

**GOVERNMENT COLLEGE FOR WOMEN (AUTONOMOUS) KUMBAKONAM**  
(Curriculum – B.Sc., Chemistry– 2023 - 2024)

Department : Chemistry

Programme Code: USCH

**SEMESTER – I**

Part	Course Type	Course Code	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
							CIA	ESE	Total
I	LC I	U231T1	Tamil	6	3	3	25	75	100
II	ELC I	U231E1	English	6	3	3	25	75	100
III	CC – I	U23CHC101	General Chemistry - I	5	5	3	25	75	100
III	CC – II	U23CHC102 P	Quantitative Inorganic estimation (titrimetry) and Inorganic Preparations	3	2	3	40	60	100
III	EC - I		<u>Maths</u> Calculus and Fourier series	6	5	3	25	75	100
			<u>Botany</u> Cryptogamous - Botany <u>Zoology</u> Biology of Invertebrates and chordates	4	4	3	25	75	100
	EC - II		<u>Botany</u> Lab course in Cryptogamous - Botany <u>Zoology</u> Lab course in Invertebrates and chordates	2	1	3	40	60	100
IV	VE	U231VE	Value Education	2	2	3	25	75	100
IV	FC	U23CH1FC	Introductory Chemistry	2	2	3	25	75	100
<b>Total</b>				<b>30</b>	<b>22</b>				<b>700/800</b>

Total marks for Maths allied 700 Total marks for Zoology/ Botany allied 800

**SEMESTER - II**

Part	Course Type	Course Code	Title of the Course	Hrs/Week	Credits	Exam Hrs	Marks		
							CIA	ESE	Total
I	LC II	U232T2	Tamil	6	3	3	25	75	100
II	ELC II	U232E2	English	6	3	3	25	75	100
III	CC - III	U23CHC2 03	General Chemistry - II	5	5	3	25	75	100
III	CC - IV	U23CHC2 04P	Qualitative Organic Analysis and Preparation of Organic Compounds Practical	3	2	3	40	60	100
III	EC - III		<u>Maths</u> Laplace transform and vector calculus	6	5	3	25	75	100
			<u>Botany</u> General principle of Botany <u>Zoology</u> General principle of Zoology	4	4	3	25	75	100
	EC - IV		<u>Botany</u> Lab course in General principle of Botany <u>Zoology</u> Lab course in General principle of Zoology	2	1	3	40	60	100
IV	SEC -I	U23CH2S E1	Role of chemistry in everyday life	2	2	3	25	75	100
IV	EVS	U232ES	Environmental Studies	2	2	3	25	75	100
<b>Total</b>				<b>30</b>	<b>22</b>				<b>700/800</b>

Total marks for Maths allied 700

Total marks for Zoology/ Botany allied 800

**SEMESTER - III**

Part	Course Type	Course Code	Title of the Course	Hrs/Week	Credits	Exam Hrs	Marks		
							CIA	ESE	Total
I	LC III		Tamil	6	3	3	25	75	100
II	ELC III		English	6	3	3	25	75	100
III	CC -V		General Chemistry III	5	5	3	25	75	100
III	CC - VI		Qualitative Inorganic Analysis Practical	3	2	3	40	60	100
III	EC - V		Basic Allied Physics	4	4	3	25	75	100
III	EC - VI		Allied Physics –Practical I	2	1	3	40	60	100
IV	SEC - II		Dairy Chemistry	2	2	3	25	75	100
IV	SEC - III		Hydro Chemistry	2	2	3	25	75	100
<b>Total</b>				<b>30</b>	<b>22</b>				<b>800</b>

**SEMESTER - IV**

Part	Course Type	Course Code	Title of the Course	Hrs/Week	Credits	Exam Hrs	Marks		
							CIA	ESE	Total
I	LC IV		Tamil	6	3	3	25	75	100
II	ELC IV		English	6	3	3	25	75	100
III	CC -VII		General Chemistry IV	6	6	3	25	75	100
III	CC - VIII		Physical Chemistry Practical-I	3	2	3	40	60	100
III	EC - VII		Advanced Allied Physics	4	4	3	25	75	100
III	EC VIII		Allied Physics Practical II	2	1	3	25	75	100
IV	SEC IV		Entrepreneurial Skills In Chemistry	1	1	3	25	75	100
IV	SEC -V		Pesticide Chemistry	2	2				
<b>Total</b>				<b>30</b>	<b>22</b>				<b>800</b>
<b>Internship/ Industrial Training*</b>				<b>-</b>	<b>-</b>				

Note :**Internship/ Industrial Training during summer vacation. The credits shall be awarded in semester V statement of marks**

**SEMESTER - V**

Part	Course Type	Course Code	Title of the Course	Hrs/Week	Credits	Exam Hrs	Marks		
							CIA	ESE	Total
III	CC – IX		Organic Chemistry – I	6	5	3	25	75	100
III	CC – X		Physical Chemistry - I	5	5	3	25	75	100
III	CC – XI		Physical chemistry Practical-II	6	3	3	40	60	100
III	CC – XII		Project with Viva voce	3	3	3	40	60	100
III	DSE – I		1. Inorganic Chemistry - I 2. Biochemistry	4	3	3	25	75	100
III	DSE – II		1. Pharmaceutical Chemistry 2. Nano Science	4	3	3	25	75	100
IV	SEC – VI		Instrumental methods of chemical analysis	2	2	3	25	75	100
	AEC - I		Internship/Industrial training	-	2				
<b>Total</b>				<b>30</b>	<b>26</b>				<b>700</b>

**SEMESTER - VI**

Part	Course Type	Course Code	Title of the Course	Hrs/Week	Credits	Exam Hrs	Marks		
							CIA	ESE	Total
I	CC – XIII		Organic Chemistry - II	5	5	3	25	75	100
II	CC – XIV		Physical chemistry - II	5	5	3	25	75	100
III	CC - XV		Gravimetric analysis Practical	6	3	3	40	60	100
III	DSE – III		1. Inorganic chemistry -II 2. Polymer Science	5	4	3	25	75	100
III	DSE - IV		1. Agricultural Chemistry 2. Fundamentals of Spectroscopy	4	3	3	25	75	100
III	SEC – VII		Forensic science	2	2	3	25	75	100
IV	AEC - II		Professional competency skill – General awareness for competitive examinations	2	2	3	25	75	100
IV	GS		Gender studies	1	1	-	-	-	-
IV	EA		Extension Activity	-	1	-	-	-	-
<b>Total</b>				<b>30</b>	<b>26</b>		-	-	<b>700</b>

**Discipline specific Elective courses offered by the Department of Chemistry**

S.no	Semester	Course type	Title of the Paper
1.	V	DSE I	1. Inorganic Chemistry - I 2. Biochemistry
		DSE II	1. Pharmaceutical Chemistry 2. Nano Science
2.	VI	DSE III	1. Organic chemistry -II 2. Polymer Science
		DSE IV	1. Agricultural Chemistry 2. Fundamentals of Spectroscopy

<b>COURSES OFFERED BY THE DEPARTMENT OF CHEMISTRY TO I YEAR ZOOLOGY AND II YEAR BOTANY STUDENTS 2023-2024 ONWARDS</b>									
III	EC-I	Theory	ChemistryForBiologicalSciencesI	4	3	3	25	75	100
	EC - II	Practical	Volumetric Analysis – Practical	2	2	3	40	60	100
III	EC- III	Theory	ChemistryForBiologicalSciencesII	4	3	3	25	75	100
	EC IV	Practical	SystematicAnalysisOfOrganicCompounds	2	2	3	40	60	100

**COURSES OFFERED BY THE DEPARTMENT OF CHEMISTRY TO  
I YEAR MATHS AND II YEAR PHYSICS STUDENTS 2023-2024 ONWARDS**

<b>III</b>	<b>EC-I</b>	Theory	<b>ChemistryForPhysicalSciences I</b>	4	3	3	25	75	100
	<b>EC -II</b>	Practical	<b>Volumetric Analysis</b>	2	2	3	40	60	100
<b>III</b>	<b>EC-III</b>	Theory	<b>ChemistryForPhysicalSciencesII</b>	4	3	3	25	75	100
	<b>EC IV</b>	Practical	<b>SystematicAnalysisOfOrganicCo mpounds</b>	2	2	3	40	60	100

<b>SEMESTER I</b> <b>CORE COURSE –I</b> <b>GENERAL CHEMISTRY-I</b>	<b>SUB CODE : U23CHC101</b> <b>HOURS:5</b> <b>CREDITS: 5</b>
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### Objectives of the course

The course aims at giving an overall view of the

- various atomic models and atomic structure
- wave particle duality of matter
- periodic table, periodicity in properties and its application in explaining the chemical behavior
- 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-Davison and Germer experiment Heisenberg's Uncertainty Principle; Electronic Configuration of Atoms and ions- Hund's rule, Pauli's exclusion principle and Aufbau principle;

#### 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 wave functions, Formulation of Schrodinger wave equation - Probability and electron density-visualizing the orbitals -Probability density and significance of  $\Psi$  and  $\Psi^2$ .

**Periodicity** Features of the periodic table; classification of elements - Periodic trends for atomic size- Atomic radii, Ionic, crystal and Covalent radii; ionization energy, electron affinity, electronegativity-electronegativity scales, applications of electronegativity.

#### UNIT-III: Structure and bonding – I

##### Ionic bond

Lewis 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 polarisation

– polarising power and polarizability; Fajans' rules - effects of polarisation on properties of compounds; problems involving the core concepts.

**Covalent bond** Shapes of orbitals, overlap of orbitals –  $\sigma$  and  $\Pi$  bonds; directed valency - hybridization; VSEPR theory - shapes of molecules of the type AB<sub>2</sub>, AB<sub>3</sub>, AB<sub>4</sub>, AB<sub>5</sub>, AB<sub>6</sub> and AB<sub>7</sub> Partial ionic character of covalent bond-dipole moment, application to molecules of the type A<sub>2</sub>, AB, AB<sub>2</sub>, AB<sub>3</sub>, AB<sub>4</sub>; 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<sub>2</sub>, NO<sub>2</sub>, CO<sub>3</sub><sup>2-</sup>, NO<sub>3</sub><sup>-</sup>; limitations of VBT; MO theory - bonding, antibonding and nonbonding orbitals, bond order; MO diagrams of H<sub>2</sub>, C<sub>2</sub>, O<sub>2</sub>, O<sub>2</sub><sup>+</sup>, O<sub>2</sub><sup>2-</sup>, O<sub>2</sub><sup>2+</sup>N<sub>2</sub>, NO, HF, CO<sub>2</sub>; magnetic characteristics, comparison of VB and MO theories.Coordinate bond:

Definition, Formation of BF<sub>3</sub>, NH<sub>3</sub>, NH<sub>4</sub><sup>+</sup>, H<sub>3</sub>O<sup>+</sup> properties

Metallic bond-electron sea model, VB model; Band theory-mechanism of conduction in solids; conductors, insulator, semiconductor – types, applications of semiconductors

Weak Chemical Forces - Vander Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces; Hydrogen bonding – Types, special properties of water, ice, stability of DNA; Effects of chemical force, melting and boiling points.

#### 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, stability of carbonium ions, carbanions and free radicals, reactivity of vinyl chloride, dipole moment of vinyl chloride and nitrobenzene, bond lengths; steric inhibition to resonance.

Hyperconjugation - stability of alkenes, bond length, orienting effect of methyl group, dipole moment of aldehydes and nitromethane. Types of organic reactions- addition, substitution, elimination and rearrangements

#### Recommended Text

1. Madan, R. D. and Sathya Prakash, *Modern Inorganic Chemistry*, 2<sup>nd</sup> ed.; S. Chand and Company: New Delhi, 2003.

- Rao, C.N. R. University General Chemistry, Macmillan Publication: New Delhi, 2000.
- Puri, B. R. and Sharma, L. R. *Principles of Physical Chemistry*, 38<sup>th</sup> ed.; Vishal Publishing Company: Jalandhar, 2002.
- Bruce, P. Y. and Prasad K. J. R. *Essential Organic Chemistry*, Pearson Education: New Delhi, 2008.
- Dash UN, Dharmarha OP, Soni P.L. Textbook of Physical Chemistry, Sultan Chand & Sons: New Delhi, 2016

#### Reference Books

- Maron, S. H. and Prutton C. P. *Principles of Physical Chemistry*, 4<sup>th</sup> ed.; The Macmillan Company: New York, 1972.
- Lee, J. D. *Concise Inorganic Chemistry*, 4th ed.; ELBS William Heinemann: London, 1991.
- Gurudeep Raj, *Advanced Inorganic Chemistry*, 26<sup>th</sup> ed.; Goel Publishing House: Meerut, 2001.
- Atkins, P.W. & Paula, J. *Physical Chemistry*, 10th ed.; Oxford University Press: New York, 2014.
- Huheey, J. E. *Inorganic Chemistry: Principles of Structure and Reactivity*, 4<sup>th</sup> ed.; Addison, Wesley Publishing Company: India, 1993

#### Website and e-learning source

- <https://onlinecourses.nptel.ac.in>
- [http://www.mikeblaber.org/oldwine/chm1045/notes\\_m.htm](http://www.mikeblaber.org/oldwine/chm1045/notes_m.htm)
- [http://www.ias.ac.in/initiat/sci\\_ed/resources/chemistry/Inorganic.html](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

- CO1:** explain the atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds.
- CO2:** classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects in organic compounds, types of reagents.
- CO3:** apply the theories of atomic structure, bonding, to calculate energy of a spectral transition,  $\Delta x$ ,  $\Delta p$  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 /P O	PO1	PO 2	PO 3	PO4	PO 5	PO 6	PO7	PO 8	PO 9	PO 10
CO 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

#### COURSE MAPPING CO -PSO

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓



<b>CORE COURSE – II QUANTITATIVE INORGANIC ESTIMATION (TITRIMETRY) AND INORGANIC PREPARATION</b>	<b>SUB CODE :U23CHC102P HOURS: 3 CREDITS :2</b>
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### Objectives of the course

This course aims

- To learn about titrimetric analysis
- To predict the concentrations of different solutions

#### I. Acidimetric and Alkalimetry

#### II. Permanganometry

1. Estimation of Mohr's salt
2. Estimation of Oxalic acid
3. Estimation of Calcium

#### III. Dichrometry

4. Estimation of Ferrous Ion

#### IV. Iodo and Iodimetry

5. Estimation of Copper
6. Estimation of Potassium Dichromate
7. Estimation of Arsenious oxide

#### V. Inorganic preparation

1. Potash alum
2. Tetraammine copper (II) sulphate
3. Hexamminecobalt (III) chloride
4. Mohr's Salt

#### Recommended text

1. Venkateswaran, V.; Veeraswamy, R.; Kulandivelu, A.R. *Basic Principles of Practical Chemistry*, 2<sup>nd</sup> ed.; Sultan Chand & Sons: New Delhi, 1997.
2. Nad, A. K.; Mahapatra, B.; Ghoshal, A.; *An advanced course in Practical Chemistry*, 3<sup>rd</sup> ed.; New Central Book Agency: Kolkata, 2007.

#### Reference Books:

1. Mendham, J.; Denney, R. C.; Barnes, J. D.; Thomas, M.; Sivasankar, B.; *Vogel's Textbook of Quantitative Chemical Analysis*, 6<sup>th</sup> ed.; Pearson Education Ltd: New Delhi, 2000.

#### Web References:

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

#### Course Learning Outcomes

**CO1:** explain the basic principles involved in titrimetric analysis and inorganic preparations.

**CO2:** compare the methodologies of different titrimetric analysis.

**CO3:** calculate the concentrations of unknown solutions in different ways and develop the skill to estimate the amount of a substance present in a given solution.

**CO4:** assess the yield of different inorganic preparations and identify the end point of various titrations.

#### COURSE MAPPING CO -PO

CO /PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

#### COURSE MAPPING CO -PSO

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓

<b>GENERIC ELECTIVE COURSE -CHEMISTRY FOR PHYSICAL</b>	<b>SUBCODE:</b>
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<b>SCIENCES I (FOR MATHEMATICS &amp; PHYSICS STUDENTS)</b>	<b>HOURS:6 CREDITS:5</b>
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### Objective of the course

This course aims to provide knowledge on the

- basics of atomic orbitals, chemical bonds, hybridization
- concepts of thermodynamics and its applications.
- concepts of nuclear chemistry
- importance of chemical industries
- Qualitative and analytical methods.

### UNIT I Chemical Bonding and Nuclear Chemistry

**Chemical Bonding:** Molecular Orbital Theory-bonding, antibonding 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 - group displacement law. Nuclear binding energy - mass defect - calculations. Nuclear fission and nuclear fusion - differences – Stellar energy. Applications of radio isotopes - 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). Silicones: Synthesis, properties and uses of silicones. 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<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>2</sub> and C<sub>6</sub>H<sub>6</sub>. Electronic effects: Inductive effect and consequences on K<sub>a</sub> and K<sub>b</sub> 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. Heterocyclic compounds: Preparation, properties of pyrrole and pyridine.

**UNIT IV Thermodynamics and Phase Equilibria** 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. Phase Equilibria: Phase rule - definition of terms in it. Applications of phase rule to water system. Two component system - Reduced phase rule and its application to a simple eutectic system (Pb-Ag).

**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.

### Recommended Text

1. V.Veeraiyan, Text book of Ancillary Chemistry; High mount publishing house, Chennai, first edition,2009.
2. S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur,2006.
3. S.ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, NewDelhi, 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.

### Reference book

5. P.L.Soni, MohanKaty, 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, fortyfourth edition, 2018.
7. B.K, Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.

### Course Learning Outcomes

- CO 1: gain in-depth knowledge about the theories of chemical bonding, nuclear reactions and its applications.
- CO 2: evaluate the efficiencies and uses of various fuels and fertilizers
- CO 3: explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.
- CO 4: apply various thermodynamic principles, systems and phase rule.
- CO 5: explain various methods to identify an appropriate method for the separation of chemical components

CO /P O	PO1	PO 2	PO 3	PO4	PO 5	PO 6	PO7	PO 8	PO 9	P O1 0
CO 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

**COURSE MAPPING CO -PSO**

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓

<b>CHEMISTRY FOR BIOLOGICAL SCIENCES I (FOR BOTANY AND ZOOLOGY STUDENTS)</b>	<b>SUB CODE :</b>  <b>HOURS:6</b>  <b>CREDITS:5</b>
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### Objectives of the course

- This course aims at providing knowledge on
- basics of atomic orbitals, chemical bonds, hybridization and fundamentals of organic chemistry
- nuclear chemistry and industrial chemistry
- importance of speciality drugs and
- separation and purification techniques.

### UNIT I

#### Chemical Bonding and Nuclear Chemistry

Chemical Bonding: Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. M. O 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-group displacement law. Nuclear binding energy - mass defect - calculations. 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).

Silicones: Synthesis, properties and uses of silicones.

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<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>2</sub> and C<sub>6</sub>H<sub>6</sub>. Polar effects: Inductive effect and consequences on K<sub>a</sub> and K<sub>b</sub> of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric-examples and explanation.

Reaction mechanisms: Types of reactions- aromaticity-aromatic electrophilic substitution; nitration, halogenation, Friedel-Craft's alkylation and acylation. Heterocyclic compounds: Preparation, properties of pyrrole and pyridine.

### UNIT IV Drugs and Speciality

#### Chemicals Drugs and Speciality Chemicals

Definition, structure and uses: Antibiotics viz., Penicillin, Chloramphenicol and Streptomycin; Anaesthetics viz., Chloroform and ether; Antipyretics viz., aspirin, paracetamol and ibuprofen;

Artificial Sweeteners viz., saccharin, Aspartame and cyclamate; Organic Halogen compounds viz., Freon, Teflon.

### UNIT V:

#### Analytical Chemistry

Introduction 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.

#### Recommended Text

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

#### Reference Books

1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.
2. B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.
3. Jayashree gosh, Fundamental Concepts of Applied Chemistry; Sultan & Chand, Edition 2006.

**Course Learning Outcomes**

**CO1:** state the theories of chemical bonding, nuclear reactions and its applications.

**CO 2:** evaluate the efficiencies and uses of various fuels and fertilizers.

**CO 3:** explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.

**CO 4:** demonstrate the structure and uses of antibiotics, anaesthetics, antipyretics and artificial sugars.

**CO 5:** analyse various methods to identify an appropriate method for the separation of chemical components.

**COURSE MAPPING CO -PO**

CO /P O	PO1	PO 2	PO 3	PO4	PO 5	PO 6	PO7	PO 8	PO 9	P O1 0
CO 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

**COURSE MAPPING CO -PSO**

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

<b>CHEMISTRY PRACTICAL FOR PHYSICAL AND BIOLOGICAL SCIENCES-I</b>	<b>SUB CODE :</b>  <b>HOURS:3</b>  <b>CREDITS:4</b>
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### OBJECTIVES

- To enable the students acquire the quantitative skills in volumetric analysis

### VOLUMETRIC ANALYSIS:

#### 1. Acidimetry and Alkalimetry

- a. Strong acid Vs Strong base
- b. Weak acid Vs Strong base

#### 2. Permanganometry

- a. Estimation of Ferrous sulphate
- b. Estimation of Oxalic acid

#### 3. Iodometry ( demonstration only)

### COURSE OUTCOMES

Students will be able to

- CO 1: To explain about standard solutions and given solution  
CO 2: Understand the handling of apparatus

### COURSE MAPPING CO -PO

CO /P O	PO1	PO 2	PO 3	PO4	PO 5	PO 6	PO7	PO 8	PO 9	P O1 0
CO 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓

விழுமிய கல்வி

VALUE EDUCATION	SUB CODE:U231VE HOURS:2 CREDITS:2
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**Unit I**

முன்னுரை- விழுமிய கல்வி

1. வாழ்வியல் விழுமியங்கள்
2. விழுமியங்களின் வகைகள்
3. வாழ்வியல் விழுமியங்களை பாதிக்கும் காரணிகள்.
4. விழுமியக் கல்வியின் அவசியம்

**Unit II**

நன்னடத்தைகள்

1. பெற்றோரை மதித்தல்
2. ஆசிரியரை மதித்தல்
3. இறை வழிபாடு
4. சுயமதிப்பு

**UNIT III**

சமூகம் சார்ந்த மதிப்புகள்

1. ஒற்றுமை
2. சமத்துவம். சகோதரத்துவம்
3. குடும்பம்
4. குடிமக்களின் கடமைகள். தேசபக்தி

**UNIT IV**

உடல் நலம் மனநலம்

1. உணவு ஒழுக்கம்
2. தனி மனித சுகாதாரம்
3. மகளிர் ஆரோக்யம்
4. எண்ணங்களின் வலிமை

**Unit V**

சீர்கேடுகளும் சீர்திருத்தங்களும்

சீர்கேடுகளும்

1. வாழ்க்கை விழுமியங்கள் மற்றும் அறங்களில் உலகமயமாதலின் பாதிப்பு
2. ஊடகங்களின் பாதிப்பு.

சீர்திருத்தங்கள்

- 3 மனக்கட்டுப்பாடு விருப்பங்களை நெறிப்படுத்துதல்
4. உடற்பயிற்சி தியானம் யோகா

FOUNDATION COURSE -FC INTRODUCTORY CHEMISTRY	SUB CODE :U23CH1FC HOURS:2 CREDITS:2
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Objectives of the course

- To create interest for the subject and research
- To providing knowledge on preparations of laboratory solutions
- To giving an overall view of latest trends in chemistry

#### UNIT –I

Definition –Chemistry, Electron, Proton, Neutron-Rutherford's nuclear model of the atom-Periodic table-electronic configuration of the s, p, d - block elements.

#### UNIT-II

Principles of Volumetric Analysis. Definition –Standard Solution, Titration, equivalence point, End point Indicator, Titrant.

#### Preparations of solution

Definition –Normality, 1N, 0.5N, 0.1N solution preparation.

#### UNIT-III- Preparation of laboratory reagents

4N HCl, 4N HNO<sub>3</sub>, 4 N H<sub>2</sub>SO<sub>4</sub>, Aqueous ammonia (5N), 2N NaOH, Lime water, FeCl<sub>3</sub>(0.5N), KMnO<sub>4</sub>(0.1N), CuSO<sub>4</sub> (0.5N), Yellow ammonium sulphide, Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub> (0.2N), Nessler's reagent, Ammonical silver nitrate, Bromine water, Fehling's solution A & B, Iodine solution, Schiff's reagent, Tollen's reagent Borche's reagent

#### UNIT-IV Test for organic subatances

Preminary test, Litmus test, Test for nitrogen , aromatic, aliphatic saturated unsaturated substances, NaHCO<sub>3</sub>, NaOH

**Test for functional groups** Carboxylic acids, aldehyde, ketone, diamide, primary amine, carbohydrate, phenol, nitro compounds.

#### UNIT-V

Definition – Solution, solvent, solute, electrolytes, Melting point, Boiling point.

Introduction and Benefits of Green Chemistry, Nano Chemistry, Polymer Chemistry, Pharmaceutical Chemistry, Sono Chemistry and Phytochemistry

#### Green Chemistry

Definition - Green chemistry, 12 principles, green chemistry metrics - atom economy, E factor, microwave assisted reactions.

#### Reference Books:

1. Venkateswaran, V.; Veeraswamy, R.; Kulandivelu, A.R. *Basic Principles of Practical Chemistry*, 2<sup>nd</sup> ed.; Sultan Chand & Sons: New Delhi, 1997.
2. Nad, A. K.; Mahapatra, B.; Ghoshal, A.; *An advanced course in Practical*
3. *Chemistry*, 3<sup>rd</sup> ed.; New Central Book Agency: Kolkata, 2007.

#### Web References:

<http://www.federica.unina.it/agraria/analytical-chemistry/volumetric-analysis>  
<https://chemdictionary.org/titration-indicator/>

#### Course Learning Outcomes

**CO1:** learn about the fundamental Theoretical knowledge of chemistry

**CO2:** learn about the fundamental Practical knowledge of chemistry

**CO3:** acquire information solution making.

**CO4:** acquire information reagents

**CO5:** have an idea about the Green Chemistry and its applications.

#### COURSE MAPPING CO -PO

CO /P O	PO1	PO 2	PO 3	PO4	PO 5	PO 6	PO7	PO 8	PO 9	P O1 0
CO 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

#### COURSE MAPPING CO -PSO

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓



# **SEMESTER –II**

<b>SEMESTER II CORE COURSE –III GENERAL CHEMISTRY-II</b>	<b>SUB CODE :U23CHC203</b>
	<b>HOURS:5</b>
	<b>CREDITS:3</b>

### Objectives of the course

- This course aims at providing an overall view of the
- chemistry of acids, bases and ionic equilibrium
- properties of s and p-block elements
- chemistry of hydrocarbons
- applications of acids and bases
- compounds of main block elements and hydrocarbons

### UNIT-I Acids, bases and Ionic equilibria

Concepts of Acids and Bases - Arrhenius concept, Bronsted-Lowry concept, Lewis concept; Relative strengths of acids, bases and dissociation constant; 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 problem

### 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<sub>2</sub>CO<sub>3</sub>, KBr, KClO<sub>3</sub> 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 monocarbonates and per dicarbonates.

### UNIT-III Chemistry of p- Block Elements (Group 15-18)

General characteristics of elements of Group 15; chemistry of H<sub>2</sub>N-NH<sub>2</sub>, NH<sub>2</sub>OH, HN<sub>3</sub> and HNO<sub>3</sub>. Chemistry of PH<sub>3</sub>, PCl<sub>3</sub>, PCl<sub>5</sub>, POCl<sub>3</sub>, P<sub>2</sub>O<sub>5</sub> and oxy acids of phosphorous (H<sub>3</sub>PO<sub>3</sub> and H<sub>3</sub>PO<sub>4</sub>). General properties of elements of group 16 - 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<sub>4</sub>). Inter-halogen compounds (ICl, ClF<sub>3</sub>, BrF<sub>5</sub> and IF<sub>7</sub>), pseudo halogens [(CN)<sub>2</sub> and (SCN)<sub>2</sub>] and basic nature of Iodine.

Noble gases: Position in the periodic table. Preparation, properties and structure of XeF<sub>2</sub>, XeF<sub>4</sub>, XeF<sub>6</sub> and XeOF<sub>4</sub>; uses of noble gases - clathrate compounds.

### UNIT-IV Hydrocarbon Chemistry-I

**Petroproducts:** Fractional distillation of petroleum; cracking, isomerisation, alkylation, reforming and uses

**Alkenes-**Nomenclature, general methods of preparation – Mechanism of  $\alpha$ -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** Nomenclature - classification – isolated, conjugated and cumulated dienes; stability of conjugated dienes; mechanism of electrophilic addition to conjugated dienes - 1, 2 and 1, 4 additions; free radical addition to conjugated dienes– Diels–Alder reactions – polymerisation – polybutadiene, polyisoprene (natural rubber), vulcanisation, polychloroprene.

**Alkynes** Nomenclature; general methods of preparation, properties and reactions; acidic nature of terminal alkynes and acetylene, polymerisation and isomerisation.

**Cycloalkanes:** Nomenclature, Relative stability of cycloalkanes, Bayer's strain theory and its limitations. Conformational analysis of cyclohexane, mono and di substituted cyclohexanes. Geometrical isomerism in cyclohexanes

### UNIT-V Hydrocarbon Chemistry - II

**Benzene:** Source, structure of benzene, stability of benzene ring, molecular orbital picture of benzene, aromaticity, Huckel's (4n+2) rule and its applications. Electrophilic substitution reactions - General mechanism of aromatic electrophilic substitution - nitration, sulphonation, halogenation, Friedel-Craft's alkylation and acylation. Mono substituted and disubstituted benzene - Effect of substituent – orientation and reactivity.





CO 4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
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CO / PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓

<b>ELECTIVE COURSE CHEMISTRY FOR PHYSICAL SCIENCES II (FOR MATHEMATICS &amp; PHYSICS STUDENTS)</b>	<b>SUB CODE :</b>  <b>HOURS:</b>  <b>CREDITS:</b>
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### Objectives of the course

This course aims at providing knowledge on the

- Co-ordination Chemistry and Water Technology
- Carbohydrates and Amino acids
- basics and applications of electrochemistry
- 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 - Applications to  $[\text{Ni}(\text{CO})_4]$ ,  $[\text{Ni}(\text{CN})_4]^{2-}$ ,  $[\text{Co}(\text{CN})_6]^{3-}$  Chelation - Biological role of Haemoglobin and Chlorophyll (elementary idea) – Applications in qualitative and quantitative analysis.

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

#### Electrochemistry

Galvanic cells - Standard hydrogen electrode - calomel electrode - standard electrode potentials -electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method – buffer solutions and its biological applications - electroplating - Nickel and chrome plating – Types of cells

-fuel cells-corrosion and its prevention.

### 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 – Catalysis - homogeneous and heterogeneous, catalyst used in Contact and Haber's processes. Concept of energy of activation and Arrhenius equation.

### 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).

### Recommended Text

1. V.Veeraiyan, Textbook of Ancillary Chemistry; High mount publishing house, Chennai, first edition,2009.
2. S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur,2006.
3. Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, 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.

### Reference Book

1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.
2. R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018.
3. B.K,Sharma, Industrial Chemistry; Meerut, sixteenth edition, 2014.

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

CO 1: gain an understanding of the use of standard flask and volumetric pipettes, burette. CO 2: design, carry out, record and interpret the results of volumetric titration.

CO 3: apply their skill in the analysis of water/hardness.

CO4: analyze the chemical constituents in allied chemical products

**COURSE MAPPING CO -PO**

CO /P O	PO1	PO 2	PO 3	PO4	PO 5	PO 6	PO7	PO 8	PO 9	P O1 0
CO 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

**COURSE MAPPING CO -PSO**

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

<b>CHEMISTRY FOR BIOLOGICAL SCIENCES- II (FOR BOTANY AND ZOOLOGY STUDENTS)</b>	<b>SUB CODE :</b>  <b>HOURS:</b>  <b>CREDITS:</b>
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This course aims to provide knowledge on

- nomenclature of coordination compounds and carbohydrates.
- Amino Acids and Essential elements of biosystem
- understand the concepts of kinetics and catalysis
- provide fundamentals of electrochemistry and photochemistry

### 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 - Applications to  $[\text{Ni}(\text{CO})_4]$ ,  $[\text{Ni}(\text{CN})_4]^{2-}$ ,  $[\text{Co}(\text{CN})_6]^{3-}$  Chelation - Biological role of Hemoglobin and Chlorophyll (elementary idea) - Applications in qualitative and quantitative analysis.

Water Technology: Hardness of water, determination of hardness of water using EDTA method, zeolite method-Purification techniques -BOD and COD.

#### Unit II Carbohydrates

Classification, preparation and properties of glucose and fructose. Discussion of open chain ring structures of glucose and fructose. Glucose-fructose interconversion. Preparation and properties of sucrose, starch and cellulose.

### UNIT III

#### Amino Acids and Essential elements of biosystem

Classification - preparation and properties of alanine, preparation of dipeptides using Bergmann method - Proteins- classification - structure - Colour reactions - Biological functions - nucleosides -nucleotides - RNA and DNA - structure. Essentials of trace metals in biological system-Na, Cu, K, Zn, Fe, Mg.

### UNIT IV

#### Electrochemistry

Galvanic cells - Standard hydrogen electrode - calomel electrode - standard electrode potentials -electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method - buffer solutions and its biological

applications - electroplating - Nickel and chrome plating - Types of cells -fuel cells-corrosion and its prevention.

### UNIT V

#### Photochemistry

Grothus - Drapper'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).

#### Recommended Book

1. V.Veeraiyan, Textbook of Ancillary Chemistry; High mount publishing house, Chennai, first edition, 2009.
2. S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006.
3. Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, 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.

#### Reference Book

1. Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition, 2012.
2. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
3. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.
4. B.R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018.
5. B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.



### Course Learning Outcomes

**CO 1:** write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology.

**CO 2:** explain the preparation and property of carbohydrate.

**CO 3:** enlighten the biological role of transition metals, amino acids and nucleic acids.

**CO 4:** apply/demonstrate the electrochemistry principles in corrosion, electroplating and fuel cells.

**CO 5:** outline the various type of photochemical process.

### COURSE MAPPING CO -PO

CO /P O	PO1	PO 2	PO 3	PO4	PO 5	PO 6	PO7	PO 8	PO 9	P O1 0
CO 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

### COURSE MAPPING CO -PSO

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

**CHEMISTRY PRACTICAL  
FOR PHYSICAL AND  
BIOLOGICAL SCIENCES-II**

**SUB CODE:  
HOURS:2  
CREDITS:1**

**OBJECTIVES**

- To enable the students acquire the quantitative skills in volumetric analysis
- To enable the analytical skills in organic qualitative skills
- To enable the analytical skills in organic qualitative skills

**QUALITATIVE ANALYSIS OF ORGANIC SUBSTANCES:**

1. Carbohydrate 2. Diamide 3. Aldehyde, 4. Ketone, 5. Acid 6. Amine (mono carboxylic acid and dicarboxylic acid) ,

**Report the followings :**

Aliphatic/ aromatic  
Saturation/ unsaturation  
Elements presence/ absence  
Functional group

**COURSE OUTCOMES**

Students will be

CO 1: Understand the handling of apparatus

CO 2: Identify the functional group

**COURSE MAPPING CO -PO**

CO /P O	PO1	PO 2	PO 3	PO4	PO 5	PO 6	PO7	PO 8	PO 9	P O1 0
CO 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

**COURSE MAPPING CO -PSO**

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓

<b>SEC-I ROLE OF CHEMISTRY IN DAILY LIFE</b>	<b>SUB CODE :U23CH2SE1</b> <b>HOURS:2</b> <b>CREDITS:2</b>
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### Objectives of the Course

This course aims at providing an overall view of the

- importance of Chemistry in everyday life
- chemistry of building materials and food
- chemistry of Drugs and pharmaceuticals

### UNIT-I

General survey of chemicals used in everyday life. Air - components and their importance; photosynthetic reaction, air pollution, green - house effect and the impact on our life style. Water - Sources of water, qualities of potable water, soft and hard water, methods of removal of hardness-water pollution

### Unit-II

Building materials - cement, ceramics, glass and refractories - definition, composition and application only. Plastics - polythene, PVC, bakelite, polyesters, melamine-formaldehyde resins -preparation and uses only.

### UNIT-III

Food and Nutrition - Carbohydrates, Proteins, Fats - definition and their importance as food constituents – balanced diet – Calories minerals and vitamins (sources and their physiological importance). Cosmetics – tooth paste, face powder, soaps and detergents, shampoos, nail polish, perfumes - general formulation and preparations - possible hazards of cosmetic use.

### UNIT-IV

Chemicals in food production – fertilizers - need, natural sources; urea, NPK fertilizers and super phosphate. Fuel – classification - solid, liquid and gaseous; nuclear fuel examples and uses.

### UNIT-V

Pharmaceutical drugs - analgesics and antipyretics - paracetamol and aspirin. Colour chemicals - pigments and dyes - examples and applications. Explosives - classification and examples.

### Recommended Text

1. Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house,

2010.

2. A textbook of pharmaceutical chemistry by Jayashree Ghosh, S Chand publishing, 2012.
3. S. Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006.
4. B. K, Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014. Introduction to forensic chemistry, Kelly M. Elkins, CRC Press Taylor & Francis Group, 2019.
5. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co. Publishers, second edition, 2006.

### Reference Book

1. Randolph. Norris Shreve, Chemical Process Industries, McGraw-Hill, Texas, fourth edition, 1977.
2. W.A. Poucher, Joseph A. Brink, Jr. Perfumes, Cosmetics and Soaps, Springer, 2000.
3. A.K. De, Environmental Chemistry, New Age International Public Co., 1990.

### Course Learning Outcomes

- CO1:** learn about the chemicals used in everyday life as well as air pollution and water pollution.
- CO2:** get knowledge on building materials cement, ceramics, glass and plastics, polythene, PVC bakelite, polyesters,
- CO3:** acquire information about Food and Nutrition. Carbohydrates, Proteins, Fats Also have an awareness about Cosmetics Tooth pastes, face powder, soaps and detergents.
- CO4:** discuss about the fertilizers like urea, NPK fertilizers and super phosphate. Fuel classification solid, liquid and gaseous; nuclear fuel - examples and uses
- CO5:** have an idea about the pharmaceutical drugs analgesics and antipyretics like paracetamol and aspirin and also about pigments and dyes and its applications

**COURSE MAPPING CO -PO**

CO /P O	PO1	PO 2	PO 3	PO4	PO 5	PO 6	PO7	PO 8	PO 9	P O1 0
CO 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO 5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

**COURSE MAPPING CO -PSO**

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

<b>PART-IV ENVIRONMENTAL STUDIES</b>	<b>SUB CODE:U232ES HOURS:2 CREDITS:2</b>
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### **UNIT:1 The Multidisciplinary nature of environmental studies**

- ❖ Definition ,scope and importance
- ❖ Need for public awareness
- ❖ Natural resources
- ❖ Renewable and non- renewable resources
- ❖ Natural resources and associated problems

### **Unit –II Biodiversity and its conversation**

- ❖ Introduction- definition, genetic , species and ecosystem diversity
- ❖ Biodiversity at global, national and local levels
- ❖ India as mega- diversity nation
- ❖ Hot – spots of biodiversity
- ❖ Conservation of Biodiversity. In-Situ and Ex-situ conservation of biodiversity

### **Unit- III Environmental problems**

- ❖ Definition
- ❖ Causes , effects and control measures of
- ❖ Air pollution
- ❖ Water pollution
- ❖ Soil pollution
- ❖ Marine pollution
- ❖ Noise pollution
- ❖ Thermal pollution
- ❖ Nuclear hazard (Radioactive pollution)
- ❖ Solid waste management: causes effects and control measure of urban and industrial wastes.
- ❖ Role of an individual in prevention of pollution
- ❖ Pollution case studies
- ❖ Disaster management: floods earthquake, cyclone and landslides.

### **UNIT- IV**

- ❖ From un sustainable to sustainable development
- ❖ Urban problems related to energy
- ❖ Water conservation rain water harvesting watershed management

- ❖ Resettlement and rehabilitation of people , its problems and concerns case studies
- ❖ Environmental ethics: issues and possible solution
- ❖ Climate change , global warming acid rain ozone layer depkletion
- ❖ Nuclear accidents and holocaust, case studies.
- ❖ Wasteland reclamation
- ❖ Consumerism and waste products
- ❖ Environment protection act
- ❖ Air (prevention and control pollution)
- ❖ Water (prevention and control pollution)
- ❖ Wildlife protection Act
- ❖ Forest conservation Act
- ❖ Issues involved in enforcement of environmental legislation
- ❖ Public awareness.

### **UNIT-V Human population and environment**

- ❖ Population growth, variations among nations
- ❖ Population explosion – family welfare programme
- ❖ Environment and human health
- ❖ Human rights
- ❖ HIV/ AIDS
- ❖ Women and child welfare
- ❖ Role of information technology in environmentl human health
- ❖ Case studies.

### **EFFECTS OF FIRE WORKS**

Man ,Environment and climate change – fire work celebrations- fire works and health hazards- types of fire- types and uses of fire extinguishers- fireworks and safety- creating awareness on reducing the usage of fire works.