# GOVERNMENT ARTS COLLEGE (AUTONOMOUS) SALEM-7

Reaccredited with B Grade by NAAC (Affiliated to Periyar University)



# **B.Sc., CHEMISTRY**

# **Regulations and Syllabus**

(Effective from the Academic Year 2022-2023)

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

REACCREDITED WITH B BY NAAC

# **Course Structure for B.Sc., Chemistry Programme - 2022 - 2023**

Part	Category	No. of Courses	Total Credits
I	Tamil	4	12
II	English + Communicative English	2+2	12
III	Core Course(CC)	10	46
III	Core Practical (CP)	4	16
III	Allied Theory(AC)	4	16
III	Allied Practical(AP)	2	6
III	Major Based Elective Course(MBEC)	4	20
IV	Skill Enhancement Course(SEC)	4	8
IV	Non-Major Elective Course (NMEC)	2	4
IV	Ability Enhancement Compulsory Course(AECC)	2	4
IV	Ability Enhancement Elective Course(AEEC)	1	2
IV	Professional English (Mandatory)	2	4
V	Extension Activity (ELECTIVE)	1	2
	TOTAL	44	152

Total Credits : 152

Total Credits in Part III : 104

Total Marks : 4300

**Signature of Board Chairman** 

#### **VISION**

To motivate and nurture the students to acquires subject knowledge skills and research aptitude through intellectual higher education along with better conduct, character and commitment to societal needs and national development while promoting and preserving the heritage of our past.

#### **MISSION**

- ✓ To impart quality educations, skills and equip students to face the challenges and demands of industry and technology.
- ✓ To caliber the students to work for societal transformation with commitment to justice and equality.
- ✓ To provide equal opportunity to girl students and make them to be confident in meeting the scientific and technological requirements of the nation.
- ✓ To excel in teaching, research, knowledge transfer and to serve the social, cultural and economic needs of the nation.
- ✓ To offer educational programmes with synergistic interaction with the industries and societies.

#### **Programme Educational Objective (PEO)**

PEO1	Achievements of chemistry in a foundational level to the current knowledge.						
PEO2	Development of cognitive research skills at a level required to pursue higher education.						
PEO3	Understanding of experimentation, observation and data analysis suitable for any chemistry based industry.						
PEO4	Familiarity with available instrumentation for conducting specific scientific research.						
PEO5	To communicate effectively, verbally and written for the purposes of conveying chemical information to both professional scientists and to the public.						

# **PROGRAMME OUTCOMES**

PO1	Students will acquire wholesome knowledge with a firm foundation in basic fundamentals and the applications in the field of chemistry
P02	Students can be able to communicate scientific information in a clear and considerate manner both orally and in written form.
PO3	Students will be equipped to solve problems of numerical, synthetic, and analytical natures that are best approached with critical thinking.
PO4	Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of the safe handling of chemicals and issues related to health, medicine, and the environment.
PO5	Students will be able to find out an independently green route for chemical reactions and identify appropriate non-toxic resources for sustainable development.

# PROGRAMME SPECIFIC OUTCOMES

PSO1	To gain familiarity with the basic realities and observations in chemistry through theory and practical work so as to develop an interest in the study of chemistry as a discipline.
PSO2	To develop the skills in applying the values of chemistry by the students in all thinkable ways.
PSO3	To understand the principles and processes underlying the academic field ofchemistry, its different subfields (analytical, inorganic, organic, and physical), and its linkages with related disciplinary areas/subjects.
PSO4	To undertake hands-on lab work and practical activities which develop problem-solving abilities required for a successful career.

PSO5	To employ critical thinking and the scientific method to design, carry out record, and analyze the results of chemical experiments and get an awareness of the impact of chemistry on the environment and society.
PSO6	To understand the measurement of chemicals, preparation of the solution, and find out the green route for the chemical reaction for sustainable development.
PSO7	To recognize the different industrial developments in new research and advanced methods and their applications.
PSO8	To acquaint the applications of chemistry in many interdisciplinary subjects
PSO9	To grow knowledge in the functioning of chemical instruments and apparatus and in the appropriate methods of management of chemicals.
PSO10	To develop skills in solving the glitches arising out of manufacturing production and conservational contamination.

Table 1. The Course Structure and scheme of Examination for the six semesters shall be as follows.

S.	r a	Course	Course Name	TTue	Cre	Mar	'ks	Man
No	Pa	Code	Course Name	Hrs	dits	IA	SE	Max
1	T T	22555 04	<u>SEMESTER - I</u>	T =		25	75	100
2	I	22FTL01 22FEL01	Language – I : Tamil –I	5 5	3	25 25	75 75	100
	11	ZZFELU1	Communicative English-I	+	3	25	75	100
3	III	22UCH01	Core Course I : General Chemistry –I	5	5	25	75	100
4	III	22AMT01/ 22ABY01/ 22AZL01	Allied – I- Course I : Maths-I/Botany-I/Zoology-I	5	4	25	75	100
5	III	22UCHP1	Core Practical - I: Volumetric Estimation	3				
6	III	22AMTP1/ 22ABYP1/ 22AZLP1	Allied – I-Practical : Maths/Botany/Zoology	3				
7	IV	22AECC1	AECC -I: Value Based Education	2	2	25	75	100
8	IV	22UPE01	Professional English-I	2	2	50		50
			TOTAL	30	18			550
			<u>SEMESTER - II</u>					
1	I	22FTL02	Language –II : Tamil-II	5	3	25	75	100
2	II	22FEL02	Communicative English-II	5	3	25	75	100
3	III	22UCH02	Core Course II : General Chemistry-II	5	5	25	75	100
4	III	22AMT02/ 22ABY02/ 22AZL02	Allied – I- Course II : Maths-II/Botany-II/Zoology-II	5	4	25	75	100
5	III	22UCHP1	Core Practical- I: Volumetric Estimation	3	4	40	60	100
6	III	22AMTP1/ 22ABYP1/ 22AZLP1	Allied – I- Course I: Practical : Maths/Botany /Zoology	3	3	40	60	100
7	IV	22AECC2	AECC-II: Environmental Studies	2	2	25	75	100
8	IV	22UPE02	Professional English-II	2	2	50		50
			TOTAL	30	25			750
		C	UM-TOTAL		43			1300
			<u>SEMESTER - III</u>					
1	I	22FTL03	Language – III : Tamil – III	5	3	25	75	100
2	II	22FEL03	Foundation English – I:	5	3	25	75	100

3	III	22UCH03	Core Course III : General Chemistry – III	5	5	25	75	100
4	III	22APY01	Allied – II- Course I: Physics - I	5	4	25	75	100
5	IV	22UCHS1	Skill Enhancement Course I: Industrial Chemistry	2	2	25	75	100
6	IV	22UCHN1	Non-Major Elective Course I: Chemistry in Daily Life-I	2	2	25	75	100
7	III	22UCHP2	Core Practical II: Inorganic Qualitative Analysis	3	1			-
8	III	22APYP1	Allied – II –Practical: Physics Practical	3				-
		22EXAT1	Extension(Community Service)* : National Cadet Corps					
9	v	22EXAT2	Extension(Community Service)* : National Social Service	ture 2		100		
9	v	22EXAT3	Extension(Community Awareness)* : Indian Heritage and Culture		2			100
		22 EXAT4	Extension(Community Awareness)* : Public Health and Personal Hygiene					
			TOTAL	30	20			700
		C	UM-TOTAL		63			2000
			<u>SEMESTER - IV</u>					
1	I	22FTL04	Language – IV: Tamil – IV	5	3	25	75	100
2	II	22FEL04	Foundation English – II	5	3	25	75	100
3	III	22UCH04	Core Course IV : General Chemistry – IV	5	5	25	75	100
4	Ш	22APY02	Allied – II-Course-II: Physics - II	5	4	25	75	100
5	IV	22UCHS2	Skill Enhancement Course II: Textile And Dye Chemistry	2	2	25	75	100
6	IV	22UCHN2	Non-Major Elective Course - II : Chemistry in Daily Life – II	2	2	25	75	100

7	III	22UCHP2	Core Practical –II: Inorganic Qualitative Analysis and Preparation	3	4	40	60	100
8	Ш	22APYP1	Allied – II – Practical: Physics Practical	3	3	60	100	
		22AEEC1	Ability Enhancement Elective Course I : Gandhian Thoughts					
		22AEEC2	Ability Enhancement Elective Course I : Human Rights	ly)				
9	IV	22AEEC3	AbilityEnhancement Elective Course I : Business Startup Fundamentals	(Self Stuo	Self Study]		100	
		22AEEC4	Ability Enhancement Elective Course I : Professional Ethics & Cyber Netiquette					
			TOTAL	30	27			900
		C	UM-TOTAL		90			2900
		C	UM-TOTAL <u>SEMESTER - V</u>		90			2900
1	III	22UCH05		4	<b>90</b> 5	25	75	100
1 2	III		SEMESTER - V  Core Course V :	4		25 25	75 75	
		22UCH05	SEMESTER - V  Core Course V: Inorganic Chemistry - I  Core Course VI:		5			100
3	III	22UCH05 22UCH06	SEMESTER - V  Core Course V: Inorganic Chemistry - I  Core Course VI: Organic Chemistry - I  Core Course VII: Physical Chemistry - I  Major Based Elective I: Spectroscopy	4	5	25 25	75 75	100 100 100
2	III	22UCH05 22UCH06 22UCH07	Core Course V: Inorganic Chemistry - I  Core Course VI: Organic Chemistry - I  Core Course VII: Physical Chemistry - I  Major Based Elective I: Spectroscopy  Major Based Elective I: Nuclear & Radiation Chemistry	4	5 5 5	25	75	100
2 3 4	III	22UCH05 22UCH06 22UCH07 22UCHM1	Core Course V: Inorganic Chemistry - I  Core Course VI: Organic Chemistry - I  Core Course VII: Physical Chemistry - I  Major Based Elective I: Spectroscopy  Major Based Elective I: Nuclear & Radiation Chemistry  Major Based Elective II: Pharmaceutical Chemistry	4 4	5 5 5	25 25 25	75 75 75	100 100 100 100
3	III	22UCH05 22UCH06 22UCH07 22UCHM1 22UCHM2	Core Course V: Inorganic Chemistry - I  Core Course VI: Organic Chemistry - I  Core Course VII: Physical Chemistry - I  Major Based Elective I: Spectroscopy  Major Based Elective I: Nuclear & Radiation Chemistry  Major Based Elective II: Pharmaceutical Chemistry  Major Based Elective II: Medicinal Chemistry	4 4	5 5 5 4	25 25	75 75	100 100 100
2 3 4	III	22UCH05 22UCH06 22UCH07 22UCHM1 22UCHM2 22UCHM3	SEMESTER - V  Core Course V: Inorganic Chemistry - I  Core Course VI: Organic Chemistry - I  Core Course VII: Physical Chemistry - I  Major Based Elective I: Spectroscopy  Major Based Elective I: Nuclear & Radiation Chemistry  Major Based Elective II: Pharmaceutical Chemistry  Major Based Elective II:	4 4	5 5 5 4	25 25 25	75 75 75	100 100 100 100

			Experiments					
8	III	22UCHP4	Core Practical – IV : Organic Practical and Gravimetric Estimation	5				-
			TOTAL	30	27			600
		С	UM-TOTAL		117			3500
			SEMESTER - VI					
1	III	22UCH08	Core Course VIII : Inorganic Chemistry – II	4	5	25	75	100
2	III	22UCH09	Core Course IX : Organic Chemistry – II	4	5	25	75	100
3	III	22UCH10	Core Course X: Physical Chemistry – II	4	5	25	75	100
		22UCHM5	Major Based Elective III : Analytical Chemistry					
4	III	22UCHM6	Major Based Elective III : Introduction toNano chemistry & Applications	4	4	25	75	100
5	III 22UCHM7		Major Based Elective IV: Polymer Chemistry	4	4	25	75	100
		22UCHM8	Major Based Elective IV: Bio chemistry					
6	IV	22UCHS4	Skill Enhancement Course IV : Food Chemistry	2	2	25	75	100
7	III	22UCHP3	Core Practical – III :Physical Chemistry Experiments	3	4	40	60	100
8	III	Core Practical – IV:		5	4	40	60	100
			TOTAL	30	35			800
		С	UM-TOTAL		152			4300



# **GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM - 7**

#### **B.Sc CHEMISTRY**

#### **SEMESTER I**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCH01	GENERAL CHEMISTRY-I	71	4	-	5

#### **Learning Objectives**

- To learn the basic concepts of Atomic structure, Quantum number.
- To know about Schrodinger wave equation.
- To understand the electronic structure of atom.
- To learn the basic concepts of electronic effect.
- To understand the behavior of Ideal, Real gases.
- To understand about the Inorganic Semi-micro Analysis.

#### **UNIT-I** Atomic Structure

[15 Hours]

Fundamental particles of matter – their composition –Comparison between Rutherford's model of atom and Bohr's model-Outline of the Bohr-Sommerfield modelits limitations-Black body radiation-Photo electric effect - De Broglie theory-Heisenberg's uncertainty principle- Quantum numbers.

Wave mechanical concept of atom – Schrodinger's wave equation (derivation not needed)-significance of  $\psi$  and  $\psi^2$  – Eigen functions and Eigen values (Definition only)-shapes of different s, p, d, f orbitals – Differences between an orbit and orbital.

#### **UNIT- II Electronic structure and Periodic properties**

[15 Hours]

Aufbau principle and its limitations - Pauli's Exclusion principle and its application-Hund's rule-its basis and applications - stability of half-filled and completely - filled orbitals, (n+1) rule.

Periodic properties: Atomic and ionic radii, Ionization Energy, Electron affinity and Electronegativity – Definition, Variation of the periodic properties along periods and groups-theoretical explanation for the variations.

s, p, d and f block elements-classification and simple characteristic properties.

#### UNIT - III Hybridization and Bonding in Organic molecules

[15 Hours]

Hybridization and geometry -bond angle, bond length, bond strength of C-H and C-Cbonds. Intermolecular interactions-Dipole-Dipole interaction, Vander Waals forces, hydrogen bond and its types-effect of intermolecular forces on physical propertiesmelting point, boiling point and solubility.

Electron displacement effects: Inductive, Inductomeric and Steric effects-their effect on properties of compounds-Mesomeric, resonance, hyper conjugation-localised and delocalised chemical bond.

Reactive intermediates -carbocations, carbanions, free radicals and carbenes with examples.

Cycloalkanes-Wurtz reaction, Dieckmann ring closure & reduction of aromatic hydrocarbons -Baeyer's strain theory and its limitations - Sache - Mohr theory – Ring strain in small rings (cyclopropane and cyclobutane) - theory of strainless rings.

#### **UNIT - IV The Gaseous State**

[15 Hours]

#### Behaviour of ideal gases

Postulates of Kinetic theory and its limitations- kinetic theory and temperaturetheory of Boltzmann constant-Maxwell's distribution of molecular velocities-types of molecular velocities- -definition of collision diameter-collision frequency-mean free path- Degrees of freedom of gaseous molecules (linear and non-linear molecules)-Principle of equipartition of energy

#### **Behaviour of Real gases**

Deviations from ideal behaviour- Explanation of deviations - Boyle point. The

virial equation of state-derivation of the principle of corresponding states.

# **UNIT - V Principles of Qualitative and Volumetric Analysis**

[15 Hours]

#### **Principle of Qualitative analysis:**

Basic principles of Inorganic semi-micro analysis-semi-micro techniques-principles involved in  $Na_2CO_3$  extract preparation-common ion effect , solubility product and their applications in qualitative analysis - separation of cations into groups.

#### **Principle of Volumetric analysis:**

Definition of molarity, molality, normality and mole fraction-Definition and examples for Primary and Secondary standards. Principles of acid-base, redox, iodometric and iodimetric titrations-calculations of equivalent weight – Definition and types of indicators - acid-base, redox, adsorption, fluorescence indicators and choice of indicators.

#### Text Books:

- 1. Arun Bahl and B.S. Bahl, A Text Book of Organic Chemistry, 22<sup>nd</sup> edn, S Chand & Company, **2016**.
- 2. P. Y.Bruice, Organic Chemistry, Vol-1 & 2, 7<sup>th</sup>edn, Pearson Education Asia, **2012**.
- 3. J.Clayden, N. Greeves, S. Warren, Organic Chemistry, 2ndedn, Oxford, 2012.
- 4. R. D. Madan, Modern Inorganic Chemistry, 3<sup>rd</sup>edn, S. Chand & Company Ltd., Reprint **2014**.
- 5. B.R.Puri, L.R.Sharma and M.S.Pathania, Principles of Physical hemistry.47<sup>th</sup>edn, Vishal Publishing Co., **2017**.

#### Reference Books:

- 1. R. T. Morrison, R. N. Boyd and S.K.Bhattacharjee, Organic chemistry, 7<sup>th</sup>edn, Pearson Education Asia, **2010.**
- 2. F. A. Carey and R. J. Sundberg, Advanced Organic Chemistry, Part A and B, 5<sup>th</sup>edn, Springer Publishers, **2008**.

- 3. N. Kundu and S.K. Jain, Physical Chemistry, S. Chand & Company Ltd. 2000
- 4. G.M.Barrow, Physical Chemistry, 6th edn, McGraw-Hill Inc., US, 1996
- 5. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23<sup>rd</sup>edn, New Delhi, ShobanLal Nagin S.Chand & Co., **1993.**
- 6. I. L. Finar, Organic Chemistry Vol-1& 2, 6thedn, Pearson Education Asia, **2004**.
- 7. P.L. Soni, Text book of Inorganic Chemistry, 20thedn, Sultan chand& Sons, **2000.**

#### **Online Resources/Tutorials:**

- 1. www.organic-chemistry.org
- 2. www.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm
- 3. www.chemguide.co.uk/orgmenu.html
- 4. www.chem.umass.edu/~samal/orginorgsites.html

## **Assignments:**

- 1. Shapes of different s, p, d, f orbitals
- 2. Hybridization and geometry -bond angle, bond length, bond strength of C-H and C-C bonds Intermolecular interactions.
- 3. Primary and Secondary standards solutions

#### **Group Tasks:**

- 1. s, p, d and f block elements-classification and simple characteristic properties.
- 2. Maxwell's distribution of molecular velocities.
- 3. Comparison between Rutherford and Bohr's Model.

# **COURSE OUTCOMES**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	Recall atomic structure and	1,2,3	Remember
	Quantum numbers.		
CO2	Tabulate the periodic properties and discuss its variation along with periods and groups.	1,2,3,5	Remembering
CO3	Illustrate the electron displacement effects.	1,2,3,4,10	Applying
CO4	Distinguish the behavior of ideal and real gases.	1,2,3,8,9,10	Analyzing
CO5	Explain the theory behind the qualitative and volumetric analysis.	1,2,3,4,5,6,9,10	Analyzing

# MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PS08	PS09	PSO10
CO1	S	S	S	-	-	-	-	L	-	-
CO2	S	S	S	-	М	-	-	-	-	-
CO3	S	S	М	L	-	-	-	-	-	L
CO4	S	S	S	-	-	-	-	L	М	L
CO5	S	S	М	М	M	S	-	-	L	L

S- Strong; M-Medium; L-Low



# **GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM - 7**

#### **B.Sc CHEMISTRY**

#### **SEMESTER II**

Course code	Course name	Lecture(L)	Lecture(L) Tutorial(T)		Credit
22UCH02	GENERAL CHEMISTRY-II	71	4	-	5

#### **Learning Objectives**

- To learn the basic concepts of bond formation and types of bonds.
- To understand Fajan's Rule.
- To learn about Hydrides, Carbides, Nitrides and Xenon compounds.
- To study about Alkane, Alkynes.
- To learn  $S_N^1$ ,  $S_N^2$ ,  $S_N^i$  reaction mechanisms and Aromaticity.
- To learn liquid state and liquid crystals and their application

#### **UNIT - I Chemical Bonding**

[15 Hours]

Ionic bond-mode of formation – properties of ionic compounds-inert pair effect-Born-Haber cycle-Polarization of ions-factors affecting Polarization-importance of Polarization of ions-Fajan's rules and applications.

Covalent Bond-mode of formation-properties of covalent compounds- Valence Shell Electron Pair Repulsion Theory (VSEPR) - Valence Bond theory-Postulates of Pauling-Slater's theory-Different types of overlapping. Molecular orbital theory-Postulates-Bonding and Anti-bonding molecular orbitals-Tabulation of various MOs formed from atomic orbitals-Energy level diagrams for MOs-Bond order-Electronic configuration of Homo and Hetero nuclear diatomic molecules –  $O_2$ ,  $F_2$ , CO, CO, CO0 and CO1.

Coordinate Bond-mode of formation-importance of coordinate bond in the

formation of metal complexes.

## UNIT-II Chemistry of Hydrides, Carbides, Nitrides and Xenon compounds

[15 Hours]

Hydrides-Classification-Types of Hydrides-Ionic Hydrides-LiH and NaH-Structure, preparation, properties and uses. Covalent Hydrides – silanes - General study - Chemistry of monosilanes and disilanes-Differences between silanes and alkanes. Metallic Hydrides-Preparation, properties, structure and uses (A brief study). Complex Hydrides-NaBH<sub>4</sub> and LiAlH<sub>4</sub>-preparation, properties, uses and structure.

Carbides-Preparation, properties and technical applications.

Nitrides – Preparation, properties and uses.

Noble Gases-position of Noble gases in the periodic Table – Preparation, properties and structure of Xenon compounds (XeF<sub>4</sub>, XeF<sub>6</sub>, XeO<sub>3</sub>, XeOF<sub>6</sub>).

#### **UNIT-III Chemistry of alkenes and alkynes**

[15 Hours]

Alkenes- Nomenclature and classification of dienes-isolated, conjugated and cumulated dienes - synthesis of dienes- 1,2 and 1,4 additions-thermodynamic and kinetic controlled products-Diels - Alder reaction

Electrophilic and free radical mechanism of addition in alkenes-Markownikoff's and Anti Markownikoff's rule-peroxide effect-mechanism of Hydroboration, Ozonolysis and allylic substitution by NBS-Polymerisation

Alkynes- Acidity of alkynes-formation of acetylides-oxidation - ozonolysis and hydroboration, addition of water with  $HgSO_4$  catalyst.

#### UNIT-IV Nucleophilic and Electrophilic Reaction Mechanisms [15 Hours]

**Reaction mechanism I:** Aliphatic nucleophilic substitution-  $S_N 1$ ,  $S_N 2$  and  $S_N 1$  reactions – Reactivity-effects of structure of substrate, attacking nucleophile, leaving group and reaction medium- Elimination reactions-mechanisms of E1 and E2

reactions-Hofmann and Saytzeff rule.

Aromatic hydrocarbons and aromaticity-resonance in benzene- Huckel's rule (4n+2) and its simple applications.

**Reaction mechanism II:** Electrophilic substitution reactions in aromatic compounds-general mechanism –Nitration, Halogenation, Sulphonation, Friedel-Crafts acylation and alkylation-directive influence – Orientation-ortho/para ratio

Polynuclear aromatic hydrocarbons- naphthalene and anthracene -isolation, synthesis, properties, and uses.

# UNIT-V Chemistry of liquid state and liquid crystals

[15 Hours]

**The liquid state:** Structure of liquids-Vapour-pressure-Trouton's rule - surface tension - surface energy-some effects of surface tension-viscosity-effect of temperature on viscosity (Experimental determination of surface tension and viscosity not necessary)-Refractive index-specific refraction-molar refraction. Physical properties and chemical constitution -Molar volume and Parachor.

#### Liquid crystals (The mesomorphic state)

Classification of liquid crystals-Smectic liquid crystals-Nematic liquid crystals-Cholesteric liquid crystals- applications.

#### **Text Books:**

- K.K.Rohatgi Mukherjee, Fundamentals of Photochemistry, Reprint, New Age International Publisher, 2006.
- K. S. Tewari and N. K. Vishnoi, A Text Book of Organic Chemistry, 4th edition, Vikas Publishing House Pvt Ltd, 2017.
- 3. Arun Bahl and B.S. Bahl, A Text Book of Organic Chemistry, 22ndedn, S Chand & Company, **2016**.
- 4. P. Y.Bruice, Organic Chemistry, Vol-1 & 2, 7thedn, Pearson Education Asia, **2012.**
- 5. J.Clayden, N. Greeves, S. Warren, Organic Chemistry, 2ndedn, Oxford, 2012.
- 6. R. D. Madan, Modern Inorganic Chemistry, 3rdedn, S. Chand & Company Ltd.,

- Reprint 2014.
- 7. Sp. Banerjee, Advanced Inorganic Chemistry 2ndedn,Vol-1, Arunabha Sen, Books and Allied (P) Ltd., Kolkata, **2017.**
- 8. Sp. Banerjee, Advanced Inorganic Chemistry Vol-2, Arunabha Sen, Books and Allied (P) Ltd., Kolkata, **2017**.
- 9. B.R.Puri, L.R.Sharma and M.S.Pathania, Principles of Physical hemistry.47thedn, Vishal Publishing Co., **2017**.

#### **Reference Books:**

- A.I. Vogel, A Textbook of Quantitative Inorganic Analysis, ELBS and Longman London, 1975
- 2. R. T. Morrison, R. N. Boyd and S.K.Bhattacharjee, Organic chemistry, 7thedn, Pearson Education Asia, **2010**.
- 3. F. A. Carey and R. J. Sundberg, Advanced Organic Chemistry, Part A and B, 5thedn, Springer Publishers, **2008**.
- 4. N. Kundu and S.K. Jain, Physical Chemistry, S. Chand & Company Ltd. 2000
- 5. G.M.Barrow, Physical Chemistry, 6th edn, McGraw-Hill Inc., US, 1996
- 6. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rdedn, New Delhi, ShobanLal Nagin Chand & Co., **1993.**
- 7. I. L. Finar, Organic Chemistry Vol-1& 2, 6thedn, Pearson Education Asia, **2004**.
- 8. P.L. Soni, Text book of Ionrganic Chemistry, 20thedn, Sultan chand& Sons, **2000.**

#### **Online Resources/Tutorials:**

- 1. www.organic-chemistry.org
- 2. www.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm
- 3. www.chemguide.co.uk/orgmenu.html
- 4. www.chem.umass.edu/~samal/orginorgsites.html

#### **Assignments:**

- 1. Electronic configuration of Hetero nuclear diatomic molecules CO, NO and HF
- 2. Structure of Xenon compounds (XeF<sub>4</sub>, XeF<sub>6</sub>, XeO<sub>3</sub>, XeOF<sub>6</sub>).
- 3. Aromaticity-Huckel's rule (4n+2) and its simple applications.

# **Group Tasks:**

- 1. Nomenclature and classification of dienes.
- 2. Liquid crystals- applications.
- 3. Structure of Xenon compounds

# **COURSE OUTCOMES:**

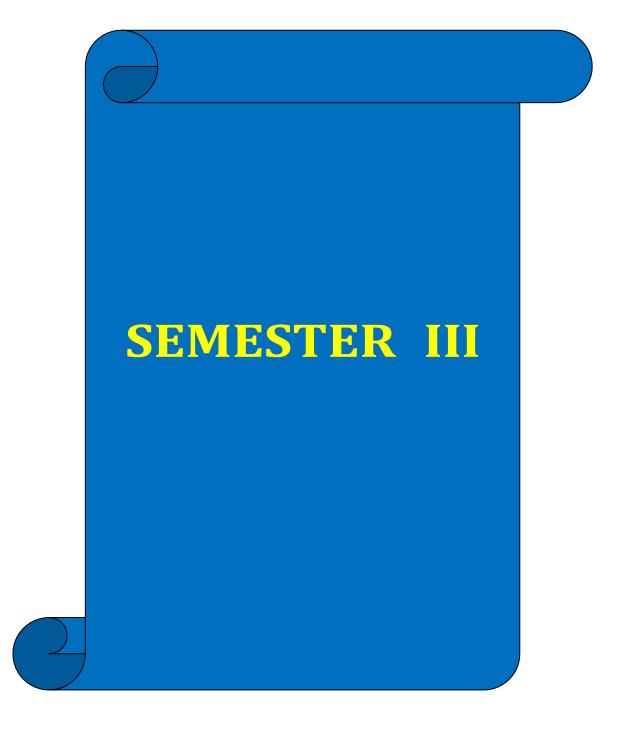
On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	Discuss the various theories involved in the mode of bond formation.	1,2,3,10	Understanding
CO2	Explain the preparation, properties, and uses of hydrides, carbides, and xenon compounds.	1,2,3,4,5,6,8,10	Understanding
CO3	Describe the addition reactions of alkenes using morkonikow's and antimorkonikow's rule.	1,2,3,5	Understanding
CO4	Apply Huckle rule to aromatic compounds	1,2,3,5,8,10	Applying
CO5	Compare the various states of liquid crystals.	1,2,3,5,7,8,9,10	Analyzing

# MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PS09	PSO10
CO1	S	S	М	-	-	-	-	1	-	L
CO2	S	S	S	M	M	M	-	L	-	L
CO3	S	S	М	-	L	-	-	-	-	-
CO4	S	S	S	-	M	-	-	М	-	L
CO5	S	S	S	-	M	-	M	M	L	L

S- Strong; M-Medium; L-Low



# **GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM - 7**

#### **B.Sc CHEMISTRY**

#### SEMESTER III

Course code	Course name	Lecture(L)	Lecture(L) Tutorial(T)		Credit
22UCH03	GENERAL CHEMISTRY-III	71	4	-	5

#### **Learning Objectives**

- To learn the basic concepts regarding principles of inorganic analysis and applications of qualitative analysis.
- To know about solvents, p-block elements, group study, aromaticity, electrophilic and nucleophilic substitution reactions, elimination reactions, mechanism.
- To learn second law of thermodynamics, derivation of equations, related problems, applications wherever necessary.

#### **UNIT-I** Transition Elements and Group Study

[15 Hours]

Transition Elements – position in the Periodic Table-General characteristics and properties of d-block elements. Occurrence, extraction, properties and uses of Titanium, Zirconium, Molybdenum, Tungsten and Platinum.

Chemistry of Titanium dioxide, Titanium tetrachloride, Vanadium pentoxide, Ammonium Vanadate, Zirconium dioxide, Zirconium halides, Ammonium molybdate, Molybdenum blue, Tungsten trioxide, Tungsten Bronzes, Chloroplatinic acid and Barium Platinocyanide. Group study of Ti, V and Cr groups.

# UNIT-II Reaction mechanism and Addition to C - Multiple bonds [15 Hours]

Mechanism of Kolbe's reaction, Reimer-Tiemann reaction, Gattermann, Lederer-Manasse and Houben-Hoesch reactions.

Preparation and uses of Cresols, nitro phenols, aminophenol's, di and trihydric phenols-alpha and beta naphthols. Epoxides-synthesis, properties and uses, Crown ethers.

Addition to Carbon – Hetero multiple bond - Addition of HCN,  $NH_2OH$ , 2,4-dinitrophenyl hydrazine, semicarbazide & Grignard reagent. Mechanism of Mannich, Reformatsky and halo form reactions. Mechanism of reduction of carbonyl group by  $NaBH_4$ ,  $LiAlH_4$  –Wolf-Kishner, Clemmensen and MPV reductions.

#### **UNIT-III Saturatedand Unsaturated Carboxylic acids**

[15 Hours]

Unsaturated acids-preparation and properties of acrylic, crotonic and cinnamic acids. Hydroxy acids-classification –Action of heat on  $\alpha,\beta,\gamma$  and  $\delta$  acids. Dicarboxylic acids-preparation of malonic, succinic, glutaric and adipic acids. Action of heat on these acids.

Mechanism of conversion of acids into acid derivatives-esterification including trans esterification. Hydrolysis of esters-mechanism - effect of substituents-structural and steric factors. Tautomerism-definition-keto-enol tautomerism-acid-base inter conversion mechanism. Malonic and Acetoacetic esters - characteristic reactions of active methylene group - synthetic uses.

#### **UNIT- IV Solid and Colloidal State**

[15 Hours]

The Solid State - Difference between crystalline and amorphous solids-isotropy and anisotropy -space lattice and unit cell-Bravis lattices- -Lattice energy-Born-Lande equation- Law of rational indices-Miller indices-X ray diffraction-Bragg's equation-Experimental methods.

Definition of colloids - classification of colloids - solids in liquids (sols) - properties-kinetic, optical and electrical-stability of colloids, protective action – Hardy - Schulze law, gold number.

Liquids in liquids (emulsions): Types of emulsions-preparation, emulsifier - Liquids in solids (gels): classification, preparation and properties, inhibition-general applications of colloids.

#### **UNIT- V** The first law of thermodynamics and its applications

[15 Hours]

Terminology of thermodynamics-Thermodynamic equilibrium-Nature of work and heat-Law of conservation of energy-first law of thermodynamics-Internal energy-Enthalpy of a system-Heat capacity of a system-Expansion of an ideal gas-work done in reversible isothermal expansion-work done in reversible isothermal compression-work done in reversible adiabatic expansion – Joule-Thomson effect, Joule-Thomson coefficient-Inversion temperature-zeroth law of thermodynamics-Absolute temperature scale.

Kirchoff's equation-Flame and explosion temperatures. Hess's law of constant heat of summation – bond energy and its calculations.

#### **Text Books:**

- 1. Jain.M.K, Principles of Organic Chemistry-Vishal publishing Co.2015.
- 2. Soni.P.L, Text Book of Inorganic Chemistry, Sultan Chand & Sons.2017.
- 3. Puri and Sharma, Text book of Inorganic Chemistry-Vishal publishing co.2015.
- 4. Madan.R.D., Inorganic Chemistry, S. Chand & Co., 2012.
- 5. Raj K. Bansal, A Text Book of Organic Chemistry, Wiley Eastern. 2012.
- 6. Singh, Mukarji and Kapoor, Organic Chemistry, Mac Millan. 2008.

#### **Reference Books:**

- 1. Maron and Lando, Fundamentals of Physical Chemistry, Collier, Mac Millan. 2005.
- 2. Castellan. G.W, Physical Chemistry, Naropa Publishing House. 2010.
- 3. Walter J. Moore, Physical Chemistry, Orient Longamann.2012.
- 4. Tiwari, Malhotra and Vishoni, Organic chemistry, Vol I and II ,Vikas Publishing House.**2015.**
- 5. Dutta, Inorganic Chemistry, Science Book Association. **2009**.

#### **Online Resources**

- 1. www.organic-chemistry.org
- 2. https://www.toppr.com/guides/chemistry/the-d-and-f-block-elements/electronic-configuration-d-block-elements/

3. https://www.khanacademy.org/science/chemistry/thermodynamics-chemistry

# **Assignments:**

- 1. General characteristics and properties of d-block elements.
- 2. Characteristic reactions of active methylene group
- 3. Types of emulsions-preparation, emulsifier

# **Group Task:**

- 1. Reduction of carbonyl group by various reagents.
- 2. Terminology of thermodynamics.
- 3. Models of Crystal structure.

#### **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB	
CO1	elements in the periodic table.	1,2,3,4,7	Remembering	
	Explain the mechanism involved in the reduction of carbonyl compounds.	1,2,3,6,8	Understanding	
CO3	Illustrate and prepare saturated and unsaturated carboxylic acids.	1,2,3,5,6	Applying	
CO4	Differentiate crystalline and amorphous solids, isotropy, and anisotropy.	1,2,3,5,7,810	Analyzing	
L CO5	Explain the terms involved in the first law of thermodynamics.	1,2,3,5,8	Applying	

# MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PS09	PSO10
CO1	S	S	S	М	-	1	L	-	-	-
CO2	S	S	S	-	-	M	-	L	-	-
CO3	S	S	S	-	L	L	-	-	-	-
CO4	S	S	S	-	M	-	М	М	-	L
CO5	S	S	S	-	M	-	-	M	-	-

S- Strong; M-Medium; L-Low

# GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM - 7

#### **B.Sc CHEMISTRY**

#### SEMESTER III

Course code	Course name	Lecture(L) Tutorial(T)		Practical(P)	Credit
22UCHS1	INDUSTRIAL CHEMISTRY	26	4	-	2

#### **Learning Objectives:**

- To learn about the cement, its manufacture and setting mechanism
- To learn about paints, its types and formulations
- To learn about the manufacture of industrial gases
- To learn about the water treatment methods

# **Unit-I Cementing Materials**

[6 Hours]

Introduction – Lime, Manufacture Lime, properties – Gypsum – Plaster - Cement manufacture of Portland Cement – Chemical composition – Wet process and dry process. Setting and hardening of cement. Cement Industries in India. Grading of cements and its importance – M-sand and P-sand.

#### **Unit-II Paints and Varnishes**

[6 Hours]

Paints and varnishes: Definition - Primary constituents of paints, dispersion medium (solvent), binder, pigments, oil based paints, latex(alkyl resins), formulation of paints and varnishes - Paint industries in India - Distemper - Enamel - Emulsion paints and Special paints - Luminescent and fire retardant paints.

Unit-III Fuels I [6 Hours]

Introduction – fossil fuels – definition and classification of fuels – Coal – classification coal based on carbon content - Petroleum - Origin, refining, Combustion

of fuels, Cracking, Knocking and Anti-knocking and octane number, LPG, synthetic gas, synthetic petrol, Fuel gases.

Unit-IV Fuels II [6 Hours]

Large scale production, storage, hazards and uses of coal gas, water gas, semi water gas, bio gas, Gobar gas, producer gas, CNG and oil gas.

#### **Unit-V Water treatment methods**

[6 Hours]

Source of water – Rain water harvesting (Basic ideas) Advantages – Hard and Soft water – methods of expressing hardness – Water treatment methods – Ion exchange, electro dialysis, reverse osmosis, softening of hard water – lime soda process – Zeolite process – Internal conditioning methods – Water supply – purification – Disadvantages of using hard water in boilers.

#### **Reference/Text Books:**

- 1. B.N. Chakrabarthy, Industrial chemistry, Oxford & IBH publishing co., New Delhi, **1981.**
- 2. B.K.Sharma, Industrial chemistry, Goel Publishing House, Meerut.2010.
- 3. P.P.singh, T.M.joseph, R.G.Dhavale, College Industrial Chemistry, Himalaya publishing House, Bombay, 4<sup>th</sup>edn.,**1983**.

#### **Online Resources:**

- 1. www.philipmarshall.net/pdf/turner\_paint\_6-9\_12.pdf
- 2. www.nzic.org.nz/ChemProcesses/polymers/10D.pdf
- 3. www.chemistryislife.com/the

#### **Assignments:**

- 1. Manufacture of Cement
- 2. Paint industries in India
- 3. Production of Petroleum

#### **Group Tasks:**

1. Collect various sample of water.

- 2. Identify the calorific value for various fuels.
- 3. Identify the composition of different type of cements and paints.

#### **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	Identify the preferred practices of cementing materials.	1,2,3,6,9,10	Remembering
CO2	Understanding the concept of paints and varnishes.	1,2,3,6,7,8,10	Understanding
603	Acquire the principles and through knowledge of fossil fuels.	1,2,3,6,7,8,10	Applying
CO4	Classify and Categorize the various types of fuels	1,2,3,4,6,8,10	Analyzing
	Outline the concept of hardness and various water treatment methods.	1,2,3,4,5,7,8,10	Analyzing

# MAPPING WITHN PROGRAMME SPECIFIC OUTCOMES

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	S	S	-	-	М	-	-	М	L
CO2	S	S	S	-	-	М	L	L	-	L
CO3	S	S	S	-	-	М	L	М	-	М
CO4	S	S	S	M	-	М	-	L	-	L
CO5	S	S	S	S	M	-	L	M	-	L

S- Strong; M-Medium; L-Low

# **GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7**

#### **B.Sc CHEMISTRY**

#### **SEMESTER III**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCHN1	CHEMISTRY IN DAILY LIFE -I	26	4	-	2

*Note:* Structure and chemical equations not required.

#### **Learning objectives:**

- To learn the water properties
- To study about dyes and fibers
- To learn the medicinal terms
- To study the food Adulterants and Indian Medicinal Plants

#### **Unit - I Water Chemistry**

[6 Hours]

Introduction, Sources of water, impurities, Hard and Soft water, Degree of Hardness, Types of Hardness, Scale and Sludge Formation in boiler and its prevention. Caustic embrittlement, softening of water, Qualities of drinking water, Break point chlorination, desalination of Brackish water - water purification – Domestic RO system – Ozone treatment.

#### **Unit II Chemistry in Fibers and Dyes**

[6 Hours]

*Fibers:* Natural fibers – cotton, wool, silk – General Characteristics, Synthetic fibers – properties and uses – Nylon 6,6- Polyester.

**Dyes:** Requirements of a dye - Classification based on mode of application to the fabric - Applications of dyes (general study). Ancient and modern colours - Example - indigo and alizarin dyes.

#### **Unit - III Pharmaceutical chemistry**

[6 Hours]

**Drug:** Chemical name, generic name and trade names with examples. Terminology: Prodrug, pharmacy, pharmacology, pharmacophore, pharmacognosy, pharmacodynamics and pharmacokinetics (elementary idea only). Antipyretics, analgesics, antacids, antihistamines, antibiotics, antiseptics, disinfectants, anaesthetics, tranquilizers, narcotics, antidepressants and psychedelic drugs (definition and examples). Side effects of Over the Counter (OTC) drugs like paracetamol, ibuprofen, diclofenac. General idea of antibiotic and antimalarial drug resistance.

#### **Unit - IV Food Chemistry**

[6 Hours]

**Common Adulterants in Different Foods:** Milk and milk products, vegetable oils, cereals, tea, coffee powder, chilly powder and beverages.

**Food Additives:** Antioxidants and food preservatives – Commonly used permitted and non-permitted food colours - Artificial sweeteners – Taste enhancers - Artificial ripening of fruits and its side effects.

**Modern Food Habits:** Definition and health effects of fast foods, instant foods, dehydrated foods and junk foods. Harmful effects of modern food habits.

Importance of milk and tender coconut.

#### **Unit - V Indian Medicinal Plants and its applications**

[6 Hours]

*Indian medicinal plants and uses* – Aloe Vera, Neem, tulsi, kilanelli, semparuthi, adathoda, nilavembu, sirianangai and thoothuvalai.

*Diabetes* – types and control of diabetes – role of insulin.

**Cancer therapy** – tumour, types and causes – use of vegetables and fruits to prevent cancer (curcumin, grape, strawberry, rosemary, tomato, tea, broccoli, ginger, saffron)

**AIDS** – causes, prevention, control and treatment.

#### **Text Books:**

- 1. B.K. Sharma, *Industrial Chemistry*, 11th Edition, Goel publishing House, Meerut, **2000**.
- 2. K.S. Tewari, N.K. Vishnoi and S.N. Mehrotra, *A Textbook of Organic Chemistry*, 2nd Edition, Vikas Publishing House (Pvt.) Ltd., New Delhi, **2004**.
- 3. Gurdeep R. Chatwal, *Synthetic Drugs*, Himalaya Publishing House, Bombay, **1995**.
- 4. Jayashree Ghosh, *A Textbook of Pharmaceutical Chemistry*, 3rd Edition, S. Chand and Company Ltd., New Delhi, **1999**.

#### **Reference Books:**

- 1. Lillian Hoagland Meyer, *Food Chemistry*, 1st Edition, CBS Publishers & Distributors, New Delhi, **2004**.
- 2. Engineering Chemistry by Jain and Jain Publisher, DhanpatRai Publishing Co. 1999.

#### **Online Resources/Tutorials:**

1. Indian materia medica https://archive.org/

#### **Assignments:**

- 1. Water purification -Domestic RO system Ozone treatment
- 2. Harmful effects of modern food habits
- 3. Cancer therapy -types and causes and tumor.

#### **Group Tasks:**

- 1. Identification and Applications of Natural dyes
- 2. Side effects of Over The Counter medicine (OTC)
- 3. Adulteration of food and its side effect.

# **COURSE OUTCOMES:**

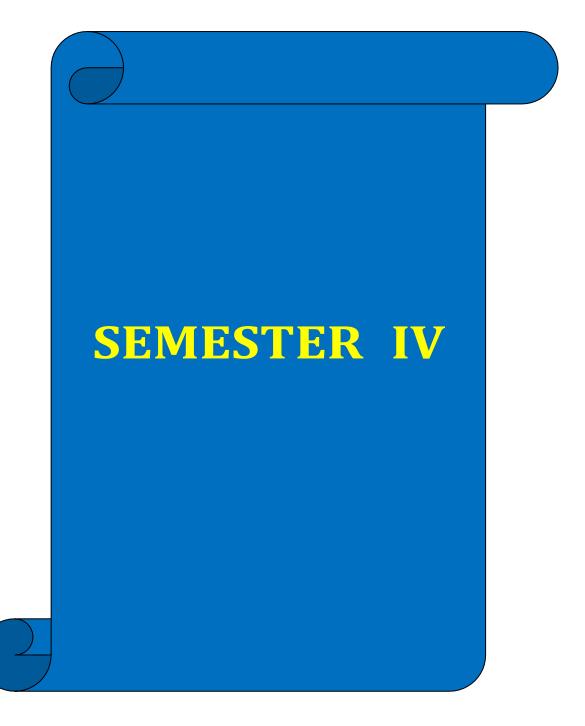
On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
	Describe the various water treatment methods and their purification.	1,2,3,4,6,8,9,10	Remembering
L02	Give examples of natural fibers and dyes.	1,2,3,8,9,10	Understanding
603	Explain the various types of drugs and the effects on OTC	1,2,3,5,8,10	Applying
CO4	Illustrate the common food adulterants and food additives.	1,2,3,6,8,10	Analyzing
	Recommended Indian medicinal plants for AIDS, Cancer, and diabetes	1,2,3,8,10	Evaluating

# MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PS08	PSO9	PSO10
CO1	S	S	S	М	-	М	-	L	L	L
CO2	S	S	S	-	-	-	-	M	М	L
CO3	S	S	S	-	M	-	-	M	-	L
CO4	S	S	S	-	-	M	-	M	-	L
CO5	S	S	S	-	-	-	-	M	-	L

S- Strong; M-Medium; L-Low



#### **B.Sc CHEMISTRY**

#### **SEMESTER IV**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCH04	GENERAL CHEMISTRY - IV	71	4	-	5

### **Learning objectives:**

- Students study about the first law of thermodynamics in previous semester and now study about the second law of thermodynamics
- To learn about the nucleus, the forces of origin, radio activity, stellar energy etc.,
- To learn about the importance of amine group in day to day life, its industrial applications and basic chemistry involved etc.,
- To study the heterocyclic chemistry, preparation properties

### **UNIT-I Nuclear Chemistry**

[15 **Hours**]

Nuclear stability-n/p ratio- nuclear forces-Exchange theory and nuclear fluid theory.Natural radioactivity – modes of decay-Geiger – Nuttall rule.Units of radioactivity – Kinetics of radioactive disintegration-Half life and average life-Radioactive equilibrium – Numerical problems.Mass defect and binding energy - Artificial transmutation and artificial radioactivity.

Nuclear fission and nuclear fusion-mechanisms-applications-differences – Stellar Energy. Application of radioactive isotopes-C-14 dating, rock dating –Numerical problems - isotopes as tracers-study of reaction mechanism (e.g. ester hydrolysis), radio diagnosis and radiotherapy. Nuclear reactors-types-common features like fuels, moderators, coolant control materials, reactor shielding-uses-Nuclear reactors in India.

## **UNIT II Heterocyclic Compounds**

[15 Hours]

Preparation, properties and uses of furan, pyrrole and thiophene and their aromatic character. Synthesis and reactions of pyridine and piperidine-comparative study of basicity of pyrrole, pyridine and piperidine with amines.

Condensed five and six membered heterocyclic compounds-preparation of indole, benzofuran, quinoline and isoquinoline-Fischer indole synthesis, Skraup synthesis and Bischer-Napieralski synthesis- Electrophilic substitution reactions.

### **UNIT III Chemistry of amines**

[15 Hours]

Aliphatic amines – separation of amines – Hinsberg's and Hoffmann methods – preparation and properties of dimethyl amine, trimethylamine, ethylene diamine and hexamethylene diamine.

Derivatives of aniline – acetanilide – N-methyl aniline and N,N'-dimethyl aniline – Preparation and properties. Diazonium compounds – diazotization mechanism - diazonium ion as a weak electrophile – preparation and synthetic uses of diazoacetic ester and diazomethane.

### UNIT-IV Second law of thermodynamics-I

[15 Hours]

Limitations of the first law-need for second law-spontaneous processes-cyclic process- Carnot cycle – Efficiency – Carnot theorem-Thermodynamic scale of temperature.

Concept of entropy-Entropy- state function-Entropy change in isothermal expansion of an ideal gas-entropy change in reversible and irreversible processes-Clausius inequality-Entropy change accompanying change of phase-calculation of entropy changes of an ideal gas with changes in P, V and T –Entropy of mixture of ideal gases-Entropy of mixing-physical significance of entropy.

#### **UNIT-V Second law of thermodynamics-II**

[15 Hours]

Work and free energy functions-Maxwell's relationships criteria for reversible and irreversible processes-Gibbs-Helmholtz equation-Partial molar free energy.

Concept of chemical potential- Gibb's Duhem equation - Chemical potential in a system of ideal gases - Duhem-Margulus equation. Clapeyron equation- Clapeyron-Clausius equation-Applications of Clapeyron-Clausius equation-concept of fugacity-Determination of Fugacity of a gas- Fugacity of a liquid component in a liquid solution-concept of activity-activity coefficient-standard states.

Nernst heat theorem-statement of III law-Evaluation of absolute entropy from heat capacity measurements-Test for the validity of the law.

### **Text Books:**

- 1. Jain.M.K, Principles of Organic Chemistry-Vishal publishing Co.2015.
- 2. Soni.P.L, Text Book of Inorganic Chemistry, Sultan Chand & Sons.2017.
- 3. Puri B.R., Sharma L.R and Pathania M.S., Principles of Physical Chemistry, 47<sup>th</sup>ed., Vishal Publishing Company, **2016**.
- 4. Madan.R.D., Inorganic Chemistry, S. Chand & Co., 2012.
- 5. Raj K. Bansal, A Text Book of Organic Chemistry, Wiley Eastern. 2012.
- 6. Singh, Mukarji and Kapoor, Organic Chemistry, Mac Millan. 2008.

### **Reference Books:**

- 1. Finar I.L. Organic Chemistry, Vol I and II ELBS.2013.
- 2. Morrison and Boyd, Organic Chemistry, Allyn and Bacon Inc.2012.
- 3. Bajapai. D.N, Advanced Physical Chemistry, S.Chand & Co., 2010.
- **4.** Gurudeep R. Chatwal, Physical Chemistry.**2010**
- **5.** Jain. S, and S.P. Jauhar, Physical Chemistry principles and problems, Tata McGraw Hill,**2010**.
- **6.** Philips and Williams, Inorganic Chemistry, Oxford University press, Vol I and II.**2008.**
- 7. Cotton and Wilkinson, Advanced Inorganic Chemistry Wiley Eastern Private Ltd. **2013.**

### **Online Resources:**

- 1. www.organic-chemistry.org
- 2. https://www.khanacademy.org/science/chemistry/nuclear-chemistry
- 3. https://www.khanacademy.org/science/chemistry/thermodynamics-chemistry

# **Assignments:**

- 1. Nuclear reactors in India.
- 2. Electrophilic substitution of Heterocyclic compounds.
- 3. Activity and Activity coefficient.

# **Group Task**

- 1. Nuclear Disasters.
- 2. Entropy of mixture of ideal gases.

# **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	POs addressed	BLOOMS VERB
CO1	List out the various applications of radioactive isotopes.	1,2,3,8,10	Remembering
CO2	Classify and illustrate the five-membered and six-membered heterocyclic compounds	1,2,3,5,8	Understanding
CO3	Prepare and explain the Aliphatic amines and Derivatives of aniline	12250	Applying
CO4	Calculate the entropy change of an ideal gas with change s, P,V and T	1,2,3,8,10	Applying
CO5	Determine the fugacity of gases and liquids.	1,2,3,8,10	Applying

# **MAPPING WITH PROGRAM OUTCOMES**

COs	PO1	PO2	PO3	PO4	P05	P06	P07	P08	P09	PO10
CO1	S	S	S	-	-	-	-	М	-	L
CO2	S	S	S	-	M	-	-	L	-	-
CO3	S	S	S	-	M	-	-	L	-	-
<b>CO4</b>	S	S	S	-	-	-	-	M	-	L
CO5	S	S	S	-	-	-	-	М	ı	L

S- Strong; M-Medium; L-Low

#### **B.Sc CHEMISTRY**

#### **SEMESTER IV**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCHS2	TEXTILE AND DYE CHEMISTRY	26	4	-	2

### **Learning objectives:**

- To learn about the fibers (both natural and synthetic) and its applications
- To learn about sizing methods and uses.
- To know about the dyes and its preparation and chemistry behind the color.
- To know about various dyeing process.

#### **Unit - I Fiber materials**

[6 Hours]

Natural fibers – cotton, wool, silk – General characteristics, synthetic fibers – Preparation, properties and applications of polyamide (Nylon 6,6) – Polyester – polyacrylonitrile– viscose fibers.

## **Unit-II Processing of Fiber**

[6 Hours]

Sizing and desizing – purpose – desizing methods. Scouring – purpose – Principle - alkali scouring, acid scouring – Kier boiling. Bleaching – Methods (Hypochlorite, peroxide and bleaching powder bleaching).

Unit-III Dyes [6 Hours]

Basic concept of dye – definition – requirement of a good dye – nomenclature of dye. Classification of dyes based on the mode of application (acid, base, direct, Natural, mordant, vat and ingrain dyes) and their structure (nitroso, azo, xanthene, anthroquinone).

## **Unit -IV Dyeing Process**

[6 Hours]

Dyeing – methods of dyeing – Direct dyeing – Vat dyeing – mordant dyeing – substantive dyeing – disperse dyeing – basic operations in dyeing. Manufacture of dye: Rhodamine B.

## **Unit-V Dye applications**

[6 Hours]

Application of the dye (for cotton fabric, for printing purpose and indigo sol process). Non-textile uses of dyes. Textile and dye effluents – characteristics, effect of untreated effluents.

## **Text Books:**

- 1. Shenai V.A An introduction to Dye stuff and Intermediates Sevak publications, Wadela, Mumbai-3.**2012**.
- 2. Abrahard E.N. Outlines of chemistry for dye stuff and Intermediates Chemical Publishing, New York.**2010**.

#### **Reference Books:**

- 1. Shenai V.A An introduction to Dye stuff and Intermediates Sevak publications, Wadela, Mumbai-3.**2012**.
- 2. Abrahard E.N. Outlines of chemistry for dye stuff and Intermediates Chemical Publishing, New York.**2010.**
- 3. Shenai V. ATechnology of textile processing,
  - a) Textile Fibre. Vol.
  - b) Techniques of Bleaching Vol. III
  - c) Principles of dyeing Vol. IV
- 4. Synthetic Organic Dyes by Chatwal and Anand.2011.

### **Assignments:**

- 1. Bleaching methods.
- 2. Requirements of Dye
- 3. Basic operations in dyeing.

## **Group Task:**

- 1. Sizing and Desizing.
- 2. ILL effects of Textile Effluents.

3. Identification of bio and non-bio Degradable plastics and polymers.

# **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	Identify the role of fiber materials in the field of the textile industry.	1,2,3,4,6,8,10	Remembering
CO2	Understanding the various concepts of processing of fiber and bleaching methods.	1,2,3,5,6,8,10	Understanding
	Acquire sound knowledge of basic concepts of dyes and its classification.	1,2,3,4,5,6,8	Understanding
CO4	Illustrate the scientific methods of dying and its basic operation.	1,2,3,4,5,6,8,10	Applying
CO5	Discuss the various applications of dyes and effects of dye effluents.	1,2,3,4,5,7,8,9,10	Understanding

# MAPPING WITH PROGRAM OUTCOMES

1-11-11			GIUII-I C							
COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	S	S	М	M	-	-	L	-	L
CO2	S	S	S	-	M	L		M	-	L
CO3	S	S	S	M	М	М	-	L	-	-
<b>CO4</b>	S	S	S	М	М	М	-	M	1	L
CO5	S	S	S	М	М	-	М	М	L	L

S- Strong; M-Medium; L-Low

#### **B.Sc CHEMISTRY**

#### **SEMESTER IV**

Course code	Course name	Lecture(L) Tutorial(T)		Practical(P)	Credit
22UCHN2	CHEMISTRY IN DAILY LIFE-II	26	4	-	2

### **Learning objectives:**

- To learn the important of fuels
- To study about agricultural
- To learn the Cleansing Agents and Cosmetics
- To study Nanotechnology and battery
- To study about Vitamins and Minerals

### **Unit - I Chemistry in Fuels**

[6 Hours]

Definition and classification of fuels – Characteristics of a good fuel – Combustion - Calorific value – Wood.

**Coal:** Classification based on carbon content – Fractional distillation products of coal and uses of various fractions. Petroleum: Origin – Fractional distillation – Different fractions, their composition and uses.

**Petrol:** Knocking - Octane number - Aviation fuel. Diesel: Cetane number. Flash point.Natural gas, biogas.

Natural gases, CNG, LPG and Methane: Composition and uses.

Pollution due to burning of fossil fuels-Solar energy and solar cells (applications only).

## **Unit - II Agricultural Chemistry**

[6 Hours]

**Fertilizers:** Essential nutrients for plants – NPK value - Natural and synthetic fertilizers - Nitrogenous, phosphatic and potash fertilizers (examples) – Impact of excessive use of fertilizers on environment – Bio fertilizers.

**Pesticides:** Classification - Insecticides, herbicides, rodenticides and fungicides (definition and examples only) - Non-degradable pesticides - Pesticide pollution and its impact on environment - Endosulfan disaster in Tamil Nadu (brief study). Pheromones.

## **Unit - III Chemistry in Cleansing Agents and Cosmetics**

[6 Hours]

**Cleansing Agents:** Soaps - Hard and soft soaps - Alkali content - TFM - Detergents (classification) - Cleaning action - Advantages and disadvantages of soaps and detergents - Shaving creams.

**Shampoos:** Ingredients and functions - Different kinds of shampoos (Antidandruff, anti-lice, herbal and baby shampoos). Tooth paste: Composition and health effects.

Cosmetics: Hair dye: Chemicals used and its harmful effects.

**Face and skin powders:** Types, ingredients and functions. Cleansing creams: Cold creams, vanishing creams and bleach creams. Perfumes, antiperspirants, Sun screen preparations, nail polishes, lipsticks, rouges, eyebrow pencils and eye liners (ingredients and functions) – Harmful effects of cosmetics.

### **Unit - IV Chemistry of Advanced Materials and Cements**

[6 Hours]

**Nanotechnology:** Introduction - Potential uses of nanomaterials in computers, sensors in textiles, mobile electronic devices and vehicles - Medical applications of nanomaterials.

**Storage cells:** Types of battery and its application.

**Cements:** Introduction, Classification of cement and properties, chemical composition of cement, standards, Manufacturing or Portland Cement, Chemistry of

Portland cement, Setting and hardening of cement, PCC and RCC.

## **Unit - V Chemistry in Vitamins and Minerals**

[6 Hours]

*Vitamins*: classification, sources, functions and deficiencies. Fat soluble vitamins (A, D, E and K), water soluble vitamins (Vitamin C and B-Complex)-Folic acid and  $B_{12}$ .

*Minerals*: Sources, bio availability, functions and deficiency of the following minerals (Calcium, Iron, Iodine, Fluorine, Sodium and Potassium).

#### **Text Books:**

- 1. B.K. Sharma, *Industrial Chemistry*, 11th Edition, Goel publishing House, Meerut, **2000**.
- 2. K.S. Tewari, N.K. Vishnoi and S.N. Mehrotra, *A Textbook of Organic Chemistry*, 2nd Edition, Vikas Publishing House (Pvt.) Ltd., New Delhi, **2004**.
- 3. Gurdeep R. Chatwal, *Synthetic Drugs*, Himalaya Publishing House, Bombay, **1995**.
- 4. Jayashree Ghosh, *A Textbook of Pharmaceutical Chemistry*, 3rd Edition, S. Chand and Company Ltd., New Delhi, **1999**.

#### **Reference Books:**

- 1. Lillian Hoagland Meyer, *Food Chemistry*, 1st Edition, CBS Publishers & Distributors, New Delhi, **2004.**
- 2. Engineering Chemistry by Jain and Jain Publisher, DhanpatRai Publishing Co,2012

## **Online Resources/Tutorials:**

1. Indian materia medica https://archive.org/

## **Assignments:**

- **1.** Knocking Octane number Aviation fuel. Diesel: Cetane number. Flash point. Natural gas
- **2.** Essential nutrients for plants NPK
- **3.** Vitamins

# **Group Tasks:**

- 1. Hair dye: Chemicals used and its harmful effects.
- 2. Identification of natural and artificial pesticides.
- 3. Identify the ingredients of face powder.

# **COURSE OUTCOMES:**

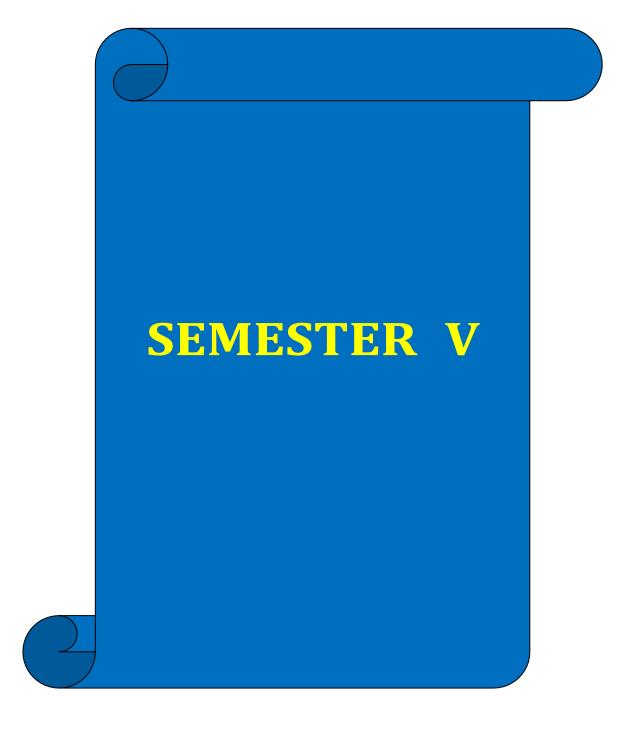
On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	Classify the fuels.	1,2,3,6,8,10	Remembering
CO2	pesticides on the environment.	1,2,3,6,8,9,10	Understanding
CO3	List out the cleansing agent and cosmetic agents and their effects.	1,2,3,4,5,6,8,9,10	Remembering
CO4	Discuss the potential uses of nanomaterial in computers, sensors, vehicles, and storage cells.		Understanding
CO5	Illustrate the sources, functions, bio- availability, and deficiency of vitamins and minerals.	1,2,3,8,9,10	Analyzing

# MAPPING WITH PROGRAM OUTCOMES

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PS09	PSO10
CO1	S	S	S	-	-	M	-	М	-	L
CO2	S	S	S	-	-	М	-	L	М	L
CO3	S	S	S	М	M	М	-	M	М	L
CO4	S	S	S	-	M	-	M	M	-	L
CO5	S	S	S	-	-	-	-	M	М	М

S- Strong; M-Medium; L-Low



#### **B.Sc CHEMISTRY**

#### **SEMESTER V**

Course code	Course name	Lecture(L)	Lecture(L) Tutorial(T)		Credit
22UCH05	INORGANIC CHEMISTRY - I	56	4	-	5

### **Learning objectives:**

- To learn the acid base concepts
- To study about the f block elements
- To learn the coordination chemistry and development through various theories
- To study the reactions of coordination compounds

# UNIT-I Concept of acids, bases and Non aqueous solvents [12 Hours]

Acids and Bases: Arrhenius theory - Concepts of Lewis, Bronsted-Lowry, Lux-Flood and Usanovich concept - Relative strength of acids and bases - Effect of solvent-Leveling effect.

Hard and Soft Acids and Bases-classification of acids and bases as hard and soft – examples-Pearson's HSAB principle, acid-base strength, hardness and softness, Symbiosis, theoretical basis of hardness and softness, electronegativity and hard and soft species. Applications of HSAB principle.

Non-aqueous solvents - physical properties of a solvent, types of solvents and their general characteristics. Reactions in non-aqueous solvents with reference to  $liq.NH_3$  and  $liq.SO_2$  Comparison.

### **UNIT-II** Chemistry of d and f-block elements

[12 Hours]

Chemistry of transition elements -electronic configuration -group study of Titanium, Vanadium, Chromium, Manganese and Iron metals -comparative study of

Zinc group metals –Important uses of transition metals and their alloys. Horizontal comparison with Fe, Co, Ni groups –toxicity of Cd and Hg –oxides, mixed oxides, halides and oxo-halides of transition metals –synthesis and reactivity of chromates, dichromate, manganate, permanganate –polycations –Interstitial compounds – Borides of Ti, V, Cr, W and their industrial uses.

General characteristics of f-block elements –comparative account of lanthanides and actinides –lanthanide series –separation by ion exchange and solvent extraction methods –lanthanide contraction –actinide series –separation of actinides –oxidation states and general properties – Uranium – occurrence and metallurgy – chemical properties of its oxides, hydrides and halides.

# **UNIT-III Coordination Chemistry -Introduction**

[12 Hours]

Definition of the terms - Classification of ligands - Nomenclature of coordination complexes -chelating ligands and chelates -chelate effect. Coordination Number and stereochemistry of complexes. Werner's theory-conductivity and precipitation studies - Sidgwick's theory-Effective Atomic Number concept.

Isomerism in complexes-Structural Isomerism-types. Stereoisomerism-Geometrical isomerism in 4 and 6 coordinated complexes-methods to distinguish between Cis-and Trans-isomers Optical isomerism in 4-and 6-coordinated complexes-Resolution of racemic mixtures. Stability of complexes-thermodynamic and kinetic stability-definition-Stepwise and overall stability constants – Factors affecting the stability of complexes.

#### **UNIT-IV Coordination Theories**

[12 Hours]

Theories of bonding in complexes - Valence Bond Theory - Postulates - Hybridization and geometries of complexes-Outer orbital and inner orbital octahedral complexes. Square planar and tetrahedral complexes -V.B. Theory and magnetic properties of complexes-limitations of V.B. Theory.

Crystal Field Theory (CFT): Postulates, d-orbital splitting in octahedral, tetrahedral and square planar complexes-strong and weak ligands-spectrochemical series-High spin and low spin complexes-CFT and magnetic properties of complexes-

Crystal Field Stabilization Energy (CFSE) -Calculation of CFSE values of  $d^1$  to  $d^{10}$  Octahedral and Tetrahedral complexes- CFT and colour of complexes-limitations of CFT -comparison between VBT and CFT.

# UNIT-V Reaction Mechanism and Application of Complexes [12 Hours]

Substitution reactions in square planar complexes-Trans effect – Series and theories of Trans effect - polarization theory and  $\pi$ -bonding theory- uses.

Application of coordination compounds in Qualitative and Quantitative analysis-separation of Copper and Cadmium ions, Cobalt and Nickel ions-Identification of Cu, Fe, and Ni. Complexometric Titrations - Principles and Titrations using EDTA. EDTA -Applications- Sequesterisation, Estimation of metals, hardness of water.

#### **Text Books:**

- 1. Cotton and Wilkinson, Advanced Inorganic Chemistry Wiley Eastern Private Ltd.2013.
- 2. Manku.G.S., Inorganic Chemistry Tata Mcgraw Hill.2010.
- 3. Soni.P.L, Text Book of Inorganic Chemistry, Sultan Chand & Sons.2017.
- 4. Puri and Sharma, Text book of Inorganic Chemistry-Vishal publishing co.2017.
- 5. Madan.R.D., Inorganic Chemistry, S. Chand & Co., **2012.**
- 6. Dutta, Inorganic Chemistry, Science Book Association. 2009.
- 7. Madan Tuli, Wahit Tuli, Malik, Modern Inorganic Chemistry, Sultan Chand & Sons. 2019.

#### **Reference Books:**

- 1. Cotton and Wilkinson, Advanced Inorganic Chemistry Wiley Eastern Private Ltd.2013.
- 2. James E.Huheey Inorganic Chemistry, 2009.
- 3. Keith F. Purcell, John C. Kotz, An Introduction to inorganic chemistry,

#### **Online Resources:**

https://chem.libretexts.org/Bookshelves/Inorganic\_Chemistry/Book%3A\_Introduction\_to\_Inorganic\_Chemistry

2. https://nlist.inflibnet.ac.in

## **Assignments:**

- 1. Different types of acid base concepts.
- 2. Types of splitting d orbitals and CFSE value of d<sup>n</sup> configuration.
- 3. Applications of co-ordination complexes.

# **Group Tasks:**

- 1. Demonstration of Lewis concept of acid and base.
- 2. EDTA application in water treatment.
- 3. Validate the colour of the complexes.

## **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
COT	State the various theories behind the acid-base concept.	1,2,3,4,5,6,8,10	Remembering
CO2	Discuss the general characteristics of lanthanides and actinides.	1,2,3,7,8,9,10	Understanding
CO3	Explain the structural and stereo isomerism in four and six coordination complexes.	1,2,3,	Understanding
CO4	Calculate the CFSE values of $d^n$ in Oh and Td complexes.	1,2,3,4,5	Applying
CO5	Outline the theories of trans effect in substitution reactions.	1,2,3,5,8	Analyzing

# MAPPING WITH PROGRAM OUTCOMES

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	S	S	М	М	M	-	L	-	L
CO2	S	S	S	1	-	-	M	M	L	L
CO3	S	S	S	-	-	-	-	-	-	-
CO4	S	S	S	L	М	-	-	-	-	-
CO5	S	S	S	-	M	-	-	L	-	-

S- Strong; M-Medium; L-Low

#### **B.Sc CHEMISTRY**

#### **SEMESTER V**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCH06	ORGANIC CHEMISTRY - I	56	4	-	5

## **Learning objectives:**

- To understand about stereo chemistry, symmetry elements, optical activity andConformational analysis of acyclic and cyclic compounds.
- To know the (i) Methods of synthesis of aldehydes, ketones and carboxylic acids (ii) Mechanism of nucleophilic reactions and (iii) oxidation-reduction reactions.
- To know the preparation, properties and applications of N-containing compounds and proteins.
- To study about the basic concepts of Steroids, Hormones., characteristic features, preparation and reaction of Biochemistry

### Unit-I Stereo isomerism - I

[12 Hours]

Elements of symmetry - Definition-Classification - Optical and Geometrical isomerism - Optical activity-Optical and Specific rotations-conditions for optical activity-asymmetric Centre-Chirality-achiral molecules-meaning of (+) and (-) and D and L notations.

Projection formulae of Fischer, Flying Wedge, Sawhorse and Newmann - Notation of optical isomers- Cahn-Ingold-Prelog (CIP) rules – R, S notations for optical isomers with one and two asymmetric carbon atoms - erythro and threo representations.

Racemization-methods of racemization (by substitution and tautomerism) - Resolution-methods of resolution (mechanical, seeding, biochemical and conversion to

diastereoisomers)- Asymmetric synthesis (partial and absolute synthesis) Walden inversion. Optical activity of allenes, spiranes and biphenyls.

#### Unit-II Stereo Isomerism - II

[12 Hours]

Geometrical isomerism – nomenclature of geometrical isomers – cis/trans, E-Z notation and syn-anti for C=C, C=N compounds- Methods to assign configurations - Stability of geometrical isomers and heats of hydrogenation.

Conformational Analysis - dihedral angle, torsion angle, eclipsed, staggered, gauche and anti; energy barrier of rotation - potential energy diagram. Relative stability of conformers on the basis of steric effect, dipole-dipole interaction, H-bonding -Conformational analysis of ethane, propane, n-butane, haloethane, 1,2-dihaloethane, 1,2-glycol and 1,2-halohydrin, cyclopentane, cyclohexane and mono substituted cyclohexanes. Conformers of mono and 1,2 1,3 and 1,4 disubstituted cyclohexanes-Conformation and stereochemistry of Cis and Trans decalins.

## **Unit-III Carbonyl Compounds and their Derivatives**

[12 Hours]

Common methods for the synthesis of aldehydes and ketones - synthesis of aldehydes from acid chlorides, Stephen's reduction - Gattermann-Koch and Etard reactions - synthesis of ketones from nitriles. Mechanism of nucleophillic additions to carbonyl group - addition of alcohols, thiols, sodium bisulfite, condensation with ammonia and its derivatives - Perkin, Benzoin and Knoevenagel condensations, Wittig reaction. Oxidation by Tollen's reagent,  $KMnO_4$ , hypohalite,  $SeO_2$  and peracids. Reduction by  $H_2/Ni$ ,  $H_2$ -Pd-C, Rosemund reduction.

 $\alpha$ ,  $\beta$  unsaturated aldehydes and Ketones – preparation and reactions. Preparation of mono carboxylic acids, acidity of carboxylic acids, effects of substituents on acid strength, acidity of aliphatic vs aromatic acids. Reactions of carboxylic acids - Hell-Volhard-Zelinsky reaction, Synthesis of acid chlorides, esters and amides, Reduction of carboxylic acids, methods and mechanism of decarboxylation.

Methods of preparation and chemical reactions of a) halo acids b) Hydroxy acids - malic, tartaric and citric acids.Reactivity of carboxylic acid derivatives - acid

chlorides, esters, amides and anhydrides - Mechanisms of esterification and hydrolysis (acid and base catalyzed reactions) - Relative stability of acyl derivatives - interconversion of acid derivatives by nucleophilic acyl substitution. Synthesis of active methylene compounds - diethyl malonate and ethyl acetoacetate.

### **Unit-IV Nitrogen Containing Compounds**

[12 Hours]

Preparation of nitroalkanes and nitroarenes - Chemical reactions of nitroalkanes and nitroarenes - reductions in acidic, neutral and alkaline media. Methods of preparation of alkyl and aryl amines - Gabriel phthalimide reaction and Hofmann reaction - Structural features effecting basicity of amines - basicity of aliphatic and aromatic amines - reactions of amines.

Amino acids-classification- Essential and non-essential amino acids-preparation of alpha amino acids-glycine, alanine and tryptophan-General properties of amino acids-Zwitter ions, isoelectric point. Peptides-synthesis - Bergmann method-structure determination of polypeptides-end group analysis.

Proteins-classification based on physical and chemical properties and on physiological functions-primary and secondary structure of proteins-helical and sheet structures (elementary treatment only) – Denaturation of proteins.

## **Unit-V Biochemistry**

[12 Hours]

**Vitamins and antibiotics:** Vitamins-occurrence and biological importance of Vitamin A, Thiamine, Riboflavin, Pyridoxin and Ascorbic acid. – Synthesis and structural elucidation of thiamine, pyridoxin and ascorbic acid. Antibiotics-structural elucidation of penicillin G and chloromycetin.

Ureides-classification-pyrimidines-thymine, uracil and cytosine-purinesadenine and guanine – synthesis (structural elucidation not necessary).

Nucleic acids-structures of ribose and 2-deoxyribose- DNA and RNA – their components – Biological functions of nucleic acids-Elementary ideas on replication and protein synthesis. Steroids and Hormones: definition - classification - Occurrence, structure and physiological activities of cholesterol, estrogens and testosterone.

#### **Text Books:**

- 1. R. T. Morrison and R. N. Boyd, S.K. Dhacharjee Organic Chemistry, 7th edition, prentice hall, **2018**.
- 2. I.L. Finar, Organic Chemistry Vol-2, 6th edn, Pearson Education Asia, 2011.
- 3. P.S.Kalsi, Stereochemistry conformation and mechanism, New age international, Multi colour edition **2019**.
- 4. Arun Bahl and B.S. Bahl, A Text Book of Organic Chemistry, 22ndedn, S.Chand & Company, **2016**.
- 5. D.Nasipuri, Stereochemistry of Organic compounds principles and applications, New age international, 4<sup>th</sup> edition **2020**.
- 6. G.Marc loudan, Organic Chemistry, 5th edition, Roberts and company, **2009**.

#### **Reference Books:**

- 1. I.L. Finar, Organic Chemistry Vol-2, 6th edn, Pearson Education Asia, 2011.
- 2. Ernest L. Eliel, Samuel H. Wilen, and Lewis N. Mander. Stereochemistry of Organic Compounds. New York: Wiley, **2010**.
- 3. F A Carey and R J Sundberg, Advanced Organic Chemistry, Part A: Structure and Mechanisms, 5th edition, Springer, **2007**.
- 4. P.S.Kalsi, Stereochemistry conformation and mechanism, New age International, Multi colour edition **2019**.
- 5. P. Y.Bruice, Organic Chemistry, Vol-1 & 2, 8<sup>th</sup> edn, Pearson Education Asia, **2016.**
- 6. J.Clayden, N. Greeves, S. Warren, Organic Chemistry, 2ndedn, Oxford, 2013.
- 7. D.Nasipuri, Stereochemistry of Organic compounds principles and applications, New age international, **2008**
- 8. G.Marc loudan, Organic Chemistry, 5th edition, Roberts and company, 2009

# **Online Resources/Tutorials:**

- 1. https://edu.rsc.org/teacher-pd/in-person/rates-of-reaction-chemistry/classroom-resources
- 2. http://www.i-aps.org/photochemistry\_links.asp

# **Assignments:**

- 1. Optical activity of allenes, spiranes and biphenyls.
- 2. Structure of DNA and RNA.
- 3. Conformational analysis ethylene glycol and chlorohydrin.

# **Group Tasks:**

- 1. Demonstrate sawhorse/Newman projections.
- 2. Arrange the aliphatic and aromatic amines.
- 3. Validate the importance of estrogen and testosterone.

## **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	Define and identify the Optical and Geometrical isomerism, D and L notations and <i>R, S</i> notations.	1,2,3,4,5,8	Remembering
L02	Explain the nomenclature of geometrical isomers and Conformational Analysis.	1,2,3,8	Understanding
CO3	Discuss the preparation and reactions of $\alpha,\beta$ unsaturated aldehydes, and ketones.	1,2,3,6,8,10	Understanding
CO4	Categorize the Preparation of nitroalkanes, nitroarenes, amino acids and Proteins.	1,2,3,4,5,6,8,9,10	Analyzing
CO5	Predict the biological importance of vitamins and nucleic acids.	1,2,3,7,8,9,10	Applying

# MAPPING WITH PROGRAM OUTCOMES

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PS09	PSO10
CO1	S	S	S	M	M	-	-	L	-	-
CO2	S	S	S	-	-	-		M	-	1
CO3	S	S	S	-	-	М	-	M	-	L
CO4	S	S	S	M	M	М	-	M	М	L
CO5	S	S	S	-	-	-	M	L	М	L

S- Strong; M-Medium; L-Low

#### **B.Sc CHEMISTRY**

#### **SEMESTER V**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCH07	PHYSICAL CHEMISTRY - I	56	4	-	5

## **Objectives:**

- To learn solutions and Colligative properties and Thermodynamic derivation.
- To learn equilibrium constants,the phenomenon of adsorption and its applications.
- To study the fundamental of chemical kinetics and concept of activation energy
- To understand various types of photochemical process and the laws of photochemistry.
- To learn the kinetics of photochemical reactions, Collision theory of reaction rates and Kinetics theory of molecular reaction.

#### UNIT-I SOLUTIONS AND COLLIGATIVE PROPERTIES

[12 Hours]

Solutions of gases in liquids – Henry's law- solutions of liquids in liquids-Raoult's law-Binary liquid mixture-ideal solution-deviation from ideal behaviour-Thermodynamics of ideal solutions-V.P-Composition curves, V-P-temperature curves - Azeotropic distillation.

Nernst's Distribution law - Thermodynamic derivations - applications. Solvent extraction.

Thermodynamic derivation of elevation of boiling point and depression in freezing point - van't Hoff factor - Abnormal molecular mass - Degree of dissociation and association.

## UNIT-II CHEMICAL EQUILIBRIUM AND ADSORPTION

[12 Hours]

Thermodynamic derivation of equilibrium constants - Kp, Kc and Kx-Relations between Kp, Kc and Kx-Standard free energy change - Derivation of van't Hoff reaction isotherm.

De Donder's treatment of chemical equilibria - concept of chemical affinity (no derivation)-Temperature dependence of equilibrium constant - van't Hoff isochore - Pressure dependence of equilibrium constant.

Adsorption - Physical and chemical adsorption - Types of adsorption isotherms-Freundlich adsorption isotherm - Langmuir adsorption isotherm (with derivation) -BET isotherm (postulates only) BET equation (statement) - Determination of surface area and pore size -Applications of adsorption.

#### UNIT-III CHEMICAL KINETICS-I

[12 Hours]

Derivation of rate constant of a second order reaction (same and different initial concentrations of reactants) and experimental determination - Derivation of rate constant of a third order reaction (same initial concentrations only).

Methods of determining the order of a reaction - Experimental methods in the study of kinetics - volumetry, manometry, polarimetry and colorimetry.

Kinetics of fast reactions by temperature jump method (no derivation) - Effect of temperature on reaction rates-Derivation of Arrhenius equation-concept of activation energy-determination of Arrhenius frequency factor and energy of activation.

## UNIT-IV CHEMICAL KINETICS-II

[12 Hours]

Collision theory of reaction rates - Derivation of rate constant of a bimolecular reaction from collision theory - Failures of CT.Lindemann theory of Unimolecular reactions.

Theory of Absolute Reaction Rates - Thermodynamic derivation of rate constant for a bimolecular reaction based on ARRT-comparison between ARRT and CT. Significance of free energy of activation and entropy of activation.

Kinetics of complex reactions of first order opposing, consecutive and parallel reactions-examples with mechanism (no derivation) – Basic principles of Fast reaction.

#### **UNIT -V PHOTOCHEMISTRY**

[12 Hours]

Laws of photochemistry - Grothus-Drapper law - Stark-Einstein law of photochemical equivalence - Quantum efficiency - determination of quantum efficiency - consequence of light absorption - Jablonski diagram - radiative and non-radiative transitions - photochemical reactions - kinetics of photochemical combination of  $H_2$ - $Cl_2$ ,  $H_2$ - $Br_2$  and decomposition of H -photolysis of aldehyde and ketone (Mechanism only)

Energy transfer in photochemical reactions –photosensitization - photosynthesis in plants – Theory of Fluorescence and Phosphorescence–Chemiluminescence and bioluminescence. Lasers-uses of lasers.

#### **Text Books:**

- P.W. Atkins, J. D. Paula Elements of Physical Chemistry, Oxford University Press,2015
- 2. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, 46<sup>th</sup> Edition, Vishal Publishing Company, New Delhi, **2013**.
- 3. P.L. Soni, O.P. Dharmaha and U.N. Dash, Textbook of Physical Chemistry, **23rd** Edition, Sultan Chand & Sons, New Delhi, **2011**.
- 4. R.L. Madan, G. D. Tuli, Physical Chemistry, S. Chand, Revised edition, 2014

#### **Reference Books:**

- 1. Glasstone.S, Text Book of Physical Chemistry, Mac Millian.2015.
- 2. Maron and Lando, Fundamentals of Physical Chemistry, Collier, Mac Millan.**2015**
- 3. Gurudeep R. Chatwal, Physical Chemistry. 2010.
- 4. Jain. S, and S.P. Jauhar, Physical Chemistry principles and problems, Tata McGraw Hill. **2015.**
- 5. Laidler.K.J, Chemical Kinetics, Harpet and Row New York.2009.

- 6. Banwell, Fundamentals of Molecular spectroscopy Tata McGraw Hill. 2006.
- 7. Kundu and Jain, Physical Chemistry, S. Chand. 2010.
- 8. Nagi and Anand, Physical Chemistry Wiley Estern. 2011.
- 9. Latham.J.L, and Burgess.A.E, Chemical Kinectics, Butler worth.2005.

## **Online Resources/Tutorials:**

- 1.https://edu.rsc.org/teacher-pd/in-person/rates-of-reactionchemistry/classroom-resources
- 2. http://www.i-aps.org/photochemistry\_links.asp

### **Assignments:**

- 1. Thermodynamic derivation of elevation of boiling point and depression in freezingpoint.
- 2. Kp, Kc and Kx-Relations between Kp, Kc and Kx.
- 3. Kinetics of complex reactions of first order opposing, consecutive and parallel reactions-examples with mechanism.

## **Group Tasks:**

- 1. Recent applications of BET isotherm.
- 2. Recent applications of Laser.
- 3. Identify the uses of bioluminescence, phosphorescence and fluorescence in daily life.

# **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	Memorize the concept of solution of gases in liquids.	1,2,3,7,8,9,10	Remembering
002	Understand the concept of chemical equilibrium, adsorption and its applications.	1,2,3,4,5,8	Understanding
CO3	Deduce the rate constant of second order and third order reaction.	1,2,3,4,8	Analyzing
CO4	Compare ARRT and CT of reaction rate.	1,2,3,5	Analyzing
	Differentiate fluorescence and phosphorescence, chemiluminescence, and bioluminescence.	1,2,3,4,5,7,8,9,10	Analyzing

# **MAPPING WITH PROGRAM OUTCOMES**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	S	S	-	-	-	M	M	L	L
CO2	S	S	S	М	M	-	-	L	-	-
CO3	S	S	S	М	-	-	-	L	-	-
CO4	S	S	S	-	L	-	-	-	-	-
CO5	S	S	S	М	L	-	L	M	М	L

S- Strong; M-Medium; L-Low

#### **B.Sc CHEMISTRY**

#### **SEMESTER V**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCHM1	SPECTROSCOPY	56	4	-	4

## **Learning objectives:**

- To study various spectral techniques.
- To learn the principles and applications of spectroscopy.
- Learn to interpret simple spectroscopic data to information.
- To know the mass determining technique.
- Learn to Identify and estimation of metals.

## **UNIT I Spectrophotometric and Colorimetric analysis**

[12Hours]

General Introduction- Electromagnetic radiation. **UV-Visible spectroscopy** — Beer-Lambert's law – Instrumentation – spectrophotometer – block diagram with description of components – Types of electronic transitions – chromophore and auxochromes – absorption bands – factors affecting  $\lambda_{max}$  and intensity – applications. **Colorimetry** – principle –photoelectric colorimeter –estimation of Cu, Fe and Ni.

### **UNIT II Infrared and Raman Spectroscopy**

[12 Hours]

**Infrared spectroscopy** – Theory –Instrumentation – block diagram with description of components – sampling techniques – Hookes law - stretching and bending vibrations –vibrational frequencies – finger print region – Degrees of freedom - vibrational modes of  $H_2O$  and  $CO_2$  – study of hydrogen bonding. Interpretation of IR spectra of Acetone, Anisole, Benzaldehyde, Ethyl acetate, Ethyl amine, Ethyl bromide, Toluene and Isopropyl phenyl ketone.

**Raman Spectroscopy** – Rayleigh and Raman scattering – stoke and antistoke lines instrumentation – block diagram – differences between IR & Raman spectroscopy –applications.Mutual exclusion principle – applications.

## UNIT III<sup>1</sup>H-NMR Spectroscopy

[12 Hours]

**NMR spectroscopy** – principle of nuclear magnetic resonance – basic instrumentation –number of signals –chemical shift – shielding and deshielding –spin –spin coupling and coupling constants –TMS as NMR standard – interpretation of NMR spectra of simple organic compounds such as Acetone, Anisole, Benzaldehyde, Ethyl acetate, Ethylamine, Ethyl Bromide, Toluene and Isopropyl phenyl ketone.

## **UNIT IV Mass Spectroscopy**

[12 Hours]

**Mass spectroscopy** – basic principles – instrumentation – molecular ion peak, base peak, metastable peak, isotopic peak and their uses. Nitrogen rule – ring rule – fragmentation –Mclafferty rearrangement –Interpretation of mass spectra of simple organic compounds such as Acetone, Anisole, Benzaldehyde, Ethyl acetate, Ethylamine, Ethyl bromide, Toluene and isopropyl phenyl ketone.

## **UNIT V Absorption and Emission Spectroscopy**

[12 Hours]

**Atomic Absorption spectroscopy** - Principle, Instrumentation and applications. **Flame photometry** – Principle, Instrumentation, and applications.

**Photo electron spectroscopy**- Principle, PES of diatomic molecules and poly atomic molecules (HCl, HBr, HI, CO, NH<sub>3</sub>, and H<sub>2</sub>O), Core electron PES, X-ray photoelectron spectroscopy (ESCA) applications.

#### **Text Books:**

- 1. William Kemp, Organic Spectroscopy ELBS.2008
- 2. Sharma.Y.R, Elementary Organic Spectroscopy, Principles and applications-S. Chand & Co., **2015**
- 3. Gopalan.R,Subramaniam.P.S, and Rengarajan.K, Elemants of Analytical Chemistry Sultan Chand & Sons.**2016.**

#### **Reference Books:**

- 1. William Kemp, Organic Spectroscopy ELBS. 2008.
- 2. Ramachandra Sastry.A, Analytical Chemistry K.C.S. Desikan & Co.2010.

### **Online Resources:**

- 1. https://onlinecourses.nptel.ac.in/noc20\_cy08/preview
- 2. https://nptel.ac.in/courses/104/102/104102213/

# **Assignments:**

- 1. Interpretation of IR and NMR.
- 2. Application of UV spectra.
- 3. Fragmentation of Mass spectra.

# **Group Task:**

- 1. Demonstration of photo electric colorimeter in recent applications.
- 2. Demonstration of AAS in gold evaluation.

# **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. No.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	Describe the Beer-Lambert's law chromophore and auxochromes.	1,2,3,5,8,9,10	Remembering
CO2	Interpret IR spectra and Raman spectra of simple organic molecules.	1,2,3,4,5,6,7,8,9	Applying
CO3	Calculate the number of signals in NMR spectra of simple organic compounds.	1,2,3,4,5,6,7,8,9	Applying
CO4	Outline the basic principles of Mass spectroscopy nitrogen rule, ring rule and fragmentation of Mclafferty rearrangement.	1,2,3,4,5,6,7,8,9	Analyzing
CO5	Analyze photoelectron spectra of diatomic and polyatomic molecules.	1,2,3,4,5,6,7,8,9	Analyzing

### MAPPING WITH PROGRAM OUTCOMES

1-11-11	MATTING WITH TROUKAM OUTCOMES									
COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	S	S	-	L	-	-	М	М	L
CO2	S	S	S	М	L	М	L	М	L	-
CO3	S	S	S	L	M	L	M	L	L	-
CO4	S	S	S	М	М	М	М	L	L	-
CO5	S	S	S	М	М	L	L	L	L	-

S- Strong; M-Medium; L-Low

#### **B.Sc CHEMISTRY**

#### **SEMESTER V**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCHM2	NUCLEAR AND RADIATION CHEMISTRY	56	4	-	4

### **Learning objectives:**

- To study the general characteristic of radioactive elements.
- To study the types of nuclear reactors
- To study the measurement of the radioactivity
- To study the elementary ideas of radiation chemistry
- To study the radioactive isotopes and its applications

#### **UNIT - I Structure of Nucleus**

[12 Hours]

Nucleus and its classification, nuclear forces, nuclear stability, binding energy, nuclear models. Radioactive decay (Radioactive elements, general characteristics of radioactive decay, decay kinetics - decay constant, half-life, mean life period), units of radioactivity, Transient and secular equilibria, Carbon dating and its usefulness.

#### **UNIT - II Nuclear Reactions**

[12 Hours]

Nuclear reactions: Bethe notation, types of nuclear reactions (n, p,  $\alpha$ ,  $\beta$  and  $\gamma$ ), conservation of quantities (mass-energy and linear momentum) in nuclear reactions, reaction cross-section, compound nucleus theory and nuclear reactions. Nuclear fission: the process, fragments, mass distribution, and fission energy.

# UNIT - III Detectors [12 Hours]

Measurement of radioactivity, idea about accelerator and detectors, Van de Graaf and linear accelerators, synchrotrons, Geiger-Muller detector, Scintillation detectors, Type of nuclear reactions, Nuclear fission, Nuclear fusion, Nuclear reactor:

classification of reactors, the natural uranium reactor, breeder reactor. Nuclear fusion and stellar energy.

## **UNIT - IV** Radiation Chemistry

[12 Hours]

Radiation chemistry: Elementary ideas of radiation chemistry, radiolysis of water and aqueous solutions, unit of radiation chemical yield (G-value), radiation dosimetry (Fricke's dosimeter), units of radiation energy (Rad, Gray, Rontgen, RBE, Rm, Sievert).

### UNIT - V Nuclear Pollution and Radiological Safety

[12 Hours]

Nuclear pollution and Radiological safety: Interaction of radiation with matter, Radiolysis of water, Radiation dosimetry. Radioactive isotopes and their applications, Isotopic dilution analysis, Neutron activation analysis, disposal of nuclear waste, nuclear disaster and its management (nuclear accidents and holocaust – discussion about case studies)

## **Recommended Books/references:**

- 1. Friendlander G, Kennedy G and Miller J. M. Nuclear and Radiochemistry, Wiley Interscience, 2008
- 2. Harvey, B. G. Introduction to Nuclear Physics & Chemistry, Prentice Hall, 2010
- 3. Overman R. T, Basic concept of Nuclear Chemistry, Chapman & Hall. 2009.
- 4. A. N. Nesmeyanov, Radiochemistry, MIR Publication, Moscow. 2008
- 5. Spinks J. W. T. and Woods R. J. An Introduction to Radiation Chemistry, Wiley, **2010**
- 6. Arnikar H. J., Essentials of Nuclear Chemistry, Wiley Eastern, Second Edition.**2012**.

## **Online Resources:**

- 1. https://nptel.ac.in/courses/115/104/115104043/
- 2. https://onlinecourses.nptel.ac.in/noc20\_me40/preview

# **Assignments:**

1. Radioactive decay and Group displacement.

- 2. Radiation dosimetry
- 3. Radioactive isotopes and their application

# **Group Task:**

- 1. Calculate the half-life and mean life period
- 2. Identify the different type of Nuclear reactor in India

# **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	Recall the radioactive decay.	1,2,3,4,6,7,8,10	Remembering
CO2	Discuss the types of nuclear reactions.	1,2,3,4,6,7,8,10	Understanding
CO3	Explain the accelerator and detectors.	1,2,3,5,8,9,10	Applying
	Illustrate an elementary idea of radiation chemistry and radiolysis of water.	1,2,3,8,9,10	Analyzing
CO5	Analyze nuclear pollution of radiological sagety.	1,2,3,6,7,8,9,10	Analyzing

# **MAPPING WITH PROGRAM OUTCOMES:**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PS09	PSO10
CO1	S	S	S	М	-	M	L	L	-	L
CO2	S	S	S	М	-	M	M	M	-	L
CO3	S	S	S	-	M	-	-	L	L	L
CO4	S	S	S	-	-	-	-	M	М	L
CO5	S	S	S	-	-	М	M	М	L	L

S- Strong; M-Medium; L-Low

#### **B.Sc CHEMISTRY**

#### **SEMESTER V**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCHM3	PHARMACEUTICALL CHEMISTRY	56	4	-	4

### **Learning objectives:**

- To learn the basics of pharmaceutical chemistry and the terms involved in it.
- To study the antibiotics and sulphadrugs, their role and mechanism of disinfection
- To study the analgesics and antipyretics, their role and mechanism of disinfection
- To learn the nerve stimulants and anticancer drugs

UNIT-I Introduction [12 Hours]

Definition of the terms – drug, pharmacophore, Pharmacopeia, pharmacology, bacteria, virus, vaccine, actinomycetes, metabolites, antimetabolites, Lethal Dose -50, Effective Dose -50.

Therapeutic index – their use in selecting drugs – Assay of drugs – Chemical and biological assays.

Action of drugs – actions at cellular, extracellular sites. Steroid hormone receptors, COX to inhibitors. Metabolism of drugs – oxidation, reduction, hydrolysis, and conjugation.

### **UNIT-II Sulpha drugs and Antibiotics**

[12 Hours]

Sulphonamides-mechanism and action of sulphadrugs – preparation and uses of sulphadiazine, sulphathiazole, sulphapyridine and sulphafurazole.

Antibiotics –definition – classification as broad and narrow spectrum antibiotics –penicillin, ampicillin, erythromycin, chlorampenicol, tetracycline –structure and mode of action only – SAR of Chlorampenicol. Indian medicinal plants and uses – Aloe vera, Papaya, Neem, tulasi, kilanelli, semparuthi, adathoda, nilavembu, sirianangai and thoothuvalai,

## **UNIT-III Analgesics and Antipyretics**

[12 Hours]

Analgesics – Definition and actions, narcotic and non-narcotic analgesics – Structure, pharmacological action and uses of Morphine and its derivatives(heroin, codeine), synthetic analgesics – pethidine and methodone – SAR of morphine.

Antipyretic analgesics – Preparation, structure and uses of salicylic acid derivatives – (methyl salicylate, aspirin), p-aminophenol derivatives (paracetamol, phenacetin) and ibuprofen.

## **UNIT-IV Antiseptics and Anesthetics**

[12 Hours]

Antiseptics and disinfectants –definition and distinction – phenol co-efficient-Structure and uses of phenolic compounds(Cresols, thymol) – Chlorinated compounds(chlorhexidine, chloroxylenol), dyes (crystal violet, acridine), cationic surfactants (benzalkonium chloride), formaldehyde and nitrofurazone.

Anaesthetics –definition –classification –local and general –volatile, nitrous oxide, ether, choloroform, cyclopropane –uses and disadvantages –nonvolatile – intravenous – thiopental sodium, methohexitol - local anaesthetics –cocaine and benzocaine - Antianaemic drugs – Iron containing drugs, vitamin  $B_{12}$  and folic acid – mode of action.

### **UNIT-V CNS, Diabetes and Cancer drugs**

[12 Hours]

Drugs affecting CNS – definition, examples for tranquilisers, sedatives, hypnotics, psychotogenic drugs –chlorpromazine and its derivatives, barbitone.

Diabetes – types and control of diabetes – role of insulin -hypoglycemic agents – sulphonyl urea, biguanides.

Cancer therapy –tumer, types and causes - mode of action of thiodopa, cyclophosphoramide, cisplatin, 5-flurocil, use of phytochemicals in cancer therapy – Taxol, Vincrystin. AIDS – causes, prevention, control and treatment.

### **Text Books:**

- 1. Chatwal, Organic Pharmaceutical Chemistry. 2010.
- 2. Jayashree Ghosh, S, Pharmaceutical Chemistry Chand & Co., 2012
- 3. Chatwal, Inorganic Pharmaceutical Chemistry. 2009.

### **Reference Books:**

- Singh.H and Kapoor.V.K, Vallabh Prakashan Organic Pharmaceutical Chemistry – New Delhi.2008
- 2. Bentley and Drivers, Pharmaceutical Chemistry. 2010
- 3. Allion Chidambaram, Pharmaceutical Chemistry. 2006

#### **Online Resources:**

- 1. https://www.classcentral.com/course/swayam-medicinal-chemistry-12908
- 2. https://nptel.ac.in/courses/104/106/104106106/

### **Assignments:**

- 1. SAR of Chloramphenicol and Morphine
- 2. Action of Drugs
- 3. Application of sulpha drugs.

# **Group Tasks:**

- 1. Collection of indian medicinal plants
- 2. Generic Drug collection in various brand

# **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOsaddressed	BLOOMS VERB
CO1	Describe the action of drugs.	1,2,3,5,8,9,10	Remembering
CO2	Indicate the sulpha drugs and antibiotics.	1,2,3,4,6,7,9,10	Understanding
CO3	Explain narcotic and non-narcotic analgesics.	1,2,3,4,6,7,9	Applying
CO4	Analyze antiseptics and anesthetics.	1,2,3,4,5,6,7,9,10	Analyzing
CO5	Analyze the drugs for treatment of diabetes, cancer and AIDS.	1,2,3,4,5,6,7,9	Analyzing

# **MAPPING WITH PROGRAM OUTCOMES:**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	S	S	-	M	-	-	M	М	L
CO2	S	S	S	L	-	M	L	-	М	L
CO3	S	S	S	М	-	L	L	-	М	-
CO4	S	S	S	М	M	М	М	-	М	L
CO5	S	S	S	М	M	М	M	-	L	-

S- Strong; M-Medium; L-Low

#### **B.Sc CHEMISTRY**

#### **SEMESTER V**

C	Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
	22UCHM4	MEDICINAL CHEMISRY	56	4	-	4

### **Learning objectives:**

- To learn the basics of medicinal chemistry and the terms in it.
- To study the bio physico chemical properties.
- To study the structural properties of drugs.
- To learn about the steroids, hormones and vitamins.

## **UNIT - I Bio-physicochemical properties**

[12 Hours]

Acidity/Basicity, Solubility, Ionization, Hydrophobic properties, Hydrophilic properties, Lipinski Rule, Drug-like properties, Understanding of the biological activity parameters such as Ki, Kd,  $LD_{50}$ ,  $EC_{50}$ ,  $IC_{50}$ ,  $CC_{50}$ , ADMET properties

### **UNIT - II Structural properties**

[12 Hours]

Isosterism, Bioisosterism, Nonclassical isosteres, Understanding of the 3D-structure along with bond length, bond angle and dihydral angle, Concept of Configuration and Conformation withexamples, Concept of stereochemistry in terms of biological response with examples, Stereoselective receptors or enzymes such as muscarinic receptor, Stereochemically pure drug and recemates, Examples such as catecholamines.

### **UNIT - III Drug target understanding**

[12 Hours]

Metabolism, Drug metabolism, Anti-metabolite, Enzyme inhibitor, Agonist, Antagonist, Examples.

## **UNIT - IV Medicinal Chemistry of Therapeutic Agent**

[12 Hours]

Structure, Chemistry, Mode of action and adverse effect of the representative therapeutic agents such as Anti-infective agent, Antimalarial, Antibacterial, Antiviral, Anticancer, CNS acting drugs, Adrenergic Agents, Cholinergic Drugs, Diuretics, Cardiovascular, local anesthetic agent, Analgesic Agents, Histamine and Antihistamine agents

## **UNIT-V Steroids, Prostaglandins, Enzyme, Hormone and Vitamins** [12 Hours]

Biophysico-chemical properties, Steroid Hormone Receptors, Chemical Contraceptive agents, COX-2 inhibitors, Prostaglandins for Ophthalmic use, pharmaceutically important enzyme products such as Pancreatin, Trypsin, Insulin. Classification of vitamins with examples.

## Concept of rational drug design

Structure activity relationship, Drug-receptor understanding, Molecular modeling, Structure based drug design. QSAR.

## **Recommended Text books/References:**

- Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical ...by Charles Owens Wilson, John H. Block, Ole Gisvold, John Marlowe Beale 2009
- 2. Foye's Principles of Medicinal Chemistry by David A. Williams, Thomas L. Lemke, William O. Foye (2008), Kluwer publication. **2000**
- 3. Remington: The Science and Practice of Pharmacy Vol 1, Ed. 19 by Joseph Price Remington, Alfonso R. Gennaro. (1995), MACK Publishing.
- 4. Burgers Medicinal Chemistry by Manfred E. Wolff, Alfred Burger 2009
- 5. Burgers Medicinal Chemistry and Drug Discovery by Abraham D. J., Lewis F. L., Burger A., vol.5,6<sup>th</sup>Edn., **2003**, Hoboken N.J.Wiley,
- 6. The Organic Chemistry of Drug Design and Drug Action by Silverman R. B., 2nd Edn., Academic Press. **2012.**
- 7. Exploring QSAR: Fundamental and applications in Chemistry and Biology by Hansch C. and Leo, A American Chemical Society (1995)

8. Patrick, G. Medicinal Chemistry, Oxford University Press (2000)

## **Online Resources:**

- 1. https://www.classcentral.com/course/swayam-medicinal-chemistry-12908
- 2. https://nptel.ac.in/courses/104/106/104106106/

## **Assignments:**

- 1. SAR of Chloramphenicol and Morphine.
- 2. Role of insulin in controlling blood sugar
- 3. Application of sulpha drugs.

# **Group Tasks:**

- 1. Collect OTC drugs of antihistamine agents
- 2. Drug collection in various generic name of drugs.

## **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	Tabulate the biological activity of various parameters.	1,2,3,5,6,7	Remembering
	Describe the concept of configuration and conformation, in terms biological response with stereoselective receptors.	1,2,3,1,7	Understanding
CO3	Explain Metabolism, Drug metabolism and Anti-metabolite with examples.	1,2,3,6,7	Applying
	Illustrate structure, chemistry mode of action and adverse effect of the therapeutic agents.	1,2,3,3,0,7,7	Analyzing
CO5	Classify vitamins with examples.	1,2,3,5,6,7,8	Analyzing

# **MAPPING WITH PROGRAM OUTCOMES:**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	S	S	-	M	S	S	-	-	1
CO2	S	S	S	М	-	-	L	-	-	-
CO3	S	S	S	-	-	М	L	-	-	-
CO4	S	S	S	-	L	М	М	-	L	-
CO5	S	S	S	-	M	М	L	L	-	-

S- Strong; M-Medium; L-Low

#### **B.Sc CHEMISTRY**

#### **SEMESTER V**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCHS3	AGRICULTURAL CHEMISTRY	26	4	-	2

### **Learning objectives:**

- To learn about importance of water and water analysis.
- To study about the various types of soil and its characteristics.
- To study about the pesticides, fertilizer and insecticides.

## **Unit-I Water Chemistry**

[6 Hours]

Water analysis: Hardness, Temporary Hardness, Permanent Hardness-Determination of hardness of water, acidity, alkalinity, pH value, determination of fluoride content and chloride content- Total dissolved solid (TDS), Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD)- Recycling of water.

## **Unit-II Soil Chemistry**

[6 Hours]

Definition of soils. Classification of soils, Properties of soils – Physical properties and mechanical analysis. Structure and texture. Soil water, soil air, and soil temperature. Chemical properties – soil-mineral, matter-soil colloids, ion-exchange reactions. Soil fertility and its evolution.

Soil organic matter and their influence on soil properties. C-N ratio effects, soil reactions. Soil pH, acidity, alkalinity, buffering of soils and its effects on the availability of N, P, K, Ca, Mg, I, Mn & sulphuric acid. Soil salinity, acid and alkaline soils - their formation and reclamation.

Unit-III Fertilizers-I [6 Hours]

Primary nutrients, secondary nutrients and micro nutrients on plant growth and development, Importance of nitrogenous fertilizers. Nitrogen cycle and fixation of atmosphere nitrogen. Principle and manufacture of ammonium nitrate, ammonium sulphate, urea and nitrolin. Harmful effects of chemical fertilizers-Eutrophication.

Unit-IV Fertilizers-II [6 Hours]

Phosphate fertilizers, preparation and uses of mono and diammonium phosphates, super phosphate and triple super phosphate. Potassium fertilizers – potassium nitrate, potassium chloride. Mixed fertilizers. Methods of compost in green manuring, concentrated organic manures and their chemical composition. Oil cakes, blood meal.

#### **Unit-V Pesticides and Insecticides**

[6 Hours]

Introduction – insecticides, fungicides and herbicides. Application and toxicity,Bordeaux mixture. Insect killers and repellants(allethrin), fluorine compounds, boron compounds, arsenic compounds, pyridine compounds. Harmful effects of DDT, BHC.

#### **Text Books:**

- 1. Brady.N.C, The Nature and properties of soils Eruasia Publishing House (P) Ltd.,
- 2. Jones.V.S, Fertilizers and soil fertility Prentice Hall of India, New Delhi.
- 3. Fracer.D.E.H, Chemistry of Pesticides D.Van Nostrand Co.,
- 4. Nature and properties of soils harry, O-Buckman Nyle C Brandy.

#### **Reference Books:**

- 1. Nature and properties of soils harry, O-Buckman Nyle C Brandy.
- 2. Insecticides, Pesticides and agro- based Industries R.K.Gupta, R.C.Palfal and K.Goel.

## **Online Resources/Tutorials:**

- 1. http://www.intechopen.com/books/agricultural-chemistry
- 2. http://advancinggreenchemistry.org/wp-content/uploads/Green-Chem-and-Sus.-Ag.-the-Role-of-Biopesticides.pdf

## **Assignments:**

- 1. Hardness, Temporary Hardness, Permanent Hardness- Determination of hardness of water
- 2. buffering of soils and its effects on the availability of N, P, K, Ca, Mg, I, Mn & sulphuric acid
- 3. Primary nutrients, secondary nutrients and micro nutrients on plant growth

# **Group Tasks:**

- 1. Oil cakes, blood meal
- 2. Harmful effects of DDT, BHC

## **COURSE OUTCOMES:**

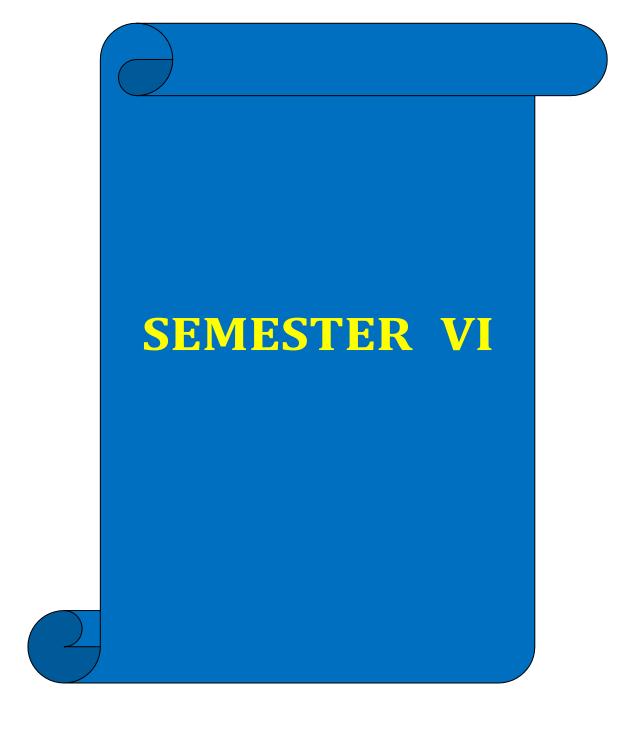
On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	Describe the hardness of water with various parameters.	1,2,3,6,7,8,9,10	Remembering
CO2	Illustrate the types of soil and its properties .	1,2,3,5,8,9,10	Understand
CO3	Explain the Primary nutrients, secondary nutrients and micro nutrients on plant growth and development.	1,2,3,4,7,8,10	Applying
CO4	List out the various types of fertilizers in agricultural	1,2,3,4,6,8,9,10	Analyzing
CO5	Outline the application of toxicity of insecticides and Pesticides.	1,2,3,5,8,9,10	Analyzing

# **MAPPING WITH PROGRAM OUTCOMES:**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PS09	PSO10
CO1	S	S	S	-	-	М	М	M	L	L
CO2	S	S	S	-	M	-	-	М	М	L
CO3	S	S	S	M	-	М	-	M	L	М
CO4	S	S	S	M	-	М		M	М	L
CO5	S	S	S	-	M	-	-	M	М	L

S- Strong; M-Medium; L-Low



#### **B.Sc CHEMISTRY**

#### **SEMESTER VI**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCH08	INORGANIC CHEMISTRY - II	56	4	-	5

### **Learning objectives:**

- To learn the mechanism of biological processes and importance of metal therein
- To study about the organometallic chemistry
- To know the iodine and inter-halogen compounds
- To study about the symmetry and its operation in inorganic compounds

# **UNIT-I Bioinorganic Chemistry**

[12 Hours]

Metal ions in biology and their vital role in the active site, Structure and functions of Metallo proteins and enzymes. Structures and characteristic features of Haemoglobin and myoglobin – Vitamin B12. Biological functions of haemoglobin and myoglobin, cytochromes and ferredoxins, carbonate bicarbonate buffering system and carbonic anhydrase. Biological nitrogen fixation, Photosynthesis: Photosystem-I and II.

### **UNIT II Organometallic compounds**

[12 Hours]

Introduction -Structure and application -metal carbonyls -mono and poly nuclear carbonyls of Ni, Fe, Cr, Co and Mn -synthesis and structure -nitrosyl compounds -classification, preparation and properties -structure of nitrosyl chloride and sodium nitroprusside.

Nomenclature of organometallic compounds, 16-and 18-electron rule. Structure and bonding in transition metal carbonyls:polynuclear carbonyls, bridging and terminal carbonyls, transition metal alkyls, carbenes, and carbynes, and metallocenes. Photochemistry of organometallic compounds -Wilkinson's catalyst and alkene

hydrogenation, hydroformylation, Monsanto acetic acid process, Ziegler – Natta catalyst and polymerization of olefins.

#### **UNIT-III Structure of Solids**

[12 Hours]

Classification of solids –amorphous and crystalline solids –Vander waals crystals –covalent crystals –Laws of crystallography –Elements of symmetry –Weiss and Miller indices –Crystal systems and Bravais lattices. Structure of ionic solids – structure of NaCl, LiCl and ZnS – Identification of simple cubic, bcc, fcc lattices and indexing of X-ray lines. Crystal defects –Schottky and Frenkeldefects – Stoichiometric and non – stoichiometric defects - F-center.

Symmetry Elements and Symmetry operations – point groups - point groups of simple molecules like  $H_2$ , HCl,  $CO_2$ ,  $H_2O$ ,  $BF_3$ ,  $NH_3$ , $CH_2Cl_2$ ,  $[PtCl_4]^{2-}$ ,  $PCl_5$ , cis and trans isomers of  $[Pt(NH_3)_2 Cl_2]$ 

## **UNIT IV Solid States Chemistry**

[12 Hours]

Ionic bonding –lattice energy –Born equation and its derivation, radius ratio rules –structures of some ionic crystals –Structure of solids –Comparison of X-ray and Neutron diffraction –derivation of Bragg's equation. Spinels and inverse spinels.

Electrical, Magnetic and optical properties of solids –band theory – semiconductors –superconductors. Solid state electrolytes –Types of magnetic behavior, dia, para, ferro, antiferro and ferrimagnetism – determination of magnetic moment using Guoy Balance-Applications of magnetic measurements.

### **UNIT V Iodine and Inter halogen compounds**

[12 Hours]

Basic properties of iodine (Compounds containing monovalent and trivalent iodine cation), Inter halogen compounds - general preparation, properties and uses. Preparation, properties and uses of ICl, IBr, ICl<sub>3</sub>, IF<sub>5</sub>, Poly halide ions and poly halides, pseudo halide ions and pseudo halogens. Similarities and dissimilarities between halogens and pseudo halogens.

#### **Text Books:**

- 1. Manku.G.S., Inorganic Chemistry Tata Mcgraw Hill.2009.
- 2. Soni.P.L, Text Book of Inorganic Chemistry, Sultan Chand & Sons.2017
- 3. Puri and Sharma, Text book of Inorganic Chemistry-Vishal publishing co.2017.
- 4. Madan.R.D., Inorganic Chemistry, S. Chand & Co., 2012.
- 5. Dutta, Inorganic Chemistry, Science Book Association. 2009.

### **Reference Books:**

- Cotton and Wilkinson, Advanced Inorganic Chemistry Wiley Eastern Private Ltd.2013.
- 2. James E.Huheey Inorganic Chemistry, 2009
- 3. Keith F. Purcell, John C. Kotz, An Introduction to inorganic chemistry,

#### **Online Resources:**

- 1. https://onlinecourses.nptel.ac.in/noc20\_cy12/preview
- 2. https://nptel.ac.in/courses/104/101/104101079/

### **Assignments:**

- 1. Band Theory of Conductors.
- 2. Symmetry Elements and Operations.
- 3. Structure of ionic compounds.

### **Group Task:**

- 1. Identification of semiconductors.
- 2. Demonstration of symmetry operations.

# **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	Describe the biological functions of hemoglobin, myoglobin, cytochromes, and ferredoxin.	1,2,3,4,0,7,0,9	Remembering
CO2	Explain classification, preparation, properties and, structure of metal carbonyls and nitrosyls compounds.	1,2,3,1,7,0	Understanding
CO3	Determine the point group of simple molecules.	1,2,3,6,8	Applying
CO4	Determine magnetic moment using Guoy balance and explain its applications.	1,2,3,5,6,8	Applying
CO5	Differentiate similarities and dissimilarities between halogen and pseudo halogen.	1,2,3,6,8	Analyzing

## MAPPING WITH PROGRAM OUTCOMES:

IVIAL I IIV	WAFFING WITH FROGRAM OUTCOMES.										
COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	
CO1	S	S	S	М	-	М	L	M	L	-	
CO2	S	S	S	М	-	-	M	L	-	-	
CO3	S	S	S	ı	1	М	-	L	ı	-	
<b>CO4</b>	S	S	S	ı	M	М	-	L	ı	-	
CO5	S	S	S	-	-	М	-	L	-	-	

S- Strong; M-Medium; L-Low

#### **B.Sc CHEMISTRY**

#### **SEMESTER VI**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UСН09	ORGANIC CHEMISTRY - II	56	4	-	5

### **Learning objectives:**

- To understand clearly about the classification and structural features of Carbohydrates.
- To know the synthetic strategies and terminologies involved in organic synthesis and the role of important reagents in organic synthesis.
- To study about the eco-friendly green products.
- To enable the concept and mechanism of rearrangements.
- To learn the classification, structure and properties of Alkaloids and Terpenoids.

### **Unit-I Carbohydrates**

[12 Hours]

Carbohydrates: Definition - Classification with suitable examples - Classification of sugars as reducing and nonreducing sugars - Stereochemistry of carbohydrates: D- and L- configurations - Erythro and threo diastereomers - Anomers and epimers with suitable examples - Monosaccharides: Classification of monosaccharides with suitable examples - Glucose - properties of glucose - Epimerisation of glucose - Anomers of glucose and mutarotation - Fructose and its properties - Conversion glucose into fructose and vice-versa - Formation of osazone and glycosides - Fischer open structure and evidences for open structure - Haworth projection cyclic structures (pyranose and furanose) and evidences for cyclic structure of glucose and fructose - Stepping up - Kiliani- Fischer synthesis and stepping down - Ruff degradation of monosaccharides.

Disaccharides:  $\alpha$  – and  $\beta$  – glycosidic linkages with suitable examples - 1, 4'and 1,6' linkages with suitable examples - Structure and properties of sucrose-Polysaccharides: Cellulose, combination of cellulose – Structure of Starch.

### **Unit-II Synthetic methodology and reagents**

[12 Hours]

Synthetic terminology - Disconnection, synthon, synthetic equivalent (SE), Functional group interconversion (FGI), Target molecule (TM). -retro synthetic analysis - Linear, Convergent and Combinatorial syntheses. List of Nucleophilic reagents and electrophilic reagents. Synthetic applications of malonic ester and ethylacetoacetate in the synthesis of a) monocarboxylic acids (propionic acid and n-butyric acid). b) dicarboxylic acids (succinic acid and adipic acid). c)  $\alpha$ ,  $\beta$ -unsaturated carboxylic acids d)heterocyclic compounds.

## **Unit-III Photo and Green Chemistry**

[12 Hours]

Norrish type I and II reactions. Green Chemistry - Definition, need and basic principles of green chemistry - green synthesis - Aqueous phase reactions, reactions in ionic liquids, Solid supported synthesis, Solvent free reactions (solid phase reactions), - Green catalysts - Phase transfer catalysts (PTC) and Biocatalysts. Microwave and Ultrasound assisted green synthesis- green chemical synthesis of Paracetamol.

## **Unit-IV Rearrangements**

[12 Hours]

Rearrangement to electron-deficient carbon - 1,2 shift (Wagner-Meerwein rearrangement, pinacol rearrangement, dienone-phenol; Wolff rearrangement, benzilbenzilic acid rearrangement). Aromatic rearrangements from oxygen to ring carbon – Fries, Claisen and benzidine rearrangement. Rearrangement to electron-deficient nitrogen – Beckmann, Schmidt, Hofmann, Lossen, Curtius rearrangement). Rearrangement to electron-deficient oxygen: Baeyer-Villiger oxidation, hydroperoxide rearrangement, cumenehydroperoxide- phenol rearrangement, Dakin reaction.

#### **Unit-V Natural Products and Biochemistry**

[12 Hours]

**Alkaloids:** Definition - classification with suitable examples for each class - properties - structural determination - Sources, isolation, physiological activities and

structure of piperine, conine, cocaine and quinine.

**Terpenoids:** definition, isoprene rule and classification with suitable examples - Isolation, properties, structure and uses of citral, geraniol and limonene.

#### **Text Books:**

- 1. V.K. Ahluwalia, Green Chemistry, Narosa Publishing House Pvt. Ltd., New Delhi, Reprint **2018**.
- 2. V.K. Ahluwalia, Organic Reaction Mechanisms, Fourth Edition, Narosa Publishing House Pvt. Ltd., New Delhi, Reprint **2018**.
- 3. M.C. Cann and M.E. Connelly, Real world cases in Green Chemistry, American Chemical Society, **2018.**
- 4. I.L. Finar, Organic Chemistry Vol-2, 6th edn, Pearson Education Asia, 2011.
- 5. J.Clayden, N. Greeves, S. Warren, Organic Chemistry, 2ndedn, Oxford, **2012.**
- 6. S. Warren, Organic Synthesis: The Disconnection Approach, 2nd Edition, John Wiley and Sons, **2011**.
- 7. S.Warren, Designing Organic Synthesis, Wiley India, 2009.

### **Reference Books:**

- 1. P.T.Anatas and J.C. Warner, Green Chemistry Theory and Practice, New York :Oxford University Press, 1998.
- 2. M.C. Cann and M.E. Connelly, Real world cases in Green Chemistry, American Chemical Society, **2008.**
- 3. J.Clayden, N. Greeves, S. Warren, Organic Chemistry, 2<sup>nd</sup>edn, Oxford, **2012**.
- 4. S. Warren, Organic Synthesis: The Disconnection Approach, 2nd Edition, John Wiley and Sons, **2008**.
- 5. S.Warren, Designing Organic Synthesis, Wiley India, 2009.
- 6. W.Carruthers, Modern methods of Organic Synthesis, 4th edition, Cambridge UniversityPress, **2004**.
- 7. B. G. Davis, A. J. Fairbanks, Carbohydrate Chemistry, Oxford Chemistry Primer, Oxford University Press, **2002**.

### **Online Resources:**

- 1. https://onlinecourses.swayam2.ac.in/cec20\_ag10/preview
- 2. https://onlinecourses.swayam2.ac.in/cec19\_ag04/preview
- 3. https://nptel.ac.in/courses/104/103/104103071/

# **Assignments:**

- 1. Conversion of carbohydrates
- 2. Structure elucidation of Pencillin G
- 3. Application of Reagents

# **Group Tasks:**

- 1. Identify rich food in carbohydrates
- 2. Demonstration of green synthesis

# **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. No.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	Identify reducing and non–reducing sugar.	1,2,3,4,7,8,10	Remembering
CO2	Explain the retrosynthetic analysis.	1,2,3,4,6,7,8	Understandin g
CO3	Demonstrate the need and basic principles of green synthesis.	1,2,3,6,7,8,9,10	Applying
CO4	Correlate the rearrangement reactions involved in electron-deficient oxygen and nitrogen compounds.		Analyzing
CO5	Determine the structural elucidation of alkaloids (piperine, cocaine, and quinine) and Terpenoids (citral, geraniol, and limonene).	1,2,3,4,7,8,9,10	Applying

# MAPPING WITH PROGRAM OUTCOMES

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PS06	PSO7	PSO8	PSO9	PSO10
CO1	S	S	S	М	-	-	М	М	-	L
CO2	S	S	S	-	-	М	L	L	-	-
CO3	S	S	S	-	-	М	M	L	L	L
CO4	S	S	S	-	-	-	L	L		-
CO5	S	S	S	М	-	-	М	M	L	L

S- Strong; M-Medium; L-Low

#### **B.Sc CHEMISTRY**

#### **SEMESTER VI**

Cours	se code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
220	ЈСН09	PHYSICAL CHEMISTRY - II	56	4	-	5

### **Learning Objectives:**

- To use Clausius Clapeyron equations for the various phase transitions.
- To know the Phase rule and its application to various systems.
- To know the fundamental concepts of conductance studies and ionic mobilities.
- To understand the theory of strong electrolytes and the fundamental concepts of pH.
- To learn the fundamentals of electro chemical cells.
- To study about the storage cells and fuel cells and the principles of polarography.

## **UNIT-I Phase Equilibria**

[12 Hours]

Definition of terms - Derivation of phase rule -One component systems- $\rm H_2O$  system, Sulphur system – explanation using Clausius - Clapeyron equation - supercooling and sublimation. Two component systems - solid liquid equilibria - reduced phase rule.

Simple eutectic systems-Ag-Pb only-Compound formation with congruent melting point- Mg-Zn system only. Peritectic change, FeCl $_3$ -H $_2$ O system, KI-H $_2$ O system-efflorescence-deliquescence. C.S.T-phenol water system –nicotine water system and triethylamine water system.

# UNIT - II Electro Chemistry -I

[12 Hours]

Metallic and electrolytic conductance -Definitions of specific, equivalent and

molar conductances – Relation between them – measurement of conductance and cell constant.

Variation of conductance with dilution – Qualitative explanation – Strong and weak electrolytes.

Migration of ions – transport number – determination by Hittorf's and moving boundary methods – Kohlrausch's law – applications – calculation of equivalent conductance for weak electrolytes and determination of transport number.

Ionic mobilities and Ionic conductances. Diffusion and ionic mobility- molar ionic conductance and viscosity.

Application of conductance measurements – Degree of dissociation of weak electrolytes – Determination of Ionic product of water – Determination of solubility of sparingly soluble salts – conductometric titrations.

## UNIT - III Electro Chemistry- II and Ionic Equilibria

[12 Hours]

Theory of strong electrolytes – Debye – Huckel – Onsager theory – verification of Onsager equation – Wien and Debye – Falkenhagen effect.

Activity and activity co-efficients of strong electrolytes – ionic strength.

Ostwalds dilution law – determination of dissociation constants – Ionic product of water – pH value.

Buffer solution – Henderson's equations – uses of Buffers including living systems – common ion effect – solubility product principle – relation to solubility – Applications in qualitative and quantitative analysis.

Hydrolysis of salts – expression for hydrolysis constant – Degree of hydrolysis and pH of salt solutions for different types of salts – Determination of Degree of hydrolysis – conductance and distribution methods.

## **UNIT - IV Galvanic Cells and Applications**

[12 Hours]

Galvanic cells - Reversible and Irreversible cells - EMF and its measurement -

Weston Standard cell – types of reversible single electrodes – standard Hydrogen electrode – calomel electrode – Derivation of Nernst equation both for EMF of cells and single electrode potentials – Nernst theory for single electrode potential – standard reduction potentials – electro chemical series – significance.

Application of EMF measurements – Application of Gibbs – Helmholtz equation to galvanic cells – calculation of thermodyamic quantities – pH using hydrogen, quinhydrone and glass electrodes – potentiometric titrations.

## **UNIT - V Concentration Cells and Battery**

[12 Hours]

Concentration cells with and without transference – LJP expression – applications of concentrations cells – valency of ions – transport number – solubility product – activity coefficient.

Storage cells – Types of cells – Dry cell, lead acid battery, Li-ion battery – mechanism of discharging and recharging – fuel cells  $(H_2-O_2)$ .

Polarization – over voltage- decomposition voltage.

#### **Text Books:**

- 1. P.W. Atkins, J. D. Paula Elements of Physical Chemistry, Oxford University Press, **2022**.
- 2. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, 46<sup>th</sup> Edition, Vishal Publishing Company, New Delhi, **2013**.
- 3. P.L. Soni, O.P. Dharmaha and U.N. Dash, Textbook of Physical Chemistry, 23<sup>rd</sup> Edition, Sultan Chand & Sons, New Delhi, **2011**.
- 4. R.L. Madan, G. D. Tuli, Physical Chemistry, S. Chand, Revised edition, 2014.

#### **Reference Books:**

- 1. Glasstone.S, Text Book of Physical Chemistry, Mac Millian.2015.
- 2. Glasstone and Lewis, Elements of Physical Chemistry, Mac Millan. 2010.
- 3. Maron and Lando, Fundamentals of Physical Chemistry, Collier, Mac Millan. 2015.
- 4. Castellan. G.W., Physical Chemistry, Naropa Publishing House. 2010.

- 5. Bajapai. D.N, Advanced Physical Chemistry, S.Chand & Co.,2010
- 6. Gurudeep R. Chatwal, Physical Chemistry.2010
- 7. Nagi and Anand, Physical Chemistry Wiley Estern. 2011
- 8. Kapoor. K.L., Physical Chemistry, Mac, Millan. 2012

## **Online Resources/Tutorials:**

- 1. 1.http://www.freebookcentre.net/Chemistry/ElectroChemistry-Books-Download.html
- 2. 2.https://ocw.mit.edu/courses/materials-science-and-engineering/3-091sc-introduction-to-solid-state-chemistry-fall-2010/syllabus/MIT3\_091SCF09\_aln10.pdf
- 3. https://nptel.ac.in/courses/103/108/103108162/

## **Assignments:**

- 1. Efflorescence and deliquescence.
- 2. Various types of conductometric titrations.
- 3. Nernst theory for single electrode potential and its calculations.

### **Group Tasks:**

- 1. Buffer solution -Application of Buffers including living systems.
- 2. Batteries lead acid battery, and Li-ion battery.

# **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	Define phase rule and explain one component, two component and simple eutectic systems.	1,2,3,4,8	Remembering, Understanding
	Relate specific, equivalent and molar conductance.	1,2,3,4,6,7	Understanding
1	Determine activity and activity co-efficient of strong electrolytes.	1,2,3,4,7	Applying
CO4	Correlate Reversible and Irreversible cells.	1,2,3,4,5,7,8,9,10	Analyzing
CO5	Construct dry cell, fuel cell, Li-ion battery and Lead acid battery.	1,2,3,4,7,8,9,10	Creating

# **MAPPING WITH PROGRAM OUTCOMES**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	S	S	М	-	-	-	L	-	-
CO2	S	S	S	М	-	L	L	-	-	-
CO3	S	S	S	М	-	-	L	-	-	-
CO4	S	S	S	M	M	-	M	M	М	L
CO5	S	S	S	М	-	-	M	M	L	L

S- Strong; M-Medium; L-Low

#### **B.Sc CHEMISTRY**

#### **SEMESTER VI**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCHM5	ANALYTICAL CHEMISTRY	56	4	-	4

### **Learning objectives:**

- To provide the basic idea about the instrumental analysis and analytical techniques.
- To know about important terminologies involved in Error analysis.
- To provide the principles of gravimetric analysis, methods and characteristic features of precipitation techniques.
- To study about the principles and classification of separation methods.
- To know about the thermo analytical techniques.

### **UNIT I Safety and Data Analysis**

[12 Hours]

Safety Measures: Handling reagents and solutions – acids, alkali, bromine water, phenol, inflammable substances etc., - disposal of wastes, waste chemicals and fumes.

Data analysis – idea of significant figures – its importance – accuracy – methods of expressing accuracy – error analysis – types of errors – precision – methods of expressing precision – mean, median, mean deviation, standard deviation and

confidence limits.

Chemical and single pan balance – precautions in using balance – source of error in weighing – correction of buoyancy, temperature effects – calibration of weights.

### **UNIT II Gravimetric Analysis**

[12 Hours]

Principle – theories of precipitation – solubility product and precipitation – factors affecting solubility. Conditions of precipitation-co- precipitation & post precipitation,

reduction of errors, Precipitation from homogeneous solution – washing and drying of precipitate.

Choice of the precipitant – specific and selective precipitants – Cupferon, Dimethyglyoxime, Ethylene diamine, 8-Hydroxy quinoline, - Use of masking agent.

Crucibles – types , care and uses. Calculations in Gravimetric analysis – use of gravimetric factor.

## **UNIT-III Purification Techniques**

[12 Hours]

Purification of organic compounds – Solvent extraction, Soxhlet extraction, Crystallization – Fractional crystallization and Sublimation – Principle – Technique and advantages.

Purification of liquids – distillation, fractional distillation, vacuum distillation – steam distillation – azeotropic distillation, criteria of purity, melting point, boiling point, refractive index and density.

# **UNIT-IV Chromatographic Techniques**

[12 Hours]

Column Chromatography – principle, types of adsorbents, preparation of the column, elution, recovery of substances and applications.

TLC – principle, choice of adsorbent and solvent, preparation of chromatoplates,  $R_f$  –values, factors affecting the  $R_f$  values. Significance of  $R_f$  values. Paper chromatography- Principle, Solvents used, development of chromatogram, ascending, descending and radial paper chromatography. Paper electrophoresis – separation of amino acids and other applications. Ion –exchange chromatography – principle – types of resins – requirements of a good resin – action of resins – experimental techniques.

### **UNIT V Thermo Analytical Methods**

[12 Hours]

Principle – thermo gravimetric analysis and differential analysis – discussion of various components with block diagram – TGA & DTA curves of  $CuSO_4.5H_2O$ ,  $MgC_2O_4.H_2O$  and  $Ca(OOCCH_3)_2.H_2O$  – Simultaneous DTA-TGA curves of  $CaC_2O_4.H_2O$  in air /  $CO_2$ -factors affecting TGA & DTA curves. Principle and instrumentation of

differential scanning calorimetry (DSC). Applications of TGA, DTA, and differential scanning calorimetry (DSC). Thermometric titrations – principle- apparatus – applications.

**Polarography -** Current-voltage relationship, theory of polarographic waves, instrumentation, qualitative and quantitative applications.

#### **Text Books:**

- 1. Douglas A, Skoog and Donal M. West Hort, Fundamentals of analytical Chemistry Rinechan and Winston Inc., New York. 2009
- 2. Janarthanam.P.B, Physico Chemical Techniques of Analysis Vol I & II Asian Publishing House Bombay. **2010**
- 3. Ramachandra Sastry.A, Analytical Chemistry K.C.S. Desikan & Co.2011

### **Reference Books:**

- 1. William Kemp, Organic Spectroscopy ELBS.2010
- 2. Sharma.Y.R, Elementary Organic Spectroscopy, Principles and applications-S. Chand & Co., **2015**
- 3. Gopalan.R, Subramaniam.P.S, and Rengarajan.K, Elemants of Analytical Chemistry Sultan Chand & Sons.**2014**
- 4. Ramachandra Sastry.A, Analytical Chemistry K.C.S. Desikan & Co.2010

#### **Online Resources:**

- 1. https://onlinecourses.nptel.ac.in/noc20\_cy18/preview
- 2. https://onlinecourses.nptel.ac.in/noc20\_cy02/preview
- 3. https://www.classcentral.com/course/swayam-analytical-techniques-13896

### **Assignments:**

- 1. Types of errors.
- 2. Precipitation technique.
- 3. Purification technique.

## **Group Tasks:**

1. Handling reagents and solution in laboratory.

# 2. Demonstration of TLC.

# **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	Describe handling reagents and solutions.	1,2,3,4,5,6,	Remembering
CO2	Predict choice of the precipitant in gravimetric analysis.	1,2,3,4,6,7,8	Understanding
CO3	Demonstrate purification techniques of organic compounds.	1,2,3,5,6,7,8,9,10	Applying
CO4	Calculate Rf value.	1,2,3,4,5,6	Applying
CO5	Analyze TGA and DTA curves of inorganic compounds.	1,2,3,4,5,6,7,8,10	Applying

# MAPPING WITH PROGRAM OUTCOMES

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	S	S	M	M	L	-	-	-	-
CO2	S	S	S	M	-	M	L	L	-	-
CO3	S	S	S	-	M	S	M	M	М	L
CO4	S	S	S	M	L	L	-	-	-	-
CO5	S	S	S	М	L	L	М	M	-	L

S- Strong; M-Medium; L-Low

#### **B.Sc CHEMISTRY**

#### **SEMESTER VI**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCHM6	INTRODUCTION TO NANO CHEMISTRY AND APPLICATIONS	56	4	-	4

### **Learning Objectives:**

- Understanding about fundamentals of Nanotechnology.
- Understand the Properties of nanometerials and nano crystals.
- Understanding about fundamentals of Characterization techniques.
- Understand the applications of nano meterials.

#### **Unit-I Introduction to Nanoscience**

[12 Hours]

Introduction to nanoscience, nanostructure and nanotechnology (basic idea), Overview of nanostructures and nanomaterials, classification, (cluster, colloid, nanoparticles, and nanostructures -Spheroid, Wire, Rod, Tube, and Quantum Dot); Calculation of percentage of surface atom and surface to volume ratio of spherical, wire, rod, and disc shapes nanoparticles.

## **Unit-II Properties of Nanomaterials**

[12 Hours]

Size dependent properties of nanomaterials (basic idea with few examples only): Quantum confinement, Electrical, Optical (Surface Plasmon resonance), variation in colors (Blue shift & Red shift), Magnetic, thermal and catalytic properties.

### **Unit-III Synthesis of Nanomaterials**

[12 Hours]

Synthesis of Nanomaterials: Brief introduction about Top-down and Bottom-up approaches & self-assembly techniques of nanoparticles synthesis, Solvothermal

process, Examples of preparation of gold and silver metallic nanoparticles, self-assembled nanostructures-control of nano-architecture-one dimensional control. Carbon nanotubes and inorganic nanowires.

### **Unit-IV Material characterization techniques**

[12 Hours]

Material characterization techniques (basic idea of use of following instruments in nanomaterial characterization need to be emphasized): Electron microscopic technique, diffraction technique, photoelectron spectroscopy, zeta-potential measurement; Examples of use of nanomaterials in environmental remediation and biology (few practical examples of use of materials can be discussed).

## **Unit- V Application of Nanomaterials**

[12 Hours]

Ferroelectric materials, coating, molecular electronics and nanoelectronics, biological and environmental, Membrane based application, Polymer applications.

### **Text Books:**

- 1. C.N. R. Rao, A. Muller, A. K. Cheetam, The Chemistry of Nanomaterials: Synthesis, Properties and Applications, Willey-VCH Verlag, Germany, **2005**.
- G.Cao, Nanostructures and Nanomaterials: Synthesis, Properties and Applications, Imperial College Press, London, 2004
- 3. R.W. Kelsall, I. W. Hameley, M. Geoghegan, Nanoscale Science and Technology, John Wiley & Sons, England, **2005**
- 4. Charles P. Poole and Frank J Owens, *Introduction to nano technology*, Wiley Interscience, **2003**.
- 5. Pradeep, T., A text of book of nanoscience and nanotechnology, Tata McGraw Hill Education Pvt. Ltd., New Delhi, **2012**.

#### References books:

- 1. C.N. R. Rao, A. Muller, A. K. Cheetam, The Chemistry of Nanomaterials: Synthesis, Properties and Applications, Willey-VCH Verlag, Germany, **2005**.
- 2. G.Cao, Nanostructures and Nanomaterials: Synthesis, Properties and Applications, Imperial College Press, London, **2004**

- R.W. Kelsall, I. W. Hameley, M. Geoghegan, Nanoscale Science and Technology, John Wiley & Sons, England, 2005
- 4. Charles P. Poole and Frank J Owens, *Introduction to nano technology*, Wiley Interscience, **2003**.
- 5. Pradeep, T., A text of book of nanoscience and nanotechnology, Tata McGraw Hill Education Pvt. Ltd., New Delhi, **2012**.

#### **Online Resources:**

- 1. https://onlinecourses.nptel.ac.in/noc19\_mm22/preview
- 2. https://nptel.ac.in/courses/118/104/118104008/
- 3. https://nptel.ac.in/courses/118/107/118107015/

## **Assignments:**

- 1. Different type of Nano Materials
- 2. Application of Nano chemistry

## **Group Tasks:**

- 1. Comparisons of one, two and three Carbonnano tubes
- 2. Discuss the properties of nano and bulk materials

# **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	Describe the classification of nanomaterial.	1,2,3,4,6,7,8	Remembering
L02	Discuss size-dependent properties of nanomaterial.	1,2,3,4,7,8,10	Understanding
CO3	Explain the various techniques for nanoparticles synthesis.	1,2,3,5,6,7,8,9,10	Applying
CO4	Outline nanomaterial characterization techniques.	1,2,3,5,6,7,8,9,10	Analyzing
CO5	List out the various application incorporates in the nanomaterial.	1,2,3,5,6,7,8,9,10	Applying

# MAPPING WITH PROGRAM OUTCOMES

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PS08	PSO9	PSO10
CO1	S	S	S	М	-	L	L	L	-	-
CO2	S	S	S	М	-	-	L	L	-	L
CO3	S	S	S	-	M	L	М	М	М	S
CO4	S	S	S	-	М	М	L	M	М	S
CO5	S	S	S	-	М	М	М	M	L	L

### **B.Sc CHEMISTRY**

#### **SEMESTER VI**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCHM7	POLYMER CHEMISTRY	56	4	-	4

## **Learning Objectives:**

- To provide the students the importance of polymers and an exposure to polymer science.
- To know various types of polymerization
- To know the applications of commercial polymers

## **UNIT - I Introduction to Polymers**

[12 Hours]

Basic Concepts: Monomer – Functionality – Polymer – Bio polymer introduction and application only. Degree of Polymerization - Stereo Specificity. Types of polymerization (addition, condensation and co polymerization)

Classification of polymers based on chemical structure and applications.

# **UNIT - II Basics of Polymers**

[12 Hours]

Nature of Polymers: Amorphous – Crystalline – Crystalline Melting point(Tm) - Glass transition temperature (Tg), Relationship between Tm and Tg and its significance.

Molecular weight of polymers – Polydispersion - Number and weight average molecular weight -End group Analysis – Viscosity method – Colligative property measurements.

# **UNIT - III Polymerization and processing technique**

[12 Hours]

Polymerization techniques: Bulk, Solution, suspension and Emulsion Polymerization.

Polymer Processing techniques: calendaring, casting (rotational, die, film), moulding (injection, extrusion, blow and compression)

# **UNIT - IV Industrial Polymers**

[12 Hours]

Poly olefine - Polythene, PTFE, Freons, PET, PVC, PP and PS.

Natural and synthetic rubbers – Constitution of natural rubber, Butyl rubber, Buna rubber, (Buna – S and Buna – N) Neoprene, Thiokol, Polyurethane and Silicone rubbers – Vulcanisation of rubber.

#### **UNIT - V Plastics and Resins**

[12 Hours]

Definitions: Thermoplastic and thermosetting resins – Compounding of Plastics – Preparation, properties and uses of phenol – Formaldehyde (Bakelite), Epoxide resin and Thermocole – Difference between Thermoplastics and Thermosetting plastics.

#### **Text Books:**

- 1. V.R. Gowariker, Polymer Science, Wiley Eastern, 1995.
- 2. G.S. Misra, Introductory Polymer Chemistry, New Age International (Pvt) Limited, **1996**.
- 3. F. N. Billmeyer, Textbook of Polymer Science, Wiley Interscience, 1971.
- 4. A. Kumar and S. K. Gupta, Fundamentals and Polymer Science and Engineering, Tata McGraw-Hill, **1978**.
- 5. Polymer Chemistry, Sharma.B.K Goel Publishing House, Meerut- 1989.
- 6. Polymer Chemistry. Arora M.G. Vadar M.S. Anmol publications (p) Ltd., New Delhi **1989.**
- 7. Polymer Chemistry An introduction M.P. Stevens, oxford.

#### **Reference Books**

- 1. V.R. Gowariker, Polymer Science, Wiley Eastern, 1995.
- 2. G.S. Misra, Introductory Polymer Chemistry, New Age International (Pvt) Limited, **1996.**
- 3. F. N. Billmeyer, Textbook of Polymer Science, Wiley Interscience, 1971.
- 4. A. Kumar and S. K. Gupta, Fundamentals and Polymer Science and Engineering, Tata McGraw-Hill, **1978**.
- 5. Polymer Chemistry, Sharma.B.K Goel Publishing House, Meerut- 1989.
- 6. Polymer Chemistry. Arora M.G. Vadar M.S. Anmol publications (p) Ltd., New Delhi 1989.
- 7. Polymer Chemistry An introduction M.P. Stevens, oxford.

## **Online Resources:**

- 1. https://nptel.ac.in/courses/104/105/104105039/
- 2. https://onlinecourses.nptel.ac.in/noc20\_cy22/preview

#### **Assignments:**

- 1. Types of polymerization
- 2. Polymerization techniques.
- 3. Thermo setting and Thermo plastic

# **Group Tasks:**

- 1. Identify the natural and synthetic rubber.
- 2. Degradable and non-Degradable polymer.

# **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	State the basic concept of polymer.	1,2,3,4,6,7,8	Remembering
CO2	Relate Tm, Tg and its significance.	1,2,3,4,6,7	Understanding
LUS	Apply the Polymerization techniques andPolymer Processing techniques.	1,2,3,4,6,7,9,10	Applying
CO4	Differentiate Natural and synthetic rubbers.	1,2,3,4,5,6,7,9,10	Analyzing
CO5	Distinguish Thermoplastic and thermosetting resins.	1,2,3,4,6,7,8,9,10	Evaluating

# **MAPPING WITH PROGRAM OUTCOMES**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	S	S	М	-	L	L	L	-	-
CO2	S	S	S	М	-	М	М	-	-	-
CO3	S	S	S	M	-	M	M	-	М	M
CO4	S	S	S	M	M	М	M	-	L	М
CO5	S	S	S	M	-	M	М	M	L	L

### **B.Sc CHEMISTRY**

#### **SEMESTER VI**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCHM8	BIOCHEMISTRY	56	4	-	4

# **Learning Objectives:**

- To provide knowledge about importance of Carbohydrates and proteins.
- To know various types of Enzymes and bio catalysis.
- To know the Lipids and Structure of DNA/RNA

## **Unit-I Carbohydrates**

[12 Hours]

Biological importance of carbohydrates, Metabolism, Cellular currency of energy (ATP), Glycolysis, Alcoholic and Lactic acid fermentations, Krebs cycle.

Unit-II Proteins [12 Hours]

Classification, biological importance; Primary, secondary and tertiary structures of proteins:  $\alpha$ -helix and  $\beta$ - pleated sheets, Denaturation of proteins.

Unit-III Enzymes [12 Hours]

Nomenclature, Characteristics (mention of Ribozymes), Classification; Active site, Mechanism of enzyme action, Stereospecificity of enzymes, Coenzymes and cofactors, Enzyme inhibitors, Biocatalysis in Green Chemistry" and Chemical Industry.

Unit-IV Lipids [12 Hours]

Biological importance of triglycerides and phosphor glycerides and cholesterol;

Lipid membrane, Liposomes and their biological functions and underlying applications.

## **Unit-V Structure of DNA/RNA**

[12 Hours]

Structure of DNA (Watson-Crick model) and RNA, Genetic Code, Biological roles of DNA and RNA: Replication, Transcription and Translation, Introduction to Gene therapy.

#### **Text Books:**

- 1. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2006) Biochemistry. VI the Edition. W.H. Freeman and Co.
- 2. Nelson, D. L., Cox, M. M. and Lehninger, A. L. (2009) principles of Biochemistry.IV Edition. W.H. Freeman and Co.
- 3. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. **(2009)** Harper's Illustrated Biochemistry. XXVIII edition. Lange medical Books/ McGraw-Hill

#### **Reference Books:**

- 1. Berg, J.M., Tymoczko, J.L. and Stryer, L. **(2006)** Biochemistry. VI the Edition. W.H. Freeman and Co.
- 2. Nelson, D. L., Cox, M. M. and Lehninger, A. L. (2009) principles of Biochemistry.IV Edition. W.H. Freeman and Co.
- 3. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. **(2009)** Harper's Illustrated Biochemistry. XXVIII edition. Lange medical Books/ McGraw-Hill

### **Online Resources:**

- 1. https://nptel.ac.in/courses/104/105/104105076/
- 2. https://nptel.ac.in/courses/104/105/102205034/

## **Assignments:**

- 1. Structure of proteins
- 2. General characters of lipids

# **Group Tasks:**

- 1. Discuss the different types of amino acids in RNA/DNA
- 2. Discuss the design and structure of bio catalysis

# **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
COI	Describe the biological importance of carbohydrates.	1,2,3,4,7,8,10	Remembering
	Summarize Primary, secondary and tertiary structures of proteins.	1,2,3,4,6,7	Understanding
	Explain the mechanism of enzymes action.	1,2,3,4,5,6,7	Applying
CO4	Outline the biological importance of triglycerides and phosphoglycerides and cholesterol.	1,2,3,4,7	Analyzing
CO5	Distinguish the Structure of DNA and RNA	1,2,3,4,6,7	Evaluating

# MAPPING WITH PROGRAM OUTCOMES

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PS08	PS09	PSO10
CO1	S	S	S	М	-	-	М	М	-	L
CO2	S	S	S	М	-	M	М	-	-	-
CO3	S	S	S	M	M	M	L	-	-	-
CO4	S	S	S	М	-	-	L	-	-	-
CO5	S	S	S	M	-	М	L	-	-	-

#### **B.Sc CHEMISTRY**

#### **SEMESTER VI**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCHS4	FOOD CHEMISTRY	26	4	-	2

## **Learning objectives:**

- To learn about food adulteration
- To know about food poisoning
- To study the food preservation and food wastage
- To learn about vitamins and minerals

#### **UNIT-I Food Adulterations**

[6 Hours]

Food – sources – functions – food groups – food in relation to health – objectives of cooking. Adulterants – common adulterants in different foods – milk and milk products, vegetable oils, and fats, spices and condiments, cereals, pulses, sweetening agents and beverages – Principles involved in the analysis of detection and prevention of food adulteration.

## **UNIT-II Food Additive and Food Poisoning**

[6 Hours]

Food additives – Definition – classification - their functions – Artificial sweeteners – saccharin, – food flavours – esters, aldehydes and heterocyclic compounds. Antioxidants. Food colours – changes in cooking – Spurious colours. Mono sodium glutamate.

Food poisoning – Sources, causes and remedies – Causes and remedies for acidity, gastritis, indigestion and constipation.

## **UNIT-III Food Preservation and Food Processing**

[6 Hours]

Food preservatives – Definition – classification – food spoilage – definition – prevention.Methods of preservation – freezing (principles and types) – drying and dehydration (definition and types) – food irradiation – thermal processing (pasteurization, sterilization and blanching).

UNIT-IV Vitamins [6 Hours]

Vitamins - classification, sources, functions and deficiencies. Fat soluble vitamins (A, D, E and K), water soluble vitamins (Vitamin C and B-Complex), -  $B_6$ , Folic acid and  $B_{12}$  - Fortification with vitamins - Effect of cooking on vitamins - different methods of cooking of vegetables and fruits.

UNIT-V Minerals [6 Hours]

Sources, functions, bioavailability and deficiency of the following minerals (calcium, iron, iodine, fluorine, sodium and potassium) – Fortification with minerals – Effect of cooking on minerals.

### **Text Books:**

- 1. Food Science III Edition B. Sri Lakshmi. New Age International Publisher, **2005.**
- 2. Food Chemistry Lilian Hoagland Meyer CBS Publishers & Distributors, 2004.
- Food Science, Nutrition and Health Brian.A.Fox, Allan G.Cameron Edward Arnold, London.
- 4. Fundamentals of Foods and Nutrition Mudambi. R.Sumathi, and Raja gopal, M.V. WileyEastern Ltd., Madras.
- 5. Siva Sankar B., Food Processing and Preservation. Prentice Hall of India Pvt. Ltd., NewDelhi. **2002.**

## **Reference Books:**

- 1. Handbook of Food and Nutrition M. Swaminathan Bangalore Printing and Publishing Co. Ltd., Bangalore.
- 2. Norman N. Potter ,Food science, CBS publishers and distributors, New Delhi.

## 1994.

- 3. Lillian Hoagoland Meyer, Food Chemistry, CBS publishers and distributors, New Delhi. **1994.**
- 4. Srilakshmi B., Food Science, New age International Pvt. Ltd. Publishers, III ed. **2003.**

# **Online Resources/Tutorials:**

- 1. http://ecoursesonline.iasri.res.in/course/view.php?id=89
- 2. https://onlinecourses.swayam2.ac.in/cec20\_ag10/preview
- 3. https://nptel.ac.in/courses/103/107/103107088/
- 4. https://onlinecourses.nptel.ac.in/noc20\_ag02/preview

# **Assignments:**

- 1. Adulterants common adulterants in different foods
- 2. Definition classification food spoilage
- 3. Fortification with minerals
- 4. Survey of food preservatives available in the market (Natural and Synthetic).

# **Group Tasks:**

- 1. Spurious colours. Mono sodium glutamate
- 2. Different methods of cooking of vegetables and fruits

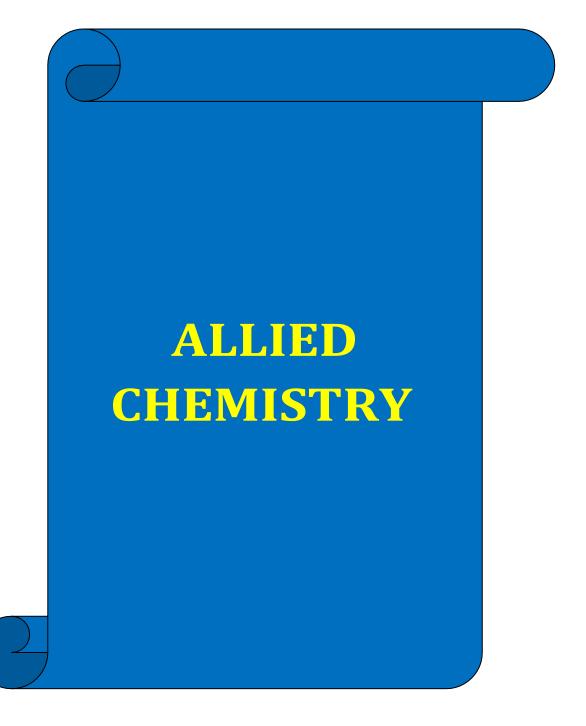
# **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOS addressed	BLOOMS VERB
CO1	Identify the different food adulterants.	1,2,3,4,8	Remembering
CO2	Describe the food additives and flavors.	1,2,3,4,5,6,7	Understanding
CO3	Explain the method of food preservatives.	1,2,3,4,6,7,8,10	Applying
CO4	Classify vitamins and the effect of cooling on vitamins.	1,2,3,4,6,7,9	Analyzing
CO5	List outsources, functions, bioavailability ,and deficiency of the minerals.	1,2,3,4,6,7,9,	Applying

# MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	P04	PO5	P06	P07	P08	P09	PO10
CO1	S	М	М	М	-	-	-	L	-	-
CO2	S	М	М	M	L	М	M	-	-	-
CO3	S	S	M	М	-	М	L	L	-	L
<b>CO4</b>	S	S	M	M	-	M	M	-	L	-
CO5	S	М	М	М	-	М	M	-	L	-



#### **ALLIED CHEMISTRY**

## **SEMESTERI / III**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22ACH01	INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-I	71	4	-	4

## **Learning Objective:**

- To learn about Bonding between atom and its strength.
- To learn about the particles of Nucleus, Radio activity and its applications.
- To understand the structure of compounds.
- To know about the stability of organic compounds.
- To aware about the Strength of solutions.

## **Unit-I Chemical Bonding**

[15 Hours]

Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals.M.O.diagrams of Hydrogen, Helium, Nitrogen, Fluorine and Nitric Oxide-discussion of bond order and magnetic properties.

 $Hydrides\mbox{-} classification \ and \ characteristics\mbox{-} preparation, properties \ and \ uses \ of Borazole, NaBH_4 \ and \ LiAlH_4.$ 

Carbonyls-mononuclear and polynuclear carbonyls-Examples. Preparation, properties and structure of  $Cr(CO)_6$ ,  $Fe(CO)_5$  and  $Ni(CO)_4$ .

## **Unit-II Nuclear Chemistry**

[15 Hours]

Fundamental particles of Nucleus – nuclide, isotopes, isobars and isotones. Natural adioactivity-radioactive series including Neptunium series-Group displacement law. Nuclear Binding energy, mass defect-Calculations. Nuclear Fission and Nuclear Fusion-differences – Stellar energy.

Artificial Radioactivity-Preparation of trans uranium elements –Np, Pu, Cf, Es and No. Applications of radioistopes-C-14 dating, rock dating, isotopes as tracers, study of Reaction mechanism (ester hydrolysis) radio-diagnosis and radiotherapy.

# Unit-III Basic concepts of Electronic effects and Isomerism [15 Hours]

Covalent Bond-Orbital Overlap-Hybridization – Geometry of Organic molecules-Methane, Ethylene, Acetylene and Benzene. Electron displacement Effects: Inductive, Resonance, Hyper conjugative & steric effects. Their effect on the properties of compounds.

Isomerisms - Geometrical isomerism: In alkene (2-butene only), Optical isomerism: lactic and tartaric acid and Conformational analysis of ethane and n-butane.

# **Unit-IV Aromatic Compounds and Polymer chemistry**

[15 Hours]

Aromatic compounds – Aromaticity – Huckel's rule. Heterocyclic compounds:-Preparation, properties and uses of Furan, Thiophene, Pyrrole and Pyridine.

Polymer chemistry - Classification of polymers (natural and synthetic) - (thermoplastic and thermosetting resins) - rubber (Buna-S, Buna-N) polyamides (Nylon 6,6), polyesters (PET), PVC-(starting materials and uses only).

# Unit-V Volumetric Analysis, Solutions and Chromatography [15 Hours]

Principle of volumetric analysis : Normality, Molality, Molarity, Mole fraction, mole concept. Primary standard ( $Na_2CO_3$ ) – definition, principle and secondary standard (NaOH) definition, principle.

Solutions: Raoult's law for ideal solutions – positive and negative deviations. Types and examples of solutions: solid in liquid, gas in liquid and liquid in liquid (totally miscible, partially miscible and immiscible liquid pairs).

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

#### **Text Books:**

- 1. Maron and Lando, Fundamentals of Physical Chemistry, Collier, Mac Millan.**2015**
- 2. Castellan. G.W, Physical Chemistry, Naropa Publishing House. 2010
- 3. Walter J. Moore, Physical Chemistry, Orient Longamann.2011
- 4. Tiwari, Malhotra and Vishoni, Organic chemistry, Vol I and II , Vikas Publishing House. **2015**

## **References:**

- 1. Singh, Mukarji and Kapoor, Organic Chemistry, Mac Millan. 2012
- 2. Jain.M.K, Principles of Organic Chemistry-Vishal publishing Co.2015
- 3. Soni.P.L, Text Book of Inorganic Chemistry, Sultan Chand & Sons.2015
- 4. Puri and Sharma, Text book of Inorganic Chemistry-Vishal publishing co.2017

#### **Online Resources:**

- 3. www.organic-chemistry.org/
- 4. www.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm
- 5. www.chemguide.co.uk/orgmenu.html
- 6. www.chem.umass.edu/~samal/orginorgsites.html

## **Assignments:**

- 1. MO Diagram of diatomic molecules
- 2. Application of radio isotopes

## **Group Tasks:**

- 1. Calculate the strength of solutions
- 2. Discuss about natural and synthetic polymer

# **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	Describe theory, bonding, antibonding and non-bonding orbital in MO theory.	1,2,3,4,7	Remembering
L02	Differentiate nuclear fission and fusion reactions.	1,2,3,4,6,7	Understanding
CO3	Explain orbital overlap and hybridization.	1,2,3,4,7	Applying
CO4	Classify polymers.	1,2,3,4,7	Analyzing
CO5	Calculate normality, molality, mole fraction and mole concept.	1,2,3,4,6,9,10	Applying

# MAPPING WITH PROGRAM OUTCOMES

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PS08	PSO9	PSO10
CO1	S	S	S	M	-	-	L	-	-	-
CO2	S	S	S	М	-	М	L	-	-	-
CO3	S	S	S	M	-	-	M	-	-	-
CO4	S	S	S	M	-	-	L	-	-	-
CO5	S	S	S	М	-	М	-	-	М	L

#### ALLIED CHEMISTRY

### **SEMESTER III / IV**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22ACH02	INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-II	71	4	-	4

## **Learning Objective:**

- To learn about co-ordination compounds.
- To aware about the biological function of primary metabolites.
- To understand about the medicinal activities of living things.
- To study about photo chemical reaction and renewable sources.
- To know about electro chemistry.

# **UNIT-I Co-ordination chemistry**

[15 Hours]

Co-ordination chemistry-definition of terms-classification of ligands-Nomenclature - Chelation-Examples. Chelate effect-explanation. Werner's theory-Sidgwick's theory-Effective Atomic Number concept. Pauling's theory-postulates-Application to octahedral, square planar and tetrahedral complexes.

Biological role of Hemoglobin and Chlorophyll (Elementary idea of structure and mechanism of action). EDTA –Principle, Structure and applications (Determination of hardness of water only).

# **UNIT - II Carbohydrates and Amino acids**

[15 Hours]

Carbohydrates: Classification – preparation, properties and uses of Glucose and Fructose – Mutarotation. Preparation properties and uses of Sucrose and lactose. Preparation and Properties of Starch, Cellulose and derivatives of Cellulose. Inter conversion of Glucose to Fructose and vice versa.

Amino Acids-classification, preparation and properties of Glycine and Alanine. Preparation of peptides (Bergmann method only). Proteins: classification according to composition, biological function and shape. Denaturation of proteins.

## **UNIT-III Medicinal Chemistry**

[15 Hours]

Chemotherapy: Preparation, uses and mode of action of sulpha drugs-prontosil, sulphadiazine and sulphafurazole. Uses of penicillin, chloramphenicol and streptomycin, Definition and one example each for-analgesics, antipyretics, tranquilizers, sedatives, hypnotics, local anesthetics and general anesthetics.

Cause and treatment of diabetes, cancer and AIDS.

Indian Medicinal Plants and uses- Nilavembu, Sirianangai, Thothuvalai, Adathoda, keezhanelli and Papaya.

## **UNIT-IV Photo chemistry**

[15 Hours]

Photochemistry: Grothus-Draper law and Stark-Einstien's law of photochemical equivalence. Quantum yield. Example for photochemical reactions- Hydrogen-Chlorine reaction (elementary idea only) photosynthesis. Phosphorescence, Fluorescence.

Renewable sources of energy: solar, wind, tidal, hydrothermal, geothermal energy. Non-renewable sources of energy: coal, petroleum fuels, LPG, CNG.

## **UNIT-V Electro chemistry**

[18Hours]

Electro Chemistry: Specific and equivalent conductivities – their determination – Kohlrausch law -measurement of conductance – conductometric titrations(strong acid versus strong base, weak acid versus weak base)

Galvanic cells-EMF-standard electrode potentials, reference electrodes (SHE and calomel) – Electrochemical series. Batteries: Introduction – Dry cell, Li-ion, Lead acid storage battery

Corrosion: Definition – types of corrosion (Dry and wet corrosion) - prevention (Electroplating method only).

### **Text Books:**

- 1. Maron and Lando, Fundamentals of Physical Chemistry, Collier, Mac Millan.2015
- 2. Castellan. G.W, Physical Chemistry, Naropa Publishing House. 2010
- 3. Walter J. Moore, Physical Chemistry, Orient Longamann.2011
- 4. Tiwari, Malhotra and Vishoni, Organic chemistry, Vol I and II, Vikas Publishing House. **2015**

## **References:**

- 1. Singh, Mukarji and Kapoor, Organic Chemistry, Mac Millan. 2012
- 2. Jain.M.K, Principles of Organic Chemistry-Vishal publishing Co.2015
- 3. Soni.P.L, Text Book of Inorganic Chemistry, Sultan Chand & Sons.2015
- 4. Puri and Sharma, Text book of Inorganic Chemistry-Vishal publishing co.2017

#### **Online Resources:**

- 1. www.organic-chemistry.org/
- 2. www.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm
- 3. www.chemguide.co.uk/orgmenu.html
- 4. www.chem.umass.edu/~samal/orginorgsites.html

## **Assignments:**

- 1. Nomenclature of co-ordination compound
- 2. Causes and treatment of diabetes
- 3. Carbohydrate and proteins

#### **Group Tasks:**

- 1. Collection of Indian medicinal plants.
- 2. Identify primary and secondary battery

# **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	Define some terminology of the coordination complex.	1,2,3,4,6	Remembering
CO2	Classify carbohydrates and discuss their uses.	1,2,3,4,6,7	Understanding
CO3	List out Indian medicinal plants and their uses.	1,2,3,4,6,7,9	Applying
CO4	Differentiate fluorescence and phosphorescence.	1,2,3,4,6,7,8,10	Analyzing
CO5	Illustrate types of corrosions.	1,2,3,4,6,7,8,9,10	Analyzing

# **MAPPING WITH PROGRAM OUTCOMES:**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PS09	PSO10
CO1	S	S	S	M	-	L	-	L	-	-
CO2	S	S	S	М	-	М	М	-	-	-
CO3	S	S	S	M	-	M	М	-	L	-
CO4	S	S	S	M	-	M	M	M	-	L
CO5	S	S	S	M	-	М	М	L	L	L



### **B.Sc CHEMISTRY**

#### **SEMESTER II**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCHP1	VOLUMETRIC ESTIMATION	-	4	41	4

- Basic Problems in Volumetric Estimation (Molality, Molarity, Normality, Molefraction, ppm & mg/L, Percentage of Solution and Preparation of Standard solution
- 2. Acidimetry Alkalimetry :
  - a) Estimation of sodium hydroxide standard sodium carbonate.
  - b) Estimation of Hydrochloric acid Standard solution Oxalic acid.
- 3. Permanganometry
  - a) Estimation of ferrous ion
  - b) Estimation of oxalic acid
  - c) Estimation of calcium
- 4. Dichrometry
  - a) Estimation of ferric ion using internal indicator
- 5. Iodometry and iodimetry
  - a) Estimation of copper
  - b) Estimation of potassium dichromate
- 6. Complexometric Titrations
  - a) Estimation of Zn and Mg using EDTA.
  - b) Estimation of Hardness of water using EDTA.

#### **Reference Books:**

- 1. Laboratory manual of organic chemistry B. B. Dey, M. V. Sitaraman.
- 2. Text book of Practical Inorganic Chemistry Edited by Vogel, ELBS, London.
- 3. Basic principles of Practical Chemistry V. Venkateswaran, R. Veerasamy, A.R. Kulandaivelu, by Sultan Chand & Sons, **2008**.

4. Advanced University Practical Chemistry, P.C. Kamboj by Vishal Publishing Co. **2014** 

# **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOsaddressed	BLOOMS VERB
CO1	Recall the basic problems in volumetric estimation.	1,2,3,4,5,6,7,9	Remembering
CO2	Explain the basic principle involved in acidimetry and alkalimetry titrations.	1,2,3,4,5,6,7,9,10	Understanding
CO3	Demonstrate permanganometry and dichrometry titrations.	1,2,3,4,5,6,7,10	Applying
CO4	Differentiate iodometry and iodimetry.	1,2,3,4,5,6,7,10	Analyzing
CO5	Estimate the amount of hardness of water using EDTA	1,2,3,4,5,6,7,9,10	Analyzing

# **MAPPING WITH PROGRAM OUTCOMES:**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	S	S	S	М	L	L	М	-	М	-
CO2	S	S	S	M	M	М	М	-	М	М
CO3	S	S	S	М	L	М	M	-	-	L
CO4	S	S	S	М	M	М	M	-	-	М
CO5	S	S	S	М	М	М	М	-	L	М

#### **B.Sc CHEMISTRY**

#### **SEMESTER IV**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCHP2	INORGANIC QUALITATIVE ANALYSIS AND PREPARATIONS	-	4	41	4

## 1. Inorganic qualitative analysis:

Analysis of a mixture containing two cations and two anions of which one will be an interfering ion. Semimicro methods using the conventional scheme with hydrogen sulphide may be adopted.

**Anions to be studied:** Carbonate, nitrite, sulphide, sulphite, thiosulphate, sulphate, nitrate, fluoride, chloride, bromide, iodide, borate, oxalate, arsenite, arsenate, phosphate, chromate, tartrate, silicate.

**Cations to be studied:** Silver, mercury, lead, bismuth, copper, cadmium, tin, antimony, arsenic, iron, aluminium, chromium, barium, strontium, calcium, sodium, potassium, magnesium, ammonium.

Not to be given for examination

Anions – nitrite, sulphide, sulphite, thiosulphate, arsenate, tartrate, chromate and silicate.

Cations – Silver, mercury, tin, antimony, sodium and potassium.

## 2. Inorganic preparations:

- a) Ferrous ammonium sulphate
- b) Tetrammine Copper (II) sulphate
- c) Microcosmic Salt
- d) Ferric Alum

## **Reference Books:**

- 1. Laboratory manual of organic chemistry B. B. Dey, M. V. Sitaraman.
- 2. Text book of Practical Inorganic Chemistry Edited by Vogel, ELBS, London.
- 3. Basic principles of Practical Chemistry V. Venkateswaran, R. Veerasamy, A.R. Kulandaivelu, by Sultan Chand & Sons, **2008**.
- 4. Advanced University Practical Chemistry, P.C. Kamboj by Vishal Publishing Co. **2014**

# **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	List out Cations and Anions in an inorganic mixture.	1,2,3,4,5,7,8,10	Remembering
CO2	Indicate the interfering ions present inorganic mixture.	1,2,3,4,5,6,7,8,10	Understanding
CO3	Determine the two Cations and two Anions inorganic mixture.	1,2,3,4,5,6,8,10	Applying
LO4	Explain the preparation of inorganic compounds and their purifications.	1,2,3,4,5,6,7,8,10	Applying
CO5	Analyze the removal of inferring ions in binary mixture.	1,2,3,4,5,6,7,8,10	Analyzing

# **MAPPING WITH PROGRAM OUTCOMES:**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PS08	PSO9	PSO10
CO1	S	S	S	М	М	-	L	L	-	L
CO2	S	S	S	М	L	L	M	L	-	L
CO3	S	S	S	M	М	M	-	L	-	L
CO4	S	S	S	М	М	М	L	M	-	L
CO5	S	S	S	М	М	L	L	M	-	L

#### **B.Sc CHEMISTRY**

#### **SEMESTER VI**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCHP3	PHYSICAL CHEMISTRY EXPERIMENTS	-	4	41	4

## **Physical Experiments**

# (Note: Short Procedure 10 marks)

### 1. Kinetics

- a) Determination of rate constant Acid catalyzed hydrolysis of an ester (methyl acetate or ethyl acetate)
- b) Determination of rate constant for the reaction between potassium iodide and potassium persulphate.
- c) Determination of rate constant acid catalyzed iodination of acetone.
- 2. Molecular weight determination –Rast method
- 3. Heterogeneous Equilibrium
  - a) Effect of impurity on CST of phenol water system and determination of concentration of sodium chloride / succinic acid.
  - b) Simple eutectic system.
  - d) Determination of transition temperature of hydrated salts sodium thiosulfate, sodium acetate, strontium chloride and manganous chloride.
- 4. Electrochemistry:
  - a) Conductivity i) Determination of cell constant
    - ii) Equivalent conductance of strong electrolytes
    - iii) Conductometric titration- acid base titration
  - b) Potentiometry: Potentiometric titration acid-base titration.
- 5. Determination of Partition Co-efficient of Iodine.

## **Reference Books:**

- 1. Laboratory manual of organic chemistry B. B. Dey, M. V. Sitaraman.
- 2. Text book of Practical Inorganic Chemistry Edited by Vogel, ELBS, London.
- 3. Basic principles of Practical Chemistry V. Venkateswaran, R. Veerasamy, A.R. Kulandaivelu, by Sultan Chand & Sons, **2008**.
- 4. Advanced University Practical Chemistry, P.C. Kamboj by Vishal Publishing Co. **2014**

# **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
COI	Describe the basic principles involved in physical chemistry experiments.	1,2,3,4,6,7,8,9,10	Remembering
	Determine the rate constant of acid catalyst hydrolysis of an ester	1,2,3,4,6,7,8,10	Understanding
	Calculate the molecular determination and freezing temperature by rast method.	1,2,3,4,6,7,8,9,10	Applying
CO4	Use conductivity bridge to determine cell constant and equivalent conductance of strong electrolytes.	1,2,3,4,5,6,7,8,9,10	Applying
CO5	Determine the effect of impurity on the CST phenol water system the and transition temperature of hydrated salts.	1,2,3,4,5,6,7,8,9,10	Applying

# **MAPPING WITH PROGRAM OUTCOMES:**

COs	P01	PO2	PO3	P04	PO5	P06	PO7	P08	P09	PO10
CO1	S	S	S	M	-	M	M	L	L	L
CO2	S	S	S	M	-	M	M	L	-	L
CO3	S	S	S	M	-	М	L	L	M	L
CO4	S	S	S	М	M	M	L	М	L	L
CO5	S	S	S	M	M	M	М	М	L	L

S- Strong; M-Medium; L-Low

### **B.Sc CHEMISTRY**

#### **SEMESTER VI**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22UCHP4	ORGANIC PRACTICAL AND GRAVIMETRIC ESTIMATIONS	-	4	71	4

# **Organic Preparations**

- 1. Preparations involving the following:
  - a) Oxidation of benzaldehyde
  - b) Hydrolysis of Methyl salicylate.
  - c) Nitration p-nitroacetanilide and m-dinitrobenzene
  - d) Bromination p- bromoacetanilide and tribromophenol
  - e) Benzoylation -- β-naphthylbenzoate
- 2. Determination of boiling point of liquids.
- 3. Analysis of organic compounds.

Characterization of organic compounds by their functional groups and confirmation by preparation of derivative. The following functional groups may be studied. Aldehydes, Ketones, carboxylic acids, aromatic primary and secondary amines, phenols, aromatic esters, amides, diamides, anilides, nitro compounds and monosaccharides.

## 4. Gravimetric Estimations

- 1. Estimation of Barium as Barium sulphate
- 2. Estimation of Barium as Barium chromate
- 3. Estimation of Lead as Lead chromate
- 4. Estimation of Calcium as Calcium oxalate monohydrate

- 5. Estimation of Calcium as Calcium carbonate.
- 6. Estimation of Sulphate as Barium sulphate.

### **Reference Books:**

- 1. Laboratory manual of organic chemistry B. B. Dey, M. V. Sitaraman.
- 2. Text book of Practical Inorganic Chemistry Edited by Vogel, ELBS, London.
- 3. Basic principles of Practical Chemistry V. Venkateswaran, R. Veerasamy, A.R. Kulandaivelu, by Sultan Chand & Sons, **2008**.
- 4. Advanced University Practical Chemistry, P.C. Kamboj by Vishal Publishing Co. **2014**

## **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	Label the organic compounds.	1,2,3,4,6,7,8	Remembering
CO2	Explain the preparation of organic compounds and their purifications.	1,2,3,4,5,6,7,9,10	Understanding
CO3	Determine the boiling point of liquids.	1,2,3,4,5,6,7,8	Applying
CO4	Apply the principle of gravimetric estimation of Ba as BaSO4by using silica crucible and Pb as Lead chromate by using sintered crucible.	1,2,3,4,5,6,7,9,10	Applying
	Analyze the organic compounds by their functional groups and its derivatives.	1,2,3,4,6,7,9,10	Analyzing

# **MAPPING WITH PROGRAM OUTCOMES:**

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PS08	PSO9	PSO10
CO1	S	S	S	М	-	М	М	L	-	-
CO2	S	S	S	M	M	M	S	ı	М	L
CO3	S	S	S	S	М	M	M	L	-	-
CO4	S	S	S	М	M	М	М	-	S	L
CO5	S	S	S	S	-	М	S	-	S	L

#### ALLIED CHEMISTRY

### **SEMESTER II/IV**

Course code	Course name	Lecture(L)	Tutorial(T)	Practical(P)	Credit
22ACHP1	ALLIED CHEMISTRY PRACTICAL	-	4	41	3

#### I. TITRIMETRY

- 1. Estimation of Sodium hydroxide Standard sodium carbonate.
- 2. Estimation of Hydrochloric acid-Standard Oxalic acid.
- 3. Estimation of Borax Standard Sodium carbonate.
- 4. Estimation of Ferrous sulphate Standard Mohr's Salt.
- 5. Estimation of Oxalic Acid Standard Ferrous Sulphate.
- 6. Estimation of Sodium hydroxide Standard. Potassium permanganate
- 7. Estimation of Ferrous iron using diphenylamine as internal indicator.

## **II. Organic Analysis:**

- 1. Detection of elements- nitrogen, sulphur and halogens.
- 2. Detection of aliphatic or aromatic.
- 3. Detection of whether saturated or unsaturated compounds.
- 4. Preliminary tests and detection of functional groups :aldehydes, phenols, aromatic amines, aromatic acids, dicarboxylic acids, Urea , benzamide & carbohydrate.

## **Reference Books:**

- 1. Laboratory manual of organic chemistry B. B. Dey, M. V. Sitaraman.
- 2. Text book of Practical Inorganic Chemistry Edited by Vogel, ELBS, London.
- 3. Basic principles of Practical Chemistry V. Venkateswaran, R. Veerasamy, A.R. Kulandaivelu, by Sultan Chand & Sons, **2008**.
- 4. Advanced University Practical Chemistry, P.C. Kamboj by Vishal Publishing Co. **2014**

# **COURSE OUTCOMES:**

On successful completion of the course, students will be able to

S. NO.	COURSE OUTCOME	PSOs addressed	BLOOMS VERB
CO1	Recall the basic problems in volumetric estimation	1,2,3,4,5,6,8,9,10	Remembering
COS	Explain the basic principle involved in acidimetry and alkalimetry titrations.	1,2,3,4,5,6,7,8,9,10	Understanding
CO3	Demonstrate permanganometry titrations.	1,2,3,4,7,8,9,10	Applying
CO4	List out the organic compounds.	1,2,3,4,7,8,10	Applying
COS	Analyze the organic compounds by their functional groups	1,2,3,4,5,7,8,10	Analyzing

# **MAPPING WITH PROGRAM OUTCOMES:**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PS08	PSO9	PSO10
CO1	S	S	S	S	M	М	-	L	L	L
CO2	S	S	S	S	M	M	М	L	L	L
CO3	S	S	S	M	-	-	М	L	L	L
CO4	S	S	S	M	-	-	М	L	-	L
CO5	S	S	S	М	М	-	М	L	-	L