PG AND RESEARCH DEPARTMENT OF CHEMISTRY

POOMPUHAR COLLEGE (AUTONOMOUS)

MELAIYUR, 609107.

(Affiliated to Annamalai University)

B.Sc. Chemistry

CHOICE BASED CREDIT SYSTEM SYLLABUS 2023 – 2024 ONWARDS

Poompuhar College (Autonomous)

Department of Chemistry

B.Sc. Chemistry

Programme Structure and Scheme of Examination (under CBCS)

(Applicable to the candidates admitted from the academic year 2023 -2024 onwards)

Part	Study Components & Course Title	Credit	Hours	Maximum Marks		
				CIA	ESE	Total
	SEMESTER – I					
I	Language – I: பொதுதமிழ் – I/ Hindi – I/ French – I	3	6	25	75	100
II	General English – I	3	6	25	75	100
III	Core – I: General Chemistry-I	5	5	25	75	100
	Core –II : Practical - I Quantitative Inorganic Estimation (Titrimetry) and Inorganic Preparations	5	4	25	75	100
	Elective - I (Generic / Discipline Specific) Mathematics-1 (or) Zoology – I	**3**/2	**5**/3	25	75	100
	Zoology Practical – I	1	2	25	75	100
IV	Skill Enhancement Course – 1 (NME-I)	2	2	25	75	100
	Foundation Course : Introductory Chemistry	2	2	25	75	100
	Total	**23**	**30**			**700/800**
	SEMESTER – II					
I	Language – II: பொது தமிழ் –II/ Hindi – II/ French –II	3	6	25	75	100
II	General English – II	3	6	25	75	100
III	Core – III: General Chemistry-II	5	5	25	75	100
	Core –IV: Practical– II Qualitative Organic Analysis and Preparation of Organic Compounds	5	5	25	75	100
	Elective - II (Generic / Discipline Specific) Mathematics-II **(or)** Zoology-II	3/2	5/3	25	75	100
	Zoology Practical – II	1	2	25	75	100
IV	Skill Enhancement Course – 2 (NME-II)	2	2	25	75	100
	Skill Enhancement Course – 3 Internet and its Applications (Common Paper)	2	2	25	75	100
	Total	**23**	**31**			**700/800**

Non-major (NME) Electives offered to other Departments

IV	Role of Chemistry in Daily Life	2	2	25	75	100
	Dairy Chemistry	2	2	25	75	100

SEMESTER: I PART: III Core – I	GENERAL CHEMISTRY-I	Credit: 5 Hours: 5

Objectives of the course	The course aims at giving an overall view of the • various atomic models and atomic structure • wave particle duality of matter • periodic table, periodicity in properties and its application in explaining the chemical behaviour • nature of chemical bonding, and • fundamental concepts of organic chemistry
Course Outline	UNIT I Introduction to Atomic structure and Quantum mechanics History of atom (J.J.Thomson, Rutherford); Atomic number, Atomic Spectra; Black-Body Radiation and Planck's quantum theory Bohr's model of atom; Photoelectric effect, Compton effect; Dual nature of Matter-DeBroglie wavelength- Heisenberg's Uncertainty Principle. Classical mechanics, Wave mechanical model of atom, distinction between a Bohr orbit and orbital; Postulates of quantum mechanics; probability interpretation of wave functions, Formulation of Schrodinger wave equation.
	Unit II Modern Periodic Table and Periodic trends Electronic Configuration of Atoms and ions- Hund's rule, Pauli'exclusion principle and Aufbau principle. Cause of periodicity; Features of the periodic table; classification of elements Periodic trends for atomic size- Atomic radii, Ionic, crystal and Covalent radii; ionization energy, electron affinity, electronegativity-electronegativity scales, applications of electronegativity.

	UNIT-III: Structure and bonding - I Ionic bond Lewis structure of ionic compounds; properties of ionic compounds; Born Haber cycle – lattice energies, Madelung constant; Ion polarisation – polarising power and polarizability. Covalent bond Shapes of orbitals, overlap of orbitals – σ and Π bonds; directed valency hybridization; Fajans' rules - effects of polarisation on properties of compounds. VSEPR theory - shapes of molecules of the type AB_2, AB_3, AB_4, AB_5, AB_6 and AB_7 Partial ionic character of covalent bond-dipole moment, application to molecules of the type A_2, AB, AB_2, AB_3, AB_4.
	UNIT-IV: Structure and bonding - II VB theory – Basic principle - MO theory – Basic principle of bonding and antibonding orbitals, applications of MOT to H_2, He_2, N_2, & O_2 – comparison of VB and MO theories. Coordinate bond: Definition. Metallic bond-electron sea model, VB model; Band theory-mechanism of conduction in solids; conductors, insulator, semiconductor – types, applications of semiconductors Weak Chemical Forces - Vander Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces; Hydrogen bonding – Types, special properties of water, ice.
	UNIT-V: Basic concepts in Organic Chemistry and Electronic effects Types of bond cleavage – heterolytic and homolytic; arrow pushing in organic reactions; reagents and substrates; types of reagents - electrophiles, nucleophiles, free radicals; reaction intermediates – carbanions, carbocations, carbenes – formation and stability. Inductive effect - acidity of halo acids, basicity of amines; inductomeric and electromeric effects. Resonance – resonance energy, conditions for resonance - acidity of phenols, basicity of aromatic amines.

	Hyperconjugation - stability of alkenes, bond length, orienting effect of methyl group, dipole moment of aldehydes and nitromethane Types of organic reactions- addition, substitution, elimination and rearrangements (definitions with examples).
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Madan, R. D. and Sathya Prakash, Modern Inorganic Chemistry, 2nd ed.; S. Chand and Company: New Delhi, 2003. 2. Rao, C.N. R. University General Chemistry, Macmillan Publication: New Delhi, 2000. 3. Puri, B. R. and Sharma, L. R. Principles of Physical Chemistry, 38th ed.;Vishal Publishing Company: Jalandhar, 2002. 4. Bruce, P. Y. and PrasadK. J. R. Essential Organic Chemistry, Pearson Education: New Delhi, 2008. 5. Dash UN, Dharmarha OP, Soni P.L. Textbook of Physical Chemistry, Sultan Chand & Sons: New Delhi,2016
Reference Books	1. Maron, S. H. and Prutton C. P. Principles of Physical Chemistry,4th ed.; The Macmillan Company: Newyork,1972. 2. Lee, J. D. Concise Inorganic Chemistry, 4th ed.; ELBS William Heinemann: London,1991. 3. Gurudeep Raj, Advanced Inorganic Chemistry, 26th ed.; Goel Publishing House: Meerut, 2001. 4. Atkins, P.W. & Paula, J. Physical Chemistry, 10th ed.; Oxford University Press:New York, 2014. 5. Huheey, J. E. Inorganic Chemistry: Principles of Structure and Reactivity, 4th ed .; Addison, Wesley Publishing Company: India,1993.
Website and e-learning source	1) https://onlinecourses.nptel.ac.in 2) http://www.mikeblaber.org/oldwine/chm1045/notes_m.htm 3) http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Inorganic.html 4) https://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding 5) https://www.chemtube3d.com/

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain the atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds.
CO2: classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects in organic compounds, types of reagents.
CO3: apply the theories of atomic structure, bonding, to calculate energy of a spectral transition, Δx, Δp electronegativity, percentage ionic character and bond order.
CO4: evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structure reactivity and electronic effects
CO5: construct MO diagrams, predict trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H – bonding and organic reaction mechanisms.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO'

SEMESTER: I PART: III Core – II	**Quantitative Inorganic Estimation (titrimetry) and Inorganic Preparations**	**Credit: 5** **Hours: 4**

Objectives of the course	This course aims at providing knowledge on • laboratory safety • handling glasswares • Quantitative estimation • preparation of inorganic compounds • To develop the skill in finding out the end points of various types of indicators
Course Outline	Unit I Chemical Laboratory Safety in Academic Institutions Introduction - importance of safety education for students, common laboratory hazards, assessment and minimization of the risk of the hazards, prepare for emergencies from uncontrolled hazards; concept of MSDS; importance and care of PPE; proper use and operation of chemical hoods and ventilation system; fire extinguishers-types and uses of fire extinguishers, demonstration of operation; chemical waste and safe disposal. Common Apparatus Used in Quantitative Estimation (Volumetric) Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper, clamp, stand, wash bottle, watch glass, wire gauge and tripod stand. Principle of Quantitative Estimation (Volumetric) Equivalent weight of an acid, base, salt, reducing agent, oxidizing agent; concept of mole, molality, molarity, normality; primary and secondary standards, preparation of standard solutions; theories of acid-base, redox, complexometric, iodimetric and iodometric titrations; indicators – types, theory of acid–base, redox, metal ion and adsorption indicators, choice of indicators.
	Permanganometry Estimation of Iron (II) sulphate by KmnO4 using a standard Mohr's salt solution. Dichrometry Estimation of $K_2Cr_2O_7$ by thio using a standard $K_2Cr_2O_7$ solution. Estimation of ferric alum using standard dichromate (internal indicator) Iodometry Estimation of copper in copper sulphate using standard dichromate Argentimetry Estimation of chloride in sodium chloride. Complexometry

	Estimation of hardness of water using EDTA Estimation of iron in iron tablets Estimation of ascorbic acid
	Preparation of Inorganic compounds Potash alum Tetraammine copper (II) sulphate Tristhiourea Copper (II) sulphate Mohr's Salt
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	Reference Books: 1.Venkateswaran, V.;Veeraswamy, R.;Kulandivelu, A.R. Basic Principles of Practical Chemistry,2nd ed.; Sultan Chand &Sons: New Delhi, 1997. 2.Nad, A. K.; Mahapatra, B.; Ghoshal, A.; An advanced course in Practical Chemistry, 3rd ed.; New Central Book Agency: Kolkata, 2007.
Reference Books	1. Mendham, J.; Denney, R. C.; Barnes, J. D.; Thomas, M.; Sivasankar, B.; Vogel's Textbook of Quantitative Chemical Analysis, 6th ed.; Pearson Education Ltd: New Delhi, 2000.
Website and e-learning source	Web References: 1) http://www.federica.unina.it/agraria/analytical-chemistry/volumetricanalysis 2)https://chemdictionary.org/titration-indicator/

Course Learning Outcomes (for Mapping with POs and PSOs)

On successful completion of the course the students should be able to

CO1: explain the basic principles involved in titrimetric analysis and inorganic preparations.
CO2: compare the methodologies of different titrimetric analysis.
CO3: calculate the concentrations of unknown solutions in different ways and develop the skill to estimate the amount of a substance present in a given solution.
CO4.Indetify the end point of various titrations
CO5 acquire knowledge on the systematic analysis of Mixture of salts., identify the cations and anions in the unknown substance.
CO5: handle the common apparatus used in volumetric estimation.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	S	S	M	S	S	S	M	S	M

CO-PO Mapping (Course Articulation Matrix)

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Note: Scheme for Practical Evaluation
Inorganic Preparation:15 marks
Record:10 marks
Procedure-10 marks
Volumetric Estimation – 40 marks
Results
< 2% - 40 marks
2-3% - 30 marks
3-4% - 20 marks
> 4% - 10 marks

SEMESTER: I PART: III	INTRODUCTORY CHEMISTRY	Credit: 2 Hours: 2

Objectives of the Course	To give insights into chemistry experiments for a beginner in 1. Lab safety and Nature of chemicals. 2. Types of titrations and Concentration terms. 3. Semi micro analysis and precipitation techniques. 4. Organic analysis 5. Gravimetric Principles
Course Outline	UNIT-I: LAB SAFETY, CHEMICALS AND GLASSWARE 1.1 laboratory hygiene and safety – first–aid techniques – general work culture inside the chemistry lab. 1.2 Nature of chemicals – toxic, corrosive, explosive, inflammable, carcinogenic, other hazardous chemicals – safe storing and handling of chemicals – disposal of chemical wastes. 1.3. Handling of glass wares- Calibration of pipette, standard measuring flask and burette.
	UNIT-II: TITRIMETRIC METHODS OF ANALYSIS 2.1 Definitions of Molarity and Normality. Primary and secondary standards, Criteria for primary standards-Preparation of standard solutions. 2.2 Concepts of Acids & Bases - Indicators-Theory and their choice.. 2.3 Types of titrations- Acid-base Titrations, Redox Titrations, Precipitation Titrations and Complexometric Titrations- Principles and theory.
	UNIT-III: SEMIMICRO METHODS 3.1. Identification of interfering & non-interfering acid radicals - removal of interfering radicals (any one test for each). 3.2 Separation of cations into groups-Reagents involved and their principle 3.3 Spot test analysis for ammonium, Pb, Cu, Mg, Mn and Ni.
	UNIT-IV: BASICS OF ORGANIC ANALYSIS
	4.1 Preliminary and solubility tests for identifying organic compounds. Test for Aliphatic/Aromatic – Saturated/ Unsaturated compounds 4.2 Detection of Nitrogen, Sulphur and halogens 4.3– Test for functional groups: phenol, aldehyde, ketone, ester, carbohydrate, amine, amide & carboxylic acid (any one test for each).

	UNIT V: GRAVIMETRIC METHODS 5.1 Gravimetric analysis- principle, theory and calculation. 5.2 Steps of a gravimetric analysis: precipitation, digestion, filtration, washing, drying and weighing. 5.2 Conditions for precipitation-choice of precipitants-advantages and disadvantages of using organic precipitants.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	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. 3. Gopalan R., Rangarajan K., Subramanian P.S. Elements of Analytical Chemistry, Sultan Chand & Sons, 2003 4. Svehla, 2012, Vogel's Qualitative Analysis, Pearson Education, 7thEdition,New Delhi. 5. Venkateswaran V, Veeraswamy R, Kulandaivelu A R,1997,Basic Principles Of Practical Chemistry, Sultan Chand and Sons, 2nd Edition, New Delhi. 6. D.A. Skoog, D.M. West and F. J.Holler, 1990, Analytical chemistry,Saunders college publishing, 5th Edition, Philadelphia.
Reference Books	1. Svehla, 2012, Vogel's Qualitative Analysis, Pearson Education, 7thEdition,New Delhi. 2. Venkateswaran V, Veeraswamy R, Kulandaivelu A R,1997,Basic Principles Of Practical Chemistry, Sultan Chand and Sons, 2nd Edition, New Delhi

	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Website and e-learning source	1. https://www.tees.ac.uk/parttime_courses/engineering_&_construction/certificate_of_credit_foundation_process_chemistry_(by_flexible_open_learning).cfm 2. https://le.ac.uk/courses/chemistry-with-foundation-year-bsc/2023 3. https://www.researchgate.net/publication/345381808_Foundations_for_Teaching_Chemistry_Chemical_Knowledge_for_Teaching 4. https://yuli-elearning.com/mod/resource/view.php?id=738 5. https://pubs.acs.org/doi/10.1021/acs.jchemed.1c00666
Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to CO1: to understand laboratory safety and hygiene. CO2: to understand principle of titrations. CO3: to understand semi micro analysis. CO4: to understand basics of organic compound analysis. CO5: to understand about gravimetric analysis	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	2	2	2
CO2	2	2	2	2	2
CO3	2	2	2	2	2
CO4	2	2	2	2	2
CO5	2	2	2	2	2
Weightage	10	10	10	10	10
Weighted percentage of Course Contribution to Pos	2.0	2.0	2.0	2.0	2.0

Level of Correlation between PSO's and CO's

SEMESTER: I PART: II Core III	GENERAL CHEMISTRY-II	Credit: 4 Hours: 4

Objectives of the course	This course aims at providing an overall view of the • chemistry of acids, bases and ionic equilibrium • properties of s and p-block elements • chemistry of hydrocarbons • applications of acids and bases • compounds of main block elements and hydrocarbons
Course Outline	UNIT-I Acids, bases and Ionic equilibria Concepts of Acids and Bases - Arrhenius concept, Bronsted-Lowry concept, Lewis concept; Relative strengths of acids, bases and dissociation constant; ionic product of water, pH scale, pH of solutions; Degree of dissociation, common ion effect, factors affecting degree of dissociation; acid base indicators, theory of acid base indicators – action of phenolphthalein and methyl orange, titration curves - use of acid base indicators; Buffer solutions – types, mechanism of buffer action in acid and basic buffer, Henderson-Hasselbalch equation; Salt hydrolysis - salts of weak acids and strong bases, weak bases and strong acids, weak acids and weak bases - hydrolysis constant, degree of hydrolysis and relation between hydrolysis constant and degree of hydrolysis.
	Unit-II Chemistry of s - Block Elements Hydrogen: Position of hydrogen in the periodic table. Alkali metals: Formation of oxides, hydroxides, halides and carbonates. Diagonal relationship of Li with Mg. Preparation, properties and uses of NaOH, Na_2CO_3, KBr, $KClO_3$ alkaline earth metals. Anomalous behaviour of Be. Chemistry of p- Block Elements (Group 13 & 14) preparation and structure of diborane, borazine and borax. Extraction of Al and its uses. Comparison of carbon with silicon. Carbon-di-sulphide – Preparation and uses.
	UNIT-III Chemistry of p- Block Elements (Group 15-18) General characteristics of elementsof Group 15; chemistry of NH_2OH and HNO_3. Chemistry of PH_3, PCl_5, $POCl_3$, P_2O_5 and oxy acids of phosphorous (H_3PO_3 and H_3PO_4). General properties of elements of group16 - Structure and allotropy of elements - chemistry of ozone - Classification and properties of oxides -

	oxides of sulphur (SO_3) and selenium – Oxy acids of sulphur (Caro's and Marshall's acids). Chemistry of Halogens: General characteristics of halogen with reference to electro-negativity, electron affinity, oxidation states and oxidizing power. Peculiarities of fluorine. Halogen acids (HF, HCl, HBr and HI), oxides and oxy acids ($HClO_4$). Inter-halogen compounds (ICl and IF_7), pseudo halogens [$(CN)_2$ and $(SCN)_2$] and basic nature of Iodine. Noble gases: Position in the periodic table. Preparation, properties and structure of XeF_2 and $XeOF_4$; uses of noble gases - clathrate compounds.
	UNIT-IV Hydrocarbon Chemistry-I Petroproducts: Fractional distillation of petroleum; cracking, isomerisation, alkylation, reforming and uses Alkenes-Nomenclature, general methods of preparation – Mechanism of elimination reactions – E_1 and E_2 mechanism - factors influencing – stereochemistry – orientation – Hofmann and Saytzeff rules. Reactions of alkenes – addition reactions – mechanisms – Markownikoff's rule, Kharasch effect, oxidation reactions, Alkadienes Nomenclature - classification – isolated, conjugated and cumulated dienes; stability of conjugated dienes; mechanism of electrophilic addition to conjugated dienes - 1, 2 and 1, 4 additions; free radical addition to conjugated dienes– Diels–Alder reactions – polymerisation – polybutadiene, polyisoprene (natural rubber), vulcanization. Alkynes Nomenclature; general methods of preparation, properties and reactions; Cycloalkanes: Nomenclature, Relative stability of cycloalkanes, Bayer's strain theory and its limitations.

	UNIT-V Hydrocarbon Chemistry - II Benzene: Source, structure of benzene, stability of benzene ring, molecular orbital picture of benzene, aromaticity, Huckel's (4n+2) rule and its applications. Electrophilic substitution reactions - General mechanism of aromatic electrophilic substitution - nitration, sulphonation, halogenation, Friedel-Craft's alkylation and acylation. Polynuclear Aromatic hydrocarbons: Naphthalene – nomenclature, Haworth synthesis; physical properties, reactions – electrophilic substitution reaction, nitration, sulphonation, halogenation, Friedel – Crafts acylation & alkylation, preferential substitution at - position – reduction, oxidation – uses. Anthracene – synthesis by Elbs reaction, physical properties; reactions - Diels-Alder reaction, preferential substitution at C-9 and C-10; uses.
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nd ed, S.Chand and Company, New Delhi. 2. Sathya Prakash, Tuli G D,Basu S K and Madan R D, (2003), Advanced Inorganic Chemistry, 17th ed., S.Chand and Company, New Delhi. 3. Bahl B S, Arul Bhal, (2003), Advanced Organic Chemistry, 3rd ed., S.Chand and Company, New Delhi. 4. Tewari K S, Mehrothra S N and Vishnoi N K, (1998), Text book of Organic Chemistry, 2nd ed., Vikas Publishing House, New Delhi. 5. Puri B R, Sharma L R, (2002), Principles of Physical Chemistry, 38th ed., Vishal Publishing Company, Jalandhar.
Reference Books	1. Maron S H and Prutton C P, (1972), Principles of Physical Chemistry, 4th ed., The Macmillan Company, Newyork. 2. Barrow G M, (1992), Physical Chemistry, 5th ed., Tata McGraw Hill, New Delhi. 3. Lee J D, (1991), Concise Inorganic Chemistry, 4thed., ELBS William Heinemann, London. 4. Huheey J E, (1993), Inorganic Chemistry: Principles of Structure and Reactivity, 4th ed., Addison Wesley Publishing Company, India. 5. Gurudeep Raj, (2001), Advanced Inorganic Chemistry Vol – I, 26th ed., Goel Publishing House, Meerut. 6. Agarwal O P, (1995), Reactions and Reagents in Organic Chemistry, 8thed., Goel Publishing House,Meerut.

Website and e-learning source	https://onlinecourses.nptel.ac.inhttp://cactus.dixie.edu/smblack/chem1010/lecture_notes/4B.html http://www.auburn.edu/~deruija/pdareson.pdfhttps://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding MOOC components http://nptel.ac.in/courses/104101090/ Lecture 1: Classification of elements and periodic properties http://nptel.ac.in/courses/104101090/

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain the concept of acids, bases and ionic equilibria; periodic properties of s and p-block elements, preparation and properties of aliphatic and aromatic hydrocarbons
CO2: discuss the periodic properties of sand p- block elements, reactions of aliphatic and aromatic hydrocarbons and strength of acids
CO3: classify hydrocarbons, types of reactions, acids and bases, examine the properties s and p-block elements, reaction mechanisms of aliphatic and aromatic hydrocarbons CO4: explain theories of acids, bases and indicators, buffer action and important compounds of s-block elements
CO5: assess the application of hard and soft acids indicators, buffers, compounds of s and p-block elements and hydrocarbons

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO-PO Mapping (Course Articulation Matrix)

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO&CO

SEMESTER: II PART: II Core IV	QUALITATIVE ORGANIC ANALYSIS AND PREPARATION OF ORGANIC COMPOUNDS	Credit: 5 Hours: 4

Objectives of the course	This course aims at providing knowledge on • laboratory safety • handling glass wares • analysis of organic compounds • preparation of organic compounds
Course Outline	UNIT I Safety rules, symbols and first-aid in chemistry laboratory Basic ideas about Bunsen burner, its operation and parts of the flame. Chemistry laboratory glassware –basis information and uses
	Unit II Qualitative Organic Analysis Preliminary examination, detection of special elements - nitrogen, sulphur and halogens Aromatic and aliphatic nature, Test for saturation and unsaturation, identification of functional groups using solubility tests Confirmation of functional groups • monocarboxylic acid, dicarboxylic acid • monohydric phenol, polyhydric phenol • aldehyde, ketone, ester • carbohydrate (reducing and non-reducing sugars) • primary, secondary, tertiary amine • monoamide, diamide, thioamide • anilide, nitro compound • Preparation of derivatives for functional groups
	UNIT III Preparation of Organic Compounds i. Halogenation - p-bromo acetanilide from acetanilide ii. Oxidation - benzoic acid from Benzaldehyde iii. Methyl benzoate to Benzoic acid iv. Salicylic acid from Methyl Salicylate v. Hydrolysis of benzamide to Benzoic Acid

	Unit-IV Separation and Purification Techniques (Not for Examination) 1. Purificationof organic compounds by crystallization (from water / alcohol) and distillation 2. Determination of melting and boiling points of organic compounds.
Reference Books	1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. Basic Principles of Practical Chemistry, 2nd ed.; Sultan Chand: New Delhi, 2012. 2. Manna, A.K. Practical Organic Chemistry, Books and Allied: India, 2018. 3. Gurtu, J. N; Kapoor, R. Advanced Experimental Chemistry (Organic), Sultan Chand: New Delhi, 1987. 4. Furniss,B. S.; Hannaford, A. J.; Smith, P. W. G.; Tatchell, A.R. Vogel's Textbook of Practical Organic Chemistry, 5th ed.; Pearson: India,1989.
Website and e-learning source	https://www.vlab.co.in/broad-area-chemical-sciences

Scheme of Valuation	Max. marks(75)
Record	:10 Marks
Preparation	:15 Marks
Recrystallization	:05 Marks
Organic Qualitative Analysis	:45 Marks
Preliminary Test	:05 Marks
Detection of Elements	:05 Marks
Detection of Functional Group	:05 Marks
Identification of the compound	:05 Marks
Confirmatory Test	:15 Marks
Derivatives preparation and its m.pt determination	:10 Marks

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: observe the physical state, odour, colour and solubility of the given organic compound.

CO2: identify the presence of special elements and functional group in an unknown organic compound performing a systematic analysis.

CO3: compare mono and dicarboxylic acids, primary, secondary and tertiary amines, mono and diamides, mono and polyhydric phenols, aldehyde and ketone, reducing and non- reducing sugars and explain the reactions behind it.

CO4: exhibit a solid derivative with respect to the identified functional group.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M

CO-PO Mapping (Course Articulation Matrix)

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO’s and CO’s

Non-major (NME) Electives offered to other Department

SEMESTER: I **PART: III**	**ROLE OF CHEMISTRY IN DAILY LIFE**	**Credit: 2** **Hours: 2**

Objectives of the course	This course aims at providing an overall view of the • importance of Chemistry in everyday life • chemistry of building materials and food • chemistry of Drugs and pharmaceuticals
Course Outline	UNIT-I General survey of chemicals used in everyday life. Air - components and their importance; photosynthetic reaction, air pollution, green - house effect and the impact on our life style. Water - Sources of water, qualities of potable water, soft and hard water, methods of removal of hardness-water pollution
	Unit-II Building materials - cement, ceramics, glass and refractories - definition, composition and application only. Plastics - polythene, PVC, bakelite, polyesters, melamine-formaldehyde resins -preparation and uses only.
	UNIT-III Food and Nutrition - Carbohydrates, Proteins, Fats - definition and their importance as food constituents – balanced diet – Calories minerals and vitamins (sources and their physiological importance). Cosmetics – tooth paste, face powder, soaps and detergents, shampoos, nail polish, perfumes - general formulation and preparations - possible hazards of cosmetic use.
	UNIT-IV Chemicals in food production – fertilizers - need, natural sources; urea, NPK fertilizers and super phosphate. Fuel – classification - solid, liquid and gaseous; nuclear fuel examples and uses.
	UNIT-V Pharmaceutical drugs - analgesics and antipyretics - paracetamol and aspirin. Colour chemicals - pigments and dyes - examples and applications. Explosives - classification and examples.

Recommended Text	1.Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house, 2010. 2. A textbook of pharmaceutical chemistry by Jayashree Ghosh, S Chand publishing, 2012. 3. S. Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006. 4. B. K, Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.Introduction to forensic chemistry, Kelly M. Elkins, CRC Press Taylor & Francis Group, 2019. 5. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand &Co.Publishers, second edition, 2006.
Reference Books	1. Randolph. Norris Shreve, Chemical Process Industries, McGraw-Hill, Texas, fourthedition, 1977. 2. W.A.Poucher,JosephA.Brink,Jr.Perfumes,Cosmetics and Soaps,Springer, 2000. 3. A.K.De,EnvironmentalChemistry,NewAge InternationalPublicCo.,1990.
Website and e-learning source	1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7044178/ 2. https://byjus.com/question-answer/name-the-element-which-is-important-component-of-ceramics-glass-and-cement-csialca-1/ 3. https://kids.britannica.com/students/article/food-and-nutrition/274373 4. https://study.com/academy/lesson/pharmaceutical-drugs-definition-types.html

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: learn about the chemicals used in everyday life as well as air pollution and water pollution.

CO2: get knowledge on building materials cement, ceramics, glass and plastics, polythene, PVC bakelite, polyesters,

CO3: acquire information about Food and Nutrition. Carbohydrates, Proteins, Fats Also have an awareness about Cosmetics Tooth pastes, face powder, soaps and detergents.

CO4: discuss about the fertilizers like urea, NPK fertilizers and super phosphate. Fuel classification solid, liquid and gaseous; nuclear fuel - examples and uses

CO5: have an idea about the pharmaceutical drugs analgesics and antipyretics like paracetamol and aspirin and also about pigments and dyes and its applications.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO-PO Mapping (Course Articulation Matrix)

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO’s and CO’s

SEMESTER: II PART: III	DAIRY CHEMISTRY	Credit: 2 Hours: 2

Objectives of the course	This course aims at providing an overall view of the • chemistry of milk and milk products • processing of milk • preservation and formation of milk products.
Course Outline	UNIT I Composition of Milk Milk-definition-general composition of milk- constituents of milk - lipids, proteins, carbohydrates, vitamins and minerals - physical properties of milk - colour, odour, acidity, specific gravity, viscosity and conductivity -Factors affecting the composition of milk - adulterants, preservatives with neutralizer- examples and their detection- estimation of fat, acidity and total solids in milk.
	Unit II Processing of Milk Microbiology of milk - destruction of micro - organisms in milk, physico – chemical changes taking place in milk due to processing - boiling, pasteurization – types of pasteurization -Bottle, Batch and HTST (High Temperature Short Time) – Vacuum pasteurization – Ultra High Temperature Pasteurization.
	UNIT III Major Milk Products Cream - definition - composition - chemistry of creaming process - gravitational and centrifugal methods of separation of cream - estimation of fat in cream. Butter - definition -composition - theory of churning – desi butter - salted butter, estimation of acidity and moisture content in butter. Ghee - major constituents - common adulterants added to ghee and their detection - rancidity - definition - prevention - antioxidants and synergists - natural and synthetic.
	UNIT IV Special Milk Standardised milk - definition - merits - reconstituted milk - definition - flow diagram of manufacture - Homogenised milk - flavoured milk - vitaminised milk - toned milk -Incitation milk - Vegetable toned milk - humanized milk - condensed milk - definition, composition and nutritive value.

	UNIT V Fermented and other Milk Products Fermented milk products – fermentation of milk - definition, conditions, cultured milk - definition of culture - example, conditions - cultured cream, butter milk - Bulgarious milk -acidophilous milk – YoheerIndigeneous products- khoa and chhena definition - Ice cream -definition-percentage composition-types-ingredients-manufacture of ice–cream, stabilizers emulsifiersandtheirrole-milkpowder-definition-needformakingmilkpowderdryingprocess-types of drying.