


ANNAMALAI UNIVERSITY
204 - B. Sc. Chemistry

Programme Structure and Scheme of Examination (under CBCS)
 (Applicable to the candidates admitted in Affiliated Colleges from the academic year
 2022 -2023 onwards)

Course Code	Part	Study Components & Course Title	Hours/Week	Credit	Maximum Marks		
					CIA	ESE	Total
SEMESTER - I							
22UTAML11	I	Language Course - I : Tamil/Other Languages	5	3	25	75	100
22UENGL12	II	English Course - I : Communicative English I	5	3	25	75	100
22UCHEC13	III	Core Course - I :General chemistry-I	4	4	25	75	100
22UCHEC14		Core Course - II :General Chemistry-II	4	4	25	75	100
		Core Practical – I:Volumetric analysis	3	-	-	-	-
		Allied - I: Paper – 1	4	3	25	75	100
		Allied Practical -I:	3	-	-	-	-
22UENVS18	IV	Environmental Studies	2	2	25	75	100
Total			30	19			600
SEMESTER - II							
22UTAML21	I	Language Course - II : Tamil/Other Languages	5	3	25	75	100
22UENGL22	II	English Course - II : Communicative English II	5	3	25	75	100
22UCHEC23	III	Core Course – III :General Chemistry-III	4	4	25	75	100
22UCHEP24		Core Practical – I :Inorganic Qualitative Analysis	3	4	40	60	100
		Allied – I: Paper -2	3	3	25	75	100
		Allied Practical – I:	3	3	40	60	100
22UCHEE27		Internal Elective – I	3	3	25	75	100
22UVALE27	IV	Value Education	2	1	25	75	100
22USOFS28		Soft Skill	2	1	25	75	100
Total			30	25			900

Internal Elective Courses

22UCHEE27-1	Internal Elective - I	Health Chemistry
22UCHEE27-2		Pharmaceutical Chemistry
22UCHEE27-3		Textile Chemistry

Allied Courses offered by the Department of Chemistry

22UCHEA01	Theory	Allied Chemistry-I
22UCHEA02	Theory	Allied Chemistry-II
22UCHEAP1	Practical	Allied Chemistry Practical-I

SEMESTER- I	22UCHEC13: GENERAL CHEMISTRY – I	CREDITS: 4
PART- III		HOURS: 60

COURSE OBJECTIVES

- 1) To provide basic idea about regarding atomic structure
- 2) To impart knowledge about Periodic Properties, Bonding Concepts, Ionic Bond, VSEPR and MO Theories.
- 3) To acquire in-depth knowledge about Nomenclature of Organic Compounds, Hybridisation, Reaction Intermediates.
- 4) To inculcate interest in Gaseous State, Kinds of velocities, Virial equation of state.
- 5) Make the students to understand about Liquid state, Liquid crystals, Solid state, X-ray diffraction.

Unit: 1 ATOMIC STRUCTURE

HOURS: 12

Quantum numbers n , l , m and s – Pauli's exclusion principle – Energy distribution and orbitals - Hund's rule of maximum multiplicity - Aufbau's principle – Electronic Configuration of elements - Stability of Half-filled and completely filled orbitals. Shapes of s , p , d and f orbitals.

Classification of elements – General characteristics of s , p , d and f - Block elements – Periodicity of properties- Definition and Periodicity of the following properties – Atomic radii and Ionic radii - Factors affecting the Atomic radii and Ionic radii.

Ionisation potential, Electron affinity and Electronegativity - Factors affecting the Ionisation potential, Electron affinity and Electronegativity – Pauling scale – Mulliken electronegativity scale – Applications of Electronegativity regarding the Bonding nature. Trends in periodic table and applications in predicting and explaining the chemical behavior.

Unit: 2 CHEMICAL BONDING

HOURS: 12

Ionic bond - Conditions for the formation of ionic bond - General properties – Energetics of formation of NaCl from Na^+ and Cl^- - Hydration energy, Lattice energy and their applications – Born-Haber cycle - Polarisation of ions- Fajan's rule - Transition from ionic to covalent character.

Covalent bond - Conditions for the formation of covalent bond - General properties -Polarity of bonds - Orbital overlap - Bond lengths and Bond energies - Hybridisation -Sigma and Pi bonds - VSEPR theory - Geometries of BeCl_2 , BF_3 , NH_3 , CH_4 , SF_4 , ICl_2^- , H_2O , PCl_5 , ClF_3 , XeF_6 , SF_6 and IF_7 molecules - Partial ionic character of covalent bond - Percentage of ionic character from dipole moment and electronegativity difference.

Molecular Orbital theory – Bonding and Anti-bonding orbitals - Relative order of Energies of molecular orbitals - MO diagram of H_2 , He_2 , O_2 , O_2^+ , O_2^- , N_2 , F_2 , HF and CO - Bond Order - Stability and Magnetic properties of the molecules - Comparison of VB and MO theories. Hydrogen bonding-types, examples and effect on properties.

Unit: 3 BASIC CONCEPTS OF ORGANIC CHEMISTRY

HOURS: 12

Classification of Organic Compounds – Nomenclature of Organic Compounds – Functional Groups - Homologous Series - IUPAC Recommendations for Naming Simple Aliphatic and Alicyclic Compounds.

Basic concepts of bonding in organic chemistry - Hybridisation – Definition – Geometry of Molecules - Methane, Ethane, Ethylene, Acetylene and Benzene - Electron displacement effects - Inductive - Inductomeric - Electromeric – Mesomeric Effect - Resonance - Hyperconjugation and Steric Effects.

Cleavage of bonds - Homolytic and Heterolytic fission of carbon-carbon bond – Methods to determine the Reaction Mechanism - Reaction intermediates - Structure and Stability of Carbocations, Carbanions and Free radicals.

Unit: 4 STATES OF MATTER-I

HOURS: 12

Gaseous state - Kinetic gas equation - Postulates and Derivation - Gas laws from the kinetic gas equation.

Kinds of velocities - Mean, RMS, Most Probable Velocities - Calculation of molecular velocities - Maxwell's distribution of Molecular Velocities.

Effect of Temperature on velocity distribution - Equipartition of energy - Heat capacity on molecular basis - Virial equation of state - Boyle temperature - Coefficient of Compressibility and Thermal expansion.

Unit: 5 STATES OF MATTER-II

HOURS: 12

Liquid state - Density – Diffusion - Viscosity – Evaporation - Surface tension Determination using Stalagmometer - Effect of temperature on surface tension - Parachor - Definition and Applications only - Coefficient of Viscosity- determination using Oswald's Viscometer- Effect of Temperature and Pressure.

Liquid crystals - Classification and Applications.

Solid State - Crystal lattices - Symmetry elements in crystals - Unit cell- Seven crystal systems - Space lattice - Bravais lattices - Laws of Crystallography-law of constancy of inter facial angles and Rational Indices- Miller indices, X-ray diffraction by crystals.

COURSE OUTCOMES

- 1) Recollect the Chemistry of Quantum Numbers.
- 2) Discuss various types of bonding through VB & MO theories.
- 3) Name simple Aliphatic and Aromatic Compounds and Illustrate and apply electron displacement effects and reaction mechanisms.
- 4) Understand Gaseous state, kinds velocities.
- 5) Elaborate the basic concepts of solid and liquid states.

Text Books

- 1) P.L. Soni, 2000, "Text book of Inorganic Chemistry", 20th revised edition, Sultan Chand & Sons, New Delhi.
- 2) Bahl, B.S. and Bahl, A., 2010, Advanced Organic Chemistry, (12th edition), Sultan Chand & Co., 12th Edition, New Delhi.
- 3) Puri B.R., Sharma L.R. and Pathania M.S. 2013, Principles of Physical Chemistry, Shoban Lal Nagin chand and Co., 35th Edition, New Delhi.

Supplementary Readings

- 1) J.D. Lee, 2000 'Concise Inorganic Chemistry', Sultan Chand & Sons, 20th revised Edition, New Delhi.
- 2) Morrison, R.T. and Boyd, R.N., Bhattacharjee, 2011, S. K. Organic Chemistry, Pearson, India, 7th Edition, New Delhi.
- 3) Glasstone S. and Lewis D., 1963, Elements of Physical Chemistry, London, Mac Millan & Co Ltd; 1st Edition, New Delhi.

OUTCOME MAPPING

	PO1	PO2	PO3	PO4	PO5
CO1	2	3	3	3	2
CO2	3	3	2	2	3
CO3	3	2	3	3	3
CO4	2	3	2	3	3
CO5	3	2	3	2	3

(1-Low, 2-Moderate, 3-High)

SEMESTER: I	22UCHEC14	CREDIT: 4
PART: III	GENERAL CHEMISTRY – II	HOURS: 60

COURSE OBJECTIVES

- 1) Lab safety and Nature of chemicals.
- 2) Types of titrations and Concentration terms.
- 3) Semimicro analysis and precipitation techniques.
- 4) Organic analysis
- 5) Logarithm, drawing graph, rules of differentiation and integration.

Unit: 1 LAB SAFETY, CHEMICALS AND GLASSWARE

HOURS: 12

Philosophy of lab safety – first-aid techniques – general work culture inside the chemistry lab– importance of wearing lab coat, eye glasses. Personal protection.

Nature of chemicals – toxic, corrosive, explosive, inflammable, carcinogenic, other hazardous chemicals – safe storing and handling of chemicals – disposal of chemical wastes – glassware – handling of glassware – handling of different types of equipment's like Bunsen burner, centrifuger, Kipp's apparatus, etc. – ventilation facilities.

Heating methods, stirring methods filtration techniques. Calibration of pipette, standard measuring flask and burette. Weighing principle in chemical balance and single pan balance.

Unit: 2 TITRIMETRIC METHODS OF ANALYSIS

HOURS: 12

General Introduction General principle: Types of titrations. Requirements for titrimetric analysis. Concentration systems: Molarity, formality, normality, wt% ppm, milli equivalence and millimoles-problems. Primary and secondary standards, criteria for primary standards, preparation of standard solutions, standardization of solutions. Limitation of volumetric analysis, end point and equivalence point.

Acid-base Equilibria pH of strong and weak acid solutions. Buffer solutions. Henderson equations. Preparation of acidic and basic buffers. Relative strength of acids and bases from K_a and K_b values. Neutralisation titration curve, theory of indicators, choice of indicators. Use of phenolphthalein and methyl orange.

Complexometric titrations Stability of complexes, titration involving EDTA. Metal ion indicators and characteristics. Precipitation titrations Argentometric titrations, indicators for precipitation titrations involving silver. Determination of chloride by Volhard's method. Adsorption indicators.

Unit: 3 SEMIMICRO METHODS AND GRAVIMETRIC METHODS

HOURS: 12

Laboratory methods in semi-micro qualitative analysis – Filtration of precipitates – washing of precipitates – heating and evaporation – transferring residue – methods 7 of precipitating sulphides – types of reactions involved in qualitative analysis – spot test analysis – removal of interfering ions.

General Separation Techniques Solubility and solubility products, expressions for solubility products. Determination of solubility from solubility products.

Methods of obtaining the precipitate – conditions for precipitation – choice of precipitants – advantages and disadvantages of using organic precipitants – types of organic precipitants – specific and selective precipitants – sequestering agents.

Unit: 4 BASICS OF ORGANIC ANALYSIS

HOURS: 12

Principle of distillation –Detection of elements – Lassaigne's test - nitrogen, sulphur, halogens.

Estimation of nitrogen by Kjeldahl method – estimation of halogens by Carius method.

Qualitative tests to identify organic functional groups – aliphatic and aromatic, test for unsaturation, phenols, aldehydes, ketones, esters, carbohydrates, amines, amides, carboxylic acids (any one test for each).

Unit: 5 CHEMICAL MATHEMATICS

HOURS: 12

Logarithm: Rules of logarithm, Characteristic and mantissa, change of sign and base, Problems based on pH and pOH.

Graphical representation of equations: Rules for drawing graph co-ordinates etc., Equation of straight line, slope and intercept, plotting the graph from the data of chemical properties and problems.

Derivative: Rules of differentiation and partial differentiation, Algebraic, logarithmic and exponential functions and problems. Rules of integration, Algebraic and exponential functions and problems.

COURSE OUTCOMES

After completion of the course students will be able to understand

- 1) How to be safe in chemistry laboratory and handle chemicals carefully.
- 2) Concentration terms, handling burette, pipette etc and various types of titrations.
- 3) How qualitative methods are useful in finding inorganic radicals.
- 4) Organic analysis.
- 5) Taking logarithm, drawing graphs.

Text Books:(IN API STYLE)

- 1) U.N. Dash, 2005, Analytical Chemistry: Theory and Practice, Sultan Chand and sons. Educational Publishers, 2nd Edition, New Delhi,
- 2) J.Bassett, R.C.Denney, G.H.Jerrey and J.Mendham, 1994, Vogel's Text Book Of Inorganic Quantitative Analysis, ELBS, 5th Edition, London.

Supplementary Readings

- 1) Svehla, 2012, Vogel's Qualitative Analysis, Pearson Education, 7th Edition, New Delhi.
- 2) Venkateswaran V, Veeraswamy R, Kulandaivelu A R, 1997, Basic Principles Of Practical Chemistry, Sultan Chand and Sons, 2nd Edition, New Delhi.
- 3) D.A. Skoog, D.M. West and F. J.Holler, 1990, Analytical chemistry, Saunders college publishing, 5th Edition, Philadelphia.

OUTCOME MAPPING

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CO4	2	3	2	2	2
CO5	3	3	2	3	3

(1-Low, 2-Moderate, 3-High)

SEMESTER: II	22UCHEP24	CREDIT: 3
PART: III	VOLUMETRIC ANALYSIS AND INORGANIC PREPARATIONS	HOURS: 45

COURSE OBJECTIVES

- 1) To enhance the knowledge and principles behind volumetric analysis.
- 2) To impart skills in weighing.
- 3) To understand the principles of standardizing the solution using the analytical technique known as titration.
- 4) To know about the uses of various indicators.
- 5) To invoke the basic knowledge of various primary standard salts and their significance.

A. VOLUMETRIC PRACTICALS

- 1) Calibration of volumetric kits: burette, pipettes and standard flasks.
- 2) Acid - Base titrations:
 - I. Estimation of HCl - Standard Oxalic acid
 - II. Estimation of Borax - Standard sodium carbonate.
- 3) Redox titrations:
 - a. Permanganometry:
 - I. Estimation of Ferrous sulphate - Standard:FAS
 - II. Estimation of Oxalic acid - Standard Oxalic acid
 - b. Iodometry;
 - I. Estimation of $K_2Cr_2O_7$ - Standard $K_2Cr_2O_7$
 - II. Estimation of Copper - Standard Copper Sulphate
 - c. Dichrometry:

Estimation of Fe^{2+} using diphenyl amine as indicator.
- 4) Complexometric titrations:
 - I. Estimation of calcium using EDTA.
 - II. Estimation of magnesium using EDTA.
- 5) Precipitation Titration

Estimation of Chloride in neutral medium (Demonstration Experiment).

B. INORGANIC PREPARATIONS

- 1) Preparation of FAS.
- 2) Preparation of tetraamminecopper (II) sulphate.
- 3) Preparation of potassium trioxalatoaluminate.
- 4) Preparation of potassium trioxalatoferrate.
- 5) Preparation of micro cosmic salt
- 6) Preparation of Tris(thiourea) copper (II) Chloride.

COURSE OUTCOMES

- 1) Analyse the given unknown solution and assess its normality.
- 2) Evaluate the amount of substance from normality.
- 3) Able to plan experimental projects and execute them.
- 4) Orient towards the important concepts of redox and precipitation titrations.
- 5) Understand the laboratory techniques behind inorganic preparations.

Text Books

- 1) Sundaram, Krishnan, Raghavan, 1996, Practical Chemistry (Part III), S.Viswanathan Co. Pvt., Ltd;, Chennai.
- 2) B.S.Furniss, A.J.Hannaford, P.W.G.Smith, A.R.Tatchell, 2005, Vogel's Text Book of Practical Chemistry, Pearson Education, 5th Edition, New Delhi.
- 3) N.S.Gnanapragasam and G.Ramamurthy, 1998, Organic Chemistry - Lab manual, S.Viswanathan Co. Pvt., Chennai.
- 4) Anbusrinivasan.P, 2021, Volumetry and Inorganic Chemistry Practicals, Principles and Procedures Shri Publications, 1st edition, Chidambaram, Tamil Nadu.

Supplementary Readings

- 1) Vogel, A.I., Vogel's Text Book of Quantitative Chemical Analysis, Prentice Hall, New Jersey.
- 2) Mendhan. J., 2009, Vogel's Text Book of Quantitative Chemical Analysis, Pearson Education, New Delhi.

SCHEME OF EVALUATION

Internal assessment:	40 Marks
External assessment:	60 Marks
Total:	100 Marks
Record:	10 Marks
Preparation:	5 Marks(Quantity:10, Quality: 5)
Short Procedure:	5 Marks
Error upto 2 %	: 30 Marks
2.1 – 3 %	: 25 Marks
3.1 – 4 %	: 20 Marks
4.1 – 5 %	: 15 Marks
>5 %	: 10 Marks

For incomplete or wrong calculation deduct 20 % of total marks scored.

For no calculation deduct 40 % of total marks scored.

For each arithmetic error deduct 1 mark.

OUTCOME MAPPING

	PO1	PO2	PO3	PO4	PO5
CO1	2	2	3	3	3
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CO3	3	3	3	2	2
CO4	3	2	3	2	2
CO5	2	3	2	3	3

(1-Low, 2-Moderate, 3-High)

SEMESTER: II	22UCHEC23	CREDIT: 4
PART: III	GENERAL CHEMISTRY-III	HOURS: 60

COURSE OBJECTIVES

- 1) To obtain a comprehensive overview on s and p block elements.
- 2) To understand the properties and reactions of alkanes, alkenes and alkynes.
- 3) To impart knowledge regarding the basics of dienes and cycloalkanes.
- 4) To understand the various terminologies and reactions related to Quantum Chemistry and Thermodynamics.
- 5) To understand the laws and reactions related to Thermochemistry.

Unit:1 NIT-I s- AND p- BLOCK ELEMENTS**HOURS: 12**

Alkali metals - Li, Na, K, Rb and Cs - Occurrence - Comparative study of Elements with respect to Oxides, Halides, Hydroxides and Carbonates - Exceptional property of Lithium - Diagonal Relationship of Li with Mg.

Alkaline earth metals - Be, Mg, Ca, Sr and Ba - Occurrence - Comparative study of the elements with respect to Oxides, Hydroxides, Halides, Sulphates and Carbonates - Exceptional property of Beryllium - Diagonal relationship of Be with Al - Comparison of Alkaline Earth Metals with Alkali Metals - Magnesium acting as bridge element between II A and II B groups - Magnesium resembles Zinc.

p- Block elements - Boron family - Group discussion - Anomalous behaviour of Boron - Diagonal Relationship between Boron and Silicon - Electron deficiency and Electron acceptor behaviour of Boron trihalides - Bonding in Diborane (Hydrogenbridge structure) - Preparation, Properties, structure and Uses of Borazine, NaBH₄, LiAlH₄ and boron nitride.

Unit: 2 HYDROCARBONS**HOURS: 12**

Alkanes - Methods of preparation of alkanes - Wurtz method, Kolbe's method and Reduction of alkyl halides - Physical and Chemical Properties of alkanes - Mechanism of Free Radical Substitution in alkanes - Halogenation and Reactivity.

Alkenes - Properties of alkenes - Electrophilic and Free radical addition - Addition reactions of Alkenes with mechanism - Addition of Hydrogen, Halogens, Hydrogen Halide (Markownikoff's rule) - Hydrogen bromide (Peroxide effect) - Sulphuric Acid, Water, BH₃, Ozonolysis, Hydroxylation with KMnO₄ - Allylic substitution by NBS.

Alkynes - Acidity of alkynes - Addition of hydrogen - Hydroboration - Hydrohalogenation - Addition of hypohalous acid, Hydration - Addition of water with HgSO₄ catalyst - Oxidation with KMnO₄ - Ozonolysis - Formation of Acetylides.

Unit: 3 DIENES AND CYCLOALKANES**HOURS: 12**

Dienes - Classification - Conjugated, Isolated and Cumulative Dienes - Stability of Dienes - 1, 2- and 1, 4- Addition reactions of H₂ and HX with mechanisms - Synthesis of dienes - 1, 3 - Butadiene, Isoprene and Chloroprene - Diels-Alder reaction.

Cycloalkanes - Preparation using Wurtz's reaction, Dieckmann's ring closure and Reduction of aromatic hydrocarbons - Substitution and Ring opening reactions.

Stability of Alkanes, Alkenes and Cycloalkanes - Bayer's strain theory - Theory of Strainless rings.

Unit: 4 QUANTUM CHEMISTRY AND THERMODYNAMICS**HOURS: 12**

Planck's Quantum theory of radiation - Photoelectric Effect - Compton Effect - Wave mechanical concept of the atom - de Broglie's relationship - Davisson and Germer experiment - Wave nature of electron - Heisenberg's Uncertainty Principle.

Schrodinger wave equation (Without derivation) - Significance of wave functions ψ and ψ^2 - Shapes of s, p and d- orbitals.

Thermodynamics - Definition and Explanation of terms - System, Boundary, Surroundings - Homogeneous and Heterogeneous systems - Open, Closed and Isolated systems - Intensive and Extensive properties - State of a system - Independent state variables - Dependent state variables - Thermodynamic functions - State and Path functions.

Unit: 5 THERMODYNAMICS AND THERMOCHEMISTRY

HOURS: 12

Thermodynamic processes - Types of processes - Cyclic - Reversible - Irreversible - Isothermal - Adiabatic Process - Exact and Inexact Differentials - Concept of Heat and Work - Zeroth Law of Thermodynamics.

First law of Thermodynamics - Statement and Equation - C_p and C_v Relationship - Calculation of w , q , ΔE and ΔH for the Expansion of Ideal Gases under Reversible, Isothermal and Adiabatic Conditions.

Thermochemistry - Heat of a reaction - Exothermic and Endothermic reactions - Calculation of ΔH from ΔE and vice versa - Thermochemical equations - Bond dissociation energy - Calculation from thermochemical data - Variation of Heat of a reaction with temperature - Kirchoff's Equation and Its significance.

COURSE OUTCOMES

- 1) Compare basic properties of elements and their Compounds of s & p block elements.
- 2) Explain the reaction mechanisms of alkanes, alkenes and alkynes and predict the products.
- 3) Classify dienes and analyze the stability of alkanes, alkenes and cycloalkanes.
- 4) Recollect the basic concepts of Quantum Theory and Thermodynamics.
- 5) Calculate thermodynamic parameters using thermochemical equations and data.

Text Books: (IN API STYLE)

- 1) P.L. Soni, 2000, Text book of Inorganic Chemistry, Sultan Chand & Sons, 20th revised edition, New Delhi.
- 2) Bahl, B.S. and Bahl, A., 2010, Advanced Organic Chemistry, Sultan Chand & Co., 12th Edition, New Delhi.
- 3) Puri B.R., Sharma L.R. and Pathania M.S., 2013, Principles of Physical Chemistry, Shoban Lal Nagin Chand and Co., 35th edition, New Delhi.

Supplementary Readings

- 1) J.D. Lee, 2000, Concise Inorganic Chemistry, Sultan Chand & Sons, 20th Revised Edition, New Delhi.
- 2) Morrison R.T. and Boyd R.N., Bhattacharjee, S. K., 2011, Organic Chemistry, Pearson India, 7th Edition, New Delhi.
- 3) Glasstone S. and Lewis D., 1963, Elements of Physical Chemistry, London, Mac Millan & Co Ltd; 1st Edition, New Delhi.

OUTCOME MAPPING

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CO4	2	2	3	2	3
CO5	3	3	2	2	2

(1-Low, 2-Moderate, 3-High)

SEMESTER: IV	22UCHEP44	CREDIT: 4
PART: III	INORGANIC QUALITATIVE ANALYSIS	HOURS: 60

COURSE OBJECTIVES

- 1) To describe the methodologies which aid in analysing the inorganic salt mixture
- 2) To identify both interfering and non-interfering anions.
- 3) To enable the students to develop analytical skill and perform a systematic qualitative analysis.
- 4) To appreciate the various colored chemical reactions of metal ions.
- 5) To be aware of principle behind the reactions.

SEMI MICRO QUALITATIVE ANALYSIS

- 1) Training sessions for three classes:

Mixture of anions containing an interfering anion and its elimination technique.

Mixture of cations of simple radicals to familiarize with the inter group separation techniques.

- 2) Semi micro qualitative analysis of inorganic salt mixtures containing one interfering acid radical.
- 3) Simple anions:
Carbonate, Nitrate, Sulphate, Sulphide, Sulphite, Chloride and Bromide.
- 4) Interfering anions:
Borate, Fluoride, Oxalate, Phosphate, Arsenite and Chromate.
- 5) Cations:

Group I cations:	Lead,
Group II cations:	Copper, Cadmium, Bismuth,.
Group III cations:	Aluminium, Ferrous, Ferric, Chromium.
Group IV cations:	Cobalt, Nickel, Manganese, zinc.
Group V cations:	Barium, Strontium, Calcium
Group VI cations:	Magnesium, Ammonium.

COURSE OUTCOMES

- 1) Perform inorganic Analysis systematically and independently.
- 2) Analyze inorganic salt mixture containing an interfering anion.
- 3) Describe the methodologies which aid in analysing the inorganic mixture.
- 4) Apply the solubility product principle to qualitative analysis.
- 5) Identify the groups where the cations belong along with theory behind the reactions.

Text Books: (IN API STYLE)

- 1) V.V. Ramanujam, 1974, Inorganic Semi Micro Qualitative Analysis, The National Publishing Company, 3rd Edition, Chennai.
- 2) Vogel, 1974, Vogel's Text Book of Inorganic Qualitative Analysis, ELBS, , 4th edition, London.
- 3) Anbusrinivasan.P, 2021, Volumetry and Inorganic Chemistry Practicals- Principle and Procedures, Shri Publications, 1st edition, Chidambaram, Tamil Nadu.

Supplementary Readings

- 1) Vogel, 1989, Vogel's Text Book of Quantitative Chemical Analysis, , ELBS/ Longman, 5th Edition, England.

SCHEME OF EVALUATION:

Internal assessment:	40 Marks
External assessment:	60 Marks
Total:	100 marks
Record:	15 Marks
Analysis:	45 Marks.
Each radical with procedure:	10 Marks
For eliminating procedure:	5 Marks
(Spotting for each radical - 5 Marks; Fixing the group - 5 Marks)	

MAPPING- COURSE OUTCOMES VERSUS PROGRAMME OUTCOMES:

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CO1	2	3	3	3	3
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CO5	3	2	3	3	3

(1-Low, 2-Moderate, 3-High)

SEMESTER: II	22UCHEE27A HEALTH CHEMISTRY	CREDIT: 3
PART: III		HOURS: 45
INTERNAL		
ELECTIVE- I		

COURSE OBJECTIVES

- 1) 1. To recognize the causes of common diseases, their control and treatment
- 2) 2. To understand the first aid for accidents
- 3) 3. To study the organic pharmaceutical aids
- 4) 4. To know about organic diagnostic agents
- 5) 5. To have an idea about diabetes and cancer.

Unit: 1 CAUSES, CONTROL AND TREATMENT OF COMMON DISEASES**HOURS: 9**

Insect borne diseases- Malaria, Filariasis, Plague.

Air-borne diseases-Diphtheria, whooping cough, influenza, measles, mumps, tuberculosis (TB), and common cold,

Water borne diseases- cholera, typhoid, dysentery. Some other common diseases-Jaundice, Asthma, Epilepsy, Piles, Leprosy.

Unit: 2 FIRST AID FOR ACCIDENTS**HOURS: 9**

Important rules of First Aid – Cuts and Wounds, Abrasions, Bruises, Bleeding, Fractures, Burns, Fainting Poisonous bites. First Aid Box.

Detection of Hallucinogens and poisons-Antidotes for Poisoning-Some common Poisons-Symptoms and their antidotes-Acid poisoning, Alkali poisoning, Disinfectant poisoning, Alcohol poisoning, Mercury poisoning and Salicylate poisoning.

Unit: 3 ORGANIC PHARMACEUTICAL AIDS**HOURS: 9**

Preservatives, Antioxidants, Emulsifying agent, Sequestrants, Colouring, Flavouring and Sweetening agent, Ointment bases, Solvents, Stabilizing and Suspending agents

Unit: 4 ORGANIC DIAGNOSTIC AGENTS**HOURS: 9**

Drug used as X-rays contrast media, Drugs used to test organ functions, Drugs used to determine blood volume, Hemopoietic functions, Drugs used for miscellaneous diagnostic tests.

Unit: 5 DIABETES AND CANCER**HOURS: 9**

Diabetes and hypoglycemic drugs: Blood sugar level –Diabetes –causes, symptoms and control- Preliminary ideas about the structure and sources of insulin- oral hypoglycemic drugs- sulphonyl ureas and biguanides (synthesis not expected)

Antineoplastic drugs: Causes of cancer- treatment methods-alkylating or cytotoxic agent- antimetabolite drugs

COURSE OUTCOMES

- 1) Describe the causes, control and treatment of common diseases.
- 2) Understand the concepts of first aid for accidents.
- 3) Classify different organic pharmaceutical aids.
- 4) Explain organic diagnostic agents.

- 5) Describe diabetes, cancer and their control and treatment.

Textbooks: (IN API STYLE)

- 1) Jayashree Ghosh, 2003, A Text Book of Pharmaceutical Chemistry, S.Chand & Company Ltd, 3rd revised Edition, New Delhi.
- 2) Lakshmi S, 1995, Pharmaceutical Chemistry, S.Chand & Company Ltd, 1st edition, New Delhi.
- 3) A. L. Leninger, 1998, Biochemistry, Kalyani Publishers, 2nd Edition, Ludhiana

Supplementary Readings

- 1) Chatwal G.R, 1991, Pharmaceutical Chemistry-Organic-Volume II, Himalaya Publishing House, New Delhi.
- 2) Ashutoshkar and Mehta S.C, 2018, Essentials of Pharmacology, New Age International Publishers, New Delhi.
- 3) Gurdeep Chatwal, 2012 , Medicinal Chemistry, Himalaya Publishing house private Ltd., Mumbai.

OUTCOME MAPPING

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	3
CO2	2	3	2	3	2
CO3	3	3	3	2	3
CO4	3	2	3	3	3
CO5	2	3	2	2	2

(1-Low, 2-Moderate, 3-High)

SEMESTER: II PART: III INTERNAL ELECTIVE-I	22UCHEE27B PHARMACEUTICAL CHEMISTRY	CREDIT: 3 HOURS: 45
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COURSE OBJECTIVES

- 1) To know the basics of pharmaceutical chemistry
- 2) To realize the role of Indian medicinal plants and blood
- 3) To have an idea about alkaloids and sulphonamides
- 4) To distinguish about antibiotics and analgesics
- 5) To learn anaesthetics, antiseptics and disinfectants

Unit: 1 INTRODUCTION, HETEROCYCLICS AND QUINOLINES **HOURS: 9**

Definition of the following terms - Drug, Pharmacophore, Pharmacology, Pharmacopoeia, Bacteria, Virus, Chemotherapy and Vaccine.

Chemistry of Heterocyclics: A brief introduction - drugs derived from pyridine derivatives, Tripeleminamine and mepyramine. Quinoline derivatives: Chloroquine, amodiaquine and primaquine, Pyrimidines – Ureides and barbiturates.

UNIT: 2 STUDY OF INDIAN MEDICINAL PLANTS AND BLOOD **HOURS: 9**

Indian Medicinal Plants and Their Uses - Tulasi, Neem, Kizhanelli, Mango, Semparuthi, Adadodai and Thoothuvelai.

Composition of blood plasma: Analysis of serum proteins, Functions of plasma, Osmotic regulation, function of hemoglobin. Transport of Oxygen and maintenance of pH of blood. Analysis of hemoglobin in blood. Rh factor. Blood pressure- normal, high and low Blood pressure and their control. Causes, Detection and Control of Anaemia and Diabetes Diagnostic test for sugar, salt and cholesterol in serum and urine.

Unit: 3 ALKALOIDS AND CHEMISTRY OF SULPHONAMIDES **HOURS: 9**

Alkaloids: General methods of extraction from a plant source, colour reactions and detection. Morphine and Quinine with special reference to structure relationship (SAR) and uses.

Chemistry of sulphonamides: Mode of action of Sulpha drugs - Sulphadiazine, Sulphapyridine, phthalyl sulphathiazole, sulpha furazole, and prontosil - Preparation and uses.

Unit: 4 ANTIBIOTICS AND ANALGESICS **HOURS: 9**

Antibiotics - Definition – Gram positive and Gram-negative bacteria. Pharmacological action – structural elucidation synthesis, assay and uses of chloramphenicol, Streptomycin and penicillin.

Analgesics: Classification, Narcotic analgesic– Morphine and derivatives. synthetic analgesics – pethidine and methadones. Antipyretic analgesics. Salicylic acid derivatives, indolyl derivatives and p-aminopheno derivatives, synthesis, action and uses.

Unit: 5 ANAESTHETICS, ANTISEPTICS AND DISINFECTANTS **HOURS: 9**

Anaesthetics – Definition – Classification - Local and General – Volatile – Uses of volatile liquids as Inhalation Anaesthetics – Chloroform, halothane, trichloroethylene - Gaseous Anaesthetics - Nitrous Oxide, Ether and Cyclopropane - Uses and Disadvantages – Intravenous Anaesthetic Agents – Thiopental sodium, Methohexital and Propanidid. Local anaesthetics – cocaine and its derivatives. Drugs affecting CNS - Definition, Distinction and Examples for Tranquilizers, Sedatives (Phenobarbital, Diazepam) - Hypnotics, Psychedelic Drugs.

Antiseptics and disinfectants: phenols and related compounds, Organic mercurials. Dyes, cationic surface active agents, miscellaneous agents like chloramines – T, Chlorhexidine, dequalinium chloride, formaldehyde and nitrofurazone.

COURSE OUTCOMES

- 1) Realize the role of pharmaceutical chemistry
- 2) Understand the role of Indian medicinal plants and blood
- 3) Describe alkaloids and sulphonamides
- 4) Explain antibiotics and analgesics
- 5) Describe anaesthetics, antiseptics and disinfectants

Textbooks: (IN API STYLE)

- 1) Jayashree Ghosh.S, 2003, A Text Book of Pharmaceutical Chemistry -S. Chand Company Ltd, 3rd revised Edition, New Delhi.
- 2) S. Lakshmi, 1995, Pharmaceutical Chemistry , S.Chand & Company Ltd;, 1st Edition, New Delhi.
- 3) A. L. Leninger, 1998, Biochemistry, Kalyani Publishers,2nd Edition, Ludhiana.

Supplementary Readings

- 1) Asuthosh Kar, 2013, Medicinal Chemistry, New Age International Publishers, 5th Edition, New Delhi.
- 2) O. D. Tyagi, A Text Book Of Synthetic Drugs, Ammol Publications.
- 3) Gurdeep Chatwal, 2012, Medicinal Chemistry, Himalaya Publishing house private Ltd., Revised Edition, Mumbai.
- 4) Ahluwalia, 2012, Medicinal Chemistry, Ane Books Pvt. Ltd;, 2nd Edition, New Delhi.
- 5) Rasheeduz Zafar, 2000, Medicinal Plants of India, CBS Publishers and Distributors.

OUTCOME MAPPING

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	2	2	3	3	2
CO3	3	3	2	2	3
CO4	3	3	2	3	3
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(1-Low, 2-Moderate, 3-High)

SEMESTER: II	22UCHEE27C TEXTILE CHEMISTRY	CREDIT: 3
PART: III		HOURS: 45
INTERNAL		
ELECTIVE-I		

COURSE OBJECTIVES

- 1) To know the basics of fibres.
- 2) To realize the properties of fibres.
- 3) To learn processing of fibres.
- 4) To understand dye chemistry.
- 5) To learn dyeing process.

Unit:1 INTRODUCTION TO FIBRES**HOURS: 9**

General Classification of Fibers – Chemical structure – Production – Properties – Count, Denier, Tex, Staple Length, Spinning Properties, Strength, Elasticity and Creep. Applications of the following Natural Cellulose Fibres (Cotton and Jute).

Natural Protein Fibres (Wool and Silk) – General characteristics.

Unit: 2 PROPERTIES OF FIBRES**HOURS: 9**

Chemical Structure, Production and properties of the following Synthetic Fibres – Man-made Cellulose Fibres (Rayon and Modified cellulose fibres).

Polyamide Fibres (Different types of Nylons) - Preparation – Nylon degradation – Polyester Fibres – Preparation - Degradation – Polyacrylonitrile fibre - Preparation and Properties – Viscose fibre - Preparation and Properties. Identification tests for Cellulose, Cotton, Wool, Silk, Rayon, Acrylic, Viscose, Polyamide and Polyester Fibres.

Unit: 3 PROCESSING OF FIBERS**HOURS: 9**

Impurities in Raw Cotton and Grey Cloth, Wool and Silk. General principles of the Removal, Scouring - Purpose, Alkali Scouring and Acid Scouring – Bleaching (Methods - Hypochlorite, Peroxide and Bleaching Powder) - Desizing (Hydrolytic and Enzymatic), Kier Boiling and Chemicking.

Dyeing of Polyester and Blends – Functions of Dispersing agents - Fibre swelling – Carrier dyeing - High temperature dyeing - Selection of dyestuff.

Unit: 4 DYE CHEMISTRY**HOURS: 9**

Colour and Constitution – A general treatment – Chromophores – Auxochromes - Bathochromes and Hypso-chromes.

Classification of dyes – Acidic, Basic, Direct, Mordant, Azoic, Ingrain, Vat and Reactive Dyes - Classification as per Chemical constitution – Azo dyes – Triphenyl Methane Dyes, Phthalein Dyes, Indigo and Anthraquinone Dyes.

Structure, Preparation and Uses – Methyl Orange, Phenolphthalein and Malachite Green.

Unit: 5 DYEING PROCESS**HOURS: 9**

Dyeing - Dyeing of Wool and Silk – Fastness properties of dyed materials.

Dyeing of Nylon, Terylene and other Synthetic Fibres – Finishing – Finishes given to Fabrics – Mechanical finishes on Cotton, Wool and Silk.

Method used in process of Mercerizing – Anticrease and Antishrink finishes – Water Proofing.

COURSE OUTCOMES

- 1) Understand the basics of fibers
- 2) Realize the properties of fibers
- 3) Describe processing of Fibers
- 4) Explain dye chemistry
- 5) Describe dyeing process

Textbooks: (IN API STYLE)

- 1) F. Sadov, M. Horchagin and A. Matetshy, 1973, Chemical Technology Of Fibrous Materials, Mir Publishers, 1st edition, Moscow.
- 2) R. H. Peters, 1963, Textile Chemistry-Vol-II, Elsevier, 1st Edition, New York.

Supplementary Readings

- 1) E.R.Trotman, Dyeing and Chemical Technology of Textile Fibres , Charles Griffin &Co Ltd, London.
- 2) V.A.Shenai, Chemistry of dyes & Principles of Dyeing, Sevak Publications, Chennai.
- 3) E. R. Trotman, Scouring and Bleaching, Charles Griffin & Co Ltd., London.

OUTCOME MAPPING

	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	3	3
CO2	2	3	3	2	3
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