GOVERNMENT ARTS COLLEGE (AUTONOMOUS)
KUMBAKONAM-612002

Department of Chemistry

B.Sc. CHEMISTRY

SYLLABUS

[Students admitted 2023-2024 onwards]

(Course Structure Under CBCS pattern)

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
Course Structure Under CBCS for UG-CHEMISTRY (2023 - 2024)
U.G. Programme (B.Sc. Chemistry)

SEM	Part	COURSE	Credits	INST. Hours/wee	Marks		Total
					Int.	Ext.	
I	I	Tamil-I	3	6	25	75	100
	II	English-I	3	6	25	75	100
	III	General Chemistry–I (CC I)	5	5	25	75	100
		Volumetric Practical (CP I)	3	3	40	60	100
		Zoology-I / Maths -I (AC I)	4	4	25	75	100
		Allied Practical-I / Maths-II	-	2	-	-	-
	IV	Value Education	2	2	25	75	100
		Foundation Course in Chemistry	2	2	25	75	100
Total			**22**	**30**	**Total Marks**		**700**
II	I	Tamil-II	3	6	25	75	100
	II	English-II	3	6	25	75	100
	III	General Chemistry – II (CC II)	5	5	25	75	100
		Qualitative Organic Analysis Practical (CP II)	3	3	40	60	100
		Zoology-II / Maths -II (AC II)	4	4	25	75	100
		Allied Zoology Practical - I (AP I) / Maths -III	2	2	40	60	100
	IV	Environmental Studies	2	2	25	75	100
		NMS-Overview of English language communication assessment & certification from Cambridge / Skill Enhancement Course SEC I – Chemistry of soil and water	2	2	25	75	100
Total			**24**	**30**	**Total Marks**		**800**
III	I	Tamil-III	3	6	25	75	100
	II	English-III	3	6	25	75	100
	III	General Chemistry–III (CC III)	5	5	25	75	100
		Qualitative Inorganic Analysis Practical (CP III)	3	3	40	60	100
		Physics -I (AC III)	4	4	25	75	100
		Allied Physics Lab (AP II)	-	2	-	-	-
		Skill Enhancement Course SEC- II: Dairy Chemistry	2	2	25	75	100
		Skill Enhancement Course SEC III – Food Chemistry / Naan Mudhalvan	2	2	25	75	100
Total			**22**	**30**	**Total Marks**		**700**
IV	I	Tamil-IV	3	6	25	75	100
	II	English-IV	3	6	25	75	100
	III	General Chemistry–IV (CC IV)	5	5	25	75	100
		Physical Chemistry Practical (CP IV)	3	3	40	60	100
		Physics -II (AC IV)	4	4	25	75	100
		Allied Physics Lab (AP II)	2	2	40	60	100
	IV	Skill Enhancement Course SEC IV - (Soft skills Development)	2	2	25	75	100
		Skill Enhancement Course SEC V – Chemistry in Everyday life / Naan Mudhalvan	2	2	25	75	100
Total			**24**	**30**	**Total Marks**		**800**

SEM	Part	COURSE	Credits	INST. Hours/we	Marks		Total
					Int.	Ext.	
V	III	Organic Chemistry -I (CC V)	5	5	25	75	100
		Inorganic Chemistry -I (CC VI)	4	5	25	75	100
		Physical Chemistry (CC VII)/ Project	4	4	25	75	100
		Gravimetric Analysis Practical (CP V)	3	6	40	60	100
		Biochemistry (MBE I)	3	4	25	75	100
		Industrial Chemistry (MBE II)	3	4	25	75	100
	IV	Skill Enhancement Course SEC VI – Health Chemistry / Naan Mudhalvan	2	2	25	75	100
		Internship / Industrial Visit / Field Visit	2	_	_	_	_
	Total		**26**	**30**	**Total Marks**		**700**
VI	III	Organic Chemistry -II (CC VIII)	5	6	25	75	100
		Inorganic Chemistry - II (CC IX)	4	6	25	75	100
		Preparation of Inorganic & Organic compounds Practical (CP VI)	3	6	25	75	100
		Pharmaceutical Chemistry (MBE III)	3	5	40	60	100
		Fundamentals of Spectroscopy (MBE IV)	3	5	25	75	100
	IV	Skill Enhancement Course SEC VII – Agricultural Chemistry / Naan Mudhalvan	2	2	25	75	100
		Gender studies	1	-	-	-	-
		Extension Activity	1	-	-	-	-
Total			**22**	**30**	**Total Marks**		**600**
Net Total Credits			**140**	**180**	**Net Total Marks**		**4300**

COURSE PATTERN – SUMMARY

PART		Subject	TOTAL PAPERS	CREDITS
Part	I	Tamil	4	12
Part	II	English	4	12
Part	III	Core Course (CC)	9	42
		Core Practical (CP)	6	18
		Allied Course (AC)	4	16
		Allied Course – Practical (AP)	2	4
		Major Based Elective (MBE)	4	12
Part	IV	Foundation Course (FC)	1	2
		Value Education	1	2
		Environmental Studies	1	2
		Skill Enhancement Course (SEC)/Naan Mudhalvan	7	14
		Gender studies	1	1
		Internship / Industrial Visit/ Field Visit	_	2
		Skill Enhancement Course SEC (NME)	_	1
NET TOTAL			**44**	**140**

Contents

SEMESTER - I

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc., CHEMISTRY PROGRAM

Title of the Subject: GENERAL CHEMISTRY-I (CC - I) **Credits : 5**
Subject Code : 23U1C1 **Contact Hours: 90**
Semester : I **Marks : 100**

Course objective:

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 thechemical behaviour
- nature of chemical bonding, and fundamental concepts of organic chemistry

UNIT I

Atomic structure and Periodic trends

History of atom (J.J.Thomson, Rutherford); Moseley's Experiment and Atomic number, Atomic Spectra; Black-Body Radiation and Planck's quantum theory - Bohr's model of atom; The Franck-Hertz Experiment; Interpretation of H- spectrum; Photoelectric effect, Compton effect; Dual nature of Matter- De- Broglie wavelength-Davisson and Germer experiment Heisenberg's Uncertainty Principle; Electronic Configuration of Atoms and ions- Hund's rule, Pauli' exclusion principle and Aufbau principle; Numerical problems involving the core concepts**.**

Unit II

Introduction to Quantum mechanics

Classical mechanics, Wave mechanical model of atom, distinction between a Bohr orbit and orbital; Postulates of quantum mechanics; probability interpretation of wavefunctions, Formulation of Schrodinger wave equation - Probability and electron density-visualizing the orbitals -Probability density and significance of Ψ and Ψ^2.

Modern Periodic Table: 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. Problems involving the core concepts.

UNIT-III: Structure and bonding - I

Ionic bond: Lewis dot structure of ionic compounds; properties of ionic compounds; Energy involved in ionic compounds; Born Haber cycle – lattice energies, Madelung constant; relative effect of lattice energy and solvation energy; Ion polarization – polarizing power and polarizability; Fajans' rules - effects of polarization on properties of compounds; problems involving the core concepts.

Covalent bond: Shapes of orbitals, overlap of orbitals – σ and Π bonds; directed valency -hybridization; 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; percentage ionic character- numerical problems based on calculation of percentage ionic character.

UNIT-IV: Structure and bonding - II

VB theory – application to hydrogen molecule; concept of resonance - resonance structures of some inorganic species – CO_2, NO_2, CO_3^{2-}, NO_3^- ; limitations of VBT; MO theory - bonding, antibonding and nonbonding orbitals, bond order; MO diagrams of H_2, C_2, O_2, O_2^+, O^{2-}, O_2^{2-}, N_2, NO, HF, CO; magnetic characteristics, comparison of VB and MO theories. Coordinate bond: Definition, Formation of BF_3, NH_3, NH_4^+, H_3O^+ properties

Metallic bond-electron sea model, VB model; Band theory-mechanism of conduction in solids;

conductors, insulator, semiconductor – types, applicationsof 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, stability of DNA; Effects of chemical force, melting and boilingpoints.

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, arynes and nitrynes.

Inductive effect - reactivity of alkyl halides, 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, orients effect of methylgroup, dipole moment of aldehydes and nitromethane.

Spatial effect – Steric hinderance and steric acceleration with examples.

Text Books

1) Madan, R. D. and Sathya Prakash, *Modern Inorganic Chemistry,* 2nded.; S.Chand and Company: New Delhi, 2003.
2) Rao, C.N. R. University General Chemistry, Macmillan Publication: NewDelhi, 2000.
3) Puri, B. R. and Sharma, L. R. *Principles of Physical Chemistry,*
4) 38thed.;Vishal Publishing Company: Jalandhar, 2002.
5) Bruce, P. Y. and PrasadK. J. R. *Essential Organic Chemistry,* PearsonEducation: New Delhi, 2008.
6) 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,*4thed.; The Macmillan Company: Newyork,1972.
2. Lee, J. D. *Concise Inorganic Chemistry,* 4th ed.; ELBS WilliamHeinemann: London,1991.
3. Gurudeep Raj, *Advanced Inorganic Chemistry,* 26thed.; Goel PublishingHouse: Meerut, 2001.
4. Atkins, P.W. & Paula, J. *Physical Chemistry,* 10th ed.; Oxford UniversityPress: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)

Students will be able:

CO1: **e**xplain 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.

CO-PO Mapping (Course Articulation Matrix)

	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

Strong - 3 **Medium-2** **Low-1**

Level of Correlation between PSO's and CO'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

3 – Strong, 2 – Medium, 1 - Low

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: Volumetric Analysis (CP I) **Credits : 3**
Subject Code : 23U1CP1 **Contact Hours: 60**
Semester : I **Marks : 100**

Course objective:
This course aims at providing knowledge on
- laboratory safety
- handling glass wares
- Quantitative estimation

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.

Unit II
Quantitative Estimation (Volumetric)
Preparation of standard solution, dilution from stock solution
Permanganometry
Estimation of sodium oxalate using standard ferrous ammonium sulphate
Dichrometry
Estimation of ferric alum using standard dichromate (external indicator)
Estimation of ferric alum using standard dichromate (internal indicator)
Iodometry
Estimation of copper in copper sulphate using standard dichromate
Argentimetry
Estimation of chloride in barium chloride using standard sodium chloride / Estimation of chloride in sodium chloride (Volhard's method)
Unit III
Complexometry
Estimation of hardness of water using EDTA
Estimation of iron in iron tablets
Estimation of ascorbic acid.

Text Books:
1. Venkateswaran,V.; Veeraswamy, R .; Kulandivelu, A. R. Basic Principles of Practical Chemistry; Sultan Chand & Sons: New Delhi, 1997.
2. Nad, A.K.; Mahapatra, B.; Ghoshal,A.; Anadvanced 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.;
2. Vogel's Textbook of Quantitative Chemical Analysis, 6th ed.; Pearson Education Ltd: New Delhi, 2000.

Website and e-learning source:

1) http://www.federica.unina.it/agraria/analytical-chemistry/volumetric- analysis
2) https://chemdictionary.org/titration-indicator/

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able:

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 skillto estimate the amount of a substance present in a given solution.

CO-PO Mapping (Course Articulation Matrix)

	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

3 – Strong, 2 – Medium, 1 – Low

Level of Correlation between PSO's and CO'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
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 - Low

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: Foundation Course – I	**Credits : 2**
Subject Code : 23U1CFC	**Contact Hours: 45**
Semester : I	**Marks : 100**

Course objective:

The course aims at giving an overall view of the

- various gas laws and applications
- basic concept of electro chemistry and thermo chemistry
- various crystal structures and properties
- organic separation techniques

UNIT I

Gas laws: Boyle's law, Charles law, Gay Lussac's law, Avogadro's law, ideal gas equation.

Theory of dilute solutions: Colligative properties - Lowering of vapour pressure: Raoult's law, Measurement of lowering of vapour pressure, Boiling point elevation and measurement-Freezing point depression and measurement (No derivation required).

Unit II

Introduction to Electrochemistry: Conductors-types, Electrodes-types, electrode potential, Galvanic cell, Lead – acid battery.

Thermodynamics - basic concepts, Introduction of state functions U (Internal Energy) & H (Enthalpy), heat capacities Cv and Cp, Introduction of Entropy S.

Unit III

Solid state chemistry: Types of solids, physical and chemical properties of solids, types of crystalline solids, crystal structures.

Importance of coordination chemistry: Introduction to coordination chemistry, Types of complexes, Classification of Ligands, Naming of complexes.

UNIT-IV:

Some organic basic principles and techniques in organic chemistry: Classification of organic compounds, IUPAC system of nomenclature Methods of purification - Sublimation, crystallization simple distillation. Fractional distillation, steam distillation and distillation at reduced pressure, chromatographic techniques.

UNIT-V:

Elemental analysis in organic chemistry: Detection of elements in organic analysis -preliminary identification of characteristic functional groups of organic compounds, containing a definite element.

Text Books

1) Madan,R.D.and Sathya Prakash, *Modern InorganicChemistry*,2nded.; S. Chand and Company: NewDelhi,2003.
2) Rao,C.N.R.University General Chemistry, Macmillan Publication:NewDelhi,2000.
3) Puri,B. R. and Sharma, L. R. *Principles of Physical Chemistry,*
4) 38thed.;Vishal Publishing Company:Jalandhar,2002.
5) Arun Bahl, B S Bahl GD Tuli, Essentials of Physical Chemistry, S Chand Co, New Delhi,2019.
6) Morrison Boyd, Organic Chemistry, 5th Ed., Prentice Hall of India, New Delhi, 1989.

Reference Books:

1. Maron,S.H.and Prutton C.P.*Principles of Physical Chemistry*,4thed.; The Macmillan Company: Newyork, 1972.
2. Lee, J.D.*Concise Inorganic Chemistry*,4th ed.; ELBS William Heinemann: London,1991.
3. GurudeepRaj,*Advanced InorganicChemistry*,26thed.;GoelPublishingHouse:Meerut,2001.
4. Atkins,P.W. & Paula,J.*PhysicalChemistry*,10thed.;Oxford UniversityPress:NewYork,2014.
5. Huheey, J.E.*Inorganic Chemistry :Principles of Structure and Reactivity*, 4thed.; 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/

SEMESTER - II

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: General Chemistry II (CC - II) **Credits : 5**
Subject Code : 23U2C2 **Contact Hours: 90**
Semester : II **Marks : 100**

Course objective:

The course aims at giving 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

UNIT I

Acids, bases and Ionic equilibria

Concepts of Acids and Bases - Arrhenius concept, Bronsted-Lowry concept, Lewis's concept; Relative strengths of acids, bases and dissociation constant; dissociation of poly basic acids, 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; Solubility product - determination and applications; numerical problems involving the core concepts.

Unit II

Chemistry of s - Block Elements

Hydrogen: Position of hydrogen in the periodic table. Alkali metals: Comparative study of the elements with respect to oxides, hydroxides, halides, carbonates and bicarbonates. 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 and borazine. Chemistry of borax. Extraction of Al and its uses. Alloys of Al. comparison of carbon with silicon. Carbon-di-sulphide – Preparation, properties, structure and uses. Percarbonates, per onocarbonates and per dicarbonates.

UNIT-III:

Chemistry of p- Block Elements (Group 15-18)

General characteristics of elements of Group 15; chemistry of $H_2N\text{-}NH_2$, NH_2OH and HNO_3. Chemistry of PH_3, PCl_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 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, ClF_3, BrF_5 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, XeF_4, XeF_6 and $XeOF_4$; uses of noble gases – clathrate compounds.

UNIT-IV:

Hydrocarbon chemistry-I

Alkanes- general methods of preparation, properties and reactions, isomerisms.

Cycloalkanes- relative stability of cycloalkanes, Bayer's strain theory and its limitations.

Alkenes-general methods of preparation – Mechanism of elimination reactions – E1 and E2 mechanism - factors influencing – stereochemistry – orientation – Hofmann and Saytzeff rules. Reactions of alkenes – addition reactions – mechanisms – Markownikoff's rule, Kharasch effect, oxidation reactions – hydroxylation, oxidative degradation, epoxidation, ozonolysis; polymerization.

Alkadienes-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 – polymerization – polybutadiene, polyisoprene (natural rubber), vulcanization, polychloroprene.
Alkynes- general methods of preparation, properties and reactions; acidic nature of terminal alkynes and acetylene, polymerization and isomerization.

UNIT-V:
Benzene: 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 - reduction, oxidation – uses. Anthracene – synthesis by Elbs reaction, Diels – Alder reaction and Haworth synthesis; physical properties; reactions - Diels-Alder reaction, preferential substitution at C-9 and C-10; uses.

Text Books

1. Madan,R.D. and Sathya Prakash, Modern InorganicChemistry,2nded.; S. Chand and Company: NewDelhi,2003.
2. Rao,C.N.R.University General Chemistry, Macmillan Publication: NewDelhi, 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 Prasad K.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,4thed.; 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: NewYork, 2014.

Website and e-learning source:

https://onlinecourses.nptel.ac.in
http://www.mikeblaber.org/oldwine/chm1045/notes_m.htm
http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Inorganic.html
https://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding
https://www.chemtube3d.com/

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able:

CO1: explain the concept of acids, bases and ionic equilibria; periodic properties of s and pblock elements, preparation and properties of aliphatic and aromatic hydrocarbons

CO2: discuss the periodic properties of sand p- block elements, reactions of aliphatic andaromatic 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 compoundsof s-block elements

CO5: assess the application of hard and soft acids indicators, buffers, compounds of s and p- block elements and hydrocarbons

.

CO-PO Mapping (Course Articulation Matrix)

	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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 - Low

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: Qualitative Organic Analysis (CP - II)	**Credits : 3**
Subject Code : 23U2CP2	**Contact Hours: 60**
Semester : II	**Marks : 100**

Course objective:
This course aims at providing knowledge on

- laboratory safety
- handling glass wares
- analysis of organic compounds

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 andhalogens
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

Reference Books:

1. 1 Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. *Basic Principlesof 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'sTextbook of Practical Organic Chemistry*, 5th ed.; Pearson: India,1989.

Website and e-learning source:
https://www.vlab.co.in/broad-area-chemical-sciences

Course Learning Outcomes (for Mapping with POs and PSOs)
Students will be able:

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.

CO-PO Mapping (Course Articulation Matrix)

	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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 – Low

SEMESTER - III

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: General Chemistry – III (CC-III)	**Credits : 5**
Subject Code : 23U3C3	**Contact Hours: 90**
Semester : III	**Marks : 100**

Course objective:
This course aims to provide a comprehensive knowledge on

- the physical properties of gases, liquids, solids and X-ray diffraction of solids.
- fundamentals of nuclear chemistry and nuclear waste management applications of nuclear energy
- basic chemistry of halo-organic compounds, phenol and other aromatic alcohols.
- preparation and properties of phenols and alcohols.

Unit – I: Gaseous state
Kinetic molecular model of a gas: postulates and derivation from the kinetic gas equation; The Maxwell – Boltzmann distribution of speed of molecules average, root mean square and most probable velocity and average kinetic energy, degrees of freedom and molecular basis of heat capacities. Collision frequency; collision diameter; mean free path and viscosity of gases.
Real gases: Deviations from ideal gas behaviour,); compressibility factor, Z, and its variation with pressure for different gases. equations of states for real gases-van der Waal's equation; Virial equation; Boyle temperature; Numerical problems based on equations of states for real gases, isotherms of real gases – critical phenomena – van der Waal's equation and the critical state; law of corresponding states-liquefaction of gases; numerical problems involving the core concepts.

Unit – II: Liquid and Solid State
Properties of Liquids- Surface tension, viscosity and their applications. Crystalline and amorphous– differences-geometry, isotropy and anisotropy, melting point; isomorphism, polymorphism.
Crystals – size and shape; laws of crystallography; symmetry elements – plane, centre and axis; Miller indices, unit cells and space lattices; classification of crystal systems; Bravais lattices; X – ray diffraction – Bragg's equation Packing in atomic solids – simple cubic, body centered cubic, face centered and hexagonal close packing; Co-ordination number in typical structures - NaCl, CsCl, ZnS, TiO_2; comparison of structure and properties of diamond and graphite. Defects in solids - stoichiometric and nonstoichiometric defects.
Liquid crystals – classification and applications.

Unit – III: Nuclear Chemistry
Natural radioactivity -α, β and γ rays; half-life period; Fajan–Soddy group displacement law; Geiger–Nattal rule; isotopes, isobars, isotones, mirror nuclei, iso diaphers; nuclear isomerism; radioactive decay series; magic numbers; units – neutron-proton ratio; binding energy; packing fraction; mass defect. Simple calculations involving mass defect and B.E., decay constant and $t_{1/2}$ and radioactive series.
Isotopes – uses – tracers – determination of age of rocks by radiocarbon dating. (Problems to be worked out)
Nuclear energy; nuclear fission and fusion – major nuclear reactors in India; radiation hazards, disposal of radioactive waste and safety measures.

Unit – IV: Halogenated hydrocarbons
Nomenclature and classes of alkyl halides – isomerism, physical properties, chemical reactions. Nucleophilic substitution reactions – SN_1, SN_2 and SN_i mechanisms with stereochemical aspects. Di, Tri & Tetra Halogen derivatives: Nomenclature, classification, preparation, properties and applications.
Aromatic halogen compounds Nomenclature, preparation, properties and uses Mechanism of nucleophilic aromatic substitution – benzyne intermediate.
Aryl alkyl halides Nomenclature, benzyl chloride – preparation – preparation properties and uses.

Unit – V: Alcohols & Ethers
Alcohols: Nomenclature, classification, preparation, properties, use; conversions – ascent and descent of series; test for hydroxyl groups. Oxidation of diols by periodic acid and lead tetra acetate.

Thiols: Nomenclature, structure, preparation and properties.

Elimination reactions – Hoffmann and Saytzeff eliminations – E_1 and E_2 mechanisms – stereochemistry of E_2 reactions in acyclic systems – elimination versus substitution.

Ethers and thioethers: Nomenclature of ethers and methods of their formation, physical properties - Chemical reactions - cleavage and autoxidation, Ziesel's method - synthesis of epoxides -acid and base catalyzed ring opening of epoxides, reactions of organolithium reagents with epoxides– general methods of preparation of thioethers – ethyl sulphide – mustard gas.

Text books:

1. B.R. Puri, L.R. Sharma, M.S. Pathania; Principles of Physical Chemistry, 46th edition, Vishal Publishing, 2020.
2. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers and Distributors, New Delhi, thirtieth edition, 2009.
3. P.L. Soni and Mohan Katyal, Textbook of Inorganic Chemistry, Sultan Chand & Sons, twentieth edition, 2006.
4. M. K. Jain, S. C. Sharma, Modern Organic Chemistry, Vishal Publishing, fourth reprint, 2003.
5. S.M. Mukherji, and S.P. Singh, Reaction Mechanism in Organic Chemistry, Macmillan India Ltd., third edition, 1994.

Reference books:

1. T. W. Graham Solomons, *Organic Chemistry*, John Wiley & Sons,fifth edition, 1992.
2. A. Carey Francis, *Organic Chemistry*, Tata McGraw-Hill Education Pvt.,Ltd.,New Delhi, seventh edition, 2009.
3. I. L. Finar, *Organic Chemistry*, Wesley Longman Ltd, England, sixth edition, 1996.

Website ande-learning source

https://nptel.ac.in/courses/104104101 Solid state chemistry
https://nptel.ac.in/courses/103106071 Nuclear industries and safety
https://nptel.ac.in/courses/104106119s Introduction to organic chemistry

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

CO1: explain the kinetic properties of gases by using mathematical concepts.

CO2: describe the physical properties of liquid and solids; identify various types of crystalswith respect to its packing and apply the XRD method for crystal structure determinations.

CO3: investigate the radioactivity, nuclear energy and its production, also the nuclear waste management.

CO4: write the nomenclature, physical & chemical properties and basic mechanisms of haloorganic compounds and alcohols.

CO5: investigate the named organic reactions related to phenol; explain the preparation andproperties of aromatic alcohol including thiol.

CO-PO Mapping (Course Articulation Matrix)

	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

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 – Low

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: Qualitative Inorganic Analysis (CP - III) **Credits : 3**
Subject Code : 23U3CP3 **Contact Hours: 60**
Semester : III **Marks : 100**

Course objective:
To develop the skill on systematic analysis of simple inorganic salts and mixtureof salts.

Semi - Micro Qualitative Analysis

1. Analysis of simple acid radicals: Carbonate, sulphide, sulphate, thiosulphite, chloride, bromide, iodide, nitrate
2. Analysis of interfering acid radicals: Fluoride, oxalate, borate, phosphate,arsenate, arsenite.
3. Elimination of interfering acid radicals and identifying the group of basic radicals
4. Analysis of basic radicals (group wise): Lead, copper, bismuth, cadmium, tin, antimony, iron, aluminium, arsenic, zinc, manganese, nickel, cobalt, calcium, strontium, barium, magnesium, ammonium
5. Analysis of a mixture - I to VIII containing two cations and two anions (of which one is interfering type)

Reference Books:

1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. *Basic Principlesof Practical Chemistry,* 2nd ed.; Sultan Chand: New Delhi, 2012.

Website and e-learning source:
https://www.vlab.co.in/broad-area-chemical-sciences

Course Learning Outcomes (for Mapping with POs and PSOs)
Students will be able:

CO 1: acquire knowledge on the systematic analysis of Mixture of salts.

CO 2: identify the cations and anions in the unknown substance.

CO 3: identify the cations and anions in the soil and water and to test the quality of water.
CO4: assess the role of common ion effect and solubility product

CO-PO Mapping (Course Articulation Matrix)

	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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 – Low

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: DAIRY CHEMISTRY (SEC - I) **Credits : 2**
Subject Code : 23U3CSE2 **Contact Hours: 45**
Semester : III **Marks : 100**

Course objective:

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.

UNIT-I: Composition of Milk

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 – vitaminized 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 – Yoheer Indigeneous products- khoa and chhena definition - Ice cream -definition-percentage composition-types-ingredients-manufacture of ice–cream, stabilizers – emulsifiers and their role - milk powder-definition-need for making milk powder- drying process-types of drying.

Text Books:

1. K. Bagavathi Sundari, Applied Chemistry, MJP Publishers, first edition,2006.
2. K. S. Rangappa and K.T. Acharya, Indian Dairy Products, Asia PublishingHouse New Delhi, 1974.
3. Text book of dairy chemistry, M.P. Mathur, D. Datta Roy, P. Dinakar, IndianCouncil of Agricultural Research, 1 st edition, 2008.
4. A Text book of dairy chemistry, Saurav Singh, Daya Publishing house, 1 stedition,2013.

Text book of dairy chemistry, P. L. Choudhary, Bio-Green book publishers,2021.

Reference Books

1. Robert Jenness and S. Patom, Principles of Dairy Chemistry, S.Wiley, NewYork, 2005.
2. F.P.Wond, Fundamentals of Dairy Chemistry,Springer,Singapore,2006.
3. Sukumar De, Outlines of Dairy Technology, Oxford University Press, NewDelhi, 1980.
4. P.F.Fox and P.L.H. Mcsweeney, Dairy Chemistry and Biochemistry,Springer, Second edition, 2016.
5. Dairy chemistry and biochemistry, P. F. Fox, T. Uniacke-Lowe, P.L.H.

McSweeney, J.A. OMahony, Springer, Second edition, 2015.

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO 1: understand about general composition of milk – constituents and its physical properties.

CO 2: acquire knowledge about pasteurization of Milk and various types of pasteurization -Bottle, Batch and HTST Ultra High Temperature Pasteurization.

CO 3: learn about Cream and Butter their composition and how to estimate fat in cream andGhee

CO 4: explain about Homogenized milk, flavoured milk, vitaminised milk and toned milk.

CO 5: have an idea about how to make milk powder and its drying process - types of dryingprocess explodes.

CO-PO Mapping (Course Articulation Matrix)

	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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

SEMESTER - IV

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: General Chemistry – IV (CC-IV)	**Credits : 5**
Subject Code : 23U4C4	**Contact Hours: 90**
Semester : IV	**Marks : 100**

Course objective:

This course aims to provide a comprehensive knowledge on

- thermodynamic concepts on chemical processes and appliedaspects.
- thermochemical calculations
- transition elements with reference to periodic properties and groupstudy of transition metals.
- the organic chemistry of ethers, aldehydes and ketones the organic chemistry of carboxylic acids

UNIT I

Thermodynamics I

Terminology – Intensive, extensive variables, state, path functions; isolated, closed and open systems; isothermal, adiabatic, isobaric, isochoric, cyclic, reversible and irreversible processes; First law of thermodynamics – Concept and significance of heat (q), work (w), internal energy (E), enthalpy (H); calculations of q, w, E and H for reversible expansion of ideal gas under isothermal and adiabatic conditions; relation between heat capacities (Cp & Cv); Joule Thomson effect- inversion temperature.

Thermochemistry - heats of reactions, standard states; types of heats of reactions and their applications; effect of temperature (Kirchhoff's equations) on enthalpy of reactions; Hess's law and its applications; determination of bond energy; Measurement of heat of reaction – determination of calorific value of fuels. Zeroth law of thermodynamics-Absolute Temperature scale.

Unit – II:

Thermodynamics II

Second Law of thermodynamics - Limitations of first law, spontaneity and randomness; Carnot's cycle; Concept of entropy, entropy change for reversible and irreversible processes, entropy of mixing. Free energy and work functions - Need for free energy functions, Gibbs free energy, Helmholtz free energy - criteria for spontaneity; Gibbs-Helmholtz equation – derivations and applications; Maxwell relationships. Third law of thermodynamics - Nernst heat theorem; Applications of third law - evaluation of absolute entropies from heat capacity measurements, exceptions to third law.

Unit – III: General Characteristics of d-block elements

Transition Elements- Electronic configuration - General periodic trend variable valency, oxidation states, stability of oxidation states, colour, magnetic properties, catalytic properties and tendency to form complexes. Comparative study of transition elements and non-transition elements – comparison of II and III transition series with I transition series. Group study of Titanium, Vanadium, Chromium, Manganese, Iron, Cobalt, Nickel and Zinc groups.

Unit – IV:

Phenolic Compounds: Nomenclature- structure and bonding –preparation- physical properties - acidic character of phenols -comparative acidic strength of alcohols acids and phenols-explanation on the basis of resonance stabilization- reactions of phenols - electrophilic aromatic substitution, acylation and carboxylation – Kolbe's reaction – Riemer - Tiemann reaction - Gattermann reaction – Laderer-Manese reaction – Blanc reaction – Hoesh reaction- catechol, resorcinol, quinol, pyrogallol, phloroglucinol and hydroxyquinol - α- and β-naphthol – preparation and properties.

Unit – V:

Aldehydes and Ketones

Nomenclature, structure and reactivity of aliphatic and aromatic aldehydes and ketones; general methods of preparation and physical properties. Carbonyl group – polarization of C=O bond – reactivity of carbonyl group – acidity of α-hydrogen – nucleophilic addition to carbonyl bond – HCN, $NaHSO_3$, NH_3 and alcohols

- condensation with hydrazine, phenyl hydrazine and semi carbazide. Nucleophilic addition reactions, base catalyzed reactions with mechanism- Aldol, Cannizzaro's reaction, Perkin reaction, Benzoin condensation, Haloform reaction, Knoevenagel reaction. Reformatsky, Wittig and Dieckmann reactions. Oxidation of aldehydes; Baeyer - Villiger oxidation of ketones. Reduction: Clemmensen reduction, Wolf -Kishner reduction, Meerwein – Pondorf Verley reduction, reduction with $LiAlH_4$ and $NaBH_4$.

Text books:

1. 1. B.R. Puri and L.R. Sharma, *Principles of Physical Chemistry*, ShobanLal Nagin Chand and Co., thirty three edition, 1992.
2. K. L. Kapoor, *A Textbook of Physical chemistry*, (volume-2 and 3), Macmillan, India Ltd, thirdedition, 2009.
3. P.L. Soni and Mohan Katyal, *Textbook of Inorganic Chemistry*, Sultan Chand & Sons, twentieth edition, 2006.
4. M. K. Jain, S. C. Sharma, *Modern Organic Chemistry*, Vishal Publishing, fourth reprint, 2003.
5. S.M. Mukherji, and S.P. Singh, *Reaction Mechanism in OrganicChemistry*, Macmillan India Ltd., third edition, 1994.
6. Sachin Kumar Ghosh, Advanced General Organic Chemistry A Mordern Approach Part 1 & 2, New Central Book Agency P Ltd.

Reference books:

1. Maron, S. H. and Prutton C. P. *Principles of Physical Chemistry*,4thed.; The Macmillan Company: Newyork,1972.
2. Lee, J. D. *Concise Inorganic Chemistry*, 4th ed.; ELBS WilliamHeinemann: London,1991.
3. Gurudeep Raj, *Advanced Inorganic Chemistry*, 26thed.; GoelPublishing House: Meerut, 2001.
4. Atkins, P.W. & Paula, J. *Physical Chemistry*, 10th ed.; OxfordUniversity Press:New York, 2014.
5. Huheey, J. E. *Inorganic Chemistry: Principles of Structure and Reactivity*, 4th ed; Addison Wesley Publishing Company: India,1993

Website ande-learning source

https://nptel.ac.in/courses/112102255 Thermodynamics
https://nptel.ac.in/courses/104101136 Advanced transition metal chemistry

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

CO1: explain the terms and processes in thermodynamics; discuss the various laws of thermodynamics and thermo chemical calculations.

CO2: discuss the second law of thermodynamics and its application to heat engine; discussthird law and its application on heat capacity measurement.

CO3: investigate the chemistry of transition elements with respect to various periodicproperties and group wise discussions.

CO4: discuss the fundamental organic chemistry of ethers, epoxides and carbonyl compounds including named organic reactions.

CO5: discuss the chemistry and named reactions related to carboxylic acids and their derivatives; discuss chemistry of active methylene compounds, halogen substituted acidsand hydroxyl acids.

CO-PO Mapping (Course Articulation Matrix)

	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

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 - Low

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: Physical Chemistry Practical – I (CP - IV) **Credits : 3**
Subject Code : 23U4CP4 **Contact Hours: 60**
Semester : IV **Marks : 100**

Course objective:
The course aims at providing an understanding of

- the laboratory experiments in order to understand the conceptsof physical changes in chemistry
- the rates of chemical reactions

I. Kinetics:
Acid catalyzed hydrolysis of an ester (Methyl acetate or Ethyl acetate)
II. Molecular weight determination:
Rast's method: Naphthalene, m-dinitrobenzene and diphenyl as solvents.
III. Heterogeneous equilibrium
1. Critical solution temperature of phenol-water system- effect of impurity on C.S.T. (2% NaCl or 2 % succinic acid solutions).
2. Simple eutectic system: Naphthalene – Biphenyl, Naphthalene-Diphenylamine.
3. Determination of transition temperature: Sodium acetate.$3H_2O$, $Na_2S_2O_3.5H_2O$, $SrCl_2.6H_2O$ & $MnCl_2.4H_2O$.
IV. Electrochemistry
1. Conductometric titrations by Strong acid by strong base
2. Conductometric titrations by Weak acid by strong base

Reference Books:

1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. *Basic Principlesof Practical Chemistry*, 2nd ed.; Sultan Chand: New Delhi, 2012.

Website and e-learning source:
https://www.vlab.co.in/broad-area-chemical-sciences

Course Learning Outcomes (for Mapping with POs and PSOs)
Students will be able:
CO1: describe the principles and methodology for the practical work

CO2: explain the procedure, data and methodology for the practical work.

CO3: apply the principles of electrochemistry, kinetics for carrying out the practical work.
CO4: demonstrate laboratory skills for safe handling of the equipment and chemicals

CO-PO Mapping (Course Articulation Matrix)

	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

3 – Strong, 2 – Medium, 1 - Low
Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 – Low

SEMESTER - V

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: Organic Chemistry – I (CC-V) **Credits : 5**
Subject Code : 23U5C5 **Contact Hours: 90**
Semester : V **Marks : 100**

Course objective:

This course aims to provide a comprehensive knowledge on

- Carboxylic acid and its derivatives
- Preparation and properties of aromatic and aliphatic nitro compounds and amines
- Preparation of different dyes, food colour and additives
- Preparation and properties of five membered heterocycles like pyrrole, furan and thiophene
- Preparation and properties of six membered heterocycles like pyridine, quinoline and isoquinoline.

UNIT-I: Carboxylic Acids: Nomenclature, structure, preparation and reactions of aliphatic and aromatic mono carboxylic acids. Physical properties, acidic nature, effect of substituent on acidic strength. HVZ reaction, Claisen ester condensation, Bouveault Blanc reduction, decarboxylation - Hunsdiecker reaction. Formic acid - reducing property.

Carboxylic acid Derivatives: Preparations of aliphatic and aromatic acid chlorides, esters, amides and anhydrides. Nucleophilic substitution reaction at the acyl carbon facylhalide, anhydride, ester, amide. Schottan-Baumann reaction. Claisen condensation, Dieckmann and Reformatsky reactions, Hofmann bromamide degradation and Curtius rearrangement

Halogen substituted acids - nomenclature; preparation by direct halogenation, iodination from unsaturated acids, alkyl malonic acids.

Hydroxyacids - nomenclature; preparation from halo, amino, aldehydic and ketonic acids, ethylene glycol, aldol acetaldehyde; reactions - action of heat on α, β and γ-hydroxyl acids.

UNIT-II: Chemistry of Nitrogen Compounds-I

Nitro alkanes: Nomenclature, isomerism, preparation from alkyl halides, haloacids, alkanes; physical properties; reactions-reduction, halogenations, Grignard reagent, pseudo acid character, nitro-acinitro tautomerism.

Aromatic nitro compounds: Nomenclature, preparation - nitration, from diazonium salts, physical properties; reactions-reduction of nitrobenzene in different medium, electrophilic substitution reactions, TNT.

Amines: Aliphatic amines: Nomenclature, isomerism, preparation-Hofmann's degradation reaction Gabriel's phthalimide synthesis. Physical properties, reactions-alkylation, acylation, carbylamines reaction, Mannich reaction, oxidation, basicity of amines.

UNIT-III: Chemistry of Nitrogen Compounds-II

Aromatic amines-Nomenclature, preparation-from nitro compounds, Hofmann's method; Schmidt reaction, properties-basic nature, ortho effect; reactions-alkylation, acylation, carbylamines reaction, reaction with nitrous acid, aldehydes, oxidation, Electrophilicsubstitution reactions, diazotization and coupling reactions; sulphanilic acid-zwitter ion formation.

Distinction between primary, secondary, and tertiary amines - aliphatic and aromatic diazonium compounds.

Dyes-Theory of colour and constitution; classification based on structure and application; preparation - Martius yellow, aniline yellow, methyl orange, alizarin, indigo, malachite green.

Industry oriented content - Dyes Industry, Food colour and additives.

UNIT-IV: Heterocyclic compounds

Nomenclature and classification. General characteristics-aromatic character and reactivity. Five - membered hetero cyclic compounds - Pyrrole - preparation - from succinimide, Paal Knorr synthesis; reactions-reduction, basic character, acidic character, electrophilic substitution reactions, ring opening. Furan - preparation from mucic acid and pentosan; reactions - hydrogenation, reaction with oxygen, Diels-Alder reactions, formation of thiophene and pyrrole; Electrophilic substitution reaction. Thiophene

synthesis - from acetylene; reactions - reduction; oxidation; electrophilic substitution reactions. Pyridine - synthesis - from acetylene, Physical properties; reactions - basic character, oxidation, reduction, electrophilic substitution reactions; nucleophilic substitution - uses. Condensed ring systems - Quinoline - preparation - Skraup synthesis and Friedlander's synthesis; reactions-basic nature, reduction, oxidation; electrophilic substitutions; nucleophilic substitutions -Chichibabin reaction - Isoquinoline - preparation by the Bischler - Napieralski reaction, reduction, oxidation; electrophilic substitution.

UNIT-V: Synthetic utilities of common organic molecules

Benzene diazonium chloride: Benzene diazonium chloride - preparations and synthetic applications.

Organo metallic compounds in organic synthesis: Preparation, properties and applications: Grignard reagents, Organo Lithium compounds, Ziegler-Natta, Wilkinson, Metal Carbonyl, Zeiss's salt.

Active methylene compounds: Keto-enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethyl aceto acetate.

Text books:

1. M.K.Jain, S.C.Sharma, Modern Organic Chemistry, Vishal Publishing, fourth eprint, 2009.
2. S.M.Mukherji, and S.P.Singh, Reaction Mechanism in Organic Chemistry, Macmillan India Ltd., 3rd edition, 2009.
3. Arun Bahl and B.S.Bahl, Advanced organic chemistry, NewDelhi, S.Chand & Company Pvt. Ltd., Multi colour edition, 2012.
4. P.L.Soni and H.M.Chawla, Text book of Organic Chemistry, Sultan Chand & Sons, New Delhi, 29th edition, 2007.
5. C.N.Pillai, Text Book of Organic Chemistry, Universities Press (India) Private Ltd., 2009.

Reference books:

1. R.T.Morrison and R.N.Boyd, Organic Chemistry, Pearson Education, Asia, 6th edition, 2012.
2. T.W.Graham Solomons, Organic Chemistry, John Wiley & Sons, 11th edition, 2012.
3. Carey Francis, Organic Chemistry, Tata McGraw-Hill Education Pvt. Ltd., New Delhi,7th edition, 2009.
4. I.L. Finar, Organic Chemistry, Vol. (1&2), England, Wesley Longman Ltd, 6th edition, 2006.
5. J.A.Joule, and G.F.Smith, Heterocyclic Chemistry, Wiley, 5th Edition, 2010.

Website ande-learning sources:

www.epgpathshala.nic.in

www.nptel.ac.in

Course Learning Outcomes (for Mapping with Pos and PSOs) On completion of the course the students should be able to

CO1: Preparation and properties of Organometallics and benzene diazonium chlorides

CO2: Explain preparation and properties of aromatic and aliphatic nitro compounds and amines

CO3: Explain colour and constitution of dyes and food additives

CO4: Discuss preparation and properties of five membered heterocycles like pyrrole, furan and thiophene; Discuss preparation and properties of six membered heterocycles like pyridine, quinoline and isoquinolin

CO5: Express potential knowledge on carboxylic acid and its derivatives

CO-PO Mapping (Course Articulation Matrix)

	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

Level of Correlation between PSO's and CO'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

3 – Strong, 2 – Medium, 1 – Low

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: Inorganic Chemistry-I (CC VI) **Credits : 4**
Subject Code : 23U5C6 **Contact Hours : 60**
Semester : V **Marks : 100**

Course objective:

The course aims to provide knowledge on

- nomenclature, isomerism and theory of coordination compounds, and chelate complexes
- crystal field theory, magnetic properties, stability of complexes and Jahn Teller effect
- preparation and properties of metal carbonyls
- Lanthanoids and actinoids
- preparation and properties of inorganic polymers

UNIT I

Co-ordination Chemistry – I

IUPAC Nomenclature of coordination compounds, Isomerism in coordination compounds.Werner's coordination theory – effective atomic number –interpretation of geometry and magnetic properties by Pauling's theory – geometry of co-ordination compounds with co-ordination number 4 &6. Chelates – types of ligands forming chelates – stability of chelates,applications of chelates in qualitative and quantitative analysis–application of DMG and oxine in gravimetric analysis –estimation of hardness of water using EDTA, metal ion indicators. Role of metal chelates in living systems – haemoglobin and chlorophyll

UNIT II

Co-ordination Chemistry – II

Crystal field theory –Crystal field splitting of energy levels in octahedral and tetrahedral complexes, Crystal field stabilization energy (CFSE), spectrochemical series - calculation of CFSE in octahedral and tetrahedral complexes - factors influencing the magnitude of crystal field splitting, crystal field effect on ionic radii, lattice energies, heats of ligation with water as a ligand (heat of hydration), interpretation of magnetic properties, spectra of $[Ti(H_2O)_6]^{3+}$ - Jahn – Teller effect. Stability of complexes in aqueous solution, stability constants- factors affecting the stability of a complex ion, thermodynamic and kinetic stability (elementary idea). Comparison of VBT and CFT.

UNIT III

Organometallic compounds

Metal Carbonyls

Mono and polynuclear carbonyls, General methods of preparation of carbonyls – general properties of binary carbonyls – bonding in carbonyls – structure and bonding in carbonyls of Ni, Fe, Cr, Co, Mn, Ru and Os. EAN rule as applied to metal carbonyls. Ferrocene-Methods of preparation, physical and chemical properties

UNIT IV

Inner transition elements (Lanthanoids and Actinoids)

General characteristics of f-block elements - Comparative account of lanthanoids and actinoids - Occurrence, Oxidation states, Magnetic properties, Colour and spectra - Lanthanoids and Actinoids, Separation by ion-Exchange and Solvent extraction methods – Lanthanoids contraction- Chemistry of thorium and Uranium-Occurrence, Ores, Extraction, properties and uses - Preparation, Properties and uses of ceric ammonium sulphate, thorium dioxide and uranyl acetate.

UNIT V

Inorganic polymers

General properties – classification of inorganic polymers based on element in the backbone (Si S, B & P) - preparation and properties of silicones (polydimethylsiloxane and polymethylhydrosiloxane)

phosphorous based polymer (polyphosphazines and polyphophonitrilic chloride), sulphur-based polymer (polysulfide and polymeric sulphur nitride), boron-based polymers (borazine polymers) – industrial applications of inorganic polymers.

Text Books:

1. Puri B R, Sharma L R, Kalia K C (2011), Principles of InorganicChemistry, 31thEdition, Milestone Publishers & Distributors, Delhi.
2. Satya Prakash, Tuli G. D., Basu S. K., Madan R. D. (2009), Advanced Inorganic Chemistry, 18th Edition, S. Chand & Co., New Delhi
3. Lee J D, (1991), Concise Inorganic Chemistry, 4th Edition, ELBSWilliam Heinemann, London.
4. W V Malik, G D Tuli, R D Madan, (2000), Selected Topics inInorganic Chemistry, S. Chand and Company Ltd.
5. A. K. De, Text book of Inorganic Chemistry, Wiley East Ltd,seventh edition, 1992.

Reference Books:

1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nd ed ., S.Chand and Company, New Delhi.
2. Gopalan R, (2009) Inorganic Chemistry for Undergraduates, Ist Edition, University Press (India) Private Limited,Hyderabad
3. Sivasankar B, (2013) Inorganic Chemistry.Ist Edition, Pearson, Chennai
4. Alan G. Sharp (1992), Inorganic Chemistry, 3rd Edition, Addition- Wesley, England
5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, Inorganic Chemistry, Oxford University Press, sixth edition, 2014.

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to
CO1: explain isomerism, Werner's Theory and stability of chelate complexes
CO2: discuss crystal field theory, magnetic properties and spectral properties of complexes.
CO3: explain preparation and properties of metal carbonyls
CO4: give a comparative account of the characteristics of lanthanoids and actinoids
CO5: explain properties and uses of inorganic polymers of silicon, sulphur, boron and phosphorous

CO-PO Mapping (Course Articulation Matrix)

	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

Level of Correlation between PSO's and CO'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

3 – Strong, 2 – Medium, 1 – Low

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: Physical Chemistry (CC-VII) **Credits : 4**
Subject Code : 23U5C7 **Contact Hours: 75**
Semester : V (CC-VII) **Marks : 100**

Course objective:

The course aims at providing an overall view of

- Gibbs free energy, Helmholtz free energy, Ellingham's diagramand partial molar properties
- chemical kinetics and different types of chemical reactions
- adsorption, homogeneous and heterogeneous catalysis
- colloids and macromolecules photochemistry, fluorescence and phosphorescence

UNIT I

Thermodynamics - III

Free energy and work functions - Need for free energy functions, Gibbs free energy, Helmholtz free energy - their variation with temperature, pressure and volume, criteria for spontaneity; Gibbs-Helmholtz equation – derivations and applications, thermodynamic equations of state; Thermodynamics of mixing of ideal gases, Ellingham Diagram-application. Partial molar properties – chemical potential, Gibbs Duhem equation, variation of chemical potential with temperature and pressure, chemical potential of a system of ideal gases, Gibbs- Duhem-Margules equation

Unit – II:

Chemical Kinetics

Rate of reaction - Average and instantaneous rates, factors influencing rate of reaction - molecularity of a reaction - rate equation - order of reaction. order and molecularity of simple and complex reactions, Rate laws - Rate constants – derivation of rate constants and characteristics for zero, first order, second and third order (equal initial concentration) Derivation of time for half change with examples. Methods of determination of order of Volumetry, manometry and polarimetry.

Effect of temperature on reaction rate – temperature coefficient - concept of activation energy - Arrhenius equation. Theories of reaction rates – Collision theory – derivation of rate constant of bimolecular gaseous reaction – Failure of collision theory. Lindemann's theory of unimolecular reaction. Theory of absolute reaction rates – Derivation of rate constant for a bimolecular reaction – significance of entropy and free energy of activation. Comparison of collision theory and ARRT.

Complex reactions – reversible and parallel reactions (no derivation and only examples) kinetics of consecutive reactions – steady state approximation

Unit – III:

Adsorption – Chemical and physical adsorption and their general characteristics- distinction between them Different types of isotherms – Freundlich and Langmuir. Adsorption isotherms and their limitations – BET theory, kinetics of enzyme catalysed reaction –Michaelis- Menten and Briggs- Haldene equation – Lineweaver- Burk plot – inhibition – reversible – competitive, noncompetitive and uncompetitive (no derivation of rate equations)

Catalysis – general characteristics of catalytic reactions, auto catalysis, promoters, negative catalysis, poisoning of a catalyst – theories of homogenous and heterogeneous catalysis – Kinetics of Acid – base and enzyme catalysis. Heterogenous catalysis

Unit – IV:

Colloids and Surface Chemistry

Colloids: Types of Colloids, Characteristics Colloids (Lyophilic and Lyophobic sols), Preparation of Sols- Dispersion methods, aggregation methods, Properties of Sols- Optical properties, Electrical properties - Electrical double layer, Electro Kinetic properties- Electro-osmosis, Electrophoresis, Coagulation or precipitation, Stability of sols, associated colloids, Emulsions, Gels-preparation of Gels, Applications of colloids

Macromolecules: Molecular weight of Macromolecules-Number average molecular weight- average molecular weight, Determination of Molecular weight of molecules

Unit – V:

Photochemistry

Laws of photo chemistry – Lambert – Beer, Grotthus – Draper and Stark – Einstein. Quantum efficiency.

Photochemical reactions – rate law – Kinetics of H_2-Cl_2, H_2-Br_2 and H_2-I_2 reactions, comparison between thermal and photochemical reactions. Fluorescence – applications including fluorimetry – sensitised fluorescence, phosphorescence – applications - chemiluminescence and photosensitisation – examples Chemistry of Vision – 11 cis retinal – vitamin A as a precursor - colour perception of vision

Text Books

1. B.R. Puri and L.R. Sharma, Principles of Physical Chemistry,Shoban Lal Nagin Chand and Co., forty eighth edition, 2021.
2. Peter Atkins, and Julio de Paula, James Keeler, Physical Chemistry, Oxford University press, International eleventhedition, 2018.
3. ArunBahl, B.S. Bahl, G. D. Tuli Essentials of physicalchemistry, 28th edition 2019, S, Chand & Co.
4. S. K. Dogra and S. Dogra, Physical Chemistry through Problems: New Age International, fourth edition, 1996.
5. J. Rajaram and J.C. Kuriacose, Thermodynamics,ShobanLalNagin Chand and CO., 1986.

References

1. J. Rajaram and J.C. Kuriacose, Chemical Thermodynamics,Pearson, 1st edition, 2013.

Keith J. Laidler, Chemical kinetics, third edition, Pearson, 2003.

2. P. W. Atkins, and Julio de Paula, Physical Chemistry, OxfordUniversity press, seventh edition, 2002.
3. L. Kapoor, A Textbook of Physical Chemistry, Macmillan India Ltd, third edition, 2009.
4. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Shobanlal Nagin Chand and Co. Jalendhar,forty first, edition, 2001

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the Students should be able to

CO1: explain Gibbs and Helmholtz free energy functions, partial molar quantities andEllinghams

CO2: apply the concepts of chemical kinetics to predict the rate of the reaction and order ofthe reaction, demonstrate the effect of temperature on reaction rate, and the significance of free energy and entropy of activation.

CO3: compare chemical and physical adsorption, Freundlich and Langmuir adsorptionisotherms, and differentiate between homogenous and heterogeneous catalysis.

CO4: demonstrate the types and characteristics of colloids, preparation of sols andemulsions, and determine the molecular weights of macromolecules.

CO5: utilize the concepts of photochemistry in fluorescence, phosphorescence,chemiluminescence and color Perception of vision.

CO-PO Mapping (Course Articulation Matrix)

	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

Level of Correlation between PSO's and CO'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

3 – Strong, 2 – Medium, 1 – Low

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: Gravimetric Analysis Practical (CP - V) **Credits : 3**
Subject Code : 23U5CP5 **Contact Hours: 60**
Semester : V **Marks : 100**

Course objective:
The course aims at providing an understanding of

- To know the accuracy of estimation of compounds

I. Gravimetric Analysis

1. Estimation of Lead as Lead sulphate
2. Estimation of Lead as Lead Chromate
3. Estimation of Barium as Barium sulphate
4. Estimation of Barium as Barium chromate
5. Estimation of Nickel as Nickel-DMG
6. Estimation of Calcium as Calcium sulphate

Reference Books:

1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. *Basic Principlesof Practical Chemistry*, 2nd ed.; Sultan Chand: New Delhi, 2012.

Website and e-learning source:
https://www.vlab.co.in/broad-area-chemical-sciences

Course Learning Outcomes (for Mapping with POs and PSOs)
Students will be able:
CO1: describe the principles and methodology for the practical work

CO2: explain the procedure, data and methodology for the practical work.

CO3: apply the principles of gravimetric principles for carrying out the practical work.
CO4: demonstrate laboratory skills for safe handling of the equipment and chemicals

CO-PO Mapping (Course Articulation Matrix)

	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

3 – Strong, 2 – Medium, 1 - Low
Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 – Low

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: Biochemistry (MBC I) **Credits : 3**
Subject Code : 23U5CMBE1 **Contact Hours: 60**
Semester : V **Marks : 100**

Course objective:
The course aims at providing knowledge on

- relationship between biochemistry and medicine, composition of blood
- structure and properties of amino acids, peptides, enzyme, vitamins and proteins
- biological functions of proteins, enzymes, vitamins and hormones
- biochemistry of nucleic acids and lipids metabolism of lipids

UNIT I
Logic of Living Organisms
Relationship of Biochemistry and Medicine Blood - Composition of Blood, Blood Coagulation – Mechanism. Hemophilia and Sickle Cell Anaemia Maintenance of pH of Blood – Bicarbonate Buffer, Acidosis, Alkalosis.

UNIT II
Peptides and Proteins
Amino acids – nomenclature, classification – essential and Nonessential; Synthesis - Gabriel Phthalimide, Strecker; properties – zwitter ion and isoelectric point, electrophoresis and reactions.
Peptides – peptide bond – nomenclature – synthesis of simple peptides – solution and solid phase. Determination of structure of peptides, N terminal analysis – Sanger's & Edmann method; C terminal analysis - Enzymic method.
Proteins –classification based on composition, functions and structure; properties and reactions – colloidal nature, coagulation, hydrolysis, oxidation, denaturation, renaturation; colour tests for proteins; structure of proteins – primary, secondary, tertiary and quaternary. Metabolism of Amino acids – general aspects of metabolism (a brief outline); urea cycle.

UNIT III
Enzymes and Vitamins
Nomenclature and classification, characteristics, factors influencing enzyme activity – mechanism of enzyme action – Lock and key hypothesis, Koshland's induced fit model. Proenzymes, antienzymes, coenzymes and isoenzymes; allosteric enzyme regulation.
Vitamins as coenzymes – functions of TPP, lipoic acid, NAD, NADP, FMN, FAD, pyridoxal phosphate, CoA, folic acid, biotin, cyanocobalamin.

UNIT IV
Amino acids
Components of nucleic acids - nitrogenous bases and pentose sugars, structure of nucleosides and nucleotides, DNA- structure & functions; RNA –types– structure - functions; biosynthesis of proteins
Hormones Adrenalin and thyroxine — chemistry, structure and functions (No structure elucidation).

UNIT V
Lipids
Occurrence, biological significance of fats, classification of lipids. Simple lipids – Oils and fats, chemical composition, properties, reactions – hydrolysis, hydrogenation, trans-esterification, saponification, rancidity; analysis of oils and fats – saponification number, iodine number, acid value, R.M. value. Distinction between animal and vegetable fats. Compound lipids – Lipoproteins - VLDL, LDL, HDL, chylomicrons – biological significance.
Cholesterol – occurrence, structure, test, physiological activity. Metabolism of lipids: β-oxidation of fatty acids.

Text Books:
1. Bahl, B. S.; Bhal, A. *Advanced Organic Chemistry*, 3rd ed.; S. Chand: New Delhi, 2003.

2. Jain, M.K.; Sharma, S.C. *Modern Organic Chemistry*, VishalPublications: New Delhi, 2017.
3. Shanmugam, A. *Fundamentals of Biochemistry for Medical Students*,6th ed.; Published by the author, 1999.
4. Veerakumari, L. *Biochemistry*, 1st ed.; MJP Publications: Chennai,2004.
5. Jain, J. L.; *Fundamentals of Biochemistry*, 2nd ed.; S.Chand: New Delhi, 1983.

Reference Books

1. Conn, E. E.; Stumpf, P. K. Outline of Biochemistry, 5th ed.; Wiley Eastern: New Delhi, 2002.
2. West, E. S.; Todd, W. R.; Mason, H. S.; Van Bruggen, J. T. Text Book of Biochemistry, 4th ed.; Macmillan: New York, 1970.
3. Lehninger, A. L. Principles of Biochemistry, 2nd ed.; CBS Publisher Delhi, 1993.
4. Rastogi, S. C. Biochemistry, 2nd ed.; Tata McGraw-Hill: New Delhi, 2003.
5. Chatterjea, M. N.; Shinde, R. Textbook of Medical Biochemistry, 5th ed.; Jaypee Brothers: New Delhi, 2002.

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

CO1: explain molecular logic of living organisms, composition of blood and bloodcoagulation
CO2: explain synthesis and properties of amino acids, determination of structure of peptidesand proteins
CO3: explain factors influencing enzyme activity and vitamins as coenzymes
CO4: explain RNA and DNA structure and functions
CO5: explain biological significance of simple and compound lipids

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 PSOs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CO /PO	PO1	PO2	PO3	PO4	PO5
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

3 – Strong, 2 – Medium, 1 – Low

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 - 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: Industrial Chemistry (MBE-II) **Credits : 3**
Subject Code : 23U5CMBE2 **Contact Hours: 45**
Semester : V **Marks : 100**

Course objective:
This course is designed to provide knowledge on

- classifications and characteristics of fuels
- preparation of cosmetics
- manufacture of sugar, paper, cement and leather and foodprocessing
- applications of abrasives, lubricants and other industrial products
- intellectual property rights

UNIT - I: Survey of Indian Industries and mineral resources in India

Fuels: Classification, characteristics of fuels. Solid fuels: coal - classification; analysis of coal- proximate analysis and ultimate analysis; calorific value-determination, carbonisation of coal.

Liquid fuels: Petroleum - characteristics; Gasoline aviation petrol- knocking in internal combustion engines, antiknock agents; unleaded petrol-octane number, cetane number.

Gaseous fuel: advantages over solid and liquid fuels; water gas, producergas, carbureted water gas - preparations - uses.

Natural gas: LPG-composition, advantages, application; gobar gas- production, composition, advantages, application. Propellants – rocket fuels (basic idea)

UNIT - II:

Cosmetics

Skin care: powders, ingredients; creams and lotion-cleansing, moisturizing, all-purpose shaving cream, sunscreen; make up preparations.

Dental care: tooth pastes – ingredients.

Hair care**:** shampoos-types, ingredients; conditioners-types, ingredients. Perfumes: natural-plant origin-parts of the plant used, chief constituents; animal origin-amber gries, civetone and musk; synthetic-classification- esters-amyl salicylate alcohols-citronellol; terpeneols-gereniol and nerol; ketones-muskone, coumarin; aldehydes-vanilin.

Soaps and Detergents

Soaps-properties, manufacture of soap-batch process; types-transparent soap, toilet soap, powder soap and liquid soap – ingredients.

Detergents-definition, properties-cleaning action; soapless detergents- anionic, cationic and non-ionic (general idea only); uses of detergents as surfactants. Biodegradability of soaps and detergents.

UNIT - III:

Sugar Industry

Manufacture from sugar cane; recovery of sugar from molasses; testingand estimation of sugar.

Food Preservation and processing

Food spoilage – causes; Food preservation - methods – high temperature, low temperature, drying, radiation; Food additives – preservatives, flavours, colours, anti-oxidants, sweetening agents; hazards of using food additives; Food standards – Agmark and Codex alimentarius.

UNIT - IV:

Abrasives

Definition, characteristics, types-natural and synthetic; natural abrasives – diamond, corundum, emery, garnet, quartz – composition, uses; synthetic abrasives – carborundum, aluminium carbide, boron carbide, boronnitride, synthetic graphite – composition and uses.

Leather Industry

Structure and composition of skin, hide; Manufacture of leather – pre- tanning process – curing, liming, beating, pickling; methods of tanning- vegetable, chrome – one bath, two bath process; finishing.

Paper Industry

Manufacture of pulp - mechanical, chemical processes; sulphate pulp, rag pulp; manufacture of paper-beating, refining, filling, sizing, colouring, calendaring; cardboard.

UNIT - V

Lubricants Definition, classification-liquid, semi-solid, solid and synthetic; properties-viscosity index, flash point, cloud point, pour point,aniline point and drop point; greases-properties, types; cutting fluids, selection of lubricants.

Cement Industry

Cement – types, raw materials; manufacture-wet process, constituent of cement, setting of cement; properties of cement-quality, setting time, soundness, strength; mortar, concrete, RCC; curing and decay of concrete.

Intellectual Property Rights

Introduction to Intellectual Property Rights – Patents - Factors for patentability - Novelty, non - obviousness, Industrial applications - Patent offices in India: Trademark - Types of trademarks- Certification marks, logos, brand names, signatures, symbols and service marks

Text books:

1. Sharma, B.K. *Industrial Chemistry*, 9th ed.; Goel Publishing House:Meerut, 1998.
2. Wilkinson, J.B.E. Moore, R.J. *Harry's Cosmeticology*, 7th ed.;Chemical Publishers: New York, 1982.
3. Alex V. Ramani, *Food Chemistry*, MJP publishers: Chennai, 2009.
4. Jayashree Ghosh, *Applied Chemsitry*, S. Chand : New Delhi, 2006.
5. Srilakshmi, B. *Food Science*, 4th ed.; New Age InternationalPublication, 2005.

Reference Books

1. 1. Jain, P.C.; Jain, M. *Engineering Chemistry*, 16th ed.; Dhanapet Rai: Delhi, 1992
2. George Howard, *Principles and Practice of Perfumes and Cosmetics*,Stanley Therones, Cheltenham: UK, 1987.
3. Thankamma Jacob, *Foods, Drugs and Cosmetics - A ConsumerGuide*, Macmillan : London, 1997.
4. ShankuntalaManay, N.; Shadaksharaswamy, M. *Food Facts andPrinciples*, 3rd ed.; New Age Publication, 2008.
5. Neeraj Pandey, KhushdeepDharni, *Intellectual Property Rights*, PHILearning, 2014.

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: summarize the properties of fuels which include petroleum, water gas, natural gas and propellents

CO2: evaluate cosmetic products, soaps, detergents.

CO3: explain manufacture of sugar, food spoilages and food additives

CO4: explain properties of abrasives, manufacture of leather and paper

CO5: explain properties and manufacture of lubricants and cement, and intellectual property rights

CO-PO Mapping (Course Articulation Matrix)

	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

Level of Correlation between PSO's and CO'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

3 – Strong, 2 – Medium, 1 – Low

SEMESTER - VI

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: Organic Chemistry - II **Credits : 5**
Subject Code : 23U6C8 **Contact Hours: 90**
Semester : VI (CC-VIII) **Marks : 100**

Course objective:
This course aims to provide a comprehensive knowledge on

- Preparation and properties of saccharides
- Classification, isolation and functions of alkaloids and terpenes
- Different molecular rearrangement
- Eco friend methodologies in organic synthesis
- Stereo chemistry of organic molecules

UNIT-I: Carbohydrates: Definition and classification of carbohydrates with examples. Relative configuration of sugars. Determination of configuration (Fischer's Proof). Definition of enantiomers, diastereomers, epimers and anomers with suitable examples.
Monosaccharides-Configuration-D and L hexoses-aldohexoses and ketohexoses. Glucose, Fructose-Occurrence, preparation, properties, reactions, structural elucidation-uses. Inter conversions of sugar series-ascending, descending, aldose to ketose and ketose to aldose.
Disaccharides-Sucrose, lactose, maltose-preparation, properties and uses (no structural elucidation).
Polysaccharides-Source, constituents, and biological importance of homo polysaccharides-starch and cellulose, hetero polysaccharides- hyaluronic acid, heparin.

UNIT-II: Alkaloids: Classification, isolation, general properties-Hofmann exhaustive methylation; Structure elucidation-Coniine, piperine, nicotine.
Terpenes: Classification, isoprene rule, isolation and structural elucidation of Citral, alpha terpineol, Menthol, Geraniol and Camphor.

UNIT-III: Molecular rearrangements: Molecular Rearrangement-Type of rearrangements-Mechanism for Benzidine, Favorskii, Clasien, Fries, Hofmann, Curtius, Schmidt and Beckmann, Pinacol-pinacolone rearrangement.

UNIT-IV: Green Chemistry: Principles, chemistry behind each principle and applications in chemical synthesis- atom economy- Green reaction media-green solvents, green reagents and catalysts; tools used like microwave and ultra sound in chemical synthesis. Ionic liquids- characteristic behavior towards synthetic uses.

UNIT-V: Stereochemistry: Fischer Projection, Newmann and Sawhorse Projection formulae and their inter conversions; Geometrical isomerism: cis-trans, syn-anti isomerism, E/Z notations.
Optical Isomerism: Optical activity, specific rotation, asymmetry, enantiomers, distereoisomers, meso structures - molecules with one and two chiral centres, racemisation-methods of racemization; resolution-methods of resolution. C.I.P rules. R and S notations for one and two chirality (stereogenic) centres. Molecules with no asymmetric carbon atoms-allenes and biphenyls. Conformational analysis of ethane and butane.

Text books:

1. M.K.Jain, S.C.Sharma, Modern Organic Chemistry, Vishal Publishing, fourth eprint, 2009.
2. S.M.Mukherji, and S.P.Singh, Reaction Mechanism in Organic Chemistry, Macmillan India Ltd., 3rd edition, 2009.
3. Arun Bahl and B.S.Bahl, Advanced organic chemistry, NewDelhi, S.Chand & Company Pvt. Ltd., Multi colour edition, 2012.
4. P.L.Soni and H.M.Chawla, Text book of Organic Chemistry, Sultan Chand & Sons, New Delhi, 29th edition, 2007.
5. C.N.Pillai, Text Book of Organic Chemistry, Universities Press (India) Private Ltd., 2009.

References books:

1. R.T.Morrison and R.N.Boyd, Organic Chemistry, Pearson Education, Asia, 6th edition, 2012.
2. T.W.Graham Solomons, Organic Chemistry, John Wiley & Sons, 11th edition, 2012.
3. Carey Francis, Organic Chemistry, Tata McGraw-Hill Education Pvt. Ltd., New Delhi,7th edition, 2009.
4. I.L. Finar, Organic Chemistry, Vol. (1&2), England, Wesley Longman Ltd, 6th edition, 2006.
5. J.A.Joule, and G.F.Smith, Heterocyclic Chemistry, Wiley, 5th Edition, 2010.

Course Learning Outcomes (for Mapping with Pos and PSOs) On completion of the course the students should be able to

CO1: Explain isolation and properties of alkaloids and terpenes
CO2: Explain preparation and reactions of mono and disachharides
CO3: Classify biomolecules and natural products based on their structure, properties, reactions and uses.
CO4: Explain molecular rearrangements like benzidine, Hoffmann etc.,
CO5: Assigning RS notations to chirals and EZ notations to olefins and explain conformations of ethane and butane.

CO-PO Mapping (Course Articulation Matrix)

	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

Level of Correlation between PSO's and CO'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

3 – Strong, 2 – Medium, 1 – Low

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: Inorganic Chemistry-II **Credits : 4**
Subject Code : 23U6C9 **Contact Hours : 60**
Semester : VI (CC) **Marks :100**

Course objective:
The course aims to provide knowledge on

- tracer elements and their role in the biological system.
- iron transport and storage
- metallo enzymes, oxygen transport.
- silicates and their applications
- industrial applications of refractories, alloys, paints and pigments

UNIT I
Bioinorganic Chemistry
Essential and trace elements: Role of Na^+, K^+, Mg^{2+}, Ca^{2+}, Fe^{3+}, Cu^{2+} and Zn^{2+} in biological systems. Effect of excess intake (Toxicity) of Metal ions – trace elements - As, Cd, Pb, Hg.

UNIT II
Metal ion transport and storage
Iron – storage, transport - Transferrin and Ferretin; Iron-porphyrins –myoglobin, haemoglobin – oxygen transport - Bohr effect; Sodium/potassium pump, calcium pump; transport and storage – copper and zinc.

UNIT III
Metallo enzymes
Isomerase and synthetases, structure of cyanocobalamin (Vitamin B12), nature of Co-C bond; Metalloenzymes - functions of carboxy peptidase A, zinc metalloenzyme – mechanism and uses, Zn-Cu enzyme - structure and function, carbonic anhydrase, Vitamin B-12 as transferase and isomerase - Iron-sulphur proteins - 2Fe-2S – rubredoxin, 4Fe-2S – ferridoxin, Iron sulphur cluster enzymes. Invivo and Invitro nitrogen fixation – biological functions of nitrogenase and molybdo enzymes.

UNIT IV
Silicates
Introduction – general properties of silicates, structure – types of silicates – ortho silicates(zircon), pyrosilicates (thortveitite), chain silicates(pyroxenes), ring silicates(beryl), sheet silicates (talc, mica, asbestos), silicates having three-dimensional structure (feldspars, zeolites, ultramarines)

UNIT V
Industrial Applications of Inorganic Compounds
Refractories, pyrochemical, explosives. Alloys, Paints and pigments - requirements of a good paint; classification, constituents of paints –pigments, vehicles, thinners, driers, extenders, anti-knocking agents, anti-skinning agents, plasticizers, binders-application; varnishes- oils, spirit; enamels. Nanocomposite Hydrogels: synthesis, characterization and uses. Industrial visits and internship mandatory.

Text Books:

1. Satya Prakash, Tuli G. D., Basu S. K., Madan R. D. (2009), Advanced Inorganic Chemistry, 18th Edition, S. Chand & Co., New Delhi
2. Lee J D, (1991), Concise Inorganic Chemistry, 4th ed., ELBS WilliamHeinemann, London.
3. W V Malik, G D Tuli, R D Madan, (2000), Selected Topics inInorganic Chemistry, Schand and Company Ltd.
4. A. K. De, Text book of Inorganic Chemistry, Wiley East Ltd, seventhedition, 1992

Reference Books

1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry,2nded., S.Chand and Company, New Delhi.

2. Gopalan R, (2009) Inorganic Chemistry for Undergraduates, IstEdition, University Press (India) Private Limited, Hyderabad
3. Sivasankar B, (2013) Inorganic Chemistry. Ist Edition, Pearson,Chennai
4. Alan G. Sharp (1992), Inorganic Chemistry, 3rd Edition, Addition-Wesley, England
5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller,Inorganic Chemistry, Oxford University Press, sixth edition, 2014.

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: ability to explain the importance of tracer elements on biological system.
CO2: explain the metal ion transport, Bohr effect, Na, K, Ca pump.
CO3: explain the function of Vitamin B12, Zn-Cu enzyme, ferredoxin, cluster enzymes.
CO4: classification and structure of silicates.
CO5: explain the manufacture of refractories, explosives, paints and pigments

CO-PO Mapping (Course Articulation Matrix)

	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

Level of Correlation between PSO's and CO'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

3 – Strong, 2 – Medium, 1 – Low

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: Preparation of Inorganic & Organic compounds Practical (CP VI)

Credits : 3
Subject Code : 23U6CP6 **Contact Hours: 60**
Semester : VI **Marks : 100**

Course objective:

The course aims at providing an understanding of

- laboratory safety
- handling glasswares
- preparation of inorganic compounds

Unit I

Preparation of Inorganic compounds-Potash alum, Tetraammine copper (II) sulphate, Hexamminecobalt (III) chloride and Mohr's Salt

UNIT II

Preparation of Organic Compounds

i. Nitration - picric acid from Phenol
ii. Halogenation - p-bromo acetanilide from acetanilide
iii. Oxidation - benzoic acid from Benzaldehyde
iv. Microwave assisted reactions in water:
v. Methyl benzoate to Benzoic acid
vi. Salicylic acid from Methyl Salicylate
vii. Rearrangement - Benzil to Benzilic Acid
viii. Hydrolysis of benzamide to Benzoic Acid

UNIT III

Determination of melting or boiling point of given organic compound

Reference Books:

1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. *Basic Principlesof Practical Chemistry*, 2nd ed.; Sultan Chand: New Delhi, 2012.

Website and e-learning source:

https://www.vlab.co.in/broad-area-chemical-sciences

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able:

CO1: describe the principles and methodology for the practical work

CO2: explain the basic principles involved inorganic compounds preparations.

CO3: explain the basic principles involved organic compounds preparations.

CO4: demonstrate laboratory skills for safe handling of the equipment and chemicals

CO-PO Mapping (Course Articulation Matrix)

	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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 – Low

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: Pharmaceutical Chemistry **Credits : 3**
Subject Code : 23U6CMBE3 **Contact Hours: 45**
Semester : VI (MBE III) **Marks : 100**

Course objective:
This course is designed to provide knowledge on

- drugs design and drug metabolism
- important Indian medicinal plants, common diseases andantibiotics
- drugs for major diseases like cancer, diabetes and AIDS
- analgesics and antipyretic agents
- significance of clinical tests

UNIT-I

Important terminologies – drug, pharmacy, pharmacology, pharmacodynamics, pharmacokinetics, clinical pharmacology, pharmacotherapeutics, chemotherapy, toxicology, pharmacophore, bacteria, virus, fungi, actinomycetes, vaccines and therapeutic index.

Sources of drugs – dosage forms – bio availability – routes ofadministration – absorption, distribution and elimination of drugs – drug metabolism –prescription terms.

Structure and pharmacological activity

Effect of – unsaturation, chain length, isomerism; groups - halogens amino, nitro, nitrite, cyano, acidic, aldehydic, keto, hydroxyl and alkyl groups.

UNIT-II

Indian medicinal plants

Some important Indian medicinal plants – tulsi, neem, kizhanelli,mango, semparuthi, adadodai, turmeric and thoothuvalai – uses.

Common diseases and their treatment

Causes, prevention and treatment of the following diseases: Insect borne diseases– malaria, filariasis, plague;Air borne diseases– diphtheria, whooping cough, common cold, tuberculosis; Water borne diseases – cholera, typhoid , dysentery.

Antibiotics

Definition – classification – structure and therapeutic uses of chloramphenicol, penicillin, structure activity relationship of chloramphenicol; therapeutic uses of streptomycin, tetracycline.

UNIT III

Drugs for major diseases

Cancer – common causes – chemotherapy – anti neoplastic agents - classification –adverse effects of cytotoxic agents; alkylating agents – chlorambucil; anti metabolites – methotrexate, fluouracil Vinca alkaloids – vincristine, vinblastine. Diabetes – types – management of diabetes – insulin; oral hypoglycemic agent sulphonyl ureas; biguanides. Cardiovascular drugs– cardio glycosides ; anti arrhythmic agents – quinidine, propranolol hydrochloride .AIDS – causes, symptoms and prevention – anti HIV drugs - AZT, DDC.

UNIT IV

Analgesics and antipyretic agents

Classification – action of analgesics – narcotic analgesics –morphine; synthetic analgesics – pethidine, methadone; antipyretic analgesics – salicylic acid derivatives, indolyl derivatives, p-aminophenol derivatives.

Anesthetics

Definition, characteristics, classification - general anesthetics – volatile anesthetics – nitrous oxide, ethers, cyclopropane, chloroform, trichloro ethylene– storage, advantages and disadvantages non-volatile anesthetics – thiopental sodium; local anesthetics – requisites – advantages- esters – cocaine, benzocaine.

Blood and haemotological agents

Blood– composition, grouping – physiological functions of plasma proteins – mechanism of clotting; Coagulants – vitamin K, Anti coagulants – coumarins, citric acid and heparin; Anemia – causes, types and control – anti anaemic drugs.

UNIT V

Clinical Chemistry

Blood tests – blood count – complete haemotogram – Hb, RBC, GTT, TC, DC, platelets, PCV, ESR; bleeding and clotting time –- glucosetolerance test.

Significance of Clinical Tests

Serum electrolytes - blood Glucose - orthotoluidine method**;** Renal functions tests - blood urea, creatinine; liver function tests - serum proteins, albumin globulin ratio, serum bilirubin, enzymes SGOT, SGPT; lipid profile – cholesterol, triglycerides, HDL, LDL. coronaryrisk index. Urine examination – pH, tests for glucose, albumin and bile pigment.

Reference Books:

1. Chatwal G R, (2013), Pharmaceutical chemistry, inorganic (vol-I) 6thed., Himalaya publishing house, Bombay.
2. Chatwal G R, (1991), Pharmaceutical chemistry, organic (vol-II)., Himalaya publishing house, Bombay.
3. Patrick G, (2002), Instant Notes Medicinal Chemistry, Viva Books Private Limited, New Delhi.
4. Intellectual Property Rights, Neeraj Pandey, Khushdeep Dharni. Publisher: PHI Learning Pvt. Ltd., 2014 ISBN: 812034989X, 9788120349896.

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: Define the pharmaceutical terminologies; describe the principles in pharmacological activity, drug development, clinical chemistry, hematology, therapeutic drugs and treatment of diseases; list the types of IPR and trademarks.

CO2: Discuss the development of drugs, structural activity, disease types, physio-chemical properties of therapeutic agents, significance of medicinal plants, clinical tests and factors for patentability.

CO3: Apply the principles involved in structural activity and drug designing, functions of haematological agents; estimation of clinical parameters and therapeutic application of drugs for major diseases.

CO4: explain classification of analgesics and anesthetics, and physiological functions of plasma protiens

CO5: explain the significance of clinical tests like blood urea, serum proteins and coronary risk index

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 PSOs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CO /PO	PO1	PO2	PO3	PO4	PO5
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

3 – Strong, 2 – Medium, 1 – Low

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: Fundamentals of Spectroscopy (MBE IV) **Credits : 3**
Subject Code : 23U6CMBE4 **Contact Hours: 60**
Semester : VI **Marks : 100**

Course objective:
This course is designed to provide knowledge on

- Electromagnetic radiation, Interaction of EMR with the matter
- basic principles of microwave, UV-Visible, infrared, Raman,NMR and Mass spectrometry
- instrumentation of microwave, UV-Visible, infrared, Raman,NMR and Mass spectrometry
- applications of various spectral techniques in structural elucidation

UNIT I
Basics of spectroscopy and Microwave spectroscopy
Introduction
Introduction to EMR - interaction of EMR with matter. Electromagnetic spectrum. Fundamentals-Wave length, wave number, Frequency and Energy – Interrelationship. Types of spectroscopic techniques.
Microwave spectroscopy
Introduction. Rotation spectra - diatomic molecules (rigid rotator approximation) selection rules – determination of bond length, effect of isotopic substitution – instrumentation and applications.

UNIT II
Electronic spectroscopy
Introduction. Absorption laws. Beer-Lamberts law. Selection rule. Principle and Instrumentation. Types of electronic transitions. Basic concepts- Chromophore, auxochrome. Types of shifts- Bathochromic, Hypsochromic, Hyper and hypo-chromic shifts. Applications of UV-vis spectroscopy to simple organic molecules.

Unit – III:
Infrared spectroscopy
Introduction – Principle and theory. Types of molecular vibrations. Number of fundamental vibrations. Vibrational frequency and force constant. Selection rules. Instrumentation. Fingerprint region, Fermi resonance, Overtone. Applications of IR spectroscopy to organic and inorganic molecules.
Raman Spectroscopy Introduction. Rayleigh scattering and Raman scattering of light – Raman shift – classical theory of Raman effect – quantum theory of Raman effect – Stokes and Anti-Stokes lines. Vibrational Raman spectrum – selection rules – mutual exclusion principle – instrumentation (block diagram) –Simple applications.

Unit – IV:
Nuclear magnetic resonance spectroscopy:
PMR – theory of PMR – instrumentation - number of signals – chemical shift – Shielding and deshielding of protons – Alkane, vinyl and aromatic, aldehydic protons. Peak area and proton counting – spin-spin coupling –Coupling constant – instrumentation (block diagram) –Applications**.**

Unit – V:
Mass spectrometry Principle – different kinds of ionisation – instrumentation – the mass spectrum – types of ions – determination of molecular formula- fragmentation and structural elucidation Molecular ion peak, meta stable peak, isotopic peak, nitogen rule. McLafferty rearrangement;
Illustrations with simple organic molecules.

References

1. Srivastava, A. K.; Jain, P. C. *Chemical Analysis an Instrumental Approach*, 3rded.; S.Chand, New Delhi, 1997.
2. Robert D Braun. *Introduction to Instrumental Analysis*; Mc.Graw Hill: New York, 1987.
3. Skoog, D. A.; Crouch, S. R.; Holler, F.J.; West, D. M. *Fundamentals of Analytical Chemistry*,

9th ed.; Harcourt college Publishers: USA, 2013.
4. Madan, R. L.; Tuli, G. D. *Physical Chemistry*, 2nd ed.; S.Chand: New Delhi, 2005.
5. Puri, B. R.; Sharma, L. R.; Pathania, M.S. *Principles of Physical Chemistry*, 43rd ed.; Vishal Publishing: Delhi, 2008.
6. Gopalan, R.; Subramaniam, P. S.; Rengarajan, K. *Elements ofAnalytical Chemistry*; S Chand: New Delhi, 2003.
7. Usharani, S. *Analytical Chemistry*, 1sted.; Macmillan: India, 2002.
8. Banwell, C.N.; Mc Cash, E. M. *Fundamentals of MolecularSpectroscopy*, 4th ed.; Tata McGraw Hill, New Delhi, 2017.
9. U.N.Dash, Analytical Chemistry Theory and Practice, Sultan Chand&Sons,2nd Ed., 2005.
10. B.K. Sharma, Spectroscopy,22nd ed., Goel Publishing House, 2011.

Course Learning Outcomes (for Mapping with POs and PSOs)
On completion of the course the students should be able to

CO1: explain electrical and magnetic properties of materials and microwave spectroscopy
CO2: explain theory, instrumentation and applications of Infrared and Raman spectroscopy
CO3: apply selection rules to understand spectral transitions, explain Woodward – Fieser's rule for the calculation of wavelength maximum of conjugated dienes
CO4: explain theory, instrumentation and applications of NMR spectroscopy
CO5: explain theory, instrumentation and applications of Mass spectrometry

CO-PO Mapping (Course Articulation Matrix)

	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

Level of Correlation between PSO's and CO's

CO /PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**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

Syllabus for Allied Courses

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. PROGRAM (Physics Students)

Title of the Subject: Allied Chemistry – I (AC I)	**Credits : 3**
Subject Code :	**Contact Hours: 60**
Semester : III	**Marks : 100**

Course objective:
This course aims to provide a comprehensive knowledge on

- Basics of atomic orbitals, chemical bonds, hybridization and concepts of nuclear chemistry.
- Importance of chemical industries.
- Fundamental concepts in organic chemistry
- Concepts of thermodynamics and its applications.
- Qualitative and analytical methods.

UNIT I: Chemical Bonding and Nuclear Chemistry
Chemical Bonding**:** Molecular Orbital Theory-bonding, anti-bonding and non-bonding orbitals. Molecular orbital diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties.
Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers-Differences between chemical reactions and nuclear reactions - Nuclear binding energy - mass defect-Nuclear fission and nuclear fusion - differences – Stellar energy. Applications of radioisotopes – carbon dating, rock dating and medicinal applications.

UNIT II: Industrial Chemistry
Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required).
Fertilizers: Urea, ammonium sulphate, potassium nitrate, NPK fertilizer, superphosphate, triple superphosphate.

UNIT III: Fundamental Concepts in Organic Chemistry
Hybridization: Orbital overlap, hybridization and geometry of CH_4, C_2H_4, C_2H_2 and C_6H_6. Electronic effects: Inductive effect and consequences on K_a and K_b of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric- examples.
Reaction mechanisms: Types of reactions–aromaticity (Huckel's rule) – aromatic electrophilic substitution; nitration, halogenation, Friedel- Craft's alkylation and acylation.

UNIT IV: Thermodynamics
Thermodynamics: Types of systems, reversible and irreversible processes, isothermal and adiabatic processes and spontaneous processes. Statements of first law and second law of thermodynamics. Carnot's cycle and efficiency of heat engine. Entropy and its significance. Free energy change and its importance (no derivation). Conditions for spontaneity in terms of entropy and Gibbs free energy. Relationship between Gibbs free energy and entropy.

UNIT V: Analytical Chemistry
Introduction to qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques – extraction, distillation and crystallization.
Chromatography: principle and application of column, paper and thin layer chromatography.

References

1. V.Veeraiyan, Text book of Ancillary Chemistry; High mountpublishing house, Chennai, first edition,2009.
2. S.Vaithyanathan, Text book of Ancillary Chemistry; PriyaPublications, Karur,2006.
3. S.ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S. Chand andCompany, New Delhi, twenty third edition, 2012.
4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
5. P.L.Soni, Mohan Katyal, Textbook of Inorganic chemistry; Sultan Chand and Company, New

Delhi, twentieth edition, 2007.
6. B.R.Puri, L.R.Sharma, M.S.Pathania, Textbook Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018.
7. B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.

Course Learning Outcomes (for Mapping with POs and PSOs)
On completion of the course the students should be able to

CO1: Gain in-depth knowledge about the theories of chemical bonding, nuclear reactionsand its applications.
CO2: Evaluate the efficiencies and uses of various fuels and fertilizers
CO3: Explain the type of hybridization, electronic effect and mechanism involved in theorganic reactions.
CO4: Apply various thermodynamic principles and systems.
CO5: Explain various methods to identify an appropriate method for the separation ofchemical components

CO /PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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

CO /PO	PO1	PO2	PO3	PO4	PO5
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

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. PROGRAM (Botany/Zoology Students)

Title of the Subject: Allied Chemistry – I (AC I) **Credits : 3**
Subject Code : **Contact Hours: 60**
Semester : III **Marks : 100**

Course objective:

This course aims at providing knowledge on

- Basics of atomic orbitals, chemical bonds and nuclear chemistry.
- Importance of chemical industries.
- Basics concepts of hybridization and fundamentals of organic chemistry.
- Importance of specialty chemicals and drugs.
- Separation and purification techniques.
- Qualitative and analytical methods.

UNIT I: Chemical Bonding and Nuclear Chemistry

Chemical Bonding**:** Molecular Orbital Theory-bonding, anti-bonding and non-bonding orbitals. Molecular orbital diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties.

Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers-Differences between chemical reactions and nuclear reactions - Nuclear fission and nuclear fusion - differences – Applications of radioisotopes – carbon dating, rock dating and medicinal applications.

UNIT II: Industrial Chemistry

Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required).

Fertilizers: Urea, ammonium sulphate, potassium nitrate, NPK fertilizer, superphosphate, triple superphosphate.

UNIT III: Fundamental Concepts in Organic Chemistry

Hybridization: Orbital overlap, hybridization and geometry of CH_4, C_2H_4, C_2H_2 and C_6H_6. Electronic effects: Inductive effect and consequences on K_a and K_b of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric- examples.

Reaction mechanisms: Types of reactions–aromaticity (Huckel's rule) – aromatic electrophilic substitution; nitration, halogenation, Friedel- Craft's alkylation and acylation.

UNIT IV: Drugs and Speciality Chemicals

Definition, structure and uses: Antibiotics viz., penicillin and chloramphenicol
Anesthetics viz., chloroform and ether.
Antipyretics viz., aspirin, paracetamol and ibuprofen.
Artificial Sweeteners viz., saccharin, aspartame and cyclamate.
Organic halogen compounds viz., Freon and Teflon.

UNIT V: Analytical Chemistry

Introduction to qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques – extraction, distillation and crystallization.

Chromatography: principle and application of column, paper and thin layer chromatography.

References

5. V.Veeraiyan, Text book of Ancillary Chemistry; High mountpublishing house, Chennai, first edition,2009.
6. S.Vaithyanathan, Text book of Ancillary Chemistry; PriyaPublications, Karur,2006.
7. S.ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S. Chand andCompany, New Delhi, twenty third edition, 2012.
8. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
8. P.L.Soni, Mohan Katyal, Textbook of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.
9. Jayashree gosh, Fundamental Concepts of Applied Chemistry; Sultan & Chand, Edition 2006.

10. B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.

Course Learning Outcomes (for Mapping with POs and PSOs)
On completion of the course the students should be able to
CO1: State the theories of chemical bonding, nuclear reactions and its applications.
CO2: Evaluate the efficiencies and uses of various fuels and fertilizers.
CO3: Explain the type of hybridization, electronic effect and mechanism involved in theorganic reactions.
CO4: Demonstrate the structure and uses of antibiotics, anaesthetics, antipyretics andartificial sugars.
CO5: Analyse various methods to identify an appropriate method for the separation of chemical components.

CO /PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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 PSOs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CO /PO	PO1	PO2	PO3	PO4	PO5
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

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. PROGRAM (For Physics, Zoology & Botany)

Title of the Subject: Allied Chemistry Practical (AP II) **Credits: 3**
Subject Code: **Contact Hours: 60**
Semester: IV **Marks: 100**

Course outcome:

- To know the accuracy of estimation of various chemical compounds
- To understand the basic knowledge of volumetric laws and principles
- To get knowledge about the hardness of water from various ground water
- To get the knowledge about assign the assay of drugs in pharma industries

I. Volumetric Analysis

1. Acidimetry- Alkalimetry

Estimation of Sodium carbonate
Estimation of Oxalic acid

2. Permanganometry

Estimation of Ferrous ammonium sulphate
Estimation of Oxalic acid

3. Iodometry

Estimation of Copper
Estimation of Potassium dichromate

4. Dichrometry

Estimation of Zinc
Estimation of Ferrous ion

5. Complexometric titrations

Determination of Mg^{2+}, Zn^{2+} by EDTA
Estimation of hardness of water by EDTA

II. Study of characteristic of organic compound by qualitative analytical method

1. Carboxylic Acid
2. Aldehyde
3. Ketone
4. Ester
5. Phenol
6. Carbohydrate
7. Amide
8. Amine

Reference Books:

1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. *Basic Principlesof Practical Chemistry*, 2nd ed.; Sultan Chand: New Delhi, 2012.

Website and e-learning source:
https://www.vlab.co.in/broad-area-chemical-sciences

Course Learning Outcomes (for Mapping with POs and PSOs)

Students will be able:

CO1: describe the principles and methodology for the practical work

CO2: explain the basic principles involved quantitative analysis by volumetric method.

CO3: explain the basic principles involved organic compounds identifications.

CO4: demonstrate laboratory skills for safe handling of the equipment and chemicals

CO-PO Mapping (Course Articulation Matrix)

	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

3 – Strong, 2 – Medium, 1 - Low

Level of Correlation between PSO's and CO's

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

3 – Strong, 2 – Medium, 1 – Low

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. PROGRAM (Physics Students only)

Title of the Subject: Allied Chemistry – III (AC III)	**Credits : 3**
Subject Code :	**Contact Hours: 60**
Semester : IV	**Marks : 100**

Course objective:
This course aims at providing knowledge on the
- Co-ordination Chemistry and Water Technology.
- Carbohydrates and Amino acids.
- Basics and applications of colloids.
- Basics and applications of kinetics and catalysis.
- Various photochemical phenomenon.

UNIT I: Co-ordination Chemistry and Water Technology
Co-ordination Chemistry: Definition of terms-IUPAC Nomenclature - Werner's theory - EAN rule - Pauling's theory – Postulates - Chelation - Biological role of Haemoglobin and Chlorophyll (elementary idea).
Water Technology: Hardness of water, determination of hardness of water using EDTA method, zeolite method-Purification techniques- BOD, COD.

UNIT II: Carbohydrates and Amino acids
Carbohydrates: Classification, preparation and properties of glucose, fructose and sucrose. Discussion of open chain ring structures of glucose and fructose. Glucose –fructose interconversion. Properties of starch and cellulose.
Amino acids: Classification - preparation and properties of alanine, preparation of dipeptides using Bergmann method. RNA and DNA (elementary idea only).

UNIT III: Colloids
Colloids: Definition, colloidal solution and suspension, phases of colloidal solution-Electrical properties – Electrophoresis and Electro osmosis (definition and uses only) - protection of colloids – Gold number-medicinal applications of colloids.
Emulsion: definition, types, preparation, properties and applications.
Gels: definition, types, preparation, properties and applications.

UNIT IV: Kinetics and Catalysis
Order and molecularity. Integrated rate expression for I and II (2A → Products) order reactions. Pseudo first order reaction, methods of determining order of a reaction – Half-life period - Concept of energy of activation and Arrhenius equation.
Catalysis – Definition and examples-positive catalyst and negative catalyst-homogeneous and heterogeneous catalysis, autocatalysis and enzyme catalysis-Industrial applications of catalysts.

UNIT V: Photochemistry
Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield-Hydrogen-chloride reaction. Phosphorescence, fluorescence, chemiluminescence and photosensitization and photosynthesis (definition with examples).

References

1. V.Veeraiyan, Textbook of Ancillary Chemistry; High mountpublishing house, Chennai, first edition,2009.
2. S.Vaithyanathan, Text book of Ancillary Chemistry; PriyaPublications, Karur,2006.
3. Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand andCompany, New Delhi, twenty third edition, 2012.
4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; SultanChand & sons, New Delhi, twenty ninth edition, 2007.
5. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; SultanChand and Company, New Delhi, twentieth edition, 2007.
6. R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018.

7. B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

CO1: write the IUPAC name for complex, different theories to explain the bonding incoordination compounds and water technology

CO2: explain the preparation and property of carbohydrate, amino acids and nucleic acids.

CO3: Compare the phases of colloidal solutions and predict the applications.

CO4: identify the reaction rate, order for chemical reaction and explain the purpose of acatalyst.

CO5: outline the various type of photochemical process.

CO /PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**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 PSOs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CO /PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
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

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. PROGRAM (Botany/Zoology Students)

Title of the Subject: Allied Chemistry – III (AC III)	**Credits : 3**
Subject Code :	**Contact Hours: 60**
Semester : IV	**Marks : 100**

Course objective:
This course aims at providing knowledge on the

- Nomenclature of coordination compounds and applications of water technology.
- Understand the concept of carbohydrates.
- Basic concepts of Amino Acids and Essential Elements of biosystem.
- Basics and applications of colloids.
- Provide fundamentals of colloids and photochemistry

UNIT I: Co-ordination Chemistry and Water Technology
Co-ordination Chemistry: Definition of terms-IUPAC Nomenclature - Werner'stheory - EAN rule - Pauling's theory – Postulates - Chelation - Biological role of Haemoglobin and Chlorophyll (elementary idea).
Water Technology: Hardness of water, determination of hardness of water using EDTA method, zeolite method-Purification techniques- BOD, COD.

UNIT II: Carbohydrates
Carbohydrates: Classification, preparation and properties of glucose, fructose and sucrose. Discussion of open chain ring structures of glucose and fructose. Glucose –fructose interconversion. Properties of starch and cellulose.

UNIT III: Amino Acids and Essential elements of biosystem
Amino acids: Classification - preparation and properties of alanine, preparation of dipeptides using Bergmann method.
Proteins: classification – structure - Colour reactions – Biological functions.
Nucleic acids: nucleosides -nucleotides – RNA and DNA – structure. (elementary idea only).
Essentials of trace metals in biological system-Na, Cu, K, Zn, Fe, Mg.

UNIT IV: Colloids
Colloids: Definition, colloidal solution and suspension, phases of colloidal solution-Electrical properties – Electrophoresis and Electro osmosis (definition and uses only) - protection of colloids – Gold number-medicinal applications of colloids.
Emulsion: definition, types, preparation, properties and applications.
Gels: definition, types, preparation, properties and applications.

UNIT V: Photochemistry
Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield-Hydrogen-chloride reaction. Phosphorescence, fluorescence, chemiluminescence and photosensitization and photosynthesis (definition with examples).

References

1) V.Veeraiyan, Textbook of Ancillary Chemistry; High mountpublishing house, Chennai, first edition,2009.
2) S.Vaithyanathan, Text book of Ancillary Chemistry; PriyaPublications, Karur,2006.
3) Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand andCompany, New Delhi, twenty third edition, 2012.
4) P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; SultanChand & sons, New Delhi, twenty ninth edition, 2007.
5) P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; SultanChand and Company, New Delhi, twentieth edition, 2007.
6) R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018.
7) B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

CO1: write the IUPAC name for complex, different theories to explain the bonding incoordination compounds and water technology.

CO2: explain the preparation and property of carbohydrate.

CO3: enlighten the biological role of transition metals, amino acids and nucleic acids.

CO4: Compare the phases of colloidal solutions and predict the applications.

CO5: outline the various type of photochemical process.

CO /PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
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 PSOs	3.0	3.0	3.0	3.0	3.0

CO /PO	PO1	PO2	PO3	PO4	PO5
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 PO's and CO's

Syllabus instead of NAAN MUDHALVAN courses

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.SC. CHEMISTRY PROGRAM

Title of the Subject: CHEMISTRY OF SOIL AND WATER **Credits: 2**
Subject Code: 23U2CSEC1 **Contact Hours: 30**
Semester: II (Skill Based Elective Course-I) **Marks: 100**

Unit – I: Water Pollution
Pollutants – classification-effects of water pollution- sources of water pollution - types of water pollution and their effects - physical pollution- chemical pollution- biological pollution- pesticide pollution- radioactive pollution.

Unit – II: Water Analysis
Colour – turbidity–total dissolved solids – conductivity- acidity and alkalinity –hardens - **c**hloride – sulphate –fluoride – silica – phosphates- detection and estimation of herbicides.

Unit – III: Heavy Metal Pollution
Heavy metals and their toxicity and diseases – cadmium – chromium – copper – lead –mercury- total heavy metal analysis.

Unit – IV: Soil Chemistry and Fertility
Chemical composition of soil – mineral and organic constituents – organic, inorganic and physical properties – adsorption and desorption – decomposition of organic matter and humus formation. Soil fertility evaluation – principles and methods of soil test - crop response studies – response functions.

Unit – V: Soil Analysis and Manures
Moisture measurement – soil pH – determination of pH – total nitrogen – phosphorous.
Organic Manures - farmyard manure – compost- oil cakes- bone meal- blood meal- meat meal- fish meal – green manure and its advantages. Chemical fertilizers - requisites of a good fertilizers- classification into straight, complex, and mixed fertilizers.

References:
1. Analytical Chhemistry, Alka L.Guptha, Pragathi Prakashan.
2. Soil Chemistry, Second Edition, Hinrich L. Bohn, Rick A. Myer, George A. O'Connor, Wiley

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: FOOD CHEMISTRY **Credits: 2**
Subject Code: 23U3CSEC3 **Contact Hours: 30**
Semester: III (Skill Based Elective Course-III) **Marks: 100**
Course Outcomes:

- To know the importance of nutritional foods.
- To study the impact of food Adulteration.

Unit I: Nutritional Classification

Food groups and nutritive values of foods – Nutritional classification of foods – cereals, nuts and oil seeds, vegetables, fruits, eggs, meat, fish and other animal foods – planning of balanced diet – recommended dietary allowances (RDA) – calories, proteins, fat, calcium, phosphorous, iron, vitamin A, folic acid, vitamin B_{12}, vitamin D –Deficiency diseases – anemia caused by dietary deficiencies.

Unit II: Nutritive Values

Fluid and electrolyte balance – sources of water for the body – mineral elements – trace elements – role of kidney – regulation of fluid and electrolyte balance- heat processing on the nutritive value of foods. Food spoilage and food preservation – microbial food spoilage – preservation and nutritive value – food poisoning – food hygiene. Food additives – classification – risks and benefits of food additives.

Unit III: Therapeutic Nutrition – I

Therapeutic nutrition and diets – needs for modification of diets in different diseases nutrition for children and teenagers – nutrition in later maturity – peptic ulcer, diarrhea, constipation, jaundice, cardiovascular diseases, diabetes mellitus, rheumatoid arthritis, fevers and diets in surgery and injury. Nutrition during pregnancy and lactation, infancy.

Unit IV: Therapeutic Nutrition – II

Obesity definition – occurrence, complication due to obesity. Diet and dental health. Under nutrition – causes, signs of under nutrition, nutritional requirements. Milk and milk products –common diary processes, market milk, Pasteurization, dairy products (cheese, ice cream, condensed milk, butter milk).

Unit V: Food Adulteration

Food adulteration and detection – definition of adulterated food – food standards – common food adulterants – contamination of food with harmful microorganisms – chemical contaminants – detection of adulterants in milk, honey, chili powder, edible oils, ghee. Beverages – coffee, tea, cocoa, carbonated non-alcoholic beverages. Fermented foods and its therapeutic values.

References

1. Fundamentals of Nutrition, Corinne H. Robinson, Macmillan Publishing Co., Inc.
2. Milk and Milk Products, Clarence Henry Eckles, Willes Barnes combs, Harold Macy, Tata McGraw-Hill Publishing Co. Ltd.
3. Food Science and Experimental Foods, M. Swaminathan, Ganesh & Co.
4. Food Science – A Chemical Approach, Brain A Fox, Allen G Cameron, Holders and Stoughton.
5. Food and Nutrition Vols 1&2, M. Swaminathan, BAPCO.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc. CHEMISTRY PROGRAM

Title of the Subject: CHEMISTRY IN EVERYDAY LIFE **Credits: 2**
Subject Code: 23U4CSEC5 **Contact Hours: 30**
Semester: IV (Skill Based Elective Course-V) **Marks: 100**

Course Outcomes:

- To learn the Textile chemistry other materials.
- Such as soaps, detergent, cosmetics & polymers dyes.

Unit – I: Textile Fiber

Definition, Classification of textile fibers – vegetable fibers, animal fibers, properties, uses and features of cotton, wool, silk and jute fibers. Genetically modified cotton: Its merit and demerits. Viscose fiber, chemical structure, production of viscose fiber, properties and uses.

Unit – II: Soaps

Introduction, cleaning action of soap. Toilet soap, bathing bars, washing soaps, liquid soap manufacture – Batch process, cold process, hot process – semi boiled process, boiled process. Additives, fillers and flavors. Significances of acidity and alkalinity.

Unit – III: Detergents

Introduction, Detergent action, types of detergents – cationic, anionic, amphiphilic detergents. Common detergent chemicals. Additives, excipients colors and flavors. Enzymes used in commercial detergents. Environmental Hazards.

Unit – IV: Cosmetics

Introduction, classification – bathing oils. Face creams, Face powder, skin products, dental cosmetics, hair dyes, shaving cream, shampoo. General formation for each type. Toxicology of cosmetics.

Unit – V: Material Chemistry

Lubricants- Definition, classification, properties application of each type – synthetic lubricants. Adhesive- Definition, adhesive action- important adhesives- epoxy resin (Araldite)
Dyes and Dyeing process: Difference between dye and pigment -Witt's colour theory, classification of dyes based on application (Direct, Vat, Acid, Reactive, Mordant and Disperse). Important food dyes.

References

1. T.P. Coultate, Food – The Chemistry of its components. Royal Society of Chemistry London.
2. Shashi Chowls, Engineering Chemistry, Darpat Rai Publication, Meerut, India.
3. B.K. Sharma, Industrial Chemistry, Goel Publications, Meerut, India.
4. CNR Rao, Understanding Chemistry, Universities Press. Hyderabad, India.
5. Engineering Chemistry by Jain & Jain.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc., CHEMISTRY PROGRAM

Title of the Subject: HEALTH CHEMISTRY **Credits: 2**
Code No: 23U5CSEC6 **Contact Hours: 30**
Semester: V (Skill Based Elective Course-VI) **Marks: 100**

Course Outcomes:

- To know the essentials of health and drugs.
- To learn the functions of enzymes, hormones and body fluids
- To know common diseases and their treatment

UNIT I: HEALTH
Definition: Food, Food Pyramid - Health-Hygiene- mal, under and over nutrition, their causes and remedies, sanitation.

UNIT II: DRUGS
Drugs - Types of drugs-depressants, anticonvulsant, narcotics, antipyretics, antibiotics, antiseptics, analgesics, muscle relaxants and cardiovascular and vasodepressants, steroids (Only Applications).

UNIT III: BODY FLUIDS
Blood volume, groups, coagulation, blood pressure, anaemia, blood sugar, haemoglobin. Chemistry of urine.

UNIT IV: ENZYMES AND HORMONES
Types of enzymes and enzyme action, Characters of hormones action, examples of essential hormones.

UNIT V: COMMON DISEASES
Common diseases - Jaundice, vomiting, fever, night blindness, ulcer, and diabetes.

REFERENCES

1. Alex V Ramani, Food Chemistry, MJP Publishers, Chennai, 2009
2. Deb A C, Fundamentals of Biochemistry, New Central Book Agency, Calcutta, 1994.
3. Satake M and Mido Y, Chemistry for Health Science, Discovery Publishing House, New Delhi, 2003.
4. Jayashree Ghosh, A Text book of Pharmaceutical Chemistry, S. Chand and Co.Ltd, 1999.
5. Ashutosh Kar, Medicinal Chemistry, Wiley Easterns Limited, New Delhi, 1993.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR THE STUDENTS ADMITTED FROM 2023 – 2024
B.Sc., CHEMISTRY PROGRAM

Title of the Subject: AGRICULTURAL CHEMISTRY **Credits: 2**
Code No: 23U6CSEC7 **Contact Hours: 30**
Semester: VI (Skill Based Elective Course-VII) **Marks: 100**

Course Outcomes:

- To know the essentials of nutrition requirements for plant growth.
- To learn the functions of fertilizers &pesticides
- To understand the pollution

UNIT I

Soil Chemistry

Soil chemistry: Chemical composition of soil – mineral and organic constituents – soil colloids – organic, inorganic and physical properties – flocculation, adsorption and desorption – soil reactions – decomposition of organic matter and humus formation.

UNIT II

Nutrition Requirements of Plants

Nutrition requirements and mineral nutrition of plants: Characteristics of an essential element – sources of plant nutrients – nutrition uptake and factors affecting it. Factors affecting plant composition – role of essential elements in plant nutrition – nutrient deficiency symptoms.

UNIT III

Chemistry of Fertilizers

Nitrogenous fertilizers – importance – classification– manufacture of urea and calcium cyanamide. Phosphate fertilizers – importance – classification– manufacture of super phosphate.

Potassium fertilizers – importance – classification – manufacture of KCl, KNO_3 and K_2SO_4. Complex and mixed fertilizers – NPK

UNIT IV

Chemistry of Pesticides

Pesticides: classification – general methods of preparation and applications – toxicity – safety measures. Insecticides – Organic insecticides, Inorganic insecticides, Fungicides & Herbicides.

UNIT V

Soil Pollution

Soil pollution: Pesticide residues in soil – sources – caution in applying pesticides. Insecticide pollution – effect of insecticide on soil enzymes and CO_2 evolution – insecticide residue accumulation in soil and earthworms. Effect of effluents from paper mill, tannery and chrome industries on soil. Recycling of urban wastes in agriculture – sewage treatment – method of sludge disposal – composting.

References:

1.Textbook of Soil Science 2/e, T.D. Biswas, S.K. Mukherjee, Tata McGraw Hill Publishing Co Ltd. (1994)
2.Soil Pollution and Soil Organisms, P.C.Mishra, Ashish Publishing House, New Delhi. (1989)
3.Soil Fertility – Theory and Practice, Edited by J.S.Kanwar, Indian Council of Agricultural Research, New Delhi. (1976)
4.Agricultural Chemistry, Vols. 1 and 2, Edited by Yagodin, Mir Publishers, Mascow.
5.Fundamentals of Soil Science 4/e, C.E.Millar, L.M.Turk, H.D.Foth, John Wiley and Sons, Inc. (1965)
6.Soil Fertility in India, R.R.Ararwal, Asia Publishing Hosue. (1967)
7.Soil Physics 3/e, L.D.Baver, Asia Publishing Hosue. (1960)
8.Chemistry of the Soil, Edited by Firman E. Beer, Reinhold Publishing Corporation, New York. (1960)