understand the properties of halogens.
- To know about the minerals, metals and its composition.

Course Outcome:

- Acquire knowledge about various metallurgical process
- Gaining the ideas about the composition and applications of alloys
- Apply in-depth knowledge on analytically and industrially oriented inorganic compounds
- Gain understanding the role of metal oxide as catalyst in industrial process
- Knowing the periodic properties of Group-IV elements
- Understanding the concept of nitrogen and its compounds role as inorganic reagents
- Learn about the pseudohalogen, interhalogen compound
- Mastering in the oxyacids and oxides of Group 17 elements

Unit – I **(15 Hrs)**
Metallurgy

Occurrence of metals – minerals and ores – mineral wealth of India – refining of metals – zone refining – electrolytic refining – van Arkel – de Boer process – important ores and extraction of the following metals- Titanium, Thorium, Molybdenum, Cobalt and Platinum –Alloys : composition and applications of Nickel, Copper and Zinc alloys.

Unit II **(15 Hrs)**
Metallic compounds – I

Preparation, properties and uses of some important compounds- titanium dioxide, vanadium pentoxide, potassium dichromate, ammonium molybdate, tungsten trioxide, potassium permanganate, ferrous ammonium sulphate,.

Unit III **(15 Hrs)**
Metallic compounds – II

Preparation, properties and uses of some important compounds - Sodium Cobalt nitrate, Chloroplatinic acid, Copper sulphate, Silver nitrate, Gold chloride, Mercuric chloride, Thorium dioxide and oxides of uranium.

Unit-IV **(15 Hrs)**

General discussion of group IV elements-Comparison between carbon and silicon-Hydrides of silicon and silicates structure-lead monoxide-red lead-white lead.

General discussion of group V elements-active nitrogen-preparation and properties of hydrazine, hydrazoic acid and hydroxylamine-test for arsenic

Unit-V

Chemistry of Halogens

(15 Hrs)

Position of halogens in the periodic table-anomalous behaviour of fluorine-modern method of isolation of fluorine-estimation of available chlorine in bleaching powder-properties and uses - perchloric acid - potassium perchlorate. Oxides and oxy acids of bromine-brominating mixture-periodic acid-preparation-properties-uses -interhalogen compounds- polyhalides - pseudohalogens-basic iodine.

Reference:

1. Satya Prakash, G.D. Tuli, S.K. Basu and R.D. Madan, Advanced Inorganic Chemistry, Vol II , S. Chand & Company LTD, 2004 .
2. F.A.Cotton and G. Wilkinson, "Advanced Inorganic Chemistry", 5th Edn, John Wiley & sons, Singapore, 1998.

Sri Kaliswari College (Autonomous)-Sivakasi
Choice based credit system
U. G Programme - B.Sc Chemistry-2015- 2018
Semester-III

Skill based course– I: Paper and Pulp Technology -15UCHS31

Duration: 30 Hrs

Credits: 2

Aim and objectives:

- To know the components and chemicals used in the paper industry.
- To understand the technical methods in the manufacture of paper.
- To know about the various types of paper.

Course Outcome

- Gather the historical development of paper industries in India
- Acquire knowledge on the manufacturing process in paper pulp
- Learning the chemical process of preparation of sulphite, sodalime and rag pulp
- Realise the various process involved in the manufacture of paper and its applications

Unit I

(6 Hrs)

Paper

History – development, source-various raw materials used for the preparation of paper. Various paper industries in India.

Unit II

(6 Hrs)

Pulp

Manufacture of pulp, debarking- slashing- grinding- mechanical process- Production of news paper, Production of tissue paper and its applications.

Unit III

(6 Hrs)

Chemical process

Preparation of sulphite pulp, soda lime pulp, Rag pulp.

Unit IV

(6 Hrs)

Manufacturing Process

Manufacture of paper- Various processes: beating, refining, filling, sizing, coloring and calendaring.

Unit V

(6 Hrs)

Types and applications

Types of paper and its applications -General writing paper, Kraft paper, Wall paper, Art paper, Fluorescent paper, Carbon paper, Laser paper and tissue paper

Reference:

Industrial chemistry including chemical Engineering 2007.B.K.Sharma Goel publishing. House 13th revised and enlarged edition.

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Semester-III

Value Based Course - I: Match Industry -15UCHV31

Duration: 30 Hrs

Credits: 1

Aim and objective :

- To understand the manufacturing process in match industry.
- To know about the chemicals used in the preparation of match head and matchside.
- To know the analysis of finished products.
- To provide a basic idea about the safety methods followed in the match industry

Course Outcome:

- Understand the History and Preparation of Lucifer and Safety Matches
- Obtain Knowledge in the preparation, properties of Match Head Chemicals
- Know the preparation, properties of Match side chemicals
- Realising Manufacturing process of Match Industry

UNIT-I

(6 Hrs)

Introduction

History-Lucifer matches-Safety matches - Preparation of Lucifer matches – colored smokes-Match industries in Tamil Nadu.

UNIT-II

(6 Hrs)

Match head chemicals

Preparation, Properties & Uses of chemicals in match stick head -KClO₃, KNO₃, Sulphur, Antimony sulphide, Borax, MnO₂ (Black-Orange), Wax, Glue, Potassium dichromate.

UNIT-III

(6 Hrs)

Match Side Chemicals

Preparation, properties & uses of Red Phosphorus, Glass Pieces, Borax, Glue, Phosphorus trisulphide in the manufacture of matches.

UNIT-IV

(6 Hrs)

Manufacturing Process:

Preparations of Match stick - Dipping Process- chemical dipping – wax dipping - Drying-Packing-Disposal of wastes. Safety rules in Match industry.

UNIT-V

(6 Hrs)

Analysis of finished product:

Testing the finished product -Analysis of Match stick - methods to analyse the components of match stick and head KClO₃, Glue, Sulphur, As₂S₃, MnO₂.

Match side – Red Phosphorus - Glass Powder.

Reference:

Text Book of Inorganic analysis By P.L.Sony Mohan katya.
Sultan chand & Sons-New Delhi 2004.

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Semester-IV

Core Paper– VII: Adsorption, Chemical Kinetics and Solid state -15UCHC41

Duration: 60 Hrs

Credits: 4

Aim and objective:

- To know about the various theory and concept in adsorption.
- To understand the reaction rate, order, various theory and calculations involved in the chemical kinetics.
- To know about the structure and applications of crystals.

Course Outcome:

- Knowing the factors influencing adsorption and its applications
- Deliberating first, second, third and pseudo order reactions
- Significant knowledge in rate law, rate constant, order and molecularity of reactions
- Understanding the theories of reaction rate
- Gain knowledge on primary and secondary salt effect
- Acquire ideas about X-ray diffraction study of crystals
- Skill to identify symmetry elements of crystal systems and calculate Miller indices
- Deepening the knowledge of types of crystals

Unit I

(12 Hrs)

Adsorption

Terminologies involved – adsorption of gases on solids – characteristics of adsorption of gases on solids – physical adsorption and chemisorption – factors influencing adsorption – adsorption isotherm – BET theory (Elementary idea only) - applications of adsorption.

Unit II

(12 Hrs)

Chemical Kinetics- I

Introduction – rate of reaction – rate law and rate constant – order and molecularity of a reaction. Reaction of first and pseudo unimolecular reactions. Catalytic decomposition of hydrogen peroxide – Decomposition of dinitrogen pentoxide. Inversion of cane sugar and hydrolysis of ester by acid. Second, third and zero order reactions – examples – rate equation – half life period (no derivation required).

Unit – III

(12 Hrs)

Chemical Kinetics- II

Influence of temperature on the rate of reaction : Arrhenius rate equation and its significance – measurement of parameters. Theory of reaction rates: Bimolecular collision theory – unimolecular reactions – Lindemann's hypothesis – Absolute Reaction Rate theory. Influence of ionic strength on reaction rate – Primary and secondary salt effect – kinetics of fast reactions – relaxation method.

Unit – IV**(12 Hrs)****Solid State- I**

Laws of crystallography – law of constancy of interfacial angle law of symmetry, law of symmetry, law of rational indices – Miller indices – symmetry elements in a crystal – calculations involving interplanar spacing in crystal systems. X- ray diffraction – Bragg's equation – experimental method of determination of interplanar spacing – X –ray spectrophotometer – Debye – Scherrer method.

Unit – V**(12 Hrs)****Solid State- II**

Types of crystals – ionic, molecular, covalent, and metallic crystals.
Ionic crystals: Analysis of NaCl, KCl, CsCl – determination of Avogadro number.
Molecular crystals – Water and ammonia.
Covalent crystals – Diamond and graphite.
Metallic crystals – metallic bond in metals.
Conductors, insulators, superconductors and semiconductors – Frenkel and Schottky defects.

References:

1. Text book of physical chemistry by Puri & Sharma (latest edition 2008).
2. Advanced Physical Chemistry by D.N. Bajpai, S.Chand Company Ltd, 2010
3. Essential of Physical Chemistry by Arun Bahl, B.S. Bahl and G. D. Tuli, S.Chand Company Ltd, 2012.

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Semester-IV

Optional courses – I: Green chemistry -15UCHO41

Duration: 60 Hrs

Credit:3

Aim and objective of the course

- To understand the basic concepts in green chemistry
- To carry out reaction free from pollution.
- To get maximum yield with minimum usage of organic solvents

Course Outcome:

- Knowing the twelve major principles of Green Chemistry
- Gaining significant knowledge in methods of practising green chemistry
- Gain knowledge in aqueous phase reaction, ionic liquid, solid state and solid support reactions
- Acquire ideas about sonication in green synthesis
- Gain considerable knowledge in theory, technique and the applications of microwave in dry media synthesis
- Gain proficiency in the principle, advantages and applications of PTC

Unit – I

(12 Hrs)

Introduction to Green Chemistry

Anastas and Warner's twelve major principles of Green Chemistry – prevention of waste – Atom economy – synthesis of less hazardous chemicals – use of safer solvents – auxiliaries.

Unit – II

(12 Hrs)

Methods of practising green chemistry

Design of energy efficiency – use of renewable feed stocks – Reduction of unnecessary derivatisation. Use of catalytic reagents – design of environment friendly and easily degradable products – real time analysis for pollution and prevention – safer chemistry to prevent accident.

Unit – III

(12 Hrs)

Planning a green synthesis in a chemical reaction

Atom utilization – evaluation of the type of reaction involved – selection of appropriate solvent – aqueous phase reaction – ionic liquid – solid state – solid support - starting materials – avoiding protecting group–sonication in green synthesis like: acyloin condensation using $(\text{CH}_3)_3\text{SiCl}$. Thiamine - Aldol condensation in aqueous media – solid phase-solid phase Baeyer-Villiger oxidation–Barbier reaction-Cannizaro reaction – Claisen rearrangement

Unit - IV

(12 Hrs)

Microwave (oven) reactor

Theory – Reaction vessels – Techniques in using microwave – Applications of dry media synthesis- protection of functional groups – deprotection reaction- rearrangement reactions – solvent mediated reactions – oxidation reactions – chiral synthesis.

Unit – V

(12 Hrs)

Phase Transfer Catalysts (PTC)

Principle – introduction – Advantages – Application of PTC in Williamson's synthesis – Aromatic nucleophilic substitution reaction – esterification – Gabriel synthesis- Drug discovery – Chiral synthesis – Benzoin condensation – Flavone – Claisen reaction – Darzen reaction

References:

1. K.R. Desai, Green Chemistry (Microwave synthesis), Himalaya Publishing House, Mumbai, 2005.
2. N. R. Sanghi and M.M.Srinivasta, Green Chemistry (Environmental Friendly Alternatives), Narosa Publishing House, New Delhi, 2003.
3. Rashmi Sanghi, M. M. Srivastava, Green Chemistry, Environment Friendly Alternatives, Narosa Publishing House, 2007.
4. V. Kumar, An Introduction to Green Chemistry, Vishal Publishing CO. Jalandhar, 2007.
5. V.K. Ahluwalia, M. Kidwai, New Trends In Green Chemistry, 2nd Edn, Anamaya Publishers, New Delhi.

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Semester-IV

Optional courses – II: Medicinal chemistry -15UCHO42

Duration: 60 Hrs

Credit:3

Aim and objectives :

- To know the different types of drugs.
- To understand the mode of action of drugs.
- To understand the concept in clinical test

Course Outcome:

- Knowing the definition and classification of drugs
- Acquiring significant knowledge in methods of administration, mechanism of action and metabolism of drugs
- Understanding different types of analgesics and antipyretic drugs
- Acquire ideas about chemotherapy
- Gain considerable knowledge about hormones, vitamins and anesthetics
- Get proficiency in diagnostic tests, detection of anemia, diabetes and poisons
- Skill to identify antidotes for poisoning

Unit – I

(12 Hrs)

Introduction to drug

Drug – definition - classification of drug – routes of administration of drugs – different types of action - Mechanism of action of drug – Metabolism of drugs.

Unit – II

(12 Hrs)

Analgesics and Antipyretics

Narcotic analgesics – Morphine and its derivatives. Synthetic analgesics - Pethidine and Methadones.

Antipyretic analgesics – Salicylic acid derivatives, Indolyl derivatives and *p*-Aminophenol derivatives (Medicinal uses and structure only)

Unit – III

(12 Hrs)

Chemotherapy and application of few drugs (Structure not necessary)

Sulpha drugs – Sulphadiazine, Prontosil and Prontosil – S

Anti malarial drug – Quinine, Plasmoquine.

Antineoplastic agents: 5- Fluorouracil, Cisplatin.

Antibiotics: Definition, Penicillin – Tetracycline (Auramycin and Terramycin) – Streptomycin and Chloromyceitin

Unit – IV

(12 Hrs)

Hormones Vitamins and anesthetics (structure not necessary)

Definition – classification of hormones – physiological action of hormone: Testosterone, Progesterone, Thyroxin. Definition – classification of Vitamins – biological role of Vitamins: Vitamin A, B₆, B₁₂, C, D, E, and K. Introduction – therapeutic use and structure of vinyl ether – cyclopropane - chloroform – halohydrocarbons - local anesthetics – cocaine and its derivatives.

Unit - V

(12 Hrs)

Clinical Chemistry

Diagnostic test and estimation of sugar, salt and cholesterol in serum, urine. detection of diabetes – detection of anemia – Estimation of haemoglobin – detection of poisons – antidotes for poisoning.

References:

1. A text book of Pharmaceutical Chemistry by Jayashree Ghosh - S. Chand & Company LTD. – third revised edition – 2003.
2. G.L.Partrick, An introduction to Medicinal Chemistry, II end., Oxford University Press, 2001.
3. T.Nagradi, Medicinal Chemistry- A Biochemical Approach, Oxford University Press-2004.
4. J.B. Taylor and P.D.Kennewell, Introductory Medicinal Chemistry, Ellisworth Puplichers, 1985.
5. Medicinal Chemistry by Asutoskour,

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Semester-V

Core Paper– IX: Organic Chemistry I -15UCHC51

Duration: 60 Hrs

Credit: 5

Aim and objective:

- To understand the concepts of geometrical and optical isomerism.
- To know about the stability of various isomers using conformational analysis.
- To get knowledge about the structure and applications of carbohydrate.
- To know about the preparation, properties and applications of various organic compounds

Course Outcome:

- Acquire proficiency in understanding the geometrical and optical isomerism
- Skill to identify the configurations for geometrical isomers using E/Z notation and optical isomers using R/S notation
- Significant knowledge in conformational analysis of organic compounds
- Understanding the reaction, structure and interconversion of monosaccharides
- Knowing the concept of mutarotation
- Acquire ideas about disaccharides and polysaccharides
- Skill to manipulate the mechanism of organic name reactions
- Expertise on the applications of benzene diazonium chloride
- Deepening the knowledge of polynuclear hydrocarbons and their derivatives
- Gain meaningful knowledge on chromophore - auxochrome theory and classification of dyes

Unit – I

(12 Hrs)

Stereo isomerism

Geometrical isomerism- cis – trans isomerism – definition and explanation - Determination of configuration of maleic and fumaric acids - aldoxime & ketoxime – determination of configuration by Beckmann rearrangement – E/Z notation for geometrical isomers.

Optical isomerism - Definition – Condition for optical activity - elements of symmetry. Optical isomerism of compounds with one & two chiral sites- R/S notation-optical activity of compounds not containing asymmetric carbon atoms - biphenyls, allene & spiranes. Optical activity of nitrogen compounds. Racemisation – resolution - Walden inversion – asymmetric synthesis.

Unit - II

(12 Hrs)

Conformational Analysis

Definition - Difference between configuration and conformation. Fischer, Saw-horse and Newman projection formulae - Conformational analysis of ethane, n-butane 1,2-dichloroethane, mono and disubstituted cyclohexanes

Unit - III

(12 Hrs)

Carbohydrates

Monosaccharides : Glucose and fructose- reaction and structure (acyclic and cyclic only) Interconversion of glucose and fructose and glucose and arabinose - Mutarotation .

Disaccharides: Preparation, properties, constitution and configuration of sucrose and maltose. Polysaccharides: A general study of starch and cellulose

Unit - IV

(12 Hrs)

Aromatic compounds

Phenols - acidity- relative acidity – Reimer Tieman reaction - Kolbe's reaction-cresols - dihydric phenols and trihydric phenols.

Benzaldehyde - mechanism of Cannizaro, Perkin, Claisen, Knoevenagel reaction and Benzoin condensation - Houben-Hosch synthesis.

Preparation & properties of salicylic, anthranilic, cinnamic, phthalic acids. phenylacetic acid, mandelic acid, sulphonic acid, saccharin and chloramine-T.

Synthetic applications of benzene diazonium chloride.

Unit - V

(12 Hrs)

Polynuclear hydrocarbons and their derivatives and dyes

Isolated systems: Preparation and properties of diphenyl, benzidine, diphenic acid, diphenylmethane, triphenylmethane and stilbene.

Condensed systems: Preparation – properties - structure and uses of naphthalene, naphthylamines, naphthols, naphthaquinones, anthracene, anthraquinone, alizarin and phenanthrene.

Dyes – definition - theory of colour and constitution-classification of dyes according to structure and applications.

Azodyes- preparation of methyl orange, congo red and Bismark brown.

Triphenyl methane dyes: Preparation of malachite green, rosaniline and crystal violet.

Phthalein dyes: Preparation of phenolphthalein, fluorescein and eosin

Vat dyes - Preparation of indigo.

References:

1. P.Ramesh, Basic Principles of Organic Stereochemistry, Meenu Publications, Madurai, 2005.
2. I.L.Finar, Organic Chemistry, Vol. I, 5th edn., ELBS, 1975.
3. Text book of organic chemistry by P.L. Soni (Latest edition 2008)

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Semester-V

Core Paper– X: Inorganic Chemistry I -15UCHC52

Duration: 75 Hrs

Credit: 5

Aim and objective:

- To know about the various theory and concept in co-ordination and nuclear chemistry.
- To understand the properties of inner transition elements, To get knowledge about the basic concept of various titrations
- To know the applications of radioactivity in various fields.

Course Outcome:

- Knowing the theories of coordination compounds
- Acquire proficiency in nomenclature of coordination compounds
- Deepening the knowledge of extraction of lanthanides lanthanide contraction
- Understanding the concept of lanthanide contraction and its consequences
- Gain knowledge about preparation, properties and extraction of actinides
- Get meaningful idea about volumetric estimations
- Significant knowledge in conformational analysis of organic compounds
- Understanding the reaction, structure and interconversion of monosaccharides
- Knowing the concept of mutarotation
- Acquire ideas about disaccharides and polysaccharides
- Skill to manipulate the mechanism of organic name reactions
- Expertise on the applications of benzene diazonium chloride
- Deepening the knowledge of polynuclear hydrocarbons and their derivatives
- Gain meaningful knowledge on chromophore - auxochrome theory and classification of dyes

Unit – I

(15 Hrs)

Coordination compounds

Introduction – nomenclature – isomerism in complexes – geometrical and optical – Werner's theory – Sidgwick theory – EAN rule- valence bond theory – low spin and high spin complexes – magnetic properties – limitations of VB theory – crystal field theory – octahedral and square planar complexes – color of coordination complexes – Modified CFT - Ligand field theory. Metal carbonyls – bonding and structure of $\text{Fe}(\text{CO})_5$, $\text{Fe}_2(\text{CO})_9$, $\text{Co}_2(\text{CO})_8$, $\text{Ni}(\text{CO})_4$, $\text{Cr}(\text{CO})_6$ carbonyls.

Unit II

(15 Hrs)

The inner transition elements

The lanthanide series – occurrence – properties - electronic configuration, oxidation states, ionic radii – lanthanide contraction – causes and consequences – color, magnetic

properties, oxidation potential, basic character, solubility of compounds, double salts, complexes – extraction of lanthanides from monoazite sand.

The actinide series – sources – inner transition elements – Electronic configuration – properties – oxidation states – ionic radii – color of ions – comparison of actinides with lanthanides – extraction of uranium and thorium.

Unit –III

(15 Hrs)

Volumetric estimations

Acid – base titration – titration curves for mono, di and polybasic acids – end points - selection of indicators- – metal –ion indicators. – Precipitation titrations, acid – base titrations, redox titrations, iodimetry titrations,. Complexometric titrations and EDTA titrations

Unit – IV

Nuclear Chemistry-I

(15 Hrs)

Composition of nuclei – stable and unstable nuclei - n-p ratio – magic numbers – mass defect – binding energy – whole number rule – packing fraction – mass energy relationship - particle accelerator : linear accelerator – cyclotron and synchrotron.

Natural radioactivity: Detection and measurement of radioactivity – Soddy's group displacement law.

Artificial radioactivity – definition – different types of artificial radioactivity.

Unit – V

(15 Hrs)

Nuclear chemistry – II

Nuclear fission – theories of fission – application of fission - principle of atom bomb – nuclear fusion – stellar energy and hydrogen bomb.

Application of radioactivity: application in medicine – agriculture – industry – trace element in the elucidation of structure - investigation of reaction mechanism in analytical chemistry –Neutron activation analysis – Radio carbon dating.

References:

1. Satya Prakash, G.D. Tuli, S.K. Basu and R.D. Madan, Advanced Inorganic Chemistry, Vol II , S. Chand & Company LTD, 2004 .
2. H.I. Arnika, Essentials of Nuclear Chemistry, 3rd Edn., Wiley Eastern Ltd., New Delhi, 1987
3. U.N.Dash, Nuclear Chemistry, Sultan Chand and sons, New Delhi, 1991

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Semester-V

Core Paper– XI: Thermodynamics and Photochemistry -15UCHC53

Duration: 75 Hrs

Credit: 5

Aim and objective:

- To know about the various theory and concept in Quantum mechanics.
- To understand the various theory and calculations involved in the thermodynamics.
- To know about the terms and different types of system in phase rule.

Course Outcome:

- Knowing the importance of I law of thermodynamics
- Understanding the concept of C_p , C_v and - Joule Thomson effect.
- Deepening the knowledge on I law of thermodynamics and efficiency of heat engine.
- Acquire proficiency in chemical potential
- Gain knowledge about van't Hoff reaction isotherm, van't Hoff isochore, and Lechatelier principle
- Understanding the concept of Nernst heat theorem.
- Get meaningful idea about various laws of photochemistry
- Gain significant knowledge in Quantum yield
- Understanding the various photophysical process by Jablonski diagram
- Knowing the concept of Photo chemical kinetic reaction.

Unit – I

Thermodynamics – I

(15 Hrs)

Thermodynamics – Importance of thermodynamics - terms used in thermodynamics – open ,closed and isolated systems- state functions and path functions- extensive and intensive properties-Types of processes- reversible and irreversible processes-nature of work and heat-statement and mathematical form of I law of thermodynamics –internal energy – enthalpy or heat content –heat capacity-molar heat capacity at constant volume (C_v) and at constant pressure (C_p) – relationship between C_p and C_v - Joule Thomson effect – derivation of Joule Thomson coefficient - Joule Thomson coefficient in the case of ideal and real gases – inversion temperature.

Unit – II

(15 Hrs)

Thermodynamics – II

Limitations of I law of thermodynamics – spontaneous process – Statement of II law of thermodynamics - Cyclic process-Carnot cycle – efficiency of a heat engine – Entropy - Definition and derivation of the concept of entropy – Physical significance (illustrations with unavailable energy, disorder and probability) – Work and Gibbs function — Variation of free

energy change with temperature and pressure – Gibbs-Helmholtz equations - Maxwell relations-partial molar properties – Physical significance - chemical potential - Gibbs-Duhem equation - variation of chemical potential with temperature and pressure – Clapeyron-Clausius equation-concepts of fugacity and activity.

Unit – III

(15 Hrs)

Thermodynamics – III

Application of thermodynamics to various type of equilibria – Chemical equilibrium – Law of mass action-equilibrium constant-Thermodynamics treatment of law of mass action–van't Hoff reaction isotherm–relations between K_p , K_c and K_x -Temperature–Dependence of the equilibrium constant- Integrated van't Hoff equation - van't Hoff isochore – thermodynamics interpretation of law of mass action and Lechatelier principle-effect of change of concentration, temperature and pressure.

Third law of thermodynamics – Nernst heat theorem- Statement of third law of thermodynamics.

Unit IV

(15 Hrs)

Photochemistry-I

Introduction – types of chemical reactions – Dark or thermal reactions – photo chemical reactions – Difference between dark and photochemical reactions – Absorption of light – Beer –Lambert law – validity of Beer's law – Deviation from Beer's law – Applications of Beer's law-Laws of photo chemistry – Grotthus – Draper law – Law of photochemical equivalence - Quantum yield or quantum efficiency - Experimental determination of quantum yields- process for the determination of quantum yield.

Unit V

(15 Hrs)

Photochemistry-II

Reasons of high and low quantum yield – Factors affecting quantum yield – Jablonski diagram- luminescence – fluorescence and Phosphorescence – Chemiluminescence photosensitization – Bioluminescence- Photo chemical kinetics – dissociation of HI – Hydrogen and chlorine reaction- Reaction between Hydrogen and Bromine.

References:

1. Advanced physical chemistry by Gurdeep Raj – Thirty Ninth edition (2014)
2. Principles of physical chemistry by Puri, Sharma, Pathania – 45th edition (2011-2012)
3. Advanced Physical Chemistry by Bajpai. D.N, S.Chand and company private limited.2010
4. Thermodynamics for chemist by Samuel Glasstone.

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Semester-V

Optional course II: Perfume and sweetening agents -15UCHO51

Duration: 30 Hrs

Credit: 3

Aim and objectives:

- To know about the components and chemicals used in the perfume industry.
- To understand the various natural and synthetic sweetening agents.

Course Outcome:

- Knowing the various alcohols and ketones used in the perfume industry
- Acquire significant knowledge in methods of production of natural perfumes
- Understanding the essential oils and its importance.
- Acquire ideas about various flavours used in perfume industry.
- Gain considerable knowledge about sweetening agents used in perfume industry
- Get proficiency in flavouring components.

Unit – I (6Hrs)

Introduction

Alcohols, Ketones used in perfume industry.

Unit – II (6 Hrs)

Diphenyl Compounds

Production of natural perfumes – Essential oils and its important - Nitro Musks.

Unit – III (6 Hrs)

Flavours

Jasmine – Lily, Orange blossom – Rose – fruit flowers – flower perfume-Vanillin.

Unit – IV (6 Hrs)

Sweetening agent

Anthranilates – Salicylates – Ester of benzoyl alcohol, Ester of cinnamic acid.

Unit – V (6 Hrs)

Fruit Compounds

Banana Compounds – Grape Compounds, apple compounds, and Pine apple compounds (Demonstration of jasmine Perfume)

Reference:

Industrial chemistry by B.K. Sharma – GOEL publishing house, Meerut -
edition- 2004.

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Semester-V

Optional course II: Polymer Chemistry -15UCHO52

Duration: 60 Hrs

Credit: 3

Aim and Objective

- To provide a basic knowledge about the polymer technology.
- To get a clear understanding about the properties and uses of polymers.
- To explain the processing techniques involved in the formation of polymers.

Course Outcome:

- Knowing the polymers and its types
- Significant knowledge in the mechanism of polymerization
- Acquire ideas about various polymerization techniques
- Understanding the application of polymer in day to-day life
- Acquire ideas about molecular weight determination of polymers
- Gain considerable knowledge in properties of polymers
- Gain knowledge about preparation and uses of individual polymers.
- Expertise on processing technique in polymers

Unit I

(12 Hrs)

Introduction to Polymer

Polymer – definition – classification of polymers – Stereoregular polymers - Mechanism of polymerization – Addition polymerization – chain polymerization – free radical – ionic polymerization – co-ordination polymerization.

Unit II

(12 Hrs)

Polymerization techniques

Introduction – bulk - solution – suspension – emulsion polymerizations –solid & Gas phase polymerization – Molecular weight determination – average molecular weight – Number average & weight average molecular weight.

Unit III

(12 Hrs)

Properties of polymers

Physical properties : Crystallinity in polymers – polymers and X- ray Diffraction – degree of Crystallinity – crystallisability - Glass transition temperature – factors influencing GTT – relationship between GTT & molecular weight – GTT & melting point.

Unit IV

(12 Hrs)

Individual polymers

Preparation & uses of polyethylene – polypropylene – polystyrene – polyacrylonitrile – polyesters – polyimides – polyamides – poly vinyl chloride – polytetrafluoroethylene – phenol – formaldehyde resin-urea-formaldehyde resin- rayon – Inorganic polymer – silicone polymers.

Unit V

(12 Hrs)

Polymer processing

Introduction – Processing of plastics – elastomers & fibers – compounding – Processing techniques – calendaring – Die casting – rotational casting – film casting – compression moulding – injection moulding – extrusion moulding – thermoforming – foaming.

References:

1. Polymer science by V.R. Gowariker, N.V. Viswanathan, Jayadev Sreedhar - New age International (P) Limited, New Delhi - Reprint 2002.
2. B.K.Sharma, "Polymer chemistry", Goel publishing house, Meerut, 1989.
3. P.J. Flory, "Principles of polymers chemistry", Cornell University press, Ithaca, 1953.
4. F.M. Billmeyer, Text book of polymer science, 3rd edition, John Wiley and Sons, New York, 1984.

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Semester-V

Skilled based course II – Nanochemistry -15UCHS51

Duration: 30 Hrs

Credit: 1

Aim and objectives:

- To give a basic knowledge about the Nano particles.
- To get a clear understanding about the carbon Nano tubes and Nano shells.
- To explain the role of nano science in biological system.

Course Outcome:

- Getting the knowledge about various types of nanomaterials
- Gaining idea about the types of nano composite
- Acquire in-depth knowledge on various synthetic route for nano materials
- Knowing the properties of nanomaterials.
- Understanding the instrumentation techniques like TEM, SEM, EDAX, UV - DRS.

UNIT-I

Introduction to nano chemistry

Introduction-measurement-types of nano materials-nano particles-nano capsules-nano fibers-nano wires-fullerenes-nano springs-nano belts-Quantum dots-nano fluidies

UNIT-II

Nano composites

Introduction-types of nano (i.e, metal oxide,ceramic glass and polymer based)Synthesis and applications of core-shell structured nano composite, super and hard nano composite and mile stones

UNIT-III

Chemical routes for synthesis of nano materials

Chemical precipitation and co-precipitation metal nano crystals by reduction - sol-gel synthesis - micro emulsions (or) reverse micelles, myle formation - solvothermal synthesis - thermolysis routes - sonochemical synthesis

UNIT-IV

Properties of nano particles

Properties - quantum confinement - surface to volume ratio - Brownian motion - application of nano particles.

UNIT-V

Characterisation (or) Instrumentation

Principle-application-instrumentation

Transmission electron microscope (TEM) – SEM - EDAX, UV - Visible DRS.

References:

1. Charles P. Poole Jr. and Franck Owens, Introduction to nano technology.
2. Understanding nanoscience and nanotechnology – T. Pradeep
3. Vincent Rotello, nanoparticles: Building blocks for Nanotechnology, 2004.

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Semester-V

Skilled based course III –Drug Chemistry -15UCHS52

Duration: 30 Hrs

Credit: 2

Aim and objectives:

- To understand about the importance of drugs.
- To know the different types of drug and their action
- To understand the importance and uses of vitamins in living things.
- To know about the different systems of medicine.

Course Outcome:

- Getting the ideas about important terminologies in drug
- Gaining the knowledge on various antibiotics.
- In-depth knowledge on different systems of medicines
- Knowing the role of vitamins in body 's health .
- Understanding the Analgesic and antipyretic drugs
- Gain considerable knowledge in various anasthetics

Unit I

(6 Hrs)

Importance of drugs

Important terminologies, their meaning – Bacteria, virus, fungi, Names of drugs – types of Bacteria.

Unit II

(6 Hrs)

Antibiotics

Definition – uses of antibiotics. - Ampicillin, Streptomycin, Tetracycline, Rifampicin, Erythromycin, drug actions and side effects.

Unit III

(6 Hrs)

Vitamins, Analgesics & Antipyretics

Classification of vitamins - role of vitamins in body 's health - uses of vitamins – Antipyretics, Analgesics, and anti – inflammatory agents, sulphonamide – Drug actions – uses of sulpha drugs.

Unit IV

Introduction to the different systems of medicine

(6 Hrs)

Ayurvedha, Siddha, Homeopathy and Allopathy - History of medicinal chemistry - Discovery of drugs an introduction.

Unit V

(6 Hrs)

Anaesthetics

Gaseous anaesthetics-Vinyl ether-Cyclopropane-Halohydrocarbons-chloroform-Haloethane-Trichloro ethylene-Intravenous anaesthetics-Thiopentone-Local anaesthetics-Cocaine and its derivatives,

Note: Therapeutic use only

Reference:

1. Industrial chemistry including chemical Engineering 2007.B.K.Sharma Goel publishing. House 13th revised and enlarged edition
2. Albert Burger – Medicinal chemistry
3. G. R. Chatwal - Medicinal chemistry
4. Mrs. Lakshmi – Pharmaceutical chemistry
5. Organic chemistry by P. L. Soni

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Semester-VI

Core Paper– XV – Organic Chemistry -15UCHC61

Duration: 60 Hrs

Credit: 4

Aim and objectives:

- To know about the mechanism of molecular rearrangement and free radicals
- To understand the principles and applications of UV, IR and NMR spectroscopy techniques.
- To know the preparation, structure, reactivity, mechanism and applications of various organic compounds.

Course Outcome:

- Acquire proficiency in molecular rearrangement
- Significant knowledge in preparation, detection and stability of free radicals.
- Understanding the theory and principle of UV and IR spectroscopic techniques
- Skill to calculate λ_{\max} of conjugated dienes and conjugated dienones using Woodward Fieser rule.
- Knowing the theory, principle and instrumentation technique of NMR spectroscopy.
- Skill to solve the organic problems using UV, IR and NMR spectroscopy.
- Significant knowledge in nomenclature, preparation and properties of heterocyclic compounds
- Understanding the structure, classification and synthesis of Alkaloids.
- Acquire knowledge in the classification, properties, structure and synthesis of terpenes.
- Gain ideas about the primary, secondary, tertiary and quaternary structure of proteins
- Understanding the structure of RNA and DNA.

Unit I

(12 Hrs)

Rearrangements and free radicals

Molecular rearrangement: Detailed mechanisms of the following: pinacol – pinacolone, Hofmann, benzil – benzilic acid, Claisen, benzidine and Wagner- Meerwein rearrangement.

Free radicals: Definition – preparation and reactions of short lived and long lived free radicals – stability of free radicals- detection of free radicals – chain reactions – photochemical reactions of olefins, cis – trans isomerisation. Mechanism of Sand Meyer reaction, Gomberg reaction and Hofmann – Loeffler reaction.

Unit II

(12 Hrs)

Principles and applications of spectroscopy – I

UV: Theory- Principle - Type of electronic transition – absorption laws – bathochromic shift and hypsochromic shift – hyperchromic and hypochromic effect – applications of UV to organic compounds – Woodward Fieser rule to calculate λ_{\max} of conjugated dienes and conjugated dienones

IR: Theory- Principle - Instrumentation – mode of vibration – overtone and combination bands – applications of IR to organic compounds – finger print region – effect of hydrogen bond on frequency absorption.

Unit – III

(12 Hrs)

Principles and applications of spectroscopy – II

NMR: Theory- Principle – Instrumentation – Number of signals - chemical shift – shielding and deshielding effects – factors influencing chemical shift – solvent used – splitting of signals – coupling constants – factors affecting coupling constants - NMR spectra of ethanol, diethyl ether, anisole, benzyl alcohol, ortho, para and meta cresol.

Simple problems involving the application of UV, IR and NMR spectroscopy.

Unit –IV

(12 Hrs)

Heterocyclic compounds and alkaloids

Heterocyclic compounds: Nomenclature - Preparation and properties of pyrrole, pyridine, quinoline and iso quinoline.

Alkaloids: Definition – occurrence of alkaloids – general methods for determining the structure of alkaloids – classification of alkaloids – structure and synthesis of following alkaloids – coniine, piperine, nicotine.

Unit – V

(12 Hrs)

Natural Products , Proteins and Nucleic acids

Terpenes: Introduction, classification and occurrence - general properties - isoprene rule-general methods of determining structure-synthesis. Properties and structure of citral, α -terpeniol, menthol and Camphor.

Proteins and Nucleic acids: Definition-classification of proteins - colour reactions of proteins-primary, secondary, tertiary and quaternary structure of proteins (an elementary idea only) Nucleic acids-nucleosides-nucleotides - RNA and DNA general structure.

Reference:

1. Elementary organic spectroscopy by Y. R Sharma.
2. Organic spectroscopy by Jag mohan.
3. Organic name reactions by Gowtham Brahmachari.
4. Organic reactions and their mechanism by P.S. Kalsi.
5. I.L.Finar, Organic Chemistry, Vol. I and II, 5th edn., ELBS, 1975.

Sri Kaliswari College (Autonomous)-Sivakasi
Choice based credit system
U. G Programme - B.Sc Chemistry-2015- 2018
Semester-VI

Core Paper– XV – Concept of Bio-inorganic, organometallic & Environmental chemistry -15UCHC62

Duration: 60 Hrs

Credit: 4

Aim and objective:

- To give a basic knowledge about the acids and bases concept.
- To understand the importance bio – inorganic chemistry.
- To provide a basic idea about organo- metallic compounds.
- To understand about the importance of preventing the pollution

Course Outcome:

- Knowing the various concepts of acids and bases.
- Deepening the knowledge of non – aqueous solvents
- Understanding the importance of porphyrin ring in the living system.
- Gain knowledge about structure of myoglobin and hemoglobin and their role in biological system
- Acquire knowledge in electron transfer agents.
- Develop basic knowledge about Role of alkali and alkaline earth metal ions in biological systems
- Gain significant knowledge in nomenclature, classification, preparation and properties of organometallic compounds.
- Get an idea about ferrocene
- Understanding the various sources of air pollution and water pollution.
- Expertise on BOD and COD.

Unit – I

(12Hrs)

Acids, bases and non-aqueous solvents

Acids and bases– Arrhenius concept – Lowry Bronsted concept:- conjugate acid – base pairs, relative strength of acids and bases – Lux – Flood concept- limitation – Lewis concept – Levelling effect – Usanovich concept – hard and soft acids.

Non Aqueous solvents: Classification of solvents – Chemical reaction in liquid ammonia – Precipitation reaction – Acid – base reactions in liquid ammonia – Protolysis – Ammonolysis.

Unit II

(12 Hrs)

Bio Inorganic Chemistry – I

Introduction – Porphyrin ring – Occurrence of Porphyrin ring in the nature – importance of Porphyrin ring in the living system.

Myoglobin and hemoglobin – Structure – their role in biological system – Hill constant, co-operativity effect, Bohr effect – Explanation for cooperativity effect in hemoglobin.

Metalloporphyrins – porphyrins – chlorophyll – vitamin B₁₂

Unit – III

(12 Hrs)

Bio Inorganic Chemistry – II

Electron transfer agents – Cytochrome and its functions.

Role of alkali and alkaline earth metal ions in biological systems – Role of Na⁺ and K⁺ ions – sodium ion pump – Role of Mg²⁺, Fe²⁺ and Ca²⁺ ions.

Biological functions and toxicity of elements – Cr, Cu, As and radioactive elements.

Metalloenzymes – apoenzymes - enzyme action – carboxypeptidase A – carbonic anhydrase.

Unit – IV

(12 Hrs)

Organometallic compounds

Introduction – definition – nomenclature, classification based on the nature of metal – carbon bond- - Organo metallic compounds of group III and IV elements – preparation and properties of B,Al and Si compounds-Organo metallic compounds with pi bonded ligands – preparation and properties of ferrocene.

Unit – V

(12 Hrs)

Environmental Chemistry

Pollution – introduction – definition – types of pollution

Air pollution: sources of pollutants – SO₂, NO₂, CO₂ hydrocarbons and lead – pollutant particle size – aerosols and particulates. Smog – photochemical and industrial smog – air pollution of upper atmosphere – greenhouse effect – chemical toxicology – biochemical effect of heavy metals, PAN and cyanide.

Water pollution: dissolved oxygen – BOD, COD – heavy metals as pollutants – thermal pollution – chemical pollution – fertilizers, detergents builders and pesticides – industrial waste and purification of water by classical and modern methods.

References:

1. James E.Huheey, Ellen A.Keitler and Richard L.Keitler, Inorganic Chemistry, 4thEdn. HarperCollinsCollege Publishers, New York, 1993.
2. I. Bretini et al.Bioinorganic Chemistry, Viva Books Private Ltd, Chennai,1998.
3. Text book of inorganic chemistry by Purisharma (Latest edition 2008)
4. SatyaPrakash, G.D. Tuli, S.K. Basu and R.D. Madan, Advanced Inorganic Chemistry, VolII , S. Chand & Company LTD, 2004 .

Sri Kaliswari College (Autonomous)-Sivakasi
Choice based credit system
U. G Programme - B.Sc Chemistry-2015- 2018
Semester-VI

Core Paper– XVI – Electrochemistry, Quantum mechanics and Phase rule -15UCHC63
Duration: 60 Hrs **Credit: 4**

Aim and objective:

- To give a basic knowledge about the electro chemistry.
- To understand the importance of group theory in predicting the symmetry of the molecules.
- To provide a basic idea about Phase rule.
- To know about the terms, various electrodes, calculations and concept in electrochemistry.

Course Outcome:

- Knowing the importance of Faraday's laws of electrolysis
- Understanding the concept of transport number and its determination
- Deepening the knowledge on Kohlrausch's law and its application.
- Acquire proficiency in Conductometric precipitation titrations
- Gain knowledge about various types of reversible electrodes
- Understanding the thermodynamical concept of electrochemistry.
- Get basic knowledge about Quantum mechanics
- Skill to solve problems based on Eigen value equation
- Understanding the basic concepts of Gibbs phase rule
- Knowing the concept one component system.

Unit – I

(12 Hrs)

Electro Chemistry – I

Faraday's laws of electrolysis – Conductance – Resistance – electrolytic conductance – specific conductance – equivalent conductance – molar conductance – variation of molar conductance with dilution – ionic mobility Hittorf's theoretical device – Transport number-Determination of Transport number– Hittorf's method – moving boundary method

Unit – II

Electro Chemistry – II

(12 Hrs)

Calculation of molar ionic conductance– Kohlrausch's law – Relation between molar ionic conductance and ionic mobility– Determination of ionic mobility – applications of Kohlrausch's law – Diffusion and ionic mobility – Applications of conductance measurements – Conductometric titrations – precipitation titrations.

Unit – III

Electro Chemistry – III

(12 Hrs)

Galvanic cell – Types of Reversible electrodes – Metal – Metal ion electrodes – Gas electrodes – Metal –insoluble metal salt electrodes–oxidation Reduction electrodes – Thermodynamics of Reversible electrodes and reversible cells – Electrical energy and free energy change of the cell reaction– Relation between Electrical energy and enthalpy of a cell reaction – Determination of ΔH , ΔG and ΔS of a cell reaction – Determination of ΔG° , ΔS° and ΔH° of a cell reaction – Electromotive force and equilibrium constant of a cell reaction – standard emf and equilibrium constant – Effect of concentration of electrolyte on cell potential – Effect of electrolyte concentration on electrode potential – The Nernst equation – potentiometric titrations.

Unit – IV

(12 Hrs)

Quantum mechanics

Particle and Wave nature of electron - de Broglie's concept of matter waves-derivation of de Broglie equation –Davison – Germer experiment – photoelectric effect – Compton Effect – Heisenberg's uncertainty principle - The Schrodinger wave equation (Derivation not required).

Postulates of quantum mechanics– Eigen values and eigen function (Problems based on Eigen value equation) – significance of ψ and ψ^2 – Orthogonality and normalization of wave functions-Orthonormal set

Unit V

(12 Hrs)

Phase rule

Introduction – phase – component – degree of freedom – phase reactions conditions for equilibrium between phase – Thermal equilibrium – Mechanical equilibrium – chemical equilibrium – Gibbs phase rule – one component system – water system – sulphur system – Experimental determination of transition point –dilatometric method –solubiling method – vapour pressure method– Thermometric method.

Reference:

1. Advanced physical chemistry by Gurdeep Raj – Thirty Ninth edition (2014)
2. Principles of physical chemistry by Puri, Sharma, Pathania – 45th edition (2011-2012)
3. Quantum chemistry by R.K. Prasad , Second edition,2003
4. Advanced Physical Chemistry by Bajpai. D.N, S.Chand and company private limited.2010

Sri Kaliswari College (Autonomous)-Sivakasi
Choice based credit system
U. G Programme - B.Sc Chemistry-2015- 2018
Semester-VI

Optional courses – III – Chromatography Techniques 15UCHO61

Duration: 60Hrs

Credit: 3

Aim and objectives:

- To understand about the importance of chromatography in the separation of mixtures.
- To know about the basic concepts of various types of chromatography.

Course Outcome:

- Knowing the principle and classification of chromatographic technique
- Significant knowledge in adsorption and partition chromatography
- Understanding the principle of column chromatography.
- Acquire ideas about applications of size exclusion, ion exchange chromatography.
- Gain considerable knowledge in gas chromatography
- Get proficiency in Separation of enantiomers by chiral HPLC

Unit – I

(12 Hrs)

Chromatography

Introduction – definition – Principle and classification of chromatographic technique – retention time – partition ratio – distribution coefficient – extractions – multiple extractions

Unit – II

(12 Hrs)

Adsorption and partition Chromatography

Introduction – principle and technique involved and applications of TLC, column and paper chromatography – advantages of TLC over paper chromatography.

Unit – III

(12 Hrs)

Size and Ion exchange chromatography

Introduction - Principle – technique – applications of size exclusion, ion exchange and column chromatography.

Unit – IV

(12 Hrs)

Gas Chromatography

Instrumentation – supply of carrier gas – sample injection system – column – detectors (ECD, FID and TCD) programmed temperature gas chromatography – chiral selectivity – applications.

Unit – V

(12 Hrs)

HPLC

Instrumentation – mobile phase reservoirs – pumps – gradient formers – sample injection – columns – detectors – Derivation in HPLC - Separation of enantiomers by chiral HPLC.

References:

1. Analytical Chemistry by Gary.D.Christian, John Wiley and sons, sixth edition, 2004.
1. Analytical Chemistry by U.N.Dash
2. Instrumental methods of analysis by Willard merit Dean
3. Fundamentals of analytical chemistry by Skoog.West&Holler.

Sri Kaliswari College (Autonomous)-Sivakasi
Choice based credit system
U. G Programme - B.Sc Chemistry-2015- 2018
Semester-VI

Optional courses – III – Analytical Chemistry -15UCHO62

Duration: 60 Hrs

Credit: 3

Aim and objectives:

- To know about the theory and importance of precipitation techniques in inorganic analysis.
- To understand the calculations in analyzing the errors.
- To know about the principles and applications of various spectrophotometric techniques.

Course Outcome:

- Knowing the conditions for gravimetric precipitation.
- Significant knowledge in co-precipitation, post precipitation and precipitation from homogeneous solution.
- Acquire skill in Understanding significant figures.
- Understanding the principle and application of TGA, DSC and DTA..
- Gain ideas about the principle and application of AAS and flame photometry.
- Get proficiency in fluorimetry, turbidimetry and nephelometry

Unit – I

(12 Hrs)

Precipitation

Methods of obtaining the precipitate – condition – choice of precipitant – merits and demerits of organic precipitants – types –specific and selective precipitants – sequestering agents – theory of precipitation – Dendrites – Paneth – Fajans – Hahn law – Co-precipitation – post precipitation – precipitation from homogeneous solution.

Unit - II

(12 Hrs)

Error analysis

Significant figures and their importance in calculations –classification of errors – precision and accuracy – measures of precision — linear regression – slope and intercept of the ‘best ‘ line by least square method – confidence limit – Students Q test , t test and F test – rejection of experimental data – sources and elimination of errors.

Unit – III

(12 Hrs)

Instrumental methods of analysis – I

Beer– Lambert Law – Principles of colorimetric analysis – Visual colorimeter – standard series method – balancing method – Estimation of Ni^{2+} , Fe^{2+} .

Principles and application of Thermo Gravimetric Analysis (TGA) – Differential Scanning Calorimetry (DSC) - Differential Thermal Analysis (DTA).

(12 Hrs)

Unit – IV

Instrumental methods of analysis – II

Introduction – Principle and Application : AAS, flame photometry.

Unit – V

(12 Hrs)

Instrumental methods of analysis – III

Introduction – Principle and Application : Fluorimetry, turbidimetry and nephelometry

Reference:

1. Analytical Chemistry by G.D.Christian.
2. Analytical Chemistry by U.N.Dash
3. Instrumental methods of analysis by Willard merit Dean
4. Fundamentals of analytical chemistry by Skoog.West & Holler.

Sri Kaliswari College (Autonomous)-Sivakasi
Choice based credit system
U. G Programme - B.Sc Chemistry-2015- 2018
Semester-VI

Skill based course – IV – Sugar Chemistry -15UCHS61

Duration: 30 Hrs

Credit: 2

Aim and objectives :

- To know the components and chemicals used in the sugar industry
- To understand the technical methods in the manufacture of sugar from sugar cane.
- To understand the application and side products from sugar industry.

Course Outcome:

- Knowing the sugar Industry in India.
- Significant knowledge in recovery of sucrose from molasses Defection.
- Understanding the concept of sulphitation and carbonation process.
- Gain ideas about testing and estimation of sucrose.
- Get knowledge in the preparation and uses of bagasse and alcohol.

Unit-I

(6 Hrs)

Sugar Industry in India – Sugarcane and Sugar Beet – Manufacture of cane sugar.

Unit – II

(6 Hrs)

Extraction of Juice – Concentration – Separation of crystals – Recovery of sucrose from molasses Defection.

Unit-III

(6 Hrs)

Sulphitation and carbonation – Double Sulphitation and Double carbonation processes.

Unit-IV

(6 Hrs)

Testing and Estimation of Sucrose - Determination of number of hydroxyl group in sucrose-

Unit-V

(6 Hrs)

Preparation of Bagasse – Use of Bagasse for manufacture of paper and electricity preparation of Alcohol -Manufacture of Methylated Spirit – Power Alcohol.

Reference:

Industrial chemistry by B.K. Sharma – GOEL publishing house , Meerut- 14th edition- 2004.

Sri Kaliswari College (Autonomous)-Sivakasi
Choice based credit system
U. G Programme - B.Sc Chemistry-2015- 2018
Semester-VI

Value Based Course – II: Pyrotech -15UCHV61

Duration: 30 Hrs

Credit: 1

Aim and objective :

- To give a basic knowledge about the types of chemicals involved in the fireworks industry.
- To understand the importance of color producing chemicals in the fireworks industry.
- To provide a basic idea about the safety aspects to prevent accidents.

Course Outcome:

- Knowing the various oxidizers used in pyrotech industry..
- Significant knowledge in colour producers and colour intensifiers
- Awareness about the various physical factors responsible for accidents
- Understanding the safety measures to be adopted in pyrotech industries.
- Gain ideas about the manufacturing of fireworks products.

UNIT-I

(6 Hrs)

Oxidisers

Physical, chemical properties of - Potassium nitrate (KNO_3) - Potassium chlorate (KClO_3) - Potassium perchlorate (KClO_4) - Barium perchlorate ($\text{Ba}(\text{ClO}_4)_2$)

Fuels - Sulfur (S) - Charcoal (C) - Red Phosphorus (P)- Magnalium (Mg+Al)- Aluminium chips - Alloy (Mg+Al) - Magnesium(Mg) - Aluminium powder(Al)- Titanium(Ti) - Iron filings(Fe) - Black Copper Oxide(CuO) - Bismuth Oxide (Bi_2O_3).

UNIT-II

(6 Hrs)

Colouring materials

Colour producers : Strontium nitrate ($\text{Sr}(\text{NO}_3)_2$) - Strontium Carbonate (SrCO_3)- Barium nitrate ($\text{Ba}(\text{NO}_3)_2$) - Barium Carbonate (BaCO_3)-Sodium Carbonate (Na_2CO_3)- Sodium oxalate ($\text{Na}_2\text{C}_2\text{O}_4$)- Red lead (Pb_3O_4)-Paris green-Copper powder(cu).

Colour intensifiers: PVC - Parlon- oil red - oil orange - oil yellow

Binders - dextrin - Poly vinyl alcohol.

UNIT-III

(6 Hrs)

Physical factors responsible for Accidents

Temperature - Humidity - Moisture-Pressure - Static electricity-Hygroscopy – Friction – Human errors.

UNIT-IV**(6 Hrs)****Safety measures**

Safety measures to be adopted in

- a. Raw materials storage Weighing-Mixing – Filling – Drying – Packing - Product storage - Dispatch of products.
- b. Disposal of waste.
- c. Accidents - Reason for accident – Prevention of accident
- d. First aid

UNIT-V**Manufacturing of fireworks products****(6 Hrs)**

Manufacture of flowers spot-Sparkles-Crackers-Rockets - Caps- Atom Bomb - Ground Charka-Ariel shots.

References:

1. The art, science and technique of fire works by Dr. Takeo Shimizu. of engineering, Director of Koa fireworks co Tokyo, 1981.
2. The Principles of fire works by K.N. Ghosh, second edition. 1988.

Sri Kaliswari College (Autonomous)-Sivakasi
Choice based credit system
U. G Programme - B.Sc Chemistry-2015- 2018
Semester-III & IV

Core Paper-VIII: Volumetric Analysis & Complex preparations -15UCHC4P

Duration: 60Hrs

Credit: 4

Course Outcome:

- Learn the importance of Quantitative analysis and complex preparations
- Knowing the different types of Volumetrically analysis
- Get an idea about the role of indicator at different pH range in the acidimetry and alkalimetry
- Enhancing the skill to determine the strength of the solution and its molecular weight
- Gaining idea about the oxidation and reduction of ions in redox titrations
- Expertise the skill in the determination of hardness of water by EDTA method
- Develop the synthetic knowledge in the complex preparation
- Report the complex preparation through the geometry and the yield comparison with theoretical value

Volumetric Analysis & Complex preparations

A Double titration involving the making up of the solution to be estimated and the preparation of a primary standard.

LIST OF EXPERIMENTS

I. ACIDIMETRY AND ALKALIMETRY

1. Estimation of Na_2CO_3
2. Estimation of NaOH / KOH
3. Estimation of oxalic acid

II. REDOX TITRATIONS

a. Permanganometry

- 1) Estimation of ferrous ion
- 2) Estimation of oxalic acid
- 3) Estimation of calcium

b. Dichrometry

- 1) Estimation of ferrous ion
- 2) Estimation of ferric ion using external indicator

III. IODOMETRY AND IODIMETRY

- 1) Estimation of potassium dichromate
- 2) Estimation of potassium permanganate
- 3) Estimation of copper

IV ARGENTIMETRY

Estimation of potassium chloride (Demonstration only)

V. EDTA TITRATION

Estimation of hardness of water using EDTA

VI) Preparation of complexes

- Tetraamminecopper(II) sulphate
- Tris(thiourea)copper(II) sulphate
- Hexamminenickel(II) sulphate
- Hexamminenickel(II) chloride

Distribution of Marks (Max. marks-100)

Duration of examination: 3 hrs

Internal : 40 marks

External : 60 marks

Viva Voce

- 10marks

Complex preparation

- 20 marks

Procedure writing

- 10marks

Volumetric estimation

- 20 marks

For Volumetric Estimation if the student have

Less than 2% Error - 20marks

2- 3% Error - 15 marks

3-4% error - 10marks

Greater than 4% - 5 marks

Total

60 marks

Sri Kaliswari College (Autonomous)-Sivakasi
Choice based credit system
U. G Programme - B.Sc Chemistry-2015- 2018
Semester-V & VI

Core Paper-XII: Organic Qualitative Analysis and Estimation -15UCHC6P

Duration: 4 Hrs

Credit: 4

Course Outcome:

- Learn the importance of Quantitative and qualitative organic analysis
- Knowing the confirmation of the sample through the functional group and its derivative
- Get an idea about the hydrocarbon, nitrogen, carbonyl compounds and its analysis
- Enhancing the skill for the estimation through iodometric analysis
- Gaining idea about the bifunctional group analysis
- Expertise the skill to distinguish primary, secondary and tertiary amine compounds
- Develop the synthetic knowledge in the derivative preparation
- Report the sample in a systematic way of proceedings

1. Organic Analysis

Analysis of an organic compound containing one or two functional groups like acid, phenol, aldehyde, ketone, ester, nitrocompound, amines (primary, secondary and tertiary) amide, anilide, aliphatic diamide, side chain and nuclear halogen compounds, aliphatic diamide containing sulphur and carbohydrates, confirmed by the functional group by preparing the solid derivative.

ORGANIC ESTIMATION

- 1) Estimation of phenol
- 2) Estimation of aniline
- 3) Estimation of glucose

Distribution of Marks (Max. marks-100)

Internal : 40 marks

External: 60 marks

Viva Voce

Record Note book

Organic estimation (20 marks)

Procedure - 5 marks

Estimation - 15 marks

Less than 3% Error - 15marks

3-4% error - 13 marks

4-5% Error - 10 marks

Duration of examination: 6 hrs

- 10marks

- 10 marks

Organic analysis (20 marks)

Preliminary reaction - 2 marks

Elements present - 4 marks

Aliphatic or aromatic – 3 marks

Saturated / unsaturated – 3 marks

Functional group - 6 marks

Greater than 5% - 8 marks

Derivative - 2 marks

Sri Kaliswari College (Autonomous)-Sivakasi
Choice based credit system
U. G Programme - B.Sc Chemistry-2015- 2018
Semester-V & VI

Core Paper-XIII: Physical Chemistry Practicals -15UCHC6Q

Duration: 60 Hrs

Credit: 4

Course Outcome:

- Knowing the importance of the various physical properties by practical
- Skill to determine the molecular weight of unknown substance by Rast method and transition temperature method
- Pursuing the role of phase diagram to understand the simple eutectic method
- Ability to know the effect of impurity in the strength of the substance by CST method
- Enrich the concept of thermodynamics through heat of solution determination
- Finding the composition of mixture through viscosity method
- Application of Nernst distribution law in the determination of partition co-efficient
- Rate of the reaction study through kinetic method
- Impact of the conductivity and potentiometry methods to study the electrical properties of the ionic substance, acids and bases

1. Determination of molecular weight by

- a. Transition temperature method – sodium thiosulphate pentahydrate, strontium chloride hexahydrate and sodium acetate trihydrate.
- b. Cryoscopic method – Rast method – camphor and naphthalene.

2. Phase diagram involving

- a. Simple eutectic and
- b. Compound formation

3. Critical solution temperature

Determination of CST of phenol – water system and effect of impurity on CST – strength of sodium chloride.

4. Thermo chemistry

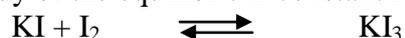
Heat of solution – potassium dichromate, ammonium oxalate and oxalic acid.

5. Viscosity

Determination of the composition of an unknown mixture.

6. Partition co- efficient experiments

- a) (i) Study of the equilibrium constant for the reaction



by determining the partition Co- efficient of iodine between water and carbon tetrachloride.

- ii) Determination of strength of given KI
- b) Determination of association factor of benzoic acid in benzene.

7. Kinetics

Determination of relative strength of acids by
Acid catalyzed hydrolysis of ester
Inversion of cane sugar

8. Electro chemistry

a) Conductivity

- 1) Determination of cell constant of the cell and equivalent conductance of solution
- 2) Conductivity titration between an acid and a base (HCl vs NaOH)

b) Potentiometric titrations

- 1) KMnO_4 vs FeSO_4
- 2) $\text{K}_2\text{Cr}_2\text{O}_7$ vs FeSO_4
- 3) HCl vs NaOH

Instrumental methods of analysis (Demonstration only)

Colorimetry

- a) Using Photoelectric Colorimeter- Estimation of Nickel, Ammonia and Iron.
- b) By Flame Photometric method- Estimation of Calcium, Sodium and Lithium.
- c) Using pH meter – Determination of pH of water.
- d) Using Dissolved oxygen meter to determine dissolved oxygen
- e) Using Abbes Refractometer – determination of Refractive index of various oils.
- f) Using Spectrophotometer – Determination of the concentration of chromium ions.

Reference

Text book of quantitative inorganic Analysis by Vogel (Latest Edition 2008)

Distribution of Marks (Max. marks-100)

Duration of examination: 3 hrs

Int: 40

Regular Test in the class: 30 Marks

Observation note book : 10Marks

Total 40 Marks

Ext: 60

Viva Voce	-	10marks
Record Note book	-	10 marks
For completion of the experiment	-	20 marks
Graph	-	2 marks
Calculation	-	5 marks

Tabulation	-	3 marks
Result	-	10 marks

	Total	60 marks

Sri Kaliswari College (Autonomous)-Sivakasi
Choice based credit system
U. G Programme - B.Sc Chemistry-2015- 2018
Semester-V & VI

Core Paper-XIV: Gravimetric and Organic Preparation -15UCHC6R
Duration: 60 Hrs

Credit: 3

Course Outcome:

- Understand the step to be followed for the preparation of Gravimetric precipitate
- Impact of the effect of acid and base addition in excess or deficient in the analysis
- Role of organic complexing agent in the precipitation of metal ions as complex through gravimetry
- Get proficiency in the role of co-precipitation and post precipitation in gravimetric analysis
- Preparation of disubstituted and trisubstituted organic compound
- Understand the role of electrophilic and nucleophilic substitution reagent in the synthetic reaction
- Applying the knowledge of directive influencing effect in the organic compound preparation
- Learn how to convert the monosubstituted compound into di and tri substituted compound

I. Gravimetric Analysis

1. Estimation of lead as lead chromate
2. Estimation of barium as barium chromate
3. Estimation of calcium as calcium oxalate monohydrate
4. Estimation of copper as cuprous thiocyanate
5. Estimation of nickel as Ni DMG.

II Organic preparation / separation

1. Nitration
 - a. m-dinitrobenzene from nitrobenzene
 - b. Picric acid from phenol
2. Bromination: p- bromoacetanilide from acetanilide
3. Hydrolysis: Aromatic acid from (a) an ester (b) an amide
4. Oxidation : benzoic acid from benzaldehyde
5. benzylation : (a) Amine (b) phenols
6. Acetylation: a) Amine b) phenols

Separation of mixtures

A mixture containing an acid or a base and a neutral compound (Acid or alkali separation)

Distribution of Marks (Max. marks-100)

Duration of examination: 6 hrs

Regular Test in the class: 30 Marks

Int: 40

Observation note book : 10Marks

Total -----
40 Marks

Ext: 60

Viva Voce

- 10marks

Record Note book

- 10 marks

Organic preparation (10 marks)

Procedure - 2 marks

Crude sample - 6 marks

Recrystallised - 2 marks

Gravimetric Estimation (30 marks)

Procedure – 10 marks

Estimation – 20 marks

Less than 2% Error - 20marks

2- 3% Error - 18 marks

3-4% error - 16 marks

4-5% Error - 14 marks

Greater than 5% - 8 marks

Sri Kaliswari College (Autonomous)-Sivakasi
Choice based credit system
U. G Programme - I B.Sc (Biotech & Botany) Semester - I
II B.Sc (Physics) Semester – III- 2015- 2018

Allied– I: Organic, Inorganic and Physical chemistry-I -
15UBTA11/5UBTA11/15UBYA11/15UPHA31

Duration: 60 Hrs

Credit: 4

Aim and objectives:

- To understand the basic concepts in chemistry.
- To know about the terms, various electrodes, calculations and concepts in electro chemistry, nuclear chemistry.

Course Outcome:

- Knowing the basic structure of nucleus and its disintegration
- Significant knowledge in nuclear fission in the stars and the sun and hydrogen bomb
- Identifying the role of glucose, fructose, starch and cellulose in the living system
- Understanding the preparation, properties and uses of polymer
- Gain ideas about the basic principle of chemical bonding
- Acquire the concept of hybridization and MO theory for the study of structure and the bonding nature of molecules
- Enhance knowledge in the electrical properties of the substance.
- Gain knowledge in various types of electrode and its importance in the analysis and in aero space industry

UNIT I

(12 Hrs)

Nuclear chemistry:

Composition of the nucleus- nuclear force-mass defect-binding energy-nuclear stability. Soddy's group displacement law-illustration-law of radioactive disintegration. Nuclear fission: Definitions-emission of energy –stellar energy-hydrogen bomb. Applications of radioactivity-In medicines, agriculture, industry and analytical fields-carbon dating.

UNIT II

(12 Hrs)

Carbohydrates

Definition - classification-monosaccharides - properties and uses of glucose and fructose-configuration of glucose-Haworth structure- distinction between sucrose, glucose and fructose.

Polysaccharides: starch and cellulose (structure only)

UNIT III

(12 Hrs)

Polymer chemistry

Types of polymerization-addition and condensation polymerization, copolymer-Homo polymer-definition of natural and synthetic fibers-natural and synthetic resins-Bakelite, Urea-formaldehyde resin, Teflon, Nylon66.

UNIT IV

(12 Hrs)

Bonding

V.B theory - postulates of V.B theory-application to the formation of simple molecules like H_2 and O_2 -overlap of atomic orbitals - s-s, s-p, p-p overlap - principal of hybridization-sp, sp^2 and sp^3 hybridization-VSEPR theory. M.O theory. Formation of M.O's - bonding, nonbonding and antibonding M.O's-M.O diagram for H_2, He, N_2 .

Unit V

Electrochemistry

(12 Hrs)

Electrochemistry- Faraday's law of electrolysis - specific and equivalent conductance- electrochemical cell - Nernst equation - convention regarding the sign of EMF of a cell - electrodes - reference electrodes - hydrogen and calomel electrodes - types of electrodes- metal - metal ion electrodes - metal - metal insoluble salt electrode - glass and ion selective electrodes - pH measurement using glass electrode - membrane potential - Hydrogen - Oxygen fuel cell.

References:

- Text book of physical chemistry by Puri & Sharma (latest edition 2008)
- Text book of organic chemistry by P.L. Soni (Latest edition 2008)
- Text book of inorganic chemistry by P.L. Soni (Latest edition 2008)

Sri Kaliswari College (Autonomous)-Sivakasi
Choice based credit system
U. G Programme - I B.Sc (Biotech & Botany) Semester - II
II B.Sc (Physics) Semester – IV- 2015- 2018

Allied– I : Organic, Inorganic and Physical chemistry-I-
15UBTA11/5UBTA21/15UBYA21/15UPHA41

Duration: 60 Hrs

Credit: 4

Aim and objectives:

- To understand the basic concepts in chemistry.
- To understand the role of fertilizers in agriculture.

Course Outcome:

- Understanding the theory and classification of dyes
- Knowing the application of dyes
- Gaining the knowledge in thermodynamics concept
- Get idea about the physical significance of entropy and Gibbs free energy
- Enhance the concept of acid and bases through various theories and to explain the HSAB concept
- Gain awareness in formation theory and control of air pollution, water pollution and green house effect
- Develop proficiency in water treatment method and its procedure
- Impact of fertilizer in the current scenario and its limitation

Unit I Dyes:

(12 Hrs)

Definition-theory of color and constitution-classification of dyes according to the structure and applications.

(i) Azo dyes: preparation of Methyl Orange, Congo Red, Bismark Brown.

(ii) Triphenylmethane dyes: Preparation of Malachite Green, Rosaniline and Crystal Violet.

(iii) Phthalein dyes: Phenolphthalein, Fluorescein, and Eosin preparation and properties.

(iv) Vat dyes: Preparation of Indigo.

Unit II

Thermodynamics

(12 Hrs)

Thermodynamics – Importance of thermodynamics - terms used in thermodynamics – open and closed systems, state functions and path functions, extensive and intensive properties, reversible and irreversible processes statement and mathematical form of first law

of thermodynamics – heat capacity at constant volume and pressure, relation between C_p and C_v . Statement of second law of thermodynamics – entropy – physical significance of entropy – Gibb's free energy and its significance.

Unit III

(12Hrs)

Acids and bases

i) Acids and bases - Arrhenius concept - Lowry Bronsted concept: conjugate acid - base pairs, relative strength of acids and bases - Lux-Flood concept - limitation - Lewis concept - Levelling effect - Usanovich concept - hard and soft acids.

ii) Preparation, properties and uses of titanium oxide, thorium oxide, copper sulphate.

Unit IV

(12Hrs)

Air and water pollution

(i) **Air pollution:** Definition-sources of air pollution-classification and effects of air pollutants-effect of fluorocarbons-ozone layer-composition-formation-depletion-greenhouse effect.

(ii) **Acid rain:** formation theory and control of acid rain-methods to control air pollution.

(iii) **Water pollution:** Types-sources-water sewages-industrial effluents-inorganic pollutants-water pollution control-water treatment.

Unit V

(12Hrs)

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 fertilizers and fertilizer industries in India.

References:

Text book of physical chemistry by Puri & Sharma (latest edition 2008)

Text book of organic chemistry by P.L. Soni (Latest edition 2008)

Text book of industrial chemistry B.K.Sharma (Goel publishing company enlarged edition).

Text book of inorganic chemistry R.D.Madan, Malik & G.D.Tuli. Sultan & Chand company New delhi.

Sri Kaliswari College (Autonomous)-Sivakasi
Choice based credit system
U. G Programme - I B.Sc (Biotech & Botany) Semester - II
II B.Sc (Physics) Semester – IV- 2015- 2018
Allied Practical - Ancillary chemistry practical - 15UBTA2P/15UBYA2P/15UPHA4P
Duration: 30 Hrs **Credit: 2**

Course Outcome:

- Learn the importance of Quantitative analysis
- Knowing the different types of Volumetric analysis
- Get an idea about the role of indicator at different pH range in the acidimetry and alkalimetry
- Enhancing the skill to determine the strength of the solution and its molecular weight
- Gaining idea about the oxidation and reduction of ions in redox titrations

VOLUMETRIC ANALYSIS
I.ACID BASE TITRATIONS

1. Estimation of NaOH
2. Estimation of oxalic acid.

II.PERMANGANOMETRY:

1. Estimation of ferrous ion
2. Estimation of oxalic acid

III.IODOMETRY AND IODIMETRY:

Estimation of potassium dichromate.

Distribution of marks (Max.marks-100)

Duration of examination: 3hrs

Regular test in the class: 30 marks

Observation note book: 10 marks

Int: 40

40 marks

Volumetric analysis Ext: 60marks

Procedure writing - 10marks

Volumetric estimation - 30marks

For volumetric Estimation if the students have

Less than 2% Error	- 30 marks
2- 4% Error	- 20 marks
Greater than 5%	- 10 marks
Viva Voce	- 10 marks
Record Note book	- 10 marks