# UNDER GRADUATE PROGRAMME – B.Sc. CHEMISTRY

# LEARNING OUTCOME BASED CURRICULUM FRAMEWORK under CBCS PATTERN

# SYLLABUS & SCHEME OF EXAMINATION

(For the candidates admitted from the academic year 2023 – 2024 onwards)

					T	$\mathbf{S}$	Z	EXA	M MAH	RKS
SEMESTER	PART	COURSE CODE	TITLE OF THE COURSE	NATURE	INSTRUCTIONA HOURS	CREDIT POINT	XAM DURATIO	CIA	ESE	TOTAL
		23UTAM101/	Tamil Paper I /							
	Ι	23UHIN101/	Hindi Paper I /	LAN	6	3	3	25	75	100
		23UFRE101	French Paper I							
	п	23UGEN101	General English I	ENG	6	3	3	25	75	100
	- 11	23UAEN101	Advanced English I	LINU	0	5	5	23	15	100
			Core I							
	III	23UCH1C01	General Chemistry I	CC	5	5	3	25	75	100
Ι			(Skill Development)							
	ш	23UCH2CP1	Core Practical I Inorganic Qualitative Analysis (Skill Development)	CC	3	-	-	-	-	-
	ш	221101114.01	Allied I	CEN	4	2	2	20	55	75
	111	230PHIA01	Physics Paper I	GEN	4	3	3	20	55	15
	III	23UPH2AP1	Allied Practical: Physics	GEN	2	-	-	-	-	-
	IV	15UVAL101	Value Education	AEC	2	2	2	-	50	50
					28	16				
	1	Γ	Γ		1 1			1		
		23UTAM202/	Tamil Paper II /							
	Ι	23UHIN202/	Hindi Paper II /	LAN	6	3	3	25	75	100
		23UFRE202	French Paper II							
	Π	23UGEN202	General English II	ENG	6	3	3	25	75	100
		23UAEN202	Advanced English II		_	-	-			
II	III	23UCH2C02	Core II General Chemistry II	CC	5	5	3	25	75	100
	III	23UCH2CP1	Core Practical I Inorganic Qualitative Analysis (Skill Development)	CC	3	3	3	40	60	100
	III	23UPH2A02	Allied II Physics Paper II	GEN	4	3	3	20	55	75

	III	23UPH2AP1	Allied Practical: Physics	GEN	2	4	3	20	30	50
	IV	21UENS202	Environmental Studies	Environmental Studies AEC 2 2		2	-	50	50	
					28	23				
		23UTAM303/	Tamil Paper III /							
	Ι	23UHIN303/	Hindi Paper III /	LAN	6	3	3	25	75	100
		23UFRE303	French Paper III							
	п	23UGEN303/	General English III	ENG	6	3	3	25	75	100
	11	23UAEN303	Advanced English III	ENO	0	5	5	23	15	100
			Core III							
	III	23UCH3C03	General Chemistry III	CC	4	5	3	25	75	100
			(Employability)							
			Core Practical II							
	ш	23UCH4CP2	Volumetric Analysis	CC	3	_	_	_	_	_
Ш			and Applied Practical	00	5					-
			(Skill Development)							
	III	23UMA3A07	Allied III	GEN	6	5	3	25	75	100
			Mathematics Paper I							
	IV		Skill Based I	arc a	2	2	2	25	75	100
		23UCH3SB1	Dye Chemistry	SEC	3	2	3	25	75	100
			(Employability)							
		23UBTA301/	Basic Tamil I /					20	30	50
	IV	23UATA301	Advanced Tamil I	AEC	2	2	2			
			System					-	50	50
	IV	22UNCCWS1	Woman Studias	AFC	2		2			50
	1 V	2501000 0051	women Studies	ALC	32	- 20		-	-	50
					34	20				
		23UTAM404/	Tamil Paper IV /							
	T	23UHIN404/	Hindi Paper IV /	LAN	6	6 3	3	25	75	100
		23UFRE404	French Paper IV		Ŭ					
		23UGEN404	General English IV				_			
	II	23UAEN404	Advanced English IV	ENG	6	3	3	25	75	100
			Core IV	~~		_				100
		23UCH4C04	General Chemistry IV	CC	4	5	3	25	75	100
			Core Practical II							
			Volumetric Analysis	00	2	4		10	<i>c</i> 0	100
IV	111	23UCH4CP2	and Applied Practical	CC	3	4	6	40	60	100
			(Skill Development)							
	тт	<b>22111 1 4 4 4 4 4 4 4 4 4 4</b>	Allied IV		E	F	2	25	75	100
	III	23UMA4A08	Allied IV Mathematics Paper II		6	5	3	25	75	100
	III	23UMA4A08	Allied IV Mathematics Paper II Skill Based II		6	5	3	25	75	100
	III	23UMA4A08	Allied IV Mathematics Paper II Skill Based II Pharmaceutical	SEC	6	5	3	25	75	100
	III IV	23UMA4A08 23UCH4SB2	Allied IV Mathematics Paper II Skill Based II Pharmaceutical Chemistry	SEC	6 3	5	3	25 25	75 75	100
	III IV	23UMA4A08 23UCH4SB2	Allied IV Mathematics Paper II Skill Based II Pharmaceutical Chemistry ( <i>Employability</i> )	SEC	6 3	5	3	25 25	75 75	100

		23UATA402	Advanced Tamil II							
		23UHUR404	Human Rights					-	50	50
					30	24				
	•									
	III	23UCH5C05	Core V Solid State, Metallurgy and Nuclear Chemistry	CC	4	5	3	25	75	100
	III	23UCH5C06	Core VI Stereochemistry, Molecular Rearrangement and Biomolecules	CC	4	5	3	25	75	100
	III	23UCH5C07	Core VII Electrochemistry ( <i>Employability</i> )	CC	4	5	3	25	75	100
	III	23NCH5E01	Non-Major Elective Essential Chemistry	GE	4	4	3	25	75	100
V	ш	23UCH5CP3	Core Practical III Organic Analysis &Organic Preparation (Skill Development)	CC	4	3	3	40	60	100
	III	23UCH6CP4	Core Practical IV Physical Practical (Skill Development)	CC	4	-	-	-	-	-
	IV	23UCH5SB3	Skill Based III Polymer Chemistry ( <i>Employability</i> )	SEC	3	2	3	25	75	100
	IV	23IDSBCH1	Skill Based IV Food Science and Technology (For other Departments) ( <i>Entrepreneurship</i> )	SEC	3	2	3	25	75	100
					30	26				
	ш	23UCH6C08	Core VIII Organic Spectroscopy and Natural Products	CC	4	5	3	25	75	100
VI	ш	23UCH6C09	(Sku Development) Core IX Quantum Mechanics, Kinetics and Photochemistry	CC	4	5	3	25	75	100
	III	23UCH6E01 23UCH6E02	Elective Basics of Cheminformatics	DSE	4	4	3	25	75	100

				r	1		1		
		(Entrepreneurship) (or) Bio Chomistry							
		( <i>Employability</i> )							
		Core Practical IV							
III	23UCH6CP4	Physical Chemistry	CC	4	4	3	40	60	100
		(Skill Development)							
		Core Practical V	aa		2	2	10	60	100
111	23UCH6CP5	Gravimetric Analysis	CC	4	3	3	40	60	100
		(Skill Development)							
IV/	23UCH6SB4	SKIII Dased V Applied Chemistry	SEC	3	2	3	25	75	100
1 1	2500110504	(Employability)	SEC	5	2	5	23	15	100
		Skill Based VI							
		Food Science and							
<b>TX</b> 7	221DSPCU1	Technology	SEC	2	2	3	25	75	100
1 V	231D5DCH1	(For other	SEC	3			23		100
		Departments)							
		(Entrepreneurship)							
III	23UCH6PVV	Group Project		4	5	Pr	oject	50	100
							vivasu	0	
		Extension and Co-							
		curricular Activities							
<b>X</b> 7		(NSS, NCC, SPORTS,			1				50
v		NECTAR, RSP, YRS,			1				30
		AICUF, CHETNA							
		WOMEN CELL							
 	19UCYS605	Cyber Security		2	2				50
		SWAYAM/NPTEL/M			2				-
				32	35				
	I			54	55	l			
					140				
		TOTAL			+2				3800
					+2				+ 50

# **PART – WISE TOTAL MARKS**

PART	COURSE	MARKS	TOTAL MARKS	CREDIT POINTS
I	Language Tamil / Hindi / French	400	400	12
II	English	400	400	12

	General / Advanced			
III	Core Theory	900		
	Core Practical	500		
	Allied Theory Maths	200		
	Allied Theory Physics	150	2100	95
	Allied Practical	50		
	NME + Elective	200		
	Project	100		
IV	Basic Tamil I &II			
	Advanced Tamil I & II			
	Indian Knowledge	150		4
	System			-
	Human Rights			
	Women Studies		850	
IV	Skill Based	<b>200</b>		13
	(6 Papers)	000		12
IV	Value Education	50		2
IV	Environmental Studies	50		2
V	Co-curricular Activity	50	50	1
	TOTAL	3800	3800	140
V	Cyber Security	50	50	2
V	MOOC/ SWAYAM/			2
	NPTEL			
	GRAND TOTAL	3800 + 50	3800 + 50	140 +
				2 +

	2
	4

# VALUE ADDED COURSE

Course	Course Code	Title of the	Instructional	Theory	Practical	Total
		Course	Hours			Marks
Certificate Course	22UCCCLM1	Chemical Laboratory Management	30	50	50	100
Certificate Course	24UCCCLM2	Basic Introduction to Research Methodology	30	50	50	100

COURSES	ABBREVIATIONS
LANGUAGE	LAN
ENGLISH	ENG
CORE	CC
GENERIC (ALLIED)	GEN
ABILITY ENHANCEMENT COURSE	AEC
SKILL ENHANCEMENT COURSE	SEC
GENERIC ELECTIVE (NME)	GE
DISCIPLINE SPECIFIC ELECTIVE	DSE

# SEMESTER: I COURSE CODE: 23UCH1CO1 TITLE OF THE COURSE: CORE I – GENERAL CHEMISTRY I (Skill development)

## **COURSE OBJECTIVES:**

- To understand periodic classification and to appreciate the principles of qualitative and qualitative analysis of chemical compounds.
- To correlate the covalent bond properties, the consequent molecular structure, isomerism and to know the chemistry of hydrocarbons, colloids.

## **COURSE OUTCOMES:**

At the end of the course, the student will have the ability to,

CO1	Explain the classification of periodic table, periodicity and the chemistry of rare gases.	К2
CO2	Recall the principles of qualitative and quantitative analysis of chemical compounds in practical chemistry.	K1
CO3	Describe the covalent bond properties, hybridisation and isomerism of organic compounds.	K1
CO4	Explain the chemistry of hydrocarbons – alkanes.	K2
CO5	Relate the concept of liquid crystal and colloidal state with daily life situations.	К3

## Credits: 5

## Syllabus

## **Instructional Hours: 75**

## UNIT I: PERIODIC PROPERTIES AND RARE GASES (K2) (15 Hours)

Division of elements into s, p, d and f block elements - periodic properties - atomic volume, atomic radius, ionic radius, density, electronegativity, metallic character, ionization potential, electron affinity - variation along periods and groups. factors determining periodic properties - causes of periodicity. Position of rare gases in the periodic table- isolation from dry air- Rayleigh & Ramsay method- comparison of physical properties- uses of rare gases- structures of XeF<sub>2</sub>, XeF<sub>4</sub>, XeF<sub>6</sub>, and XeOF<sub>4</sub>.

# UNIT II: QUALITATIVE ANALYSIS (K1)

Solubility product - principle of elimination of interfering anions, common ion effect - complexation reactions including spot tests in qualitative analysis - reactions involved in separation and identification of cations and anions in the analysis - semi micro techniques.

# Titrimetry

## (15 Hours)

# (4 = 11 )

Definitions of molarity, normality, molality and mole fraction - primary and secondary standards -types of titrimetric reactions - acid-base, redox, precipitation and complexometric titrations - indicators - effect of change in pH – types - neutralization, redox, adsorption and metal ion indicators. Oxidation and reduction.

#### **Acids and Bases**

Arrhenius, protonic and Lewis theories of acids and bases - Usanovich's generalized definition relative strengths of acids and bases - dissociation constant of acids and bases - levelling effect of water. Hard and soft acids and bases (HSAB) concept.

#### **Oxidation and Reduction: Reactions**

Oxidation number concept - balancing redox equations by oxidation number method and ion-electron method - equivalent weight of oxidising and reducing agents. (Self-Study: Sodium carbonate extract)

#### **UNIT III: COVALENT BONDING AND STRUCTURE (K1)** (15 Hours)

Covalent bonding - concept of hybridisation - structure of organic molecules based on sp<sup>3</sup>, sp<sup>2</sup> and sp hybridization – covalent bond properties of organic molecules: bond length, bond angle, bond energy, bond polarity, dipole moment, inductive, mesomeric, electromeric, resonance and hyper conjugative effects - IUPAC nomenclature of mono and bi functional aliphatic hydrocarbons (up to 10 carbon systems only) - isomerism types (structural and stereoisomerism) with appropriate examples - calculation of empirical and molecular formulae.

(Beyond the Curriculum: Concepts on acidity and basicity)

## **UNIT IV: CHEMISTRY OF ALKANES (K2)**

Petroleum source of alkanes - methods of preparing alkanes - chemical propertiesmechanism of free radical substitution in alkanes by halogenation- uses. conformational analysis of ethane and n-butane – cycloalkanes- preparation by Dieckmann's ring closure and reduction of aromatic hydrocarbons. Substitution reactions withCl<sub>2</sub>, Br<sub>2</sub>and ring opening reactions of cyclopropane with H<sub>2</sub>, Br<sub>2</sub> & HBr- Baeyer's strain theory -Sacha-Moore theory

# UNIT V: LIQUID STATE (K3)

Liquid crystals - concept of state- typical liquid crystalline substances and their properties. Classification - smectic, nematic & cholesteric - molecular arrangements in various states of liquid crystals.

### **Colloidal State**

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 (gel) - classification, preparation and properties, imbibition, general applications of colloids.

(Self-Study: Common ion effect- Effects on cation.)

#### (15 Hours)

(15 Hours)

# **TEXT BOOKS**

- 1. Soni P.L and Mohan Katyal. 2013. Text Book of Inorganic Chemistry. Sultan Chand and Sons Ltd. New Delhi.
- 2. Jain M.K and Sharma.S.C. 2009. Modern Organic Chemistry. Vishal Publishing Co., New Delhi.
- 3. Puri, Sharma and Pathania. 2009. Elements of Physical Chemistry. Vishal Publishing Company. New Delhi.

# **REFERENCES BOOKS**

1. Malik W. U, Tuli G. D and Madan R.D. 2008.Selected Topics in Inorganic Chemistry.

S. Chand and Company Ltd. New Delhi.

- 2. Puri B.R, Sharma L.R and Kalia K.C. 2017. Principles of Inorganic Chemistry. Vishal Publishing Co., New Delhi.
- 3. Soni P. L and Chawla H.M. 2001.Text book of Organic Chemistry. Sultan Chand and Sons, Educational Publishers. New Delhi.
- 4. Arun Bahl and Bahl B.S. 1997. Text book of Organic Chemistry. S. Chand Publishing
- 5. Soni P. L, Dharmarha O. P. and Dash U. N. 2014.Text book of Physical Chemistry. S. Chand Company Ltd, New Delhi.

# **BLENDED LEARNING**

# UNIT V: LIQUID STATE AND COLLOIDAL STATE (K3)

Topics	Links
Liquid State	
1.Liquid crystals - concept of mesomorphic	https://youtu.be/MuWDwVHVLio
state- typical liquid crystalline substances	https://youtu.be/nAJgchCI3kg
and their properties.	https://youtu.be/vzVjbd8_Ur0
2.Classification – smectic, nematic &	https://youtu.be/gUdDVEPZGV8
cholesteric – molecular arrangements in	
various states of liquid crystals.	
Colloidal State	
Definition of colloids	https://youtu.be/yjeFUF-fNLQ
Classification of colloids	https://youtu.be/qxTRZIR3-ZE
Solids in liquids (sols)	https://youtu.be/dK_IzaOJblI
Properties – Kinetic	https://youtu.be/e4Cmc7sZYZ8
Optical	https://youtu.be/i9LT6-MZzZA
Electrical	https://youtu.be/IjWmiXhw7NQ
Stability of colloids and Protective action	https://youtu.be/vGGa5UqcIMg
Hardy- Schulze law	https://youtu.be/iqIYaiUEEt0
Gold number	https://youtu.be/dh0SLMTTSyo
Liquids in liquids (emulsions)	https://youtu.be/bC_czAL24zY

Types of emulsions	https://youtu.be/DnwC8t8aCAQ
Preparation	https://youtu.be/uWsCCxW8Cj4
Emulsifier	https://youtu.be/7I8GXmpKrVg
Liquids in solids (gel)	https://youtu.be/dK_IzaOJblI
Classification	https://youtu.be/dK_IzaOJblI
Preparation	https://youtu.be/-kMx67ygixY
Properties	https://youtu.be/KS98vCgrKDc
Imbibition	https://youtu.be/ZzzEkBgIr6s
General applications of colloids	https://youtu.be/NYKnwr7bEg8

# MAPPING OF CO'S WITH PO'S / PEO'S

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			2	1				1		2		
CO2	3	3	1	2	3	2	1		2	2	2	3		2
CO3	3	2			3					1		1	2	
<b>CO4</b>	3	2	1	1	2	1			2	1		2		
<b>CO5</b>	3	3	2	1	2	2	1	2	2	2		3	2	1

# Correlation: 3 – High, 2 – Medium, 1 – Low

# ASSESSMENT TOOLS

S.No.	Assessment Methods	Frequency of Assessment			
1.	End Semester Examination	Once in a Semester			
2.	CIA I Examination	Once in a Semester			
3.	CIA II Examination	Once in a Semester			
4.	Model Examination	Once in a Semester			
5.	Unit - I & II Assignment	Twice in a Semester			
6.	Unit – III & IV Seminar	Twice in a Semester			
7.	Unit – V Other component: Quiz	Once in a Semester			

<b>Course Designed by:</b> Dr.Sr.S. Kulandai Therese	Verified by HOD: Dr. N.Gunavathy
Checked by CDC: Dr. G. Chitra	Approved by: Principal

## SEMESTER: II COURSE CODE: 23UCH2C02 TITLE OF THE COURSE: CORE II – GENERAL CHEMISTRY II

# **COURSE OBJECTIVES:**

- To enhance the working knowledge of the main areas of chemistry: organic, inorganic, analytical and physical.
- To gain an understanding of organic mechanisms and predict the outcome of reactions and also concepts in thermodynamics and thermochemistry.

# **COURSE OUTCOMES:**

At the end of the course, the student will have the ability to,

CO1	Identify cognitive aspect of bonding and shape and magnetic behaviour of molecules.	K1
CO2	Associate the fundamental principles of metallurgy and significance of hydrogen.	K2
CO3	Infer mechanistic approach towards the chemistry, elimination and addition reactions of alkenes/ dienes.	K2
CO4	Interpret the concept of aromaticity and chemistry of alkynes.	K2
CO5	Describe the directionality of physical and chemical changes and quantify the energy involved in thermochemical systems and consider the various aspects of use of energy on society.	K1

# Credits: 5

## **Syllabus**

## **Instructional Hours: 75**

# UNIT I: CHEMICAL BONDING (K1)

Ionic bond - lattice energy - Born-Haber cycle - Pauling and Mullikan's scale of electro negativity - polarizing power and polarizability - partial ionic character from electro negativity -transition from ionic to covalent character and vice-versa -Fajan's rule. VSEPR theory - shapes of simple inorganic molecules (BeCl<sub>2</sub>, SiCl<sub>4</sub>, PCl<sub>5</sub>, SF<sub>6</sub>, IF<sub>7</sub>, SO<sub>2</sub>, NH<sub>3</sub>, XeF<sub>6</sub>, H2O) - VB theory - principles of hybridisation - MO theory - bonding and antibonding orbital - application of MO theory to H<sub>2</sub>, He<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub>, NO and CO - comparison of VB and MO theories.

# UNIT II: METALLURGY (K2)

General principles of metallurgy – occurrence of metals - steps involved in metallurgical processes- concentration, gravity separation, magnetic separation, electrostatic separation, froth flotation, leaching- calcination, roasting- reduction – electrolytic reduction, chemical reduction, metal displacement, hydrometallurgy – refining- electrolytic method, vapour phase method, zone refining, oxidation.

## (15 Hours)

(15 Hours)

Position of hydrogen in the periodic table, nascent hydrogen, occluded hydrogen, uses of hydrogen. Physical properties of alkali metals- electronic structure, density, atomic volume, atomic and ionic radii, ionization energy and electronegativity. A comparative study of reactions of alkali metals with O2, H2, halogens and water. Extraction, properties and uses of lithium and sodium. extraction, properties and uses of radium. (Self-Study: Mineral Wealth of India.)

#### **UNIT III: ALKENES AND DIENES (K2)**

by dehydration, Alkenes methods of preparation dehalogenation, dehydrohalogenation and reduction of alkynes, Wittig reaction- reactions of alkeneshydroboration, ozonolysis, allylic substitution. elimination reactions- cis and trans eliminations - mechanism of elimination E1 and E2- Hoffmann's and Sayetzeff's rule. Dienes – stability of isolated and conjugated dienes – 1,2 and 1,4 additions – Diel's Alder reaction.

#### UNIT IV: AROMATICITY, BENZENE AND ALKYNES (K2) (15 Hours)

Aromaticity - resonance energy of benzene and Huckels rule- non benzenoid aromatic compounds- cyclopropenyl cation, cyclopentadienyl anion and tropylium cation. Aromatic electrophilic substitution reactions- nitration, halogenation, sulphonation, Friedal crafts alkylation and acylation, diazo coupling and their mechanism. Orientation and reactivity in monosubstituted benzenes. Alkynes - methods of preparation reactions - addition of water - formation of acetylides - acidity of alkynes.

(Beyond the Curriculum: Isotopic Labelling, predicting the product based meta directing groups.)

# **UNIT V: THERMODYNAMICS I (K1)**

Definition of terms- state variables - types of systems- isolated, open and closed systems - intensive and extensive properties - processes- isothermal, adiabatic, isobaric- first law of thermodynamics. Calculation of  $\Delta E$ ,  $\Delta H$ , Q and W - Work done in isothermal, adiabatic, reversible and irreversible processes for ideal gases. Joule-Thomson effect.

#### Thermochemistry

Enthalpy changes in chemical reactions and physical changes - variation of enthalpy with temperature. Kirchhoff's equation - Hess's law and applications- bomb calorimeter- bond energies and their applications in the determination of enthalpy of reactions, formation and resonance energies of an ideal gas.

(Self-Study: Le chatelier's principle, application of joule thomson effect)

**TEXT BOOKS** 

# (15 Hours)

#### (15 Hours)

- 1. Malik W.U., Tuli G.D. and Madan R.D. 2010.Selected Topics in Inorganic Chemistry. Revised Edition. S Chand Publishing. New Delhi.
- 2. Morrison R.T., Boyd R.N. and Bhattacharjee. 2012. Organic Chemistry. 7<sup>th</sup> Edition. Pearson Education India. New Delhi.
- 3. Arun Bah, Bahl B.S. and Tuli G.D. 2020.Essentials of Physical Chemistry.28<sup>th</sup> Edition. S Chand Publishing. New Delhi.

# **REFERENCES BOOKS**

- 1. Finar I.L. Organic Chemistry The Fundamental Principles Vol I. 6<sup>th</sup> Edition, Pearson Education India. New Delhi.
- 2. Puri B.R., Sharma L.R., Kalia K.C. 2020. Principles of Inorganic Chemistry. Vishal Publishing Co. New Delhi.
- 3. Pillai C.N. 2009. Text Book of Organic Chemistry, Universities Press (India) Private Limited, New Delhi.
- 4. Arun Bahl and Bahl B.S. 2019. A Textbook of Organic Chemistry. 22<sup>nd</sup> Edition. S Chand Publishing. New Delhi.
- 5. Puri B.R., Sharma L.R. and Pathania M.S. 2013. Elements of Physical Chemistry. 4<sup>th</sup> Edition. Vishal Publishing Company. New Delhi.

# BLENDED LEARNING (UNIT IV) UNIT IV: AROMATICITY, BENZENE AND ALKYNES (K2)

Topics	Links
Aromaticity	https://youtu.be/DmATl5CNTw0
Resonance energy of benzene -	https://youtu.be/MTpqLnALKcU
	https://youtu.be/XA5Af8h6p9U
Huckels rule	https://youtu.be/7-BguH4_WBQ
Non benzenoid aromatic compounds- cyclopropenyl	https://youtu.be/ab4WFo0Eq-k
cation, cyclopentadienyl anion and tropylium cation.	
Aromatic electrophilic substitution reactions -	https://youtu.be/5VhwkoP3fsE
nitration	
Halogenation	https://youtu.be/nP4-tAAGDVc
Sulphonation	https://youtu.be/siMLQishuoA
Friedel crafts alkylation	https://youtu.be/6ydPCBEVjXY
Acylation	https://youtu.be/gz6HnUfS2ow
Diazo coupling and their mechanism	https://youtu.be/7FvzeD_35gE
Orientation and reactivity in monosubstituted	https://www.youtube.com/watch?v=ry
benzenes	<u>_TSdtNSsE</u>
Alkynes	https://youtu.be/ouDS2tZU94g
Methods of preparation	https://youtu.be/HbDWBeRJboE
Reactions – Addition of water	https://youtu.be/AE1pkpcKE
Formation of acetylides	https://youtu.be/X4XE6zZ186A
Acidity of alkynes	https://youtu.be/I3HdmyYfE

# MAPPING OF CO'S WITH PO'S / PEO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
<b>CO1</b>	3			2				1						2
CO2	3	3	2		2	2	2		2		2	3	3	3
<b>CO3</b>	3			2		2				1	2		2	
<b>CO4</b>	3			2	2			2	2	1	2		2	2
<b>CO5</b>	3	3	3	2	2	2	1					3		2

**Correlation: 3 – High, 2 – Medium, 1 – Low** 

# ASSESSMENT TOOLS

S.No.	Assessment Methods	Frequency of Assessment		
1.	End Semester Examination	Once in a Semester		
2.	CIA I Examination	Once in a Semester		
3.	CIA II Examination	Once in a Semester		
4.	Model Examination	Once in a Semester		
5.	Unit - I & II Assignment	Twice in a Semester		
6.	Unit – III & IV Seminar	Twice in a Semester		
7.	Unit - V Other component: Test	Once in a Semester		

<b>Course Designed by:</b> Dr.Sr.S. Kulandai Therese	Verified by HOD: Dr. N.Gunavathy
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

# SEMESTER: I & II COURSE CODE: 23UCH2CP1 TITLE OF THE COURSE: CORE PRACTICAL I – INORGANIC QUALITATIVE ANALYSIS (Skill Development)

# **COURSE OBJECTIVES:**

- To Study the principle of distribution of metal ions in different groups.
- To know inter and intra group preparation and separation of metal ions.
- To improve the skill in the qualitative analysis interfering and non-interfering radicals
- metal ions in different groups.
- To identify the methodology to analyse a metal ion in the presence of another metal ion.

• To appreciate the acid and base radicals that they learn during the practicals.

# **COURSE OUTCOMES:**

At the end of the course, the student will be able to

CO1	Analyse systematically the given inorganic salt mixture and report the infreing anions and cations	K4
CO2	Record – records the observations and inference	K3

# Credit: 3

# **Instructional Hours: 90**

# **Inorganic Salt Analysis**

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

# **Cations to be Studied**

Lead, Copper. Bismuth, Cadmium, Iron, Aluminium, Zinc, Manganese, Cobalt, Nickel, Barium, Calcium, Strontium, Magnesium and Ammonium.

# Anions to be Studied

Carbonate, Sulphide, Sulphate, Nitrate, Chloride, Bromide, Fluoride, Borate, Oxalate and Phosphate.

# **Group Experiment**

Determination of pH of liquids.

# **TEXT BOOKS**

- 1. V. V. Ramanujam, Inorganic Semi Micro Qualitative Analysis, 3<sup>rd</sup> Edn., The National Publishing Company, Chennai, 1974.
- 2. A. O. Thomas, Practical Chemistry, 7th Edn., Scientific Book Centre, Kannur, 1999.

# REFERENCES

1. Dr. C Subha, "Semi micro qualitative analysis inorganic salt mixture"

# MAPPING OF CO'S WITH PO'S / PEO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3	3	2		2	2	2		3		2	3	3	3
CO2	3			2		2					2		2	

# Correlation: 3 – High, 2 – Medium, 1 – Low

# ASSESSMENT TOOLS

S.No.	Assessment Methods	Frequency of Assessment
1.	Observation Note	Once in a Year
2.	Record	Once in a Year
3.	Model Practical I	Once in a Year
4.	Model Practical II	Once in a Year
5.	End Semester Examination	Once in a Year

Course Designed by: Dr.Sr.S. Kulandai Therese	Verified by HOD: Dr. N.Gunavathy
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

# **SEMESTER - III**

# COURSE CODE: 23UCH3CO3

# TITLE OF THE COURSE: CORE III – GENERAL CHEMISTRY III

# (Employability)

# **COURSE OBJECTIVES:**

- To predict the nature and topology of inorganic compounds.
- To know the third law of thermodynamics its applications and to understand the nature of carbonyl compounds, acids and esters.

# **COURSE OUTCOMES:**

At the completion of the course, the student will have the ability to,

CO1	Explain the important compounds of boron and silicon.	K2
CO2	Discuss the nucleophilic addition reactions in carbonyl compounds.	K2
CO3	Describe the methods of preparation of acids and esters.	K1
CO4	Explain the application of computer languages in chemistry.	K2

Credits: 5

60

**Instructional Hours:** 

UNIT I: CHEMISTRY OF GROUP III A AND IV A (K2) (12 Hours)

Characteristics of elements of group III – compounds of boron- boric acid, borax, diborane, boron nitride, borazine. Extraction of aluminium - properties and uses of alum.

General characteristics of elements of group IV A - silicates – classification - simple, chain and sheet silicates.

# (Self-Study: Periodic Properties of p block elements, Silicones) UNIT II: CARBONYL COMPOUNDS AND NUCLEOPHILIC REACTIONS (K2) (12

## Hours)

General methods of preparation & properties of aldehydes & ketones: formaldehyde, acetaldehyde, benzaldehyde and acetone. Nucleophilic addition reactions of carbonyl compounds: addition of HCN, NaHSO<sub>3</sub>, and RMgX – reactions with NH<sub>3</sub>, NH<sub>2</sub>OH, N<sub>2</sub>H<sub>4</sub> and semi carbazide. Condensation reactions: Aldol, Perkin, Claisen, Dieckmann, Benzoin Condensations. Knoevenagel, Cannizaro, Reformatsky and Haloform reactions.

**Reduction Reactions:** Wolff-Kishner, Meerwein-Ponndorf-Verley, LiAlH<sub>4</sub>, NaBH<sub>4</sub> Reductions: Michael addition reaction.

**Nucleophilic Substitution Reactions (Simple treatment):** Mechanisms of SN<sub>1</sub>, SN<sub>2</sub>and SN<sub>i</sub> reactions and their stereochemistry – elimination *vs.* substitution reactions. (Beyond the Curriculum: Inversion based on above reaction Industrial Applications of Wolff-Kishner and Meerwein-Ponndorf-Verley reduction reaction)

#### **UNIT III: ACIDS AND ESTERS (K1)**

#### (12Hours)

General methods of preparation, properties of mono carboxylic acids- benzoic acid, benzensulphonic acid and *p*-toluene sulphonic acid. aliphatic dicarboxylic acids: preparation and properties of oxalic acid, malonic acid and succinic acid. aromatic dicarboxylic acid: preparation, properties and uses of phthalic acid, isophthalic acid, terephthalic acid. active methylene compounds – malonic ester, acetoacetic estersynthetic applications. Tautomerism in acetoacetic ester. hydroxy acids- lactic acid, citric acid – preparation and properties.

# UNIT IV: COMPUTER AND COMPUTER LANGUAGES (K2) (12

#### Hours)

**Components of computer- secondary storage devices. hardware, software and operating system. (Industry 4.0).** Types of computers. programming languages, lower-level, machine level, assembly level, high-level languages. Programming in C: character set-keywords and identifiers, constants, variables, data types- declaration of variables, assigning values to variables- defining symbolic constants. arithmetic operators- relations operators. logical operators, assignment operators, increment and decrement operators, conditional operators, bitwise operators, special operators Arithmetic expression, evaluation of expression precedence of arithmetic operators- computational problems- managing input and output operators- reading a character – writing a character – formatted output - pointer, arrays and functions. Applications in chemistry- few selected problems – determination of molarity, molality and normality of solutions. Calculation of pH. Calculation of cell parameters, calculation of concentration using Beer- Lambert aw.

### **UNIT V: Thermodynamics II (K3)**

#### Hours)

Second law of thermodynamics - need for the law - different statements of the law -Carnot's cycle and efficiency of heat engine - Carnot's theorem - concept of entropy definition and physical significance of entropy - entropy as a function of P, V and T -

(12

entropy changes during phase changes - entropy of mixing - entropy criterion for spontaneous and equilibrium processes in isolated systems - Gibb's free energy (g) and Helmholtz free energy (a) - variation of A and G with P, V and T - Gibb's - Helmholtz equation and its applications - thermodynamic equation of state - Maxwell's relations.  $\Delta A$  and  $\Delta G$  as criteria for spontaneity and equilibrium - advantage of  $\Delta G$  over entropy change.

# (Self-Study: Terminologies in thermodynamics. 1<sup>st</sup> and 2<sup>nd</sup> law of Thermodynamics) TEXTBOOKS:

- Jain M.K and Sharma S.C. *Modern Organic Chemistry*. 3<sup>rd</sup> Edition. Vishal Publishing Co. New Delhi, (2009).
- Arun Bahl and Bahl B.S. *Essentials of Physical Chemistry*.22<sup>nd</sup> Edition. Vikas Publishing House Pvt Ltd. New Delhi, (2016).
- Balagurusamy E. Computing Fundamentals & C programming.2<sup>nd</sup> Edition. Tata McGraw Hill Education Pvt Ltd. New Delhi, (2011).

# **REFERENCES BOOKS:**

- 1. Finar I.L. *Organic Chemistry The Fundamental Principles*.6<sup>th</sup> Edition. Vol I. Pearson Education Ltd. New Delhi, (2011).
- Puri B.R, Sharma L.R, Kalia K.C. *Principles of Inorganic Chemistry*.33<sup>rd</sup> Edition. Vishal Publishing Co. New Delhi, (2017).
- Morrison R.T, Boyd R.N, Bhattacharjee S.K. Organic chemistry.7<sup>th</sup> Edition. Dorling Kindersley India Pvt Ltd. Pearson Education. New Delhi, (2012).
- Madan R.D. *Modern Inorganic Chemistry*.3<sup>rd</sup> Edition. S. Chand & Company Ltd. New Delhi, (2011).
- 5. Raman K.V. *Computers in Chemistry*. Tata McGraw Hill Education Pvt Ltd. New Delhi, (2010).

## **BLENDED LEARNING**

## UNIT V: THERMODYNAMICS II (K3)

Links

Second Law of Thermodynamics, Need for The	https://www.youtube.com/watch?v=WTtxlaeC9
Law	<u>PY</u>
Different Statements of the Second Law	https://www.youtube.com/watch?v=Zm1Vu8vv
	<u>xb0</u>
Carnot's Cycle and Efficiency of Heat Engine	https://www.youtube.com/watch?v=FDrsgIdB-
	<u>rA</u>
Carnot's Theorem	https://www.youtube.com/watch?v=dvCggUOA
	MMU
Concept of Entropy, Definition and Physical	https://www.youtube.com/watch?v=YM-
Significance of Entropy	<u>uykVfq_E</u>
Entropy as a Function Of P, V And T	https://www.youtube.com/watch?v=9fTmvyLa8
	rM
	—
Entropy Changes During Phase Changes	https://www.youtube.com/watch?v=HHu3VXd
	<u>S_TI</u>
Entropy of Mixing	https://www.youtube.com/watch?v=ygX6hpFOr
	<u>-8</u>
Entropy Criterion for Spontaneous and	https://www.youtube.com/watch?v=ECAj68q-
Equilibrium Processes in Isolated Systems	<u>fGk</u>
Gibb's Free Energy (G) and Helmholtz Free	https://www.youtube.com/watch?v=R4wZ6xfK
Energy (A)	<u>plY</u>
Variation Of a And G With P, V and T	https://www.youtube.com/watch?v=flJaV-
	<u>qngdw</u>
Gibb's-Helmholtz Equation and Its Applications	https://www.youtube.com/watch?v=ihY5Mb0B
	moE
Thermodynamic Equation of State	https://www.youtube.com/watch?v=ki
	<u>URkx0KRls</u>

Maxwell's Relations

<u>5Q</u>

# MAPPING OF CO'S WITH PO'S / PEO'S

	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2	1		2	2	1		2		2	3	2
CO2	3	2	2	1	1				2		1	2	3	2
CO3	3	2	2	1	1				2		1	2	3	2
<b>CO4</b>	3	2	2	2	3	1		3	2	2		2	3	3
C05	3	2	2	2		2	2	1	2		2	2	3	2

Correlation: Low – 1, Medium – 2, High – 3

# ASSESSMENT TOOLS

S. No.	Assessment Methods	Frequency of Assessment					
1	End Semester Examination	Once in a semester					
2	CIA I	Once in a semester					
3	CIA II	Once in a semester					
4	Model Examination	Once in a semester					
5	Assignment (Unit I & II)	Twice in a semester					
6	Quiz (Unit III & IV)	Twice in a semester					
7	Group Discussion (Unit V)	Once in a semester					

Course Designed by:	Verified by HOD: Dr. N. Gunavathy
Dr.Sr.S. Kulandai Therese	

Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

# **SEMESTER - III**

# COURSE CODE: 23UCH3SB1

# TITLE OF THE COURSE: SKILL BASED I - DYE CHEMISTRY

# (Employability)

# **COURSE OBJECTIVES:**

- To offer an introduction about dye chemistry and get knowledge about the classification and theories of different classes of dyes.
- To learn dye processing and value the applications of dyes in medicine, food and chemical analysis.

# **COURSE OUTCOMES:**

At the completion of the course the student will have the ability to,

CO1	Discuss the basics of dye chemistry and classification of dyes					
	according to their applications and chemical constitution.					
CO2	Study the process of dyeing, synthesis and their applications	K2				
CO3	Describe the synthesis of different types of dyes and applications of	K2				
	organic and inorganic pigments					
CO4	Carry out the comparison of natural and synthetic dyes.	K1				
CO5	Learn the applications and non-textile uses of dyes.	K4				

# SYLLABUS

**Instructional Hours:** 

Credits: 2

45

#### UNIT I: BASIC CONCEPTS OF DYE CHEMISTRY (K2)

#### Hours)

Colour and constitution – terms used in colour chemistry – chromophores, auxochromes, bathochromic shift, hypsochromic shift. Theories of dyes - quinonoid theory, resonance theory, Witts's theory. classification of dyes according to chemical constitution- nitroso dyes (fast green O), nitro dyes (picric acid, Martius yellow, naphthol yellow-S), azo dyes (methyl orange, methyl red) classification - classification according to their applications - acid dyes – basic dyes. direct dyes, mordant dyes, vat dyes, sulphur dyes, disperse dyes, ingrain dyes, food dyes, solvent dyes and pigment dyes.

#### **UNIT II: PROCESS OF DYEING (K2)**

#### Hours)

**Basic operations in dyeing, methods of dyeing**-direct dyeing, vat dyeing, mordant dyeing, substantive dyeing, disperse dyeing. synthesis and applications of azo dyes, di and triphenyl methane dyes (auramine, malachite green, Para rosaniline, crystal violet) –phthalein dyes (phenolphthalein, fluorescein) – xanthene dyes (Rhodamine B, Eosin).

UNIT III: ORGANIC AND INORGANIC PIGMENTS (K2) (9 Hours)

Pigments – requirements of pigments. typical organic and inorganic pigments applications and their uses. Synthesis and applications of quinonoid dyes including vat dyes based on anthraquinone. anthraquinone dyes (alizarin), indigotin dyes (indigo) acridine dyes-proflavin, acriflavin, acridine violet- preparation and applications. phthalocyanine dyes-copper phthalocyanine-synthesis and applications.

### UNIT IV: SYNTHETIC VS. NATURAL DYES (K1)

#### (9

#### Hours)

Sources of natural dyes- techniques of natural dyeing- advantages and limitations of natural dyes reaction of dyes with fibres and water – fluorescent brightening agents-introduction fluorescence, mechanism of fluorescence, characteristic properties of fluorescent brightening agents, fluorescent brighteners for cellulosic fibres and acrylic fibres, toxicity of fluorescent brightener.

(9

# UNIT V: APPLICATION OF DYES (K4)

# Hours)

Cotton fabric dyeing, printing purpose (Glucose process and Rongalite process), indigo sol process. non textile uses of dyes-leather dyes, paper dyes, food colours, solvent dyes, cosmetic dyes, medicinal dyes, dyes used in photography and dyes used as indicators and reagents.

(Self-study: Applications of dyes for wool and silk dyeing process.)

# **TEXT BOOKS:**

- 1. Abrahart E. N. *Dyes and their Intermediates*. Pergamon Press Limited. Oxford, United Kingdom, (1968).
- 2. Sharma B.K. Industrial Chemistry. Goel Publishing Co. Delhi, (1997).

# **REFERENCES BOOKS:**

- 1. Rangnekir Singh. An introduction to synthetic dye. Himalaya Publishing House. Karnataka, India, (1980).
- 2. Gurdeep R. Chatwal. *Synthetic Organic Chemistry*. Himalaya Publishing House. Karnataka, India, (1986).
- 3. Tyagi O.P. and Yadav, M. *A Textbook of Synthetic Dyes*. Amol Publications Pvt limited. Karnataka, India, (1990).
- 4. Arora M. G. Text book of dyes. Amol Publications Pvt Limited. Karnataka, India, (1996).
- 5. Chatwal R. Synthetic Dyes. Himalayan Publishing House. Karnataka, India, (1995).

# **BLENDED LEARNING**

# UNIT IV: SYNTHETIC VS. NATURAL DYES (K1)

Topics	Links
Chemistry of natural dyes	https://www.youtube.com/watch?v=Gwk1B66dvAM
	https://www.youtube.com/watch?v=t0wopQ0A-7A
	https://www.youtube.com/watch?v=XtwyeamFkBQ

Reaction of dyes with fibres and	https://www.youtube.com/watch?v=-4MbpGhNrGw
water	
Fluorescent brightening agent's	https://www.youtube.com/watch?v=9pMIN9HQxYQ
introduction, properties and uses	
Mechanism of fluorescence	https://www.youtube.com/watch?v=CcssdJf0pKQ
Fluorescent brighteners for	https://www.slideshare.net/sheshir/whitening-agent
cellulosic fibres and acrylic fibres	
Toxicity of fluorescent brightener	https://www.motherearthliving.com/wiser-
	living/optical-brighteners-bluing

# MAPPING OF CO'S WITH PO'S / PEO'S

	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2			2							3		
CO2	3				2				2	3		3	2	
CO3	2	3	1	2		2			3		2	2	3	1
CO4	3	2	2	2	3	2		1	2	3		3	2	3
CO5	1		2		1				1	2		3	1	2

Correlation: Low – 1, Medium – 2, High – 3

# ASSESSMENT TOOLS

S. No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a semester
2	CIA I	Once in a semester
3	CIA II	Once in a semester
4	Model Examination	Once in a semester

5	Assignment (Unit I & II)	Twice in a semester
6	Quiz (Unit III & IV)	Twice in a semester
7	Case Studies (Unit V)	Once in a semester

Course Designed by: Dr. N. Gunavathy	Verified by HOD: Dr. N. Gunavathy
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

# **SEMESTER - III**

# COURSE CODE: 23UCH3AO1

# TITLE OF THE COURSE: ALLIED: CHEMISTRY PAPER I

# **COURSE OBJECTIVES:**

- To understand some concepts in chemistry that are useful in the study of plant and animal biotechnology like industrial chemistry, chemotherapy, and vitamins.
- To enhance the knowledge on certain topics in chemistry like chemical bonding, polar effects, kinetics and chromatography.

# **COURSE OUTCOMES:**

At the completion of the course, the student will have the ability to,

CO1	Identify the different types of chemical bonding and hybridisation in	K1
	carbon.	
CO2	Describe the types of fuel, fertiliser and dyes.	K1
CO3	Explain the polar effects and stereoisomerism present in organic compound.	K2
CO4	Predict the action of some drugs and vitamins.	K3

Instructional

# SYLLABUS

# Credits: 3

**CO5** 

### Hours: 60

### **UNIT I: CHEMICAL BONDING (K1)**

principle.

Hours)

Types of chemical bonds. ionic bond - formation of NaCl: Characteristics of ionic compounds. Covalent bond: - with examples - characteristics of covalent compounds, sigma and pi bonding; partial ionic character. States of hybridization in carbon – sp<sup>3</sup>, sp<sup>2</sup>, sp using methane, ethylene and acetylene as examples. VSEPR theory – shapes of molecules - BF<sub>3</sub>, NH<sub>3</sub>, H<sub>2</sub>O. Hydrogen bond: Types – inter and intra – important applications.

# UNIT II INDUSTRIAL CHEMISTRY (K1)

### Hours)

1. Fuel: Calorific value- requisites of a good fuel – types of fuels - comparison of solid, liquid & gaseous fuel. Gaseous fuel: natural gas, water gas, producer gas, carbureted water gas – bio - gas, oil - gas (manufacturing details not required).

2. Fertilisers: Requisites, plant nutrients – classification – role of important nutrients – urea, ammonium sulphate, triple superphosphate – preparation, characteristics

3. Dyes: Requisites of a dye - chromophore – auxochrome, bathochromic, hypsochromic effect – classification based on structure and application.

# (Self-Study: Environmental impact of fuels.)

# UNIT III: POLAR EFFECTS AND STEREOISOMERISM (K2) (12

## Hours)

1. Polar Effects: Inductive- mesomeric - steric effect - effect in properties of compounds.

2. Stereoisomerism: Cause of optical activity of tartaric and lactic acid. Racemisation and resolution. Geometric isomerism of maleic and fumaric acid.

K2

(12

(12

#### UNIT IV: CHEMOTHERAPY AND VITAMINS (K3)

### Hours)

Classification of drugs: antibiotics – antiseptics – analgesic – hypnotic – sedative tranquilisers- definition. preparation, uses and mode of action of sulpha drugs –uses of penicillin and chloromycetin (elementary details only). Vitamins: Definition – classification –sources - diseases caused by deficiency of vitamins A, B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>, B<sub>12</sub>, C, D & K. (*Self-Study: Requisites of drug.*)

# UNIT V: KINETICS AND CHROMATOGRAPHY (K2) (12 Hours)

1. Kinetics: Rate – factor influencing rate- order & molecularity-definition and their difference- pseudo unimolecular reactions, methods of determining order of a reaction. Effect of temperature on rate, Arrhenius energy of activation.

2. Chromatography: Principle, method and application of column, paper and thin layer chromatography- superiority of thin layer over paper chromatography.

# **TEXT BOOK:**

- Veeraiyan V. *Text Book of Allied Chemistry Vol I & II*.2<sup>nd</sup> Edition. High Mount Publishing House, Chennai, (2005).
- 2. Puri B.R., Sharma L.R. and Kalia K.C. *Principles of Inorganic Chemistry*. Vishal Publishing Company. New Delhi, (2020).

# **REFERENCES BOOKS:**

- 1. Malik W.U., Tuli G.D. and Madan R.D. *Selected Topics in Inorganic Chemistry*. Revised Edition. S Chand Publishing. New Delhi, (2010).
- Jain M.K. and Sharma S.C. *Modern Organic Chemistry*. Golden Jubilee Year Edition. Vishal Publishing Company. New Delhi, (2020).
- Puri B.R., Sharma L.R. and Pathania M.S. *Elements of Physical Chemistry*.4<sup>th</sup> Edition. Vishal Publishing Company. New Delhi, (2013).
- Arun Bahl, Bahl B.S. and Tuli G.D. *Essentials of Physical Chemistry*.28<sup>th</sup> Edition. S Chand Publishing. New Delhi, (2020).
- Madan R.L. Chemistry for Degree Students B.Sc. 2<sup>nd</sup> Year. S Chand Publishing. New Delhi, (2019).

# **BLENDED LEARNING**

# UNIT V: KINETICS AND CHROMATOGRAPHY (K2)

Topics	Links					
Kinetics: Rate	https://youtu.be/zkUJvGjoOA8					
Factor influencing rate	https://youtu.be/ZaXaQ9DVm1Q,					
	https://www.youtube.com/watch?v=wYqQCojggyM					
Order	https://youtu.be/x-RNwh2zuic					
Molecularity-definition and their	https://youtu.be/N4geStgtlcw					
difference	https://www.youtube.com/watch?v=1boWB9tzjrY					
Pseudo unimolecular reactions	https://youtu.be/4yMIUTxWgYQ					
Methods of determining order of a	https://youtu.be/laofsFwzrgk					
reaction	https://www.youtube.com/watch?v=rR49XFhhqhU					
Effect of temperature on rate	https://youtu.be/N7XXone66rA					
Arrhenius energy of activation	https://youtu.be/i9TSLa3XNpQError! Hyperlink					
	reference not valid.					
Chromatography – Principle	https://youtu.be/11_QQeBNds0					
	https://youtu.be/2R2iq_XR1IY,					
	https://youtu.be/ByJ6lzD2Vbg					
Method and application of column	https://www.youtube.com/watch?v=UmWMlKJAdSk					
chromatography						
Paper chromatography	https://www.youtube.com/watch?v=mz_xcNrTK_U					
Thin layer chromatography	https://www.youtube.com/watch?v=CmHFVxTxkGs					
Superiority of thin layer over paper	https://www.youtube.com/watch?v=ByJ6lzD2Vbg					
chromatography						

# MAPPING OF CO'S WITH PO'S / PEO'S

	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3		1		2					2		3		
CO2	3	2	2	1	2	2	2	1	2	2	1	3	1	1
CO3	3	1	2							2		3		
<b>CO</b> 4	3	1			2	2	1	1	2	2	1	3	1	
C05	3	3	1	1	1	1	1			2		3		1

Correlation: Low – 1, Medium – 2, High – 2

# ASSESSMENT TOOLS

S. No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a semester
2	CIA I	Once in a semester
3	CIA II	Once in a semester
4	Model Examination	Once in a semester
5	Assignment (Unit I & II)	Twice in a semester
6	Quiz (Unit III & IV)	Twice in a semester
7	Content Writing (Unit V)	Once in a semester

Course Designed by: Dr. P. Dhivya	Verified by HOD: Dr. N.Gunavathy
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

# **SEMESTER - IV**

# COURSE CODE: 23UCH4C04

# TITLE OF THE COURSE: CORE IV – GENERAL CHEMISTRY IV

# **COURSE OBJECTIVES:**

- To know the nature of metal-ligand bonding in co-ordination compounds and to study of various theories behind it.
- To co-relate the concepts of thermodynamics –III, solutions and thermodynamics of phase changes.

# **COURSE OUTCOMES:**

At the completion of the course, the student will have the ability to,

CO1	Interpret coordinate bonding in chemical systems and various theories explaining coordinate bonding.	K2
CO2	Explain the chemistry of phenols.	K2
CO3	Apply the thermodynamics to equilibria and discuss the third law of thermodynamics	K3
CO4	Discuss the thermodynamics of solutions.	K2
CO5	Describe the thermodynamics of phase changes	K1

# **SYLLABUS**

# Credits: 5

# Hours: 60

# UNIT I: CO-ORDINATION CHEMISTRY (K2)

## Hours)

IUPAC nomenclature – isomerism in complexes- structural isomerism – types – stereoisomerism - geometrical and optical isomerism in 4 & 6 co-ordinated complexes - theories of co-ordination compounds- Werner's, Sidgwick, valence bond and crystal field theory - splitting of d orbital in octahedral & tetrahedral complexes - low spin and high spin complexes.

Bio co-ordination compounds - chlorophyll and haemoglobin- functions.

Instructional

(12

# UNIT II: PHENOLS (K2)

### Hours)

Acidity of phenols- reactions of monohydric phenols with mechanism – reaction with neutral FeCl<sub>3</sub>, alkylation, esterification, nitration, sulphonation, halogenation, coupling with diazonium salts – Kolbe, Reimer – Tieman, Schotten – Baumann, Hoesch and Houben reaction, Gattermann reaction, Lederer-Manasse reaction. Dihydric and trihydric phenols.

# UNIT III: THERMODYNAMICS III (K3)

#### Hours)

Equilibrium constant and free energy change - thermodynamic derivation of law of mass action- equilibrium constants in terms of pressure and concentration. partial molar quantities - chemical potential - variation of chemical potential with T, P and X (mole fraction) - Gibb's - Duhem equation. Van't Hoff's reaction isotherm - Van't Hoff's isochore - Clapeyron equation and Clausius - Clapeyron equation –applications third law of thermodynamics: Nernst heat theorem - statement of III law and concept of residual entropy - evaluation of absolute entropy from heat capacity data. Exception to III law (ortho and para hydrogen, CO, N<sub>2</sub>O and ice).

(Self-Study: Types of Thermodynamic Systems.)

# **UNIT IV: SOLUTIONS (K2)**

## (12 Hours)

Ideal and non-ideal solutions, Raoult's law and Henry's law. Deviation from Raoult's law and Henry's law. Theory of fractional distillation. azeotropes– ethanol-water system - partially miscible liquid systems – phenol-water, triethanolamine - water and nicotine - water systems. Lower and upper CST - effect of impurities on CST - completely immiscible liquids - principle and applications of steam distillation. - Nernst distribution law - derivation. applications. dilute solutions: colligative properties, relative lowering of vapour pressure, osmosis, elevation of boiling point and depression of freezing point. Laws of osmotic pressure. Determination of molecular masses by the above properties. abnormal molecular masses, molecular dissociation - degree of dissociation – molecular association.

(Self-Study: Types of solutions and their properties.)

(12

# UNIT V: THERMODYNAMICS OF PHASE CHANGES (K1)

# Hours)

Definition of terms in the phase rule- derivation of phase rule - derivation and application to one component systems – water, carbon di oxide and sulphur. Super cooling, sublimation. Two component systems - solid liquid equilibria, simple eutectic (lead-silver, Bi-Cd), desilverisation of lead - compound formation with congruent melting point. (Mg-Zn) and incongruent melting print (Na-K).

# **TEXT BOOKS:**

- 1. Puri BR, Sharma L.R and Kalia K.C. *Principles of Inorganic Chemistry*, Vishal Publishing Co., New Delhi, (2017).
- 2. Jain M.K and Sharma S.C. *Modern Organic Chemistry*, Vishal Publishing Co., New Delhi, (2009).

# **REFERENCES BOOKS:**

- 1. Arun Bahl and Bahl B.S. *Essentials of Physical Chemistry*, Vikas Publishing House Pvt Ltd, New Delhi, (2016).
- 2. Puri, Sharma and Pathania. *Elements of Physical Chemistry*, Vishal Publishing Co., New Delhi, (2009).
- Finar I.L. Organic Chemistry The Fundamental Principles. (6<sup>th</sup> edition), Vol I, Pearson Education Ltd, New Delhi, (2011).
- 4. Morrison RT, Boyd R.N and Bhattacharjee S.K. *Organic Chemistry*, Dorling Kindersley (India) Pvt Ltd, Pearson Education, New Delhi, (2012).
- 5. Madan R.D. *Modern Inorganic Chemistry*. S. Chand & Company Ltd. New Delhi, (2011).

# **BLENDED LEARNING**

# UNIT V: THERMODYNAMICS OF PHASE CHANGES (K1)

Topics	Links
Definition of terms in the phase rule	https://youtu.be/59hvxuhjJrY, https://youtu.be/1H9vmUXe12A
Derivation of phase rule	https://youtu.be/erOKm7wbkJE

Derivation and application to one	https://youtu.be/si95eubFZdg
component systems –Water	
Carbon di oxide and Sulphur	https://youtu.be/Uhziax7qwvI
	https://youtu.be/s0YUy83STJI .
Two component systems - solid liquid	https://youtu.be/wyT_A6bBUWE
equilibria, simple eutectic lead-silver	
Bi-Cd	https://youtu.be/TDbXsFgd_HM
desilverisation of lead	https://youtu.be/zKqETPA90-E
Compound formation with congruent	https://youtu.be/_hFE9IYgD4Y,
melting point. (Mg-Zn)	
	https://youtu.be/zk-fWQZaNN8
Incongruent melting print (Na-K)	https://youtu.be/uEZ1y31FeZY

# MAPPING OF CO'S WITH PO'S / PEO'S

	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2		2	2	2	2	1	2		3	3	1
CO2	3	1	1	1			1			1		3	3	1
CO3	3	2	2			2	2		1	2	2	2	3	2
CO4	3	1	1	1		2	2	2	2	2	1	2	3	1
C05	3				1	2	2		2			3	3	1

Correlation: Low – 1, Medium – 2, High – 3

# ASSESSMENT TOOLS

S. No.	Assessment Methods	Frequency of Assessment

1	End Semester Examination	Once in a semester
2	CIA I	Once in a semester
3	CIA II	Once in a semester
4	Model Examination	Once in a semester
5	Assignment (Unit I & II)	Twice in a semester
6	Quiz (Unit III & IV)	Twice in a semester
7	Case Study (Unit V)	Once in a semester

Course Designed by:	Verified by HOD: Dr. N.Gunavathy
Dr.Sr.S. Kulandai Therese	
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

# **SEMESTER - IV**

# COURSE CODE: 23UCH4SB2

# TITLE OF THE COURSE: SKILL BASED II - PHARMACEUTICAL CHEMISTRY

# (Employability)

# **COURSE OBJECTIVES:**

- To learn the fundamentals of pharmaceutical chemistry that functions and supports the delivery of pharmaceuticals.
- To understand basic biological and pharmacological interactions of clinically active natural and synthetic drugs.

# **COURSE OUTCOMES:**

At the completion of the course the student will have the ability to,

CO1	Explain terminologies, routes of administration of drugs and diagnostic	
	test used in pharmaceutical chemistry	
CO2	Associate the uses of Indian medicinal plants, first aid and treatment of	K2
	common diseases in real life.	
CO3	Discuss the application of medically important inorganic compounds in	K2
	biological system	
CO4	Summarize the use of drugs based on the mode of action and structure	K2
	in chemotherapy	
CO5	Identify the significance and action of life saving classes of drugs	K1

#### **SYLLABUS**

Credits: 2

# **Instructional Hours:**

(9

#### 45

### UNIT I: INTRODUCTION (K2)

### Hours)

Important terminologies used in pharmaceutical chemistry – definition of the following terms – drug, pharmacology, pharmacognosy, pharmacy, pharmacophore, pharmacopoeia (BP, IP, USP) – bacteria, virus, fungi, mutation, LD<sub>50</sub>Ed<sub>50</sub>. Therapeutic index for selecting drugs.

Routes of administration – oral, rectal, parenteral, intravenous, intramuscular subcutaneous, inhalation, sublingual, topical. Clinical chemistry – diagnostic test and one method of estimation of sugar, bilirubin and cholesterol in serum or plasma or urine – biuret test for urea.

(Self-Study: Nature and Sources of drugs.)

## UNIT II: MEDICINAL PLANTS, FIRST AID AND COMMON DISEASES (K2)

#### (9Hours)

Indian medicinal plants & their importance – Adathoda vasica, Ocinum sanctum, Hibiscus rosasinensis, Mangifera indica, Azadirachta indica, Ficus, Solanum tri lobatum, Phyllanthus niruri, grasses, greens.
First aid – important rules, first aid box, first aid to prevent bleeding and for burns – some common poisons and their antidotes – cause, symptoms & treatment of malaria, filariasis, plague diphtheria, influenza, common cold, cholera, typhoid, dysentery, jaundice, asthma, piles.

#### (Self-Study: Cause, Symptoms & Treatment of COVID 19.)

UNIT III: MEDICALLY IMPORTANT INORGANIC COMPOUNDS (K2) (9 Hours)

Medically important compounds of Al, P, As, Fe and Hg – uses of the following – alum, aluminium hydroxide gel, bentonite, aluminium acetate, aluminium mono stearate, phosphoric acid, arsenous anhydride, sodium arsenate, ferrous sulphate, ferric ammonium citrate, iron sobitex, mercuric oxide, mercurous chloride – preparation of alum, phosphoric acid, sodium arsenate, ferrous sulphate, mercurous chloride. Biological role of sodium, potassium calcium, iodine, copper and zinc.

#### UNIT IV: DRUGS I (K2)

#### (9Hours)

**Drugs – definition, requisites of an ideal drug. Sulpha drugs – mode of action**, structure and application of sulphadiazine, sulphathiazole and sulphapyridine. Antibiotics – broad-spectrum & narrow spectrum – structure and applications of tetracycline and sulphapyridine. Antibiotics& analgesics – definition & specific examples – aspirin, paracetamol & ibuprofen.

#### UNIT V: DRUGS II (K1)

#### (9Hours)

Antiseptics & disinfectants – definition & distinction – examples– phenolic compounds, methylene blue, crystal violet. Anaesthetics – definition- classification. non-volatile anaesthetics – thiopental sodium local anaesthetics – cocaine, benzocaine procaine cardio vascular drugs – definition and names of antiarrhythmic drugs, antihypertensive drugs, antianginal agents, vasodilators. Cancer & antineoplastic drugs – melphalan and plant products.

#### **TEXT BOOKS:**

 Jayashree Ghosh. A Text Book of Pharmaceutical Chemistry. S. Chand & Company Ltd. New Delhi, (2008). 2. Jayashree Ghosh. *Fundamental Concepts of Applied Chemistry*. S. Chand & Company Ltd, New Delhi, (2006).

#### **REFERENCES BOOKS:**

- 1. Chatwal, G.R. *Pharmaceutical Chemistry Inorganic. Vol. I.* 2nd Edition. Himalaya Publishing House. New Delhi, (1996).
- 2. Chatwal, G.R. *Pharmaceutical Chemistry Organic Vol. II.* 2nd Revised Edition. Himalaya Publishing House. New Delhi, (1997).
- Graham Patrick. *Medical Chemistry*. 1<sup>st</sup>Edition. Viva Books Private Ltd, New Delhi, (2002).
- 4. Thomas Nogrady. Medicinal Chemistry. Oxford University Press. New Delhi, (1995).
- Ashutosh Kar. *Medicinal Chemistry*. 2<sup>nd</sup> Reprint. New Age International Private Ltd. New Delhi, (2007).

#### **BLENDED LEARNING**

#### UNIT V: DRUGS II (K1)

Topics	Links
Antiseptics & disinfectants – definition &	https://youtu.be/KN-yRtjA11c
distinction	
Examples- phenolic compounds	https://youtu.be/UHaBLTr7X-E
Methylene blue, crystal violet	https://youtu.be/qLa-DysP0t8
Anaesthetics – definition- classification	https://youtu.be/MU0IvcCrlI0
Non-volatile anaesthetics – thiopental	https://youtu.be/xEREmXZGHKk
sodium	

Local anaesthetics - cocaine, benzocaine	https://youtu.be/qsPk3cf6_18
procaine	
Cardia vacaular drugs definition and	https://woutu.he/tdthh0t02.U
Cardio vascular drugs – definition and	nups://youtu.be/taibboiQ3-U
names of antiarrhythmic drugs	
Antihypertensive drugs	https://youtu.be/RV1an_olT3Q
Antianginal agents, vasodilators	https://youtu.be/p0jRisF5p-c
Cancer & antineoplastic drugs	https://youtu.be/-kqkrMOQvyc
Melphalan and plant products	https://youtu.be/vRlkWMffJs0

## MAPPING OF CO'S WITH PO'S / PEO'S

	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	1	1			2		1		1		3	2	2
CO2	3	1	2			2	1	1		1		3	2	2
CO3	3	1	1	1		1			2	1		3	2	2
CO4	3		1			2						2	2	2
CO5	3		1			2						3	2	2

## Correlation: Low – 1, Medium – 2, High – 3

S. No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a semester
2	CIA I	Once in a semester
3	CIA II	Once in a semester
4	Model Examination	Once in a semester

5	Assignment (Unit I & II)	Twice in a semester
6	Quiz (Unit III & IV)	Twice in a semester
7	Case Study (Unit V)	Once in a semester

Course Designed by: Dr. N. Gunavathy	Verified by HOD: Dr. N.Gunavathy
Checked by CDC: Dr. G. Chitra	Approved by: Principal

#### **SEMESTER - IV**

#### COURSE CODE: 23UCH4AO2

#### TITLE OF THE COURSE: ALLIED: CHEMISTRY PAPER II

#### **COURSE OBJECTIVES:**

- To explore the fundamentals of co-ordination and organic chemistry.
- To know the basic components of life and the importance of biomolecules to life processes.

#### **COURSE OUTCOMES:**

At the completion of the course, the student will have the ability to,

CO1	Discuss the essentials of co-ordination chemistry and its applications.	K2				
CO2	Apply the principles of aromaticity and mechanisms of organic					
	reactions and comprehend the chemistry of heterocycles.					
CO3	Understand the role of biomolecules in life.	K2				
CO4	Compare the knowledge on the hormonal regulation, enzymatic and	K2				
	catalytic function.					
CO5	Sequence the quantitative calculations and qualitative judgements to	K1				
	apply, correlate and demonstrate theoretical and mechanistic principles					
	to chemical system with experimental skills.					

#### SYLLABUS

## Credits: 3 Hours: 60 UNIT I: COORDINATION COMPOUNDS (K2)

## Hours)

Nomenclature – Theories of Werner, Sidgewick, Pauling. Chelation – exampleshaemoglobin, chlorophyll, application in qualitative and quantitative analysis, EDTA.

### (Self-Study: Electronic Configuration of Transition Elements.)

### UNIT II: AROMATICITY AND HETEROCYLICS (K3) (12 Hours)

Aromaticity: Huckel's rule, electrophilic substitution in benzene – mechanism of nitration, halogenation, alkylation – acylation and sulphonation.

Heterocyclics: preparation and properties of furan, thiophene, pyrrole and pyridine.

UNIT III: CARBOHYDRATES AND AMINO ACIDS (K2) (12 Hours)

Carbohydrates: classification – preparation and properties of glucose and fructose (structure elucidation not required).

Amino acids: classification, preparation and properties – preparation of peptides, proteins – classification, preparation and properties – preparation of peptides, proteins classification, characteristics – biological function.

(Self-Study: Importance of amino acids and proteins.)

#### UNIT IV: ENZYMES, HORMONES, CATALYSIS (K2) (12

#### Hours)

Enzymes: chemical nature of enzymes – nomenclature and classifications - properties of enzymes –. hormones: introduction – properties – biological functions of adrenaline – oxytocin and insulin.

Catalysis: characteristics of catalysts- types of catalysts and industrial applications.

#### UNITV: SOLUTION AND pH (K1)

(12

#### Hours)

Solutions: Definition – types of solutions with examples - methods of expressing the concentration of solutions. Principles of volumetric analysis. acids& bases: definition based on Arrhenius concept & Lewis concept- examples of weak & strong acids &

Instructional

(12

bases. Ionic product of water – pH of a solution – definition. buffer solution – buffer action – buffer in biological systems. – pH indicators.

#### **TEXT BOOKS:**

- Veeraiyan V. Vasudevan. *Text Book of Allied Chemistry*. (2<sup>nd</sup> Edition). High Mount Publishing House. TBH Publishers & Distributors. TamilNadu. India, (2005).
- Malik W.U. Tuli G.D & Madan R.D. Selected Topics in Inorganic Chemistry. S. Chand and Company Ltd. New Delhi. India, (2008).

#### **REFERENCES BOOKS:**

- 1. Jain MK & Sharma SC. *Modern Organic Chemistry*. Vishal Publishing Co. New Delhi. India, (2016).
- Finar I.L. Organic Chemistry Stereochemistry and the Chemistry of Natural Products. (5<sup>th</sup> Edition). Vol. I. Pearson Education Ltd. New Delhi. India, (2005).
- 3. Arun Bahl & Bahl B.S. *Modern Organic Chemistry*. Vikas Publishing House Pvt Ltd. New Delhi. India, (2016).
- Puri B.R. Sharma L. R & Kalia K.C. *Principles of Inorganic Chemistry*. Vishal Publishing Pvt Ltd. New Delhi. India, (2017).
- Madan R.L. *Chemistry for Degree Students*. Sultan Chand & Co Ltd. New Delhi. India, (2012).

#### **BLENDED LEARNING**

#### UNITV: SOLUTION AND pH (K1)

Topics	Links
Solutions	
Definition – types of solutions with examples	https://www.youtube.com/watch?v=NXWUgDIzApg
Methods of expressing the concentration of solutions	https://www.youtube.com/watch?v=D6DZualiCFs
Principles of volumetric analysis	https://www.youtube.com/watch?v=wRAo- M8xBHM

Acids & bases: Definition based on	https://www.youtube.com/watch?v=EyBkPwsRY2E
Arrhenius concept & Lewis	
concept- examples of weak &	
strong acids & bases	
Ionic product of water	https://www.youtube.com/watch?v=8CT13ISnmt4
pH of a solution – definition	https://www.youtube.com/watch?v=SY2vhqRNe_8
Buffer solution – Buffer action –	https://www.youtube.com/watch?v=i6Q2jDIk6-g
Buffer in biological systems	
pH indicators	https://www.youtube.com/watch?v=wCDb0gEYCy4

## MAPPING OF CO'S WITH PO'S / PEO'S

	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2	3	3	2	2	3	3	2		2	3	2
CO2	3					2			2	2				
CO3	3	2	3		2	3	2	2	3	2	2	3	3	2
CO4	3		3		2	3	2	2	3	2	2	3	3	2
CO5	3	2	2		2	3	2	1	2			2	2	3

Correlation: Low – 1, Medium – 2, High – 3

S. No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a semester
2	CIA I	Once in a semester
3	CIA II	Once in a semester
4	Model Examination	Once in a semester
5	Assignment (Unit I & II)	Twice in a semester

6	Quiz (Unit III & IV)	Twice in a semester
7	Class Participation (Unit V)	Once in a semester

Course Designed by: Dr. P. Dhivya	Verified by HOD: Dr. N.Gunavathy
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

#### **SEMESTER - IV**

#### COURSE CODE: 23UCH4AP1

### TITLE OF THE COURSE: ALLIED CHEMISTRY PRACTICALS

#### **COURSE OBJECTIVES:**

- To acquaint the basic principles and procedures underlying chemistry.
- To quantitatively estimate the amount of given substance through volumetric titrations.
- To qualitatively analyse and identify the characteristics of organic compounds and the functional group present.

#### **COURSE OUTCOMES:**

At the completion of the course, the student will have the ability to

CO1	Recognise the principles of volumetric analysis in analytical chemistry.	K1

CO2	Analyse and interpret the various functional groups present in the organic compound.	K4
CO3	Experiment and carry out scientific experiments as well as accurately record and analyse the results of the experiments.	K4

#### **SYLLABUS**

#### Credits: 4

#### 60

### I. <u>VOLUMETRIC ANALYSIS</u>:

- 1. Estimation of sodium hydroxide using standard carbonate.
- 2. Estimation of hydrochloric acid standard oxalic acid.
- 3. Estimation of oxalic acid standard sulphuric acid.
- 4. Estimation of ferrous sulphate standard Mohr salt solution.
- 5. Estimation of oxalic acid standard ferrous sulphate.
- 6. Estimation of potassium permanganate standard sodium hydroxide.

### II. ORGANIC ANALYSIS:

- 1. Detection of Elements (N, S, Halogens).
- 2. To distinguish between Aliphatic and Aromatic, saturated and unsaturated compounds
- Functional group tests for phenols, acids (mono and di), aromatic primary amine, amide, diamide, dextrose. Systematic analysis of organic compounds containing one functional group and characterization by confirmatory test.

#### **TEXT BOOKS:**

- Dr. N.Gunavathy, *Laboratory Manual for Allied Chemistry Practical*. Mythe Creators, Coimbatore, (2019)
- Brian S Furniss, Antony J. Hannaford, Peter WG Smith, Austin R Tatcheli, Vogel's Textbook of Practical Organic Chemistry, Pearson India, 5<sup>th</sup> Edition, (2003).

#### **REFERENCE BOOKS:**

1) A. O. Thomas, *Practical Chemistry*, 7th Edn., Scientific Book Centre, Kannur, (1999).

#### **Instructional Hours:**

- 2) V. K. Ahluwalia, S. Dhingra, *Comprehensive Practical Organic Chemistry: Qualitative Analysis*, Universities Press, (2000).
- V. V. Ramanujam, *Inorganic Semi Micro Qualitative Analysis*, 3<sup>rd</sup> Edn., The National Publishing Company, Chennai, (1974).
- F. G. Mann, B. C. Saunders, *Practical Organic Chemistry*, 4<sup>th</sup> Edn., Pearson Education, (2009).
- 5) V. K. Ahluwalia, S. Dhingra, *Comprehensive Practical Organic Chemistry: Qualitative*

Analysis, Universities Press, (2000).

	РО	PO	PO	PO	РО	PO	РО	PO	РО	PO	PO	PO	PS	PS
	1	2	3	4	5	6	7	8	9	10	11	12	01	02
CO 1	3	3			3	2	2		3				2	
CO 2	3		3	3		2	3		3	2			3	3
CO 3	3	3	3		3			3	3		2			3

#### MAPPING OF CO'S WITH PO'S / PEO'S

Correlation: Low – 1, Medium – 2, High – 3

S.No.	Assessment Methods	Frequency of Assessment
1.	Observation Note	Once in a Year
2.	Record	Once in a Year
3.	Regularity	Once in a Year
3.	Model Practical I	Once in a Year

4.	Model Practical II	Once in a Year
5.	End Semester Examination	Once in a Year

Course Designed by: Dr. N. Gunavathy	Verified by HOD: Dr. N.Gunavathy
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

#### **SEMESTER - IV**

### COURSE CODE

## TITLE OF THE COURSE: CORE PRACTICAL - II – VOLUMETRIC ANALYSIS AND APPLIED PRACTICALS

#### **COURSE OBJECTIVES:**

- To prepare, standardize and to quantitatively determine the concentration of the unknown solution
- To expose students to use measurement equipment and right measurement techniques to solve chemical problems

#### **COURSE OUTCOMES:**

At the completion of the course, the student will have the ability to

CO1	Volumetric Analysis: Calculate the strength and the quantity of the	K4
	given substance present in the solution	
CO2	<b>Physical Constant</b> : Develops the evaluative skills of measuring Boiling/Melting points of different compounds	K4
CO3	Complex Preparation: Acquire skills in complex preparation	K3

CO4	Colorimeter Experiment: Improves laboratory skills in handling liquids	K4
004	and electrical equipment colorimeter	
COS	<b>Record</b> : Records the observation and the inference made during the	K3
05	practical classes	

#### SYLLABUS

#### Credit: 4

#### Instructional

#### Hours: 90

#### I VOLUMETRIC ANALYSIS

#### A. Acidimetry & Alkalimetry

- 1. Estimation of Na<sub>2</sub>CO<sub>3</sub>
- 2. Estimation of oxalic acid

#### **B.** Permanganimetry

- 1. Estimation of Ferrous sulphate & oxalic acid
- 2. Estimation of Calcium Direct method

#### **C. Dichrometry**

1. Estimation of Ferrous iron using internal indicator

#### **D. Iodometry**

- 1. Estimation of K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>
- 2. Estimation of copper

#### **E. Iodimetry**

1.Estimation of As<sub>2</sub>O<sub>3</sub>

#### F. Argentometry (Demonstration experiments)

1.Estimation of chloride – Fajan's and Volhards methods.

#### II Determination of melting point/boiling point of an organic substance.

#### III Preparation of inorganic complexes

- 1. Tetramine copper (II) sulphate
- 2. Potassium Trioxalato chromate (III)
- 3. Prussian Blue

#### 4. Sodium Cuprous Thiosulphate

#### Preparation of dye- methyl orange

#### **IV Colorimetric estimation**

- 1. Estimation of Fe with Ammonium thiocyanate.
- 2. Estimation of Ni as Nickel Dimethyl glyoxime.
- 3. Estimation of Mn in Potassium permanganate using Potassium iodate.

#### V Chromatographic experiments: (group experiments)

#### 1) Paper chromatography

Separation of components in commercial inks

#### 2) Thin layer chromatography

Determination of R<sub>f</sub> values and identification of organic compounds.

Separation of green leaf pigments (Spinach)

#### 3. Column chromatography

Separation of fluorescein and methylene blue.

(or)

Separation of leaf pigments from spinach leaves.

Saponification value of oil.

Estimation of acetic acid in vinegar.

Estimation of alkali content in commercial antacid samples.

Detection of adulterants in food.

#### **TEXT BOOK:**

1. Dr. V.G. Vasudha and Dr. N.Gunavathy, *Laboratory Manual Chemistry Core Practical* II

Volumetric Analysis and Applied Practicals, Mythe Creators, Coimbatore, (2018).

#### **REFERENCE BOOKS:**

- V. Venkateswaran, R. Veerasamy and A.R. Kulandaivelu, *Basic Principles of Practical Chemistry*, 2<sup>nd</sup> Edition, Sultan Chand & Sons Publisher, (1997).
- 2. A.I Vogel, *Qualitative Inorganic Analysis*, ELBS, 3<sup>rd</sup> Edition, (1971).

#### MAPPING OF CO'S WITH PO'S / PEO'S

	P	РО	PS	PS										
	0	2	3	4	5	6	7	8	9	10	11	12	01	02
CO1	3	3	2	3	1	1	2	1	2	1	1	1	3	2
CO2	3	3	2	1	2	2	2	1	3	1	2	3	3	3
CO3	3	1	1	2	1	2	1	1	2	2	2	2	2	3
CO4	3	1	1	2	2	2	1	2	2	1	2	1	2	2
CO5	3	3	3	2	2	2	1	3	3	1	1	3	1	2

Correlation: Low – 1, Medium – 2, High – 3

S.No.	Assessment Methods	Frequency of Assessment
1.	Observation Note	Once in a Year
2.	Record	Once in a Year
3.	Regularity	Once in a Year
3.	Model Practical I	Once in a Year
4.	Model Practical II	Once in a Year

Course Designed by: Dr. C. Subha	Verified by HOD: Dr. N.Gunavathy
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

#### SEMESTER - V

## COURSE CODE: 23UCH5CO5

## TITLE OF THE COURSE: COREV – SOLID STATE, METALLURGY AND NUCLEAR CHEMISTRY

#### **COURSE OBJECTIVES:**

- To introduce the principle of quantum mechanical concepts of various theories of photo electric effect and quantum numbers.
- To provide knowledge on basic concepts of nuclear chemistry, nuclear power station and nuclear pollution waste.
- To understands occurrence, properties of various of inorganic compounds.

#### **COURSE OUTCOMES:**

At the completion of the course, the student will have the ability to,

CO1	Identify the different types of crystal lattice present in solid state.	K1
CO2	Illustrate the fundamentals of metals and alloys.	K2
CO3	Discuss the occurrence, properties and uses of various inorganic compounds.	K2
CO4	Describes the separation and detection of isotopes and radioactive disintegration.	K3
CO5	Describe the nuclear reactions and various power projects in India.	K2

#### SYLLABUS

#### Credits: 5

#### **Instructional Hours:**

#### 60

#### UNIT I: SOLID STATE (K1)

#### Hours)

Symmetry elements in crystals - plane of symmetry, axis of symmetry and centre of symmetry - determination of number of symmetry elements in a crystal – designation of crystal planes and faces. X-ray diffraction studies of crystals – Bragg's equation –

(12

single crystal method and powder method – crystal structure of NaCl and KCl – radius ratio rule – packing in crystals - FCC and HCP.

(Beyond the Curriculum- Properties of Solids: Meissner effect, Peltier effect and Thomson effect.)

#### UNIT II: METALS AND ALLOYS (K2)

#### Hours)

Structure of metals & alloys - substitutional and interstitial solid solutions. Intermetallic compounds- Hume-Rothery ratios-metallic bonding –free electron, valence bond and band theories. Semiconductors, intrinsic and extrinsic-uses.

#### UNIT III: METALLURGY (K2)

#### Hours)

Occurrence, extraction, properties and uses of titanium, vanadium, molybdenum, selenium, tellurium and their important compounds such as TiCl<sub>4</sub>, TiO<sub>2</sub>, V<sub>2</sub>O<sub>5</sub>, ammonium molybdate. Extraction, properties and uses of Ni and Co.

(Self-Study: Basic methods in metallurgy.)

#### **UNIT IV: NUCLEAR CHEMISTRY I (K3)**

#### Hours)

Artificial transmutation of elements-synthesis of transuranic elements. Artificial radioactivity-types of nuclear reactions and mechanism-nuclear fission and nuclear fusion- atom bomb and hydrogen bomb - nuclear reactors (fission) principle and working, stellar energy – atomic power projects in India-nuclear pollution – sources-disposal of reactor wastes.

(Self-Study: Importance of nuclear energy.)

#### UNIT V: NUCLEAR CHEMISTRY II (K2)

#### Hours)

Nature of isotopes and isobars-detection of isotopes- Astons Mass Spectrograph. separation of isotopes - uses of isotopes in various fields - factors affecting nuclear stability -n / p ratio, magic numbers, nuclear binding energies, packing fraction, radioactive disintegration series.

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#### **TEXT BOOKS:**

- Soni P.L. &. Mohan Katyal. *Text book of Inorganic Chemistry*, Sultan Chand & Sons, New Delhi, (2013).
- 2. Puri & Sharma Kalia. *Principles of Inorganic Chemistry*, Milestone Publishers, New Delhi, (2011).

#### **REFERENCES BOOKS:**

- 1. Madan R.D. Modern Inorganic Chemistry, S. Chand & Co Ltd, New Delhi, (2012).
- Albert Cotton F and Geoffrey Wilkinson. *Advanced Inorganic Chemistry*, Wiley, India, (2011).
- Wahid. U. Malik, Tuli G.D and Madan R.D. Selected Topics in Inorganic Chemistry, S. Chand & Co Ltd, New Delhi, (2013).
- 4. Sahoo B, Nayak N.C, Samantaray A, Pujapanda P.K. *Inorganic Chemistry*, PHI Learning Private Limited, New Delhi, (2012).
- James E. Huheey. Ellen A. Keiter. Richard L. Keiter & Okhil K. Medhi. *Inorganic Chemistry. Principles of Structure and Reactivity* (4<sup>th</sup>Edition). Dorling Kindersley Pvt Ltd. New Delhi. India, (2011).

#### **BLENDED LEARNING**

#### UNIT V: NUCLEAR CHEMISTRY II (K2)

Topics	Links
Isotopes and isobars	https://youtu.be/qgJW1g0nCxQ
Astons mass spectrograph	https://youtu.be/mTkXCjUJXkQ
Separation of isotopes	https://youtu.be/B6Wx-oPDXXY
Detection and application of isotopes	https://youtu.be/ZbsnppQrHw8
Nuclear binding energy	https://youtu.be/KgcqjILr97E
Nuclear stability	https://youtu.be/UtTOD4cyDNc
Magic numbers	https://youtu.be/YK3Jqan9z_U

Binding energy and packing fraction	https://youtu.be/9z3Og7ziGmc
Radioactive disintegration	https://youtu.be/5hbSeR3oX_I

## MAPPING OF CO'S WITH PO'S / PEO'S

	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	1	3					1	1	3	2	
CO2	3	2	3	3	2	3	2	2	1	2	1	3	2	3
CO3	3		2	2								1		
CO4	2	2	2	1	2	3	2		2	3	2	3	2	2
C05	3		3	1		1						2	1	

Correlation: Low – 1, Medium – 2, High – 3

S. No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a semester
2	CIA I	Once in a semester
3	CIA II	Once in a semester
4	Model Examination	Once in a semester
5	Assignment (Unit I & II)	Twice in a semester
6	Seminar (Unit III & IV)	Twice in a semester
7	Report Writing (Unit V)	Once in a semester

Course Designed by: Dr. P. Dhivya	Verified by HOD: Dr. N.Gunavathy
Checked by CDC: Dr. G. Chitra	Approved by:

|--|

#### **SEMESTER - V**

#### COURSE CODE: 23UCH5C06

## TITLE OF THE COURSE: CORE VI – STEREOCHEMISTRY, MOLECULAR REARRANGEMENT & BIOMOLECULES

#### **COURSE OBJECTIVES:**

- To understand the importance of stereochemistry in organic chemistry and apply the knowledge gained to a variety of chemical problems.
- To correlate and propose pathways for the synthesis of organic molecules.

#### **COURSE OUTCOMES:**

At the completion of the course, the student will have the ability to,

CO1	Illustrate stereoisomerism based on geometry and optical activity of organic compounds.	K2
CO2	Recall the connectivity of organic chemistry by using reactions that result in skeletal rearrangements.	K1
CO3	Identify the structure, function and importance of carbohydrates and ability to assess the significance of fundamental chemical properties on bio molecular structure.	K1
CO4	Describe a deeper insight into the chemistry of amines.	K1
CO5	Explain the role of survival of life – the involvement of amino acids, the building block of proteins in living beings.	K2

#### SYLLABUS

**Instructional Hours:** 

Credits: 5

60

#### UNIT I: STEREOISOMERISM (K2)

#### Hours)

Geometrical isomerism: cis and trans, E-Z notation. Optical activity of compounds with asymmetric carbon- chirality – conditions for optical activity – enantiomers – racemisation – resolution – asymmetric Synthesis – configuration – D-L and R-S nomenclature for compounds with more than one chiral centre- diastereo isomers & meso compounds. Optical activity of allenes and biphenyls.

(Beyond the Curriculum- Significance of optically active isomer, eg.Cis- platin) UNIT II: MOLECULAR REARRANGEMENT (K1) (12

#### Hours)

Mechanism of molecular rearrangements: Pinacol – Pinacolone, Beckmann, Hoffmann, Curtius, Benzylic Acid, Schmidt, Lossen, Cope, Claisen, Benzidine and Fries.

**UNIT III: CARBOHYDRATES (K1)** 

Hours)

Chemistry and structure of glucose, fructose, sucrose (cyclic structure as well).an elementary account of starch and cellulose. (Elucidation of structure not necessary) inter conversion of sugars – mutarotation – epimerisation.

(Self-Study: Classification of Carbohydrates.)

#### UNIT IV: AMINES (K1)

#### Hours)

Structure and nomenclature of amines, separation of a mixture of primary, secondary and tertiary amines. structural features affecting basicity of amines, preparation of alkyl and aryl amines - reduction of nitro compounds, nitriles, reductive amination of aldehydes and ketones, Gabriel phthalimide reaction, Hofmann bromamide reaction. Reactions of amines – electrophilic aromatic substitution in aryl amines with nitrous acid, diazotisation and coupling reaction.

#### UNIT V: AMINO ACIDS AND PROTEINS (K2)

#### Hours)

Amino acids – classification – preparation and properties – peptides and poly peptidesproteins classification based on physical properties and biological functions – primary, secondary and tertiary structure – properties and uses.

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#### (Self-Study: Importance of Biomolecules.)

#### **TEXT BOOKS:**

- 1. Tewari N. *Advanced Organic Stereochemistry*, Arunabha Sen Books & Allied (P) Ltd, New Delhi, (2010).
- 2. Finar I.L. Organic Chemistry The Fundamental Principles Vol I. 6<sup>th</sup> Edition. Pearson Education India,(2011).

#### **REFERENCES BOOKS:**

- Nasipuri D. Stereochemistry of Organic Compounds Principles and Applications. 3<sup>rd</sup> Edition. New Age International (P) Ltd. New Delhi, (2016).
- Mukherjee K.S. *Mechanism of Organic Reactions*. Arunabha Sen Books & Allied Pvt. Ltd. New Delhi, (2010).
- 3. Finar I.L. Organic Chemistry Stereochemistry and the Chemistry of Natural Products
  Vol I. 5<sup>th</sup> Edition. Pearson Education Ltd. New Delhi, (2005).
- 4. Sanyal S.N. *Reactions, Rearrangements and Reagents*. 4<sup>th</sup> Edition. Bharathi Bhawan Publishers and Distributors. New Delhi, (2019).
- 5. Ahluwalia V.K. and Rakesh K. Parashar. *Textbook of Organic Chemistry*. Viva Books. New Delhi, (2012).

#### **BLENDED LEARNING**

#### UNIT V: AMINO ACIDS AND PROTEINS (K2)

Topics	Blended Learning Links
Classification of amino acids	https://www.khanacademy.org/test-
	prep/mcat/biomolecules/amino-acids-and-
	proteins1/v/classification-amino-acids
Preparation and properties amino acids	https://www.youtube.com/watch?v=_pXRH6
	<u>h_vJw</u>
	https://www.youtube.com/watch?v=DhwAp
	<u>6yQHQI</u>
Peptides and poly peptides	https://youtu.be/nv2kfBFkv4s

Classification of proteins based on physical	https://www.youtube.com/watch?v=z2JEDe
properties	<u>GkfCc</u>
	https://uta.pressbooks.pub/cellphysiology/ch apter/chapter-2/
Classification of proteins based on biological	https://sphweb.bumc.bu.edu/otlt/mph-
functions	modules/ph/ph709_basiccellbiology/ph709_
	basiccellbiology7.html
Primary, secondary and tertiary structure	https://www.khanacademy.org/test-
	prep/mcat/biomolecules/amino-acids-and-
	proteins1/v/four-levels-of-protein-structure
	https://www.youtube.com/watch?v=FkjilyNa T3M
	https://www.youtube.com/watch?v=N8R2W
	WIDKRM
Properties and uses of amino acids	https://www.youtube.com/watch?v=WATac 1CmHyM
Properties and uses of and proteins	https://www.sciencelearn.org.nz/resources/2
	09-role-of-proteins-in-the-body
	https://sphweb.bumc.bu.edu/otlt/mph- modules/ph/ph709_basiccellbiology/ph709_ basiccellbiology7.html

## MAPPING OF CO'S WITH PO'S / PEO'S

PO	PSO	PSO											
1	2	3	4	5	6	7	8	9	10	11	12	1	2

CO1	3	2	2	1	2	1	1	1	1	2	2	1	3	2
CO2	3	2	2	2	1	1				2	2		3	2
CO3	3	1	1	2		3	3	3	2	1	2	3	2	3
CO4	3	2	2			2	2	2	2		2	2	2	
CO5	3	1	1	3	1	3	3	3	2	2	2	3	3	

## Correlation: Low – 1, Medium – 2, High – 3

S. No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a semester
2	CIA I	Once in a semester
3	CIA II	Once in a semester
4	Model Examination	Once in a semester
5	Assignment (Unit I & II)	Twice in a semester
6	Quiz (Unit III & IV)	Twice in a semester
7	Content Writing (Unit V)	Once in a semester

Course Designed by:	Verified by HOD: Dr. N.Gunavathy
Dr.Sr.S. Kulandai Therese	
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

#### **SEMESTER - V**

#### COURSE CODE: 23UCH5C07

#### TITLE OF THE COURSE: CORE VII –ELECTROCHEMISTRY

#### (*Employability*)

#### **COURSE OBJECTIVES:**

- To provide a core for the future studies in physical chemistry and its application of important terms and laws.
- To provide knowledge on basic concepts of physical chemistry, various aspects of electrical conductance, ionic equilibria, electrochemical series.
- To impart knowledge on transformation of chemical energy.

#### **COURSE OUTCOMES:**

At the completion of the course, the student will have the ability to,

CO1	Describe the theory of electrical conductance.	K1
CO2	Explain ionic equilibria and applications of solubility.	K2
CO3	Illustrate the transformation of chemical energy into electrical energy in galvanic cells.	K2
CO4	Explain the significance of electrode potential.	K2
CO5	Compile the knowledge of fuel cells and their applications.	К3

#### SYLLABUS

#### Credits: 5

#### 60

#### **Instructional Hours:**

(12

#### UNIT I: ELECTRICAL CONDUCTANCE (K1)

#### Hours)

Conduction in metals and in electrolytic solutions - measurement of conductivity in electrolytic solution. Migration of ions – Kohlrausch' law. Arrhenius theory of electrolytic dissociation – Ostwald's dilution law. Theory of strong electrolytes – Debye – Huckel – Onsager theory (elementary account only) – Debye – Falkenhagen effect – Wien effect. Transport numbers – determination. Conductometric titrations.

#### UNIT II: IONIC EQUILIBRIA (K2

#### Hours)

Ionic equilibria – solubility and solubility product – determination of solubility product – application of solubility product principle. Dissociation of weak acids and bases – dissociation constants – pH scale – common ion effect – buffer solutions – determination of pH values of buffer mixtures – Henderson's equation.

## UNIT III: ELECTROCHEMICAL CELLS I (K2) (12

#### Hours)

Electrochemical cells – electrode potentials – the standard hydrogen electrode – kinds of electrodes and potentials – Nernst equation. EMF – computation and measurement of cell EMF - single electrode potential – determination and significance of electrode potentials – electrochemical series.

#### UNIT IV: ELECTROCHEMICAL CELLS II (K2)

#### Hours)

Reference electrodes – electrodes for measurements of pH – concentration cells with and without transport – liquid junction potential – applications of EMF measurements. Redox potentials – redox indicators – uses.

(Self-Study: Nickel cadmium cell.)

#### UNIT V: FUEL CELLS (K3)

#### Hours)

Fuel Cells: Hydrogen – oxygen cell and hydrocarbon oxygen cell. Storage cells. Lead storage cell and Lithium-ion battery. Decomposition voltage – over voltage – deposition and discharge potential. (*Beyond the Curriculum: Redox based protective coating solid oxide fuels*)

**TEXT BOOKS:** 

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 Arun Bahl. Bahl B.S and Tuli G.D. *Essentials of Physical Chemistry*. S. Chand & Co Ltd. New Delhi, (2016).

#### **REFERENCES BOOKS:**

- 1. Bahl B.S and Tuli G.D. *Essentials of Physical Chemistry*. S. Chand & Co Ltd. New Delhi, (1984).
- Gordon M Barrow. *Physical Chemistry*. 5<sup>th</sup> Edition. Tata McGraw Hill Education Pvt Ltd. New Delhi, (2010).
- 3. Madan R.L. Chemistry for Degree Students. S. Chand & Co Ltd. New Delhi, (2012).
- 4. Ira N Levine. *Physical Chemistry*. 7<sup>th</sup> Edition. McGraw Hill Education Private Ltd. New Delhi, (2016).
- Dash U.N., Dharmarha O.P., Soni P.L. *Textbook of Physical Chemistry*. Sultan Chand & Sons. New Delhi, (2016).

#### **BLENDED LEARNING**

#### UNIT V: FUEL CELLS (K3)

Topics	Blended Learning Links
Fuel cells: Hydrogen –oxygencell	https://youtu.be/iDHv3Ez97Q0,https://youtu.be/ 5_IDGna9MBM
hydrocarbonoxygencell	https://youtu.be/sa3gyUs6xHU
Storagecells-Leadstoragecell	https://youtu.be/3k9PS- 2OtLw,https://youtu.be/HhxtfULIO7c
Nickel Cadmium cell	https://youtu.be/tUvpwdqdLlI,https://youtu.be/Q 0VSVyIIM
Decomposition voltage-overvoltage	https://youtu.be/aUW1euzgXBs,https://youtu.be/ 2ubmVx0lVwk
Deposition and discharge potential	https://youtu.be/OEGapJdXk_M

### MAPPING OF CO'S WITH PO'S / PEO'S

	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	1	2	2	2	2	1	2	3	2	2	2	1	3
CO2	3	2	3	3	3	2	3	2	3	2	2	1	3	3
CO3	3	1	2	2	2	3	2	1	2	3	1	3	2	2
CO4	2	3	3	1	3	1	3	2	2	2	1	2	3	3
CO5	2	2	2	2	2	2	3	1	1	2	2	1	1	3

Correlation: Low – 1, Medium – 2, High – 3

S. No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a semester
2	CIA I	Once in a semester
3	CIA II	Once in a semester
4	Model Examination	Once in a semester
5	Assignment (Unit I & II)	Twice in a semester
6	Quiz (Unit III & IV)	Twice in a semester
7	Presentation (Unit V)	Once in a semester

Course Designed by: Dr. C. Subha	Verified by HOD: Dr. N.Gunavathy
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

#### **SEMESTER - V**

#### COURSE CODE: 23NCH5E01

## TITLE OF THE COURSE: NON-MAJOR ELECTIVE – ESSENTIAL CHEMISTRY COURSE OBJECTIVES:

- To provide knowledge about pharmaceutical chemistry, to enable students to work in pharmaceutical labs, companies and indulge in research.
- To create awareness in branches of polymer, green and Nano chemistry and to illustrate the importance of different fuels.

#### **COURSE OUTCOMES:**

At the completion of the course, the student will have the ability to,

CO1	Recall the terminologies and classes of drugs in pharmaceutical	K1
	chemistry.	
CO2	Apply some first aid technologies.	K3
CO3	Differentiate the polymers according to their applications.	K2
CO4	Relate the different types of energy sources.	K2
CO5	Explain the principles of green chemistry and applications of Nano	K2
	chemistry.	

#### SYLLABUS

Credits: 4 Hours: 60 Instructional

#### UNIT I: PHARMACEUTICAL CHEMISTRY I (K1)

#### Hours)

Introduction – terminology in drug chemistry - nature and source of drugs – requirements of a drug, lethal dose – definition and examples of antiseptics, disinfectants, analgesics, antipyretics, tranquilisers, anaesthetics, antineoplastic, hypoglycaemic, antibacterial and cardiovascular drugs - causes of common diseases and their treatment – classification of antibiotics.

## (Self-Study: Nature and Source of Drugs – Requirements of a Drug.) UNIT II: PHARMACEUTICAL CHEMISTRY II (K3)

#### Hours)

Hours)

First aid – important rules - first aid box – first aid to prevent bleeding and for burns – common poisons and their antidotes – medicinal plants of India – *Hibiscus rosa sinensis, Adathoda vasica, Ocimum sanctum, Mangifera indica*, neem, *Phyllanthus nirari, Solanum trolobatum*, grasses, greens. AIDS – symptoms – prevention and treatment. Biological role of some inorganic compounds.

#### **UNIT III: POLYMERS AND PLASTICS (K2)**

Introduction to polymers – definition of terms – monomers – polymers – copolymers – degree of polymerization – plastics – resins - elastomers – vulcanization. classification of polymers – natural – synthetic – thermoplastics – thermosetting – homo – copolymer – addition – condensation – rubbers – plastics – fibres. biodegradable plastics – uses of some important natural and synthetic polymers – starch and cellulose, rubber, polyethylene, polypropylene, PMMA, polyamide, polyester, PET, polycarbonate, polyurethane, silicones, polymer composites.

# UNIT IV: CONVENTIONAL AND NONCONVENTIONAL ENERGY SOURCES (K2) (12

#### Hours)

Requisites of fuels – coal, ranking of coal, calorific value, refining of petroleum, petroleum products, petroleum, LPG, water gas, producer gas, bio gas, solar energy, biofuels, wind energy, nuclear energy, nuclear reactors. Nuclear fuels - hazards and

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safety measures. Solar energy for heating and electrification. fuel cells – distinctive features –  $H_2$ – $O_2$  fuel cell – applications

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(Self-Study: Classification of fuels, Different natural sources of energy.)

#### UNIT V: NANO AND GREEN CHEMISTRY (K2)

#### Hours)

Introduction – properties of nano materials – **applications of nano materials in health, communication, energy, environment, safety, security, defence and agriculture** (**Industry 4.0**). Green chemistry – introduction – need for green chemistry - principles of green chemistry. Applications of green chemistry - Harpin technology to replace conventional pesticides – uses of H<sub>2</sub>O<sub>2</sub>– production of biodiesel – biopolymers and bio plastics. Green technology in waste management. Alternative fluorocarbons (AFCs) as green replacements of chlorofluorocarbons (CFCs).

#### **TEXT BOOKS:**

- Jayashree Ghosh S. Fundamental concepts of Applied Chemistry. S. Chand Limited. New Delhi, (2006).
- Gowariker V.R, Viswanathan, N.V and Jayadev Sreedhar. *Polymer Science*. New Age International (P) Ltd. New Delhi, (2008).

#### **REFERENCES BOOKS:**

- 1. Dr. Kasture A.V and Dr. Wadodkar S.G. *Pharmaceutical chemistry*. Nirali Prakashan Publishers. Mumbai, (1991).
- Charles E. Carraher. Introduction to Polymer Chemistry. 4<sup>th</sup> Edition. CRC Press. New Delhi, (2017).
- 3. Kumar V. An introduction to green chemistry. Vishal Publishing Co. New Delhi, (2010).
- 4. Ahluwalia V.K. Green Chemistry. 2<sup>nd</sup> Edition. CRC press. New Delhi, (2009).
- Alain Nouailhat. An Introduction to Nano science and Nano technology. John Wiley & Sons Inc. New York, (2008).

#### **BLENDED LEARNING**

#### UNIT V: NANO AND GREEN CHEMISTRY (K2)

Topics	Links

Introduction – properties of nano materials	https://www.youtube.com/watch?v=lFYs3XDu4fQ
Applications of nano materials in health	https://www.youtube.com/watch?v=3e-XHlvuApQ
Application of nanomaterials in	https://www.youtube.com/watch?v=dV6c0WsAnm
communicative, energy and environment	A
Application of nanomaterials in safety,	https://www.youtube.com/watch?v=YhS8Rmkk8O
security and defence	<u>8</u>
Application of nanomaterials in agriculture	https://www.youtube.com/watch?v=8Pla89xTCIc
Green chemistry – Introduction – need for	https://youtu.be/C0K1XRT1myg,https://youtu.be/e
green chemistry - Principles of green	je1JYoav-8
chemistry	
Green technology in waste management-	https://youtu.be/X9GHBdyYcyo
Alternative fluorocarbons (AFCs) as Green	
Replacements of chlorofluorocarbons	
(CFCs)	

## MAPPING OF CO'S WITH PO'S / PEO'S

	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	1		2	3	3	2	2		1	3		
CO2	3	3	2	2	3	3	3	2	2	2	1	3	2	
CO3	3	2	3	2	3	3	2		2	3	3	3	3	3
CO4	3	2	2		1	3	2		2	3	3	3		2
CO5	3	3	3	2	3	2	3		2	3	3	3		2

Correlation: Low – 1, Medium – 2, High – 3

#### **ASSESSMENT TOOLS**

S. No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a semester
2	CIA I	Once in a semester
3	CIA II	Once in a semester
4	Model Examination	Once in a semester
5	Assignment (Unit I & II)	Twice in a semester
6	Quiz (Unit III & IV)	Twice in a semester
7	Field Work (Unit V)	Once in a semester

Course Designed by: Dr. P. Kalaivani	Verified by HOD: Dr. N.Gunavathy
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

#### **SEMESTER - V**

#### COURSE CODE: 23UCH5SB3

#### TITLE OF THE COURSE: SKILL BASED III – POLYMER CHEMISTRY

#### (Employability)

#### **COURSE OBJECTIVES:**

- To provide knowledge on basic concepts of polymer chemistry, various aspects of polymerization methods, mechanism, molecular weight determination, structure, properties and applications.
- To impart knowledge to prepare natural polymer materials and apply range of laboratory techniques to study the property and to characterization of polymers, to become well trained professionals for the plastics and allied industries to meet well trained man power requirement.

#### **COURSE OUTCOMES:**

At the completion of the course the student will have the ability to,

CO1	Classify the polymers based on the basic concepts of polymer	К3
	chemistry.	
CO2	Predict the mechanism and molecular weight determination of various	К3
	polymerization process.	
CO3	Compare the polymerization techniques in relation to polymer	K2
	structure and properties.	
CO4	Predict suitable method of preparing various industrial polymers.	K3
CO5	Identify the applications of natural polymers and speciality polymers.	K1

#### SYLLABUS

Credits: 2

#### **Instructional Hours:**

#### 45

#### UNIT I: INTRODUCTION AND BASIC CONCEPTS (K3)

Hours)

Monomer, oligomer, polymer - degree of polymerization – functionality -repeat unit - classification of polymers. Copolymers - block, graft, random and alternate - thermosetting and thermoplastic polymer, elastomer, plastic, resin, fibbers - primary and secondary bonding forces. Molecular weights of polymers and molecular weight distribution - significance of molecular weight.

(Self-Study: Size of polymer molecule and freely jointed chain model.)

UNIT II: POLYMERISATION MECHANISM AND MOLECULAR WEIGHT DETERMINATION (K3)

#### Hours)

Addition and condensation polymerization. Mechanism of step reaction, free radical, anionic, cationic polymerization - Zeigler Natta catalysts - polymer molecular weight determination by cryoscopy, vapour phase osmometry, light scattering method, ultracentrifugation and viscometric method.

(Self-Study: End group analysis and their uses.)

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#### UNIT III: POLYMER STRUCTURE AND PHYSICAL PROPERTIES (K2)

#### (9Hours)

Crystallinity - polymer transition temperatures, factors affecting crystallinity, Tm and Tg - polymer degradation (thermal, photo, oxidative and hydrolytic) basic principles and comparison of polymerization techniques – bulk polymerization, solution polymerization, suspension polymerization and emulsion polymerization.

#### UNIT IV: INDUSTRIAL POLYMERS (K3)

#### (9Hours)

Important industrial polymers- preparation and applications - polyethylene, polypropylene, polyamides - polyvinyl chloride, polymethylmethacrylate polyesters polyurethanes, phenol formaldehyde, phenol melamine resins – fillers in industrial polymers - talc, glass, carbon.

## UNIT V: NATURAL POLYMERS, SPECIALTY POLYMERS AND APPLICATIONS (K1)

#### (9 Hours)

Rubber, cellulose, starch, wool, silk, nucleic acids - general structure, important applications. Heat resistant polymers, photopolymers and conducting polymers - examples and important applications.

#### **TEXT BOOKS:**

- Gowariker, V.R. Viswanathan, N.V and Jayadev Sreedhar. *Polymer Science*. New Age International Pvt Ltd. New Delhi, (2008).
- 2. Vasudha, V.G. Polymer Chemistry. Mythe Creators, Coimbatore, (2013).

#### **REFERENCES BOOKS:**

- Ahluwalia. V.K. Anuradha Mishra. *Polymer Science A Textbook*. Ane Books. India, (2008).
- 2. Selvaraj. V.K. Advanced Polymer Chemistry. Campus Books International. New Delhi, (2008).
- 3. Misra.G.S. Introductory Polymer Chemistry. Wiley Eastern Ltd. New Delhi, (1993).
- 4. Nayak. P.L. Lenka, S. Polymer Science. Kalyani Publishers. New Delhi, (1985).
- Arora. M.G. Singh. M. Polymer Chemistry. Annual Publications Pvt Ltd, New Delhi, (2001).

#### **BLENDED LEARNING**

## UNIT V: NATURAL POLYMERS, SPECIALTY POLYMERS AND APPLICATIONS (K1)

Topics	Links
Rubber- general structure,	https://youtu.be/-56gaebBcAU
important applications	
Cellulose- general structure,	https://youtu.be/H73J-hWx-zA
important applications	
Starch- general structure,	https://youtu.be/RTq9P1971Z8
important applications	
Wool- general structure,	https://youtu.be/AgBZurcxvXo
important applications	
Silk- general structure, important	https://youtu.be/fdS0aovqA
applications	
Nucleic acids - general structure,	https://youtu.be/0lZRAShqft0
important applications	
Heat resistant polymers	https://www.youtube.com/watch?v=SNIOKHFO0JU
Photopolymers	https://www.youtube.com/watch?v=-0BWuJK6UfE
Conducting polymers	https://www.youtube.com/watch?v=QXAYhFBIt7g

#### MAPPING OF CO'S WITH PO'S / PEO'S

	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3								1	2		3	2	2
CO2	3			2	1		1		1	2	1	3	2	2
CO3	3		1	2	2			2	1	2	1	3	2	2
CO4	3	2	1	2	1	1				1		2	2	2
C05	3	2	1	2	1	1				1		2	2	2

Correlation: Low – 1, Medium – 2, High – 3

S. No.	Assessment Methods	Frequency of Assessment				
1	End Semester Examination	Once in a semester				
2	CIA I	Once in a semester				
3	CIA II	Once in a semester				
4	Model Examination	Once in a semester				
5	Assignment (Unit I & II)	Twice in a semester				
6	Quiz (Unit III & IV)	Twice in a semester				
7	Group Discussion (Unit V)	Once in a semester				

Course Designed by: Dr. P. Kalaivani	Verified by HOD: Dr. N.Gunavathy
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal
### SEMESTER - V

### COURSE CODE: 23IDSBCH1

# TITLE OF THE COURSE: SKILL BASED IV– FOOD SCIENCE AND TECHNOLOGY

#### (Entrepreneurship)

# **COURSE OBJECTIVES:**

- To provide adequate knowledge to the major aspects of food science related to technological development.
- To understand the importance of cooking, preservation and quality of food.

#### **COURSE OUTCOMES:**

At the completion of the course the students will have the ability to,

CO1	Explain the constituents of food and their properties.	K2
CO2	Describes the objectives and methods of cooking.	K1
CO3	Describe awareness on Food additives and food adulterants.	K1
CO4	Associate with the methods of food preservation.	K2
CO5	Interpret food quality and gain knowledge on food biotechnology.	K2

### **SYLLABUS**

### Credits: 2

#### **Instructional Hours:**

#### 45

#### **UNIT I: CONSTITUENTS OF FOOD (K2)**

**Hours**) Properties and significance - carbohydrates, proteins, fats. additional food constituents – natural emulsifiers, organic acids, oxidants & antioxidants, enzymes, pigments & colours, flavours, vitamins & minerals, natural toxicants and water. (*Self-Study: Healthy Eating Pyramid.*)

#### **UNIT II: IMPORTANCE OF FOOD (K1)**

#### (9Hours)

(9

Food in relation to health - cooking- objectives of cooking, methods of cooking. Loss of nutrients during cooking. Vegetables and fruits- nutritive value, selection preliminary preparation.

#### (Self-Study: Importance of Food Waste Management.)

# **UNIT III: FOOD ADDITIVES AND FOOD ADULTERANTS (K1)**

Definitions, need for food additives, requirements of additive. Classification of food additives. Antioxidants, sequestrants, surface active agents, stabilizers, thickeners, bleaching and maturing agents, starch, modifiers, buffers, acids, alkalis, food colours, non-nutritive and special dietary sweeteners, nutrients supplements, flavouring agents, miscellaneous additives.

Definition- types of food adulterants-intentional, incidental, metallic, other. Investigation of food adulterants.

#### **UNIT IV: FOOD PRESERVATION (K2)**

Food spoilage- methods of preservation of food- preservation by low temperature, high temperature, preservatives, osmotic pressure and dehydration- food irradiation.

#### **UNIT V: FOOD QUALITY (K2)**

Need for testing food quality. sensory evaluation (sight, touch, smell, taste). Quality characteristics - appearance, textural & flavour factors. Biotechnology in food, bio fortification, nutraceuticals, organic foods, packaging of food.

#### **TEXT BOOKS:**

- 1. Geethamalika. G. Food Science and Technology. Mythe Creators. Coimbatore, (2012).
- 2. SriLakshmi B. Food Science. 6th Edition. New Age International Publishers Ltd. New Delhi, (2014).

#### **REFERENCES BOOKS:**

- 1. Potter. Food Science. 3rd Edition. CBS Publication. New Delhi, (1987).
- 2. Helen Kowtaluk. Food for Today. Tata McGraw Hill Publishing Company. New Delhi, (2006).
- 3. Vasudevan and SriKumari. Text Book of Biochemistry. Jay Pee Brothers Medical Publishers Pvt. Ltd. New Delhi, (2005).

(9Hours)

### (9Hours)

#### (9Hours)

- 4. Kusum Gupta, Gupta L.C and Abishek Gupta. *Food and Nutrition*. Jay Pee Brothers Medical Publishers Pvt. Ltd. New Delhi, (1983).
- 5. Premlatha Mullick. Text Book of Home Science. Kalyani Publishers. New Delhi, (2004).

# **BLENDED LEARNING**

# UNIT IV: FOOD PRESERVATION (K2)

Topics	Links
Food Spoilage	https://www.youtube.com/watch?v=WWGRTSbvef0
Preservation by low temperature	https://www.youtube.com/watch?v=zhM-yPjxaok
Preservation by high temperature	https://www.youtube.com/watch?v=e4by9FNYb60
Preservation by preservatives	https://www.youtube.com/watch?v=GdTBV1ADzVc
Preservation by osmotic pressure	https://www.youtube.com/watch?v=mjGpLlur8fM
Preservation by dehydration	https://www.youtube.com/watch?v=f141C9Kw3jo
Preservation by food irradiation	https://www.youtube.com/watch?v=OUf0XNAaT3M

# MAPPING OF CO'S WITH PO'S / PEO'S

	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2			2		2	1			1		2	1	
CO2	3	2	3	3	3	2	2	2	2	2	2	2	2	3
CO3	2	1	2	2	2	3	2		2	3	2	3	2	2
<b>CO4</b>	3		2	1		1						2	2	
CO5	3		2	2								1	1	

Correlation: Low – 1, Medium – 2, High – 3

#### **ASSESSMENT TOOLS**

S. No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a semester
2	CIA I	Once in a semester
3	CIA II	Once in a semester
4	Model Examination	Once in a semester
5	Assignment (Unit I & II)	Twice in a semester
6	Quiz (Unit III & IV)	Twice in a semester
7	Field Survey (Unit V)	Once in a semester

Course Designed by: Dr. P. Dhivya	Verified by HOD: Dr. N.Gunavathy
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

# **SEMESTER - V**

# COURSE CODE: 23UCH5CP3

# TITLE OF THE COURSE: CORE PRACTICAL III - ORGANIC ANALYSIS AND ORGANIC PREPARATION

# **COURSE OBJECTIVES:**

- To enable the student to analytical skill in organic qualitative analysis.
- To understand the techniques involved in the preparation of standard solution.
- To appreciate and apply the techniques involved in the estimation of substance.

- To enable the students to understand the mechanism involved in the name reactions and conditions of the reactions involving the preparations.
- At the end of the course the student will be able to carry out the experiments.

# **COURSE OUTCOMES:**

At the completion of the course, the student will be able to

CO1	Analyse the functional group of given organic compound	K4
CO2	Infer the principle of the organic reaction mechanism of the compound given	K4
CO3	<b>Record</b> – records the observations and inference	K3

# SYLLABUS

Credit: 3

60

# **ORGANIC ANALYSIS**

Systematic analysis of an organic compound- preliminary tests, detection of elements present, aromatic or aliphatic, saturated or unsaturated, nature of the functional group, confirmatory test and preparation of derivatives – Aldehydes, Ketones, Amines, Amides, Diamide, Carbohydrates, Phenols, Acids, Esters & Nitro compounds

**Instructional Hours:** 

# PREPARATION OF ORGANIC COMPOUNDS

- 1. Acetanilide from Aniline
- 2. p- Bromo acetanilide from Acetanilide.
- 3. Salicyclic acid from Methyl salicylate.
- 4. Phenyl benzoate from Phenol.
- 5. Benzoic acid from Benzaldehyde or toluene

# **TEXT BOOKS:**

- 1. A. O. Thomas, Practical Chemistry, 7th Edn., Scientific Book Centre, Kannur, (1999).
- 2. V. K. Ahluwalia, S. Dhingra, *Comprehensive Practical Organic Chemistry: Qualitative Analysis*, Universities Press, (2000).
- F. G. Mann, B. C. Saunders, *Practical Organic Chemistry*, 4<sup>th</sup> Edn., Pearson Education, (2009).

4. V. K. Ahluwalia, S. Dhingra, *Comprehensive Practical Organic Chemistry: Qualitative* 

Analysis, Universities Press, (2000).

# **REFERENCES:**

- 1. Gnanaprakasam and Rmamurthy, *Organic Lab Manual*, New Edition, Chennai, (2020).
- 2. Dr. N. Gunavathy, "Chemistry Core Practical III & IV Organic Chemistry and Gravimetric Analysis"
- Dr. N.Gunavathy, Laboratory Manual for Allied Chemistry Practical. Mythe Creators, Coimbatore.

# MAPPING OF CO'S WITH PO'S / PEO'S

	РО	РО	РО	PO	РО	PO	РО	PO	РО	РО	РО	РО	PS	PS
	1	2	3	4	5	6	7	8	9	10	11	12	01	02
CO1	3	3	2	3				1						2
CO2	3	3	2		2	2	2		3		2	3	3	3
CO3	3	3	3	2	2	2	1		3			3		2

# Correlation: Low – 1, Medium – 2, High – 3

# ASSESSMENT TOOLS

S.No.	Assessment Methods	Frequency of Assessment
1.	Observation Note	Once in a Year
2.	Record	Once in a Year
3.	Regularity	Once in a Year
3.	Model Practical I	Once in a Year
4.	Model Practical II	Once in a Year
5.	End Semester Examination	Once in a Year

Course Designed by:	Verified by HOD: Dr. N.Gunavathy
Dr.Sr.S. Kulandai Therese	
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

# **SEMESTER - VI**

# COURSE CODE: 23UCH6C08

# TITLE OF THE COURSE: CORE VIII – ORGANIC SPECTROSCOPY AND NATURAL PRODUCTS

# (Skill Development)

# **COURSE OBJECTIVES:**

- To understand the term spectroscopy, classification and fundamental concepts of IR, Raman, UV Visible and NMR spectroscopy.
- To explain the isoprene rule and structural elucidations of terpenoids and vitamins.
- To provide the history of alkaloids and its classifications, appropriate isolation techniques and structural determination of conine, piperine and nicotine.

# **COURSE OUTCOMES:**

At the completion of the course the student will have the ability to,

UNITS	LEARNING OBJECTIVES	LEVEL
CO1	Express the fundamental concepts of electromagnetic spectrum and	K2
	UV spectroscopy.	
CO2	Compare the theory and applications of IR and Raman spectra.	K2
CO3	Infer the basic principles of NMR spectra.	K2
<b>CO4</b>	Describe the importance of terpenoids and vitamins.	K1

#### **SYLLABUS**

# Credits: 5

#### 60

#### UNIT I: SPECTROSCOPY I (K2)

#### Hours)

Absorption spectra – fundamental concepts of electromagnetic spectrum –theory of UV and visible spectra- instrumentation (block diagram only). Types of electronic transition, effects of conjugation, concepts of chromophore, auxochrome, bathochromic and hypsochromic shift. UV spectra of conjugated enes and enones - applications of UV and visible spectroscopy.

(Self-Study: Woodward – fieser rule.)

### UNIT II: SPECTROSCOPY II (K2)

#### Hours)

Theories of IR spectra – instrumentation (block diagram only)-finger print region – hydrogen bonding –detection of functional groups- applications of IR spectra. Theory of Raman spectra – comparison of IR and Raman Spectra.

#### UNIT III: SPECTROSCOPY III (K2)

#### Hours)

NMR spectra - basic principles – instrumentation (block diagram only)-chemical shift –spin-spin splitting – shielding, deshielding, hydrogen bonding. NMR spectra of simple molecules- ethanol, 1, 2-dibromoethane, propanol, diethyl ether and ethyl benzene (High - resolution details not expected).

# (Beyond the Curriculum: MRI scanning, Increased field Strength of NMR Spectroscopy, H- NMR Probes, FT-NMR)

UNIT IV: TERPENOIDS AND VITAMINS (K1) (12 Hours)

Terpenoids: Introduction – classification – general methods of isolation – isoprene rule – structural elucidation and synthesis of Geraniol,  $\alpha$  Terpeneol, dipentene. Vitamins-

# Instructional Hours:

(12)

(12

(12

introduction – classification and importance of vitamins- structural elucidation and synthesis of retinol (Attenburrow) and thiamine (Williams).

(12

(Self-Study: Biological role of Terpenoids.)

# UNIT V: ALKALOIDS AND HORMONES (K3)

#### Hours)

Alkaloids – introduction – classification – general characteristics – general methods of determining structures - Hoffmann's exhaustive methylation, structural elucidation and synthesis of nicotine (Craig), conine (Ladenburg) and piperine (Ladenburg).

Hormones: introduction – structure elucidation and synthesis of Adrenaline and Thyroxin.

# **TEXT BOOKS:**

- Sharma Y.R. *Elements of Organic Chemistry*, S.Chand & Company Ltd., New Delhi, (2004).
- 2. Kemp W. Organic Spectroscopy. 3rd Edition, Pal Grave, California, (2004).

# **REFERENCES BOOKS:**

- 1. Kalsi P.S. *Spectroscopy of Organic Chemistry*. 6th Edition. New Age International Publishers, New Delhi, (2004).
- Robert M.Silverstein and Francis X. Webstir. Spectroscopy of Organic Compounds. 6th Edition, Wiley Publishers, New Jersey, (1996).
- Collin N.Banwell and Elaine M.Mccash. *Fundamentals of Molecular* Spectroscopy. 4 th Edition McGraw- Hill, New York, (2004).
- 4. Russell S. Drago. *Physical Methods in Inorganic Chemistry*. Reinhold Publishing Corporation. New York, (1977).
- 5. Gurdeep R. Chatwal and Sham K.Anand, *Spectroscopy*. Himalaya Publishing House. Mumbai, (2004).

# **BLEANDED LEARNING**

# UNIT V: ALKALOIDS AND HORMONES (K3)

Topics	Blended Learning Links
Introduction – Alkaloids	https://www.youtube.com/watch?v=6ZCnbCrYlJo

Classification of alkaloids	https://www.youtube.com/watch?v=7mMBUJfQ-g4
	https://www.youtube.com/watch?v=7eacpir86do
General characteristics of alkaloids	https://www.youtube.com/watch?v=a2DmFPvspeg
Hoffmann's exhaustive methylation	https://www.youtube.com/watch?v=2PWGjXg4XBo
Structural elucidation and synthesis	https://www.youtube.com/watch?v=XQi5qMONbvs
of Nicotine (Craig)	
Conine	https://www.youtube.com/watch?v=eOhqNB1W6PE
Piperine	https://www.youtube.com/watch?v=YoLOPkncl-s
Hormones	https://www.youtube.com/watch?v=lRJE8c3ghRE
Structure elucidation and synthesis of	https://www.youtube.com/watch?v=KmZ
adrenaline	LCFYHs&t=132s
Structure elucidation and synthesis of	https://www.youtube.com/watch?v=nnfpeTURSIU&t
a thyroxine	<u>=56s</u>

# MAPPING OF CO'S WITH PO'S / PEO'S

	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3		2	2	2	2	1	2	3	3	2	3	1
CO2	3	3	2	3	3	2	1			3	3	2	3	2
CO3	3	3	1	3	3	1	2	2	2	3	3	2	3	
CO4	3	2	2			2	1	2	3	2			2	3
CO5	3	2	2	2	2	2	1	3			2	1	2	3

# Correlation: Low – 1, Medium – 2, High – 3

#### **ASSESSMENT TOOLS**

S. No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a semester
2	CIA I	Once in a semester
3	CIA II	Once in a semester
4	Model Examination	Once in a semester
5	Assignment (Unit I & II)	Twice in a semester
6	Quiz (Unit III & IV)	Twice in a semester
7	Report Writing (Unit V)	Once in a semester

Course Designed by: Dr. P. Kalaivani	Verified by HOD: Dr. N.Gunavathy
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal
	· ·

# SEMESTER - VI

# COURSE CODE: 23UCH6CO9

# TITLE OF THE COURSE: CORE IX – QUANTUM MECHANICS, KINETICS AND PHOTOCHEMISTRY

### **COURSE OBJECTIVES:**

- To know the concepts of crystalline state and to appreciate the applications of electrical and magnetic properties of molecules.
- To gain knowledge about chemical kinetics and to correlate the theoretical aspects of kinetics with photochemistry.

#### **COURSE OUTCOMES:**

At the completion of the course, the student will have the ability to,

CO1	Explain the concepts of quantum mechanics.	K2
CO2	Describe the applications of electrical and magnetic properties in	K1
	structure determination.	
CO3	Define the rate laws and derive the rate equation.	K1
CO4	Interpret the knowledge about the theoretical aspects of reaction rates	K2
	and their mechanism.	
CO5	Explain the kinetics of photochemical reactions.	K2

#### **SYLLABUS**

Credits: 5

#### Hours: 60

# UNIT I: QUANTUM MECHANICS (K2)

Hours)

Black body radiation - failure of classical theory in explaining black body radiation – Planck's theory of quantisation of energy – Einstein's theory of photoelectric effect – Bohr's model of hydrogen atom & its defects. Compton effect. De Broglie theory of wave - particle dualism. Heisenberg's uncertainty principle. (No derivation). An elementary treatment of Schrodinger wave equation. Quantum numbers – concept of orbitals – significance of  $\psi \& \psi^2$ 

# UNIT II: ELECTRICAL AND MAGNETIC PROPERTIES (K1) (12

#### Hours)

Electrical properties of molecules: Molar polarization, orientation polarization and distortion polarization. polar and non-polar molecules-determination of dipole moments of polar gases, liquids and solids – application of dipole moment in the study of simple molecules. Magnetic properties of molecules: meaning of the terms-susceptibility, magnetic moment, diamagnetism, paramagnetism and ferromagnetism.

(12

Instructional

Determination of magnetic susceptibility by Guoy's method. Application of magnetic properties in solving structural problems.

# (Beyond the Curriculum-Working principles, induction stove, microwave oven.) UNIT III: CHEMICAL KINETICS I (K1) (12

#### Hours)

Empirical laws and experimental aspects. Rate laws, stoichiometry, order and molecularity of reactions. Setting up and solving simple differential equation for first order, second order, third order and zero order reactions. Characteristics of I, II, III and zero order reactions. Methods of determination of order of reactions.

(Self-Study: Adsorption of gases for zero order reaction.)

#### UNIT IV: CHEMICAL KINETICS II (K2)

(12

#### Hours)

Theoretical aspects. Effects of temperature on the rate constant. The activation energy. The collision theory of reaction rates and its limitation. Lindeman theory of unimolecular reactions. The theory of absolute reaction rates (a qualitative discussion using HI reaction). Comparison of collision theory with the absolute reaction rate theory. Catalysis- types, mechanism and industrial applications.

#### **UNIT V: PHOTOCHEMISTRY (K2)**

#### (12

#### Hours)

Kinetics of photochemical reactions. General difference between thermal & photochemical reactions. Absorption of light and photochemical processes. Grothus-Draper law- the Stark – Einstein law of photochemical equivalence. Photochemical and thermal chain reaction H<sub>2</sub>/Br<sub>2</sub>reaction.Quantum yield of photochemical reactions. Comparison of thermal and photochemical kinetics of H<sub>2</sub>/Br<sub>2</sub> reaction. Photosensitized reactions. Fluorescence, phosphorescence and chemiluminescence – example.

#### (Self-Study: Applications of photochemistry.)

# **TEXT BOOKS:**

- Arun Bahl, Bahl B.S. and Tuli G.D. *Essentials of Physical Chemistry*. 28<sup>th</sup> Edition. S. Chand Publishing. New Delhi, (2020).
- Puri B.R., Sharma L.R. and Pathania M.S. *Elements of Physical Chemistry*. 4<sup>th</sup> Edition. Vishal Publishing Company. New Delhi, (2013).

# **REFERENCE BOOKS:**

- 1. Madan R.D. *Chemistry for Degree Students for Third Year*. S. Chand and Company Ltd. New Delhi, (2013).
- 2. Negi A.S. and Chand S.C. *A Text Book of Physical Chemistry*. New Age International Publishers. New Delhi, (2007).
- 3. Gordon and Barrow. *Physical Chemistry*. Tata McGraw Hull Education Private Ltd. New Delhi, (2010).
- 4. Gurdeep Raj. *Chemical Kinetics*. Satyendra Rastogi Mitra for Krishna Prakashan Media. Meerut, (2014).
- Keith J. Laidler. *Chemical Kinetics*. 3<sup>rd</sup> Edition. Pearson Education India. New Delhi, (2003).

# **BLENDED LEARNING**

# UNIT V: PHOTOCHEMISTRY (K2)

Topics	Links
Kinetics of photochemical reactions	https://www.youtube.com/watch?v=02syn7zy6e0&fe
	<u>ature=youtu.be</u>
	https://www.youtube.com/watch?v=dkrWtP_8aHk
General difference between thermal &	https://www.youtube.com/watch?v=yskClHbsgZc
photochemical reactions	https://www.youtube.com/watch?v=YmBhr594PTA
Absorption of light and photochemical	https://www.youtube.com/watch?v=MQgMUPP-9pE
processes. Grothus - Draper law - The	
Stark – Einstein Law of Photochemical	
Equivalence	
Photochemical and Thermal chain	https://www.youtube.com/watch?v=XNR0UDgwGo
reaction H <sub>2</sub> /Br <sub>2</sub> reaction	<u>c</u>

Quantum yield of photochemical	https://www.dalalinstitute.com/books/a-textbook-of-
reactions. Comparison of thermal and	physical-chemistry-volume-1/photochemical-
photochemical kinetics of H2/Br2 reaction	reactions-hydrogen-bromine-hydrogen-chlorine-
	reactions/
Photosensitized reactions	https://www.youtube.com/watch?v=b_NLbOaxoDo
Fluorescence, phosphorescence and	https://www.youtube.com/watch?v=CcN8NnGGPhs
chemiluminescence – Definition and example	https://www.youtube.com/watch?v=RMMZ3rnzUH M
	https://www.youtube.com/watch?v=8_82cNtZSQE

# MAPPING OF CO'S WITH PO'S / PEO'S

	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2			1		2	1			1		2	2	
CO2	3	3	2	2	3	2		2	1	2		3		
CO3	3	2	2				2					3		
CO4	3	3	2	2	1				2	1	1	3		1
CO5	3	3	2		1	2			1	2	2			1

Correlation: Low – 1, Medium – 2, High – 3

# ASSESSMENT TOOLS

S. No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a semester
2	CIA I	Once in a semester

3	CIA II	Once in a semester
4	Model Examination	Once in a semester
5	Assignment (Unit I & II)	Twice in a semester
6	Quiz (Unit III & IV)	Twice in a semester
7	Content Writing (Unit V)	Once in a semester

Course Designed by: Dr. C. Subha	Verified by HOD: Dr. N.Gunavathy
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

# **SEMESTER - VI**

# COURSE CODE: 23UCH6E01

# TITLE OF THE COURSE: ELECTIVE - BASICS OF CHEMINFORMATICS

(Entrepreneurship)

**COURSE OBJECTIVES:** 

- To provide an introduction to the major aspects of cheminformatics to choose appropriate resource to search for needed data and information in chemistry.
- To appreciate data websites and concepts in the development of drug designing that are useful in the field of study for the chemical and pharmaceutical world.

#### **COURSE OUTCOMES:**

At the completion of the course the student will have the ability to,

CO1	Explain the basics of Cheminformatics using analytical mathematic	K2
	concepts.	
CO2	Describe the Cheminformatics information sources.	K1
CO3	Describe the structure of protein and application of drug action.	K1
CO4	Implement the publicly available databases in softwares used in cheminformatics.	K3
CO5	Apply molecular modelling and docking methods in drug designing.	K3

### SYLLABUS

### Credits: 4

#### 60

# UNIT I: INTRODUCTION OF CHEMINFORMATICS AND GRAPH THEORY (K2) (12 Hours)

Introduction to cheminformatics and its need.

Graph theory and molecular numerology; logic, sets and functions; algorithms, integers and matrices; mathematical reasoning, induction and recursion; counting; graphs, trees and sets, basic probability and statistics. Markov processes.

#### (Self-Study: General mathematical expressions.)

# UNIT II: CHEMINFORMATICS INFORMATION SOURCES (K1) (12

#### Hours)

Chemical literature - chemical information search - chemical information sources - chemical name and formula searching - analytical chemistry – chemical history – biography – directories - industry sources.

### UNIT III: DRUG ACTION ANDAPPLICATIONS (K1) (12 Hours)

# **Instructional Hours:**

Protein structure – primary structure, secondary structure - helix & sheet, tertiary structure, quaternary structure, covalent and non - covalent forces that maintain structures. Introduction to drug action, pro drug design and applications.

(12)

# (Self-Study: General properties of protein.)

# UNIT IV: GENOMICS AND PROTEOMICS (K3)

Hours)

Introduction -experimental sources of biological data, publicly available databases, gene expression monitoring; genomics and proteomics, metabolomics, visualisation of sequence data, visualization of structure using Rasmol or SPDB viewer or CHIME (Industry 4.0), Genetic basis of disease, personalised medicine and Gene-based diagnostics.

#### UNIT V: MOLECULAR MODELLING AND DOCKING (K3) (12

Hours)

Introduction to drugs, structure-based drug design. QSAR and3D-QSAR methods. Pharmacophore design, Ligand-based design and De Novo drug design, virtual screening, Docking of ligands. Protein structure, drug action & enzymes. Drug action & receptors. Predication of binding modes, protein-ligand binding free energies, fragment-based drug Design, ADMET prediction.

#### **TEXT BOOKS:**

- Shanmughavel, P. Principles of Bioinformatics, Pointer Publishers, Jaipur, India, (2005).
- 2. Andrew R Leach and Valerie J Gillet. An Introduction to cheminformatics, Springer (India) Private Limited, New Delhi, (2009).

#### **REFERENCES BOOKS:**

- Christopher J Cramer. Essentials of Computational Chemistry Theories and Models, (2<sup>nd</sup> Edition), John Wiley & Sons Ltd, England, (2004).
- 2. Dan E Krane and Michael L Raymer. Fundamental Concepts of Bioinformatics, Pearson Education Inc, New Delhi, (2003).
- 3. Teresa K Attwood and David J Parry Smith. Introduction to Bioinformatics, Pearson Education Inc, New Delhi, (2003).

- 4. Andreas D Baxevanis and Francis Ouellette. Bioinformatics A Practical Guide to the analysis of Genes and Proteins, John Wiley & Sons Inc Publication, New York, (2004).
- 5. Mani, K and Vijayaraj, N. Bioinformatics A Practical Approach, Aparnaa Publication, Coimbatore, (2004).

# **BLENDED LEARNING**

# UNIT IV: GENOMICS AND PROTEOMICS (K3)

Topics	Links
Introduction - Experimental sources of biological	https://youtu.be/5teoROLvijg
data, publicly available databases, Gene	
expression monitoring	
Genomics and Proteomics – Metabolomics,	https://youtu.be/jhi_vI-qVRo
visualisation of sequence data	
Visualization of structure using Rasmol or SPDB	https://youtu.be/L1svFdst5D8
viewer or CHIME	
Genetic basis of disease	https://youtu.be/NDDn-iUgUCE
Personalised medicine	https://youtu.be/DSHhep_w6pk
Gene-based diagnostics	https://youtu.be/fOKO_537YAU

# MAPPING OF CO'S WITH PO'S / PEO'S

	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2			2							3		

CO2	3	2			2				2	3		3	2	
CO3	3	3	2	2	2	2	1		2	2	2	3	2	2
CO4	3	2	2	2	3	2		1	2	3		3	2	3
CO5	3	2	2		3	2			2	2		3	2	2

Correlation: Low – 1, Medium – 2, High – 3

# ASSESSMENT TOOLS

S. No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a semester
2	CIA I	Once in a semester
3	CIA II	Once in a semester
4	Model Examination	Once in a semester
5	Assignment (Unit I & II)	Twice in a semester
6	Quiz (Unit III & IV)	Twice in a semester
7	Presenation (Unit V)	Once in a semester

Course Designed by: Dr. N. Gunavathy	Verified by HOD: Dr. N.Gunavathy
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

# SEMESTER - VI

### COURSE CODE: 23UCH6E02

# TITLE OF THE COURSE: ELECTIVE: BIOCHEMISTRY

#### (Employability)

# **COURSE OBJECTIVES:**

- To enable the student to develop a sound knowledge of fundamental concepts in biochemistry.
- To enumerate the molecular motif of a living cell, structural and functional hierarchy of biomolecules.
- To emphasis on the various aspects of metabolism and interrelationship of metabolic events.

#### **LEARNING OUTCOMES:**

At the completion of the course the student will have the ability to,

CO1	Associate the fundamental principles of living organisms and bio -	K2
	molecules.	
CO2	Identify cognitive aspect of enzyme, enzymatic action, specificity.	K1
CO3	Infer mechanistic approach towards lipids, fatty acids and metabolism.	K2
CO4	Discuss the essentials and significance of carbohydrates.	K2
CO5	Understand the role and importance of Nucleic acids.	K2

#### SYLLABUS

#### Instructional

Credits: 4 Hours: 60

#### UNIT I: BIOMOLECULES (K2)

#### Hours)

Living Cell – plant and animal cell. Cell membrane – organelles – functions of major sub-cellular components – anabolism and catabolism and their relation to metabolism. Peptide bond- stereochemistry, synthesis of peptides by solution and solid phase techniques. Proteins – classification – properties-3D structure-determination of amino

(12

acid sequence –denaturation and renaturation of protein molecules. Separation and purification of proteins – dialysis – gel filtration - electrophoresis. Catabolism of amino acids: Transamination, oxidative deamination, decarboxylation. The urea cycle and other possibilities of detoxification of ammonia.

#### UNIT II: ENZYMES (K1)

(12

#### Hours)

Nomenclature, classification and properties-specificity, factors influencing enzyme action. Mechanism of enzyme action – Lock and Key model and induced fit models. Coenzymes – cofactors – prosthetic groups of enzymes (TPP, NAD, NADP, FAD, ATP). Their importance in enzyme action. Mechanism of inhibition (competitive, non-and uncompetitive and allosteric). Immobilization of enzymes. Enzyme specificity. (*Self-study: Active site and chemical nature of enzymes; Restriction enzymes and their biological importance.*)

#### UNIT III: LIPIDS (K2)

#### (12Hours)

Classification - neutral lipids, Phospho lipids (lecithines, cephalins, plasmalogens) and glycolipids – importance, synthesis and degradation. Fatty acids – saturated, unsaturated fatty acids, EFA. Properties – Hydrolysis-acid number, saponification number. Auto-oxidation (Rancidity), addition reactions-Iodine value, Polenske number, Reichert-Meissl number, acetyl number. Hydrogenation - Cholesterol – biosynthesis. Bile salts derived from cholesterol. Metabolism: Oxidation of glycerol –  $\beta$ -oxidation of fatty acids; biosynthesis of lipids – synthesis of fatty acids and synthesis of triglycerides.

# (Self-study: Properties and structure of lipids; precursor and derived lipids.) UNIT IV: BIOPROCESS (K2)

#### (12Hours)

Stability - carbohydrates of the cell membrane – starch, cellulose and glycogen. (Structure and utility). Metabolism: Glycolysis and its reversal; TCA cycle. Relation

between glycolysis and respiration. Principles of bioenergetics, electron transport chain and oxidative phosphorylation.

#### UNIT V: NUCLEIC ACIDS (K2)

(12

#### Hours)

Nucleosides and nucleotides – purine and pyrimidine bases. Nucleic acids –Difference between DNA and RNA. Classification of RNA. Biosynthesis of DNA: Replication. Biosynthesis of mRNA: Transcription. Genetic code – mutations and mutants. DNA repair. Biosynthesis of proteins. DNA sequencing and PCR, recombinant DNA technology, DNA polymorphism. Strategies for screening DNA libraries. Blood composition. Blood coagulation.

### **TEXT BOOKS:**

- Lehninger. *Principles of Biochemistry*. Fourth Edition, by David L. Nelson and Michael M. Cox, Worth Publishers, New York. (2005).
- 2. Veerakumari L., Biochemistry, MJP publishers, Chennai, (2004).

#### **REFERENCES BOOKS:**

- Robert L. Caret, Katherine J. Denniston, Joseph J. Topping, *Principles and Applications of Organic and Biological Chemistry*, WBB Publishers, USA, (1993).
- 2. Jain J. L., Biochemistry, Sultan Chand and Co. New Delhi, (1999).
- Mazur A. and Harrow B., *Text Book of Biochemistry*, 10th Edition, W.B. Saunders Co., Philadelphia, (1971)
- Paula Yurkanis Bruice, Organic Chemistry, 3rd Edition, Pearson Education, Inc. (Singapore), New Delhi, (2002)
- 5. Lubert Stryer, Biochemistry, W. H. Freeman and Company, New York, (1975).

### **BLENDED LEARNING**

#### **UNIT IV: BIOPROCESS (K2)**

Topics	Links
Stability - carbohydrates of the cell membrane	https://youtu.be/eKMf0q5Ke7Q

Starch, cellulose and glycogen. (Structure and	https://youtu.be/e0ijBDroE48
utility)	
Metabolism: Glycolysis and its reversal; TCA	https://youtu.be/rr7IRYLqleg
cycle	
Relation between glycolysis and respiration of	https://youtu.be/XIwJcl-hpKs
bioenergetics	
Principles of electron transport chain and	https://youtu.be/wX7J2JtxM08
oxidative phosphorylation	

# MAPPING OF CO'S WITH PO'S / PEO'S

	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	3	3	3	3	3	2	2	3	3	3	
CO2	3	3	3	3		3	3	3			3	3	2	
CO3	3	3		3		3	3	3	3	3	3	3		2
CO4	3	3	2	2		3	3	3			3	3	2	
CO5	3	3	3	3	3	3	3	3	3	2	3	3	3	

Correlation: Low – 1, Medium – 2, High – 3

# ASSESSMENT TOOLS

S. No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a semester
2	CIA I	Once in a semester
3	CIA II	Once in a semester
4	Model Examination	Once in a semester
5	Assignment (Unit I & II)	Twice in a semester

6	Quiz (Unit III & IV)	Twice in a semester
7	Presentation (Unit V)	Once in a semester

Course Designed by: Dr. N. Gunavathy	Verified by HOD: Dr. N.Gunavathy
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

# **SEMESTER - VI**

# COURSE CODE: 23UCH6SB4

### TITLE OF THE COURSE: SKILL BASED V – APPLIED CHEMISTRY

# (Employability)

### **COURSE OBJECTIVES:**

- To enable students to understand and value the role of chemistry in everyday life.
- To appreciate and acquire research interest in developing areas like green and nano chemistry.

### **COURSE OUTCOMES:**

At the completion of the course, the student will have the ability to

CO1	Explain the basic facts about fats, oils, wax and soaps.	K2
CO2	Describe the details about various conventional fuels.	<b>K</b> 1

CO3	Understand the need and the significance of renewable energy sources	K2
	to be used in future.	
CO4	Extend awareness on the principles and applications of green chemistry.	K2
CO5	Explain the properties, synthesis and applications of Nano materials.	K2

#### **SYLLABUS**

# Credits: 2

#### Hours: 45

#### UNIT I: FATS, OILS, WAXES & SOAPS (K2)

#### Hours)

Distinction between oils & fats, classification of fats & oils. Hydrogenation of oils – principle & manufacturing details. Definition and determination of saponification value, acid value, iodine value, RM value, Hehner value and their significance. Elaidin test for oils. Some common waxes like spermactic, beeswax, bay berry wax and their uses. Soap and its manufacture, toilet & transparent soaps, cleansing action of soap. Detergents. Manufacture, classification.

#### UNIT II: CONVENTIONAL SOURCES OF ENERGY (K1)

(9

#### Hours)

**Fuels**: fuels calorific value, classification, requisites of a fuel – comparison of solid, liquid and gaseous fuels.

Solid fuels: coal – different grades – high & low temperature carbonisation.

**Liquid fuels**: petroleum – occurrence & composition – refining and fractionation of petroleum. Gasoline& its characteristics. Knocking, anti-knocking, octane number, cetane number, definition & examples. Cracking – definition – catalytic & thermal cracking.

**Gaseous fuels**: composition, manufacture & uses of natural gas, water gas, producer gas, coal gas, biogas (Gobar gas) &L.P.G.

(Self-Study: Importance of fuel.)

(9

Instructional

#### UNIT III: RENEWABLE SOURCES OF ENERGY (K2)

#### Hours)

Need for renewable sources of energy – solar energy – general – applications – solar water heating system- solar cells – description & uses. Wind energy: types of wind mill – Jumbo wind mill, Merry - go round wind mill, battle – AX - windmill, Holland windmill – merits & limitations of wind energy. biomass energy – introduction, biofuels, technology for converting biomass into energy impact of renewable energy sources on environment.

#### UNIT IV: GREEN CHEMISTRY (K2)

#### Hours)

Green chemistry principles & greener reactions- definition, need of green chemistry, twelve basic principles of green chemistry-planning a **green synthesis in a chemical laboratory- solvent-less reactions, selection of appropriate solvent, use of microwaves- fundamentals of closed-vessel heating and sonication.- water as greener solvent- reactions in ionic - liquid, solid supported organic synthesis, phase transfer catalyst (PTC)** (Simple treatment only) (**Industry 4.0**)

#### UNIT V: NANO CHEMISTRY (K2)

#### Hours)

Nano science- introduction – definition – types-quantum dots, wires and wells, nano rods, fullerenes and carbon nanotubes - nanowires and crystals, nano composites and clusters – properties of nano materials - plasmon resonance

Preparation of nano structured materials – bottom up and top-down approaches - methods of preparation of nano materials – plasma arching, chemical vapour deposition, electrode position, sol-gel synthesis, ball-milling, chemical reduction and use of natural nano particles (elementary treatment only) (Industry 4.0).

#### **Applications of nanomaterials**

Catalysis, environmental and biomedical (drug delivery) applications. Nanomaterials-environmental hazards. (Industry 4.0)

(Self-Study: Importance of Nanomaterials.)

**TEXT BOOK:** 

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- Sharma B.K. *Industrial Chemistry*. GOEL Publishing House. An Imprint of Krishna Prakashan Media Pvt Ltd. Meerut. Uttar Pradesh. India, (2016).
- Ahluwalia. V.K. *Green Chemistry*. Environmentally Benign Reactions. Ane Books Pvt Ltd. New Delhi, (2016).

# **REFERENCES BOOK:**

- 1. Mohan kumar.G. *Nanotechnology nano materials and nanodevices*. Narosa publishing House. New Delhi, (2016).
- 2. Chattopadhyay.K.K. Banerjee. A.N. *Introduction to Nanoscience and Nanotechnology*. PHI Learning Private Limited. New Delhi, (2012).
- 3. Arun Bhal and Bhal. *Advanced Organic Chemistry*. S. Chand & Company Ltd. New Delhi, (2009).
- 4. Gesser H.D. *Applied Chemistry: A Textbook for Engineers and Technologists*. Kluwer Academic/Plenum Publishers. Springer Science + Business Media. New York, (2002).
- Lark B.S and Batra M.S. *Theory and Practice of Engineering Chemistry*. Vishal Publishing Co Milestone Publishers & Distributors. Delhi, (2013).

# **BLENDED LEARNING**

# UNIT V: NANO CHEMISTRY (K2)

Topics	Links
- optos	
Nano Science, Introduction, definition -types-	https://youtu.be/EABqmh2aDPU
quantum dots, wires and wells	
Nanorods, fullerenes and carbon nanotubes -	https://youtu.be/wJg7s3fKoME
nanowires and crystals	
Nano composites and clusters -properties of Nano	https://youtu.be/D61QrzhaDDc
materials	
Plasmon Resonance Preparation of Nano Structured	https://youtu.be/yxxWN_pM2FE
Materials – Bottom up and Top-down approaches	

Methods of preparation of Nano materials – plasma	https://youtu.be/4eet-rjAHic
arching, chemical vapour deposition, electrode	
position, sol-gel synthesis	
Ball-milling, chemical reduction and use of natural	https://youtu.be/gJd0MeECLHA
Nanoparticles	
Applications of Nanomaterials	https://youtu.be/19i8t41g4xM
Catalysis, environmental and biomedical (drug	https://youtu.be/YCZ0vN8ydQU
delivery) applications	
Nanomaterials - environmental hazards	https://youtu.be/c6lADvpxm2g

# MAPPING OF CO'S WITH PO'S / PEO'S

	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3		2	1	2	3	2			2	1	3		2
CO2	3		2			2	1						2	
CO3	2		1	1		2	3			2	2	2		2
CO4	3		2	3	2	2	3		2	2	2	2	2	2
CO5	3		2	3	2	3	2		2	2	2	2	2	2

Correlation: Low – 1, Medium – 2, High – 3

# ASSESSMENT TOOLS

S. No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a semester
2	CIA I	Once in a semester
3	CIA II	Once in a semester

4	Model Examination	Once in a semester
5	Quiz (Unit I & II)	Twice in a semester
6	Seminar (Unit III & IV)	Twice in a semester
7	Presentation (Unit V)	Once in a semester

Course Designed by:	Verified by HOD: Dr. N.Gunavathy
Dr.Sr.S. Kulandai Therese	
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

# **SEMESTER - VI**

# COURSE CODE: 23IDSBCH1 TITLE OF THE COURSE: SKILL BASED IV– FOOD SCIENCE AND TECHNOLOGY

#### (Entrepreneurship)

#### **COURSE OBJECTIVES:**

- To provide adequate knowledge to the major aspects of food science related to technological development.
- To understand the importance of cooking, preservation and quality of food.

### **COURSE OUTCOMES:**

At the completion of the course the students will have the ability to,

CO1	Explain the constituents of food and their properties.	K2
CO2	Describes the objectives and methods of cooking.	K1
CO3	Describe awareness on Food additives and food adulterants.	K1
CO4	Associate with the methods of food preservation.	K2
CO5	Interpret food quality and gain knowledge on food biotechnology.	K2

#### **SYLLABUS**

Credits: 2

**Instructional Hours:** 

45

# UNIT I: CONSTITUENTS OF FOOD (K2)

Hours)

(9

Properties and significance - carbohydrates, proteins, fats. additional food constituents – natural emulsifiers, organic acids, oxidants & antioxidants, enzymes, pigments & colours, flavours, vitamins & minerals, natural toxicants and water.

(Self-Study: Healthy Eating Pyramid.)

# UNIT II: IMPORTANCE OF FOOD (K1)

(9Hours)

Food in relation to health - cooking- objectives of cooking, methods of cooking. Loss of nutrients during cooking. Vegetables and fruits- nutritive value, selection - preliminary preparation.

(Self-Study: Importance of Food Waste Management.) UNIT III: FOOD ADDITIVES AND FOOD ADULTERANTS (K1) (9Hours)

Definitions, need for food additives, requirements of additive. Classification of food additives. Antioxidants, sequestrants, surface active agents, stabilizers, thickeners, bleaching and maturing agents, starch, modifiers, buffers, acids, alkalis, food colours, non-nutritive and special dietary sweeteners, nutrients supplements, flavouring agents, miscellaneous additives.

Definition- types of food adulterants-intentional, incidental, metallic, other. Investigation of food adulterants.

#### **UNIT IV: FOOD PRESERVATION (K2)**

Food spoilage- methods of preservation of food- preservation by low temperature, high temperature, preservatives, osmotic pressure and dehydration- food irradiation.

#### UNIT V: FOOD QUALITY (K2)

Need for testing food quality. Sensory evaluation (sight, touch, smell, taste). Quality characteristics – appearance, textural & flavour factors. Biotechnology in food, bio fortification, nutraceuticals, organic foods, packaging of food.

#### **TEXT BOOKS:**

 Geethamalika. G. Food Science and Technology. Mythe Creators. Coimbatore, (2012).

# (9Hours)

(9Hours)

 SriLakshmi B. Food Science. 6<sup>th</sup> Edition. New Age International Publishers Ltd. New Delhi, (2014).

# **REFERENCES BOOKS:**

- 1. Potter. Food Science. 3rd Edition. CBS Publication. New Delhi, (1987).
- Helen Kowtaluk. *Food for Today*. Tata McGraw Hill Publishing Company. New Delhi, (2006).
- 3. Vasudevan and SriKumari. *Text Book of Biochemistry*. Jay Pee Brothers Medical Publishers Pvt. Ltd. New Delhi, (2005).
- 4. Kusum Gupta, Gupta L.C and Abishek Gupta. *Food and Nutrition*. Jay Pee Brothers Medical Publishers Pvt. Ltd. New Delhi, (1983).
- 5. Premlatha Mullick. *Text Book of Home Science*. Kalyani Publishers. New Delhi, (2004).

# **BLENDED LEARNING**

# **UNIT IV: FOOD PRESERVATION (K2)**

Topics	Links
Food Spoilage	https://www.youtube.com/watch?v=WWGRTSbvef0
Preservation by low temperature	https://www.youtube.com/watch?v=zhM-yPjxaok
Preservation by high temperature	https://www.youtube.com/watch?v=e4by9FNYb60
Preservation by preservatives	https://www.youtube.com/watch?v=GdTBV1ADzVc
Preservation by osmotic pressure	https://www.youtube.com/watch?v=mjGpLlur8fM
Preservation by dehydration	https://www.youtube.com/watch?v=f141C9Kw3jo
Preservation by food irradiation	https://www.youtube.com/watch?v=OUf0XNAaT3M

# MAPPING OF CO'S WITH PO'S / PEO'S

	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2			2		2	1			1		2	1	

CO2	3	2	3	3	3	2	2	2	2	2	2	2	2	3
CO3	2	1	2	2	2	3	2		2	3	2	3	2	2
CO4	3		2	1		1						2	2	
CO5	3		2	2								1	1	

Correlation: Low – 1, Medium – 2, High – 3

# ASSESSMENT TOOLS

S. No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a semester
2	CIA I	Once in a semester
3	CIA II	Once in a semester
4	Model Examination	Once in a semester
5	Assignment (Unit I & II)	Twice in a semester
6	Quiz (Unit III & IV)	Twice in a semester
7	Field Survey (Unit V)	Once in a semester

Course Designed by: Dr. P. Dhivya	Verified by HOD: Dr. N.Gunavathy	
Checked by CDC: Dr. G. Chitra	Approved by:	
	Principal	

# SEMESTER - VI

# **COURSE CODE: 23UCH6CP4**

# TITLE OF THE COURSE: PRACTICAL IV – PHYSICAL CHEMISTRY COURSE OBJECTIVES:

- To provide the key knowledge about the handling of apparatus and laboratory resources to prepare students for careers as professionals in the field of chemistry
- To build the firm foundation in the fundamentals of physical chemistry concepts and correlate with experiment results.
- To develop the skill in carrying out scientific experiments as well as accurately record and analyze the results of such experiments.

# **COURSE OUTCOMES:**

At the completion of the course, the student will have the ability to

CO1	Determine the results of the given scientific experiment	K4
CO2	<b>Record</b> : Records the observation and the inference made in the experiments carried out.	K3

# **SYLLABUS**

# Credit: 4

# **Instructional hours:**

# 120

- 1. Determination of partition coefficient of iodine between Carbon tetrachloride and water.
- 2. Determination of equilibrium constant for the reaction between Potassium iodide and Iodine.
- 3. Determination of rate constant of acid catalysed hydrolysis of an ester (Methyl acetate or Ethyl acetate).
- 4. Determination of K<sub>f</sub>/ Molecular weight by Rast methods Naphthalene, Biphenyl, and m- dinitrobenzene as solvents.
- 5. Determination of critical solution temperature of Phenol-water system.
- 6. Determination of concentration of an electrolyte (NaCl / KCl / Succinic acid).
- Determination of transition temperature of sodium acetate, sodium thiosulphate and SrCl<sub>2</sub>.6H<sub>2</sub>O.
- 8. Phase Diagram Simple Eutectic system.
- 9. Determination of cell constant, specific conductivity and equivalent conductivity of strong electrolyte.
- 10. Determination of dissociation constant of a weak acid (acetic acid).
- 11. Conductometric titrations, strong acid strong base.
- 12. Potentiometric titrations, Acid Base HCl vs. NaOH.

# II Group Experiment (Demonstration)

- 1. Polarimetry Determination of concentration of unknown sugar solution.
- 2. Colorimetry Estimation of Fe<sup>2+</sup>& Ni<sup>2+</sup> using photoelectric colorimeter

# **TEXT BOOK:**
1. P. Muniappan, R. Ramasamy, Practical Physical Chemistry, Priya Publications, Karur.

## **REFERENCE BOOKS:**

- 1. V. Venkateswaran, R. Veerasamy and Kulandaivelu, Basic Principles of Practical Chemistry, S.Chand & Sons, (2012).
- 2. Amita Dua, Practical Chemistry for Undergraduates, Ane Books PVT Ltd, (2014).

# MAPPING OF CO'S WITH PO'S / PEO'S

	P 0 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS 01	PS 02
CO1	3	3	1	3	2	1	2	2	3	2	3	2	3	3
CO2	3	3	2	3	3	2	3	2	3	3	2	3	3	3

# Correlation: Low – 1, Medium – 2, High – 3

# ASSESSMENT TOOLS

S.No.	Assessment Methods	Frequency of Assessment
1.	Observation Note	Once in a Year
2.	Record	Once in a Year
3.	Regularity	Once in a Year
3.	Model Practical I	Once in a Year
4.	Model Practical II	Once in a Year
5.	End Semester Examination	Once in a Year

Course Designed by: Dr.P.Kalaivani	Verified by HOD: Dr. N.Gunavathy

Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

# SEMESTER - VI

# **COURSE CODE: 23UCH6CP4**

# TITLE OF THE COURSE: PRACTICAL V - GRAVIMETRIC ANALYSIS COURSE OBJECTIVES:

- To enable the students to develop their gravimetric estimation skills.
- To study the principle of physical chemistry experiments.
- To understand the techniques involved in the preparation of standard solutions, standardization
- and the calculation of the solutions to be found.
- To appreciate and apply the techniques involved in the estimation of substances.
- To understand the concepts those are involved in the estimation.

## **COURSE OUTCOMES:**

At the completion of the course, the student will be able to

CO1	Analyse gravimetrically the metal ions present in the given solution	K4
CO2	<b>Record</b> : Records the observation and the inference made in the experiments carried out.	K3

## SYLLABUS

## Credit: 3

hours: 60

## I Gravimetric Analysis

- 1. Estimation of Sulphate as Barium Sulphate.
- 2. Estimation of Barium as Barium Chromate.
- 3. Estimation of Lead as Lead Chromate.
- 4. Estimation of Calcium as Calcium Oxalate.
- 5. Estimation of Nickel as Nickel Dimethylglyoxime.

## **TEXT BOOK:**

1. A. O. Thomas, *Practical Chemistry*, 7th Edn., Scientific Book Centre, Kannur, (1999).

# **REFERENCE:**

 Dr. N. Gunavathy, *Chemistry Core Practical III & IV Organic Chemistry and* Gravimetric Analysis, Mythe Creators

# MAPPING OF CO'S WITH PO'S / PEO'S

	PO 1	РО	PO 3	PO	PO 5	РО	PO 7	РО	PO o	РО	РО	PO	PS	PS
	Ĩ	2	5	4	5	6	7	8	7	10	11	12	01	02
CO1	3	3	2	3				1						2
CO2	3	3	3	2	2	2	1		3			3		2

Correlation: Low – 1, Medium – 2, High – 3

## ASSESSMENT TOOLS

S.No.	Assessment Methods	Frequency of Assessment
1.	Observation Note	Once in a Year

## Instructional

2.	Record	Once in a Year
3.	Regularity	Once in a Year
3.	Model Practical I	Once in a Year
4.	Model Practical II	Once in a Year
5.	End Semester Examination	Once in a Year

Course Designed by:	Verified by HOD: Dr. N.Gunavathy
Dr.Sr.S. Kulandai Therese	
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

# SEMESTER VI VALUE ADDED COURSE CERTIFICATE COURSE COURSE CODE: 22UCCCLM1

# TITLE OF THE COURSE: CHEMICAL LABORATORY MANAGEMENT COURSE OBJECTIVES:

- To gain proficiency in logical deduction skills through laboratory work.
- To thoughtfully sequence and integrate learning of science content and process.
- To investigate the aspect of Chemical Laboratory Management System (CLMS) which the chemistry teachers applied most in their teaching of chemistry and the extent of the application.

#### **SYLLABUS**

#### **Instructional Hours: 30**

#### **Unit I: Laboratory Safety Signs**

Introduction – safety sign components – physical, fire, first aid, hazard, radiation hazard, others safety symbols – lab safety rules and precautions - Material Safety Data Sheet (MSDS) - Globally Harmonic System (GHS) – labelling and storage of chemicals – CAS Registry Number – Chemical regulations in India – ozone depleting substance rules 2000.

#### **Unit II: Laboratory Accidents and First Aid Measures**

Accidents – important rules of first aid - first aid measures – cuts, burns, flammable liquid spill, fire accidents, chemical spill on skin and eyes – poison – antidote – inhalation of poisonous gas – sipping of chemicals into mouth – materials in first aid kit – Laboratory chemical waste management.

#### **UNIT III: Laboratory Equipments & Functions**

Introduction to common Glass wares and Apparatus – Balances – Physical and Digital, Digital Colorimeter, Digital Conductometer, Digital pH meter, Digital Potentiometer,

### 2 hours

#### 4 hours

2 hours

### **UNIT IV: Laboratory Solution Preparation**

True, Standard and Observed Value, Accuracy and Precision, Significant Figures, Errors, Types of Errors, Minimisation of Errors – Absolute and Relative Error - Calculation of Masses and Volumes to Prepare Solutions, Accuracy and Precision of Measurement of Solutes, Basic Concepts of Preparing Solutions – Molarity, Normality, Molality, Percent Solutions, Conversion between Percent Solutions, Calculating Molarity from Percent Solutions, Preparation of Laboratory Reagent, Indicators, Buffer Solutions, Bench Solutions, Volumetric:

Primary and Secondary, Standards solutions.

## **Unit V: Testing and Analysis**

Spot tests for pesticides – herbicides. Test for moisture content, pH, conductance. Identification of iron by spectrophotometer – Emulsions (Moisturizer, Sun screen, Ointment) Saponification (Soaps Liquid soap hand wash) Soil test water test.

(Any five Parameters will be decided by the faculty)

### **TEXT BOOKS:**

- R. M. Varma, *Analytical Chemistry Theory and Practice –* Third Edition. CBS Publishers & Distributors, New Delhi.
- Krushna Kumar Jilariya and Yogesh Sanghani, *Handbook of Chemistry* Lab Reagent, Scholar's Press. ISBN: 978-620-2-30260-9.

## **REFERENCES**:

- 1. <u>https://www.labmanager.com/lab-health-and-safety/science-laboratory-safety-and-hazard-signs-meanings-6644</u>
- 2. https://lab-training.com/essentials-laboratory-first-aid/
- 3. https://ehrs.upenn.edu/sites/default/files/2018-02/wastemanual2017final.pdf

## **EVALUATION**

Theory	Practical	Total Marks
50	50	100

#### 6 hours

## 16 hours

# ASSESSMENT TOOLS

S. NO	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Year
2	Practical – Hands on	Once in a Year

Course Designed by: Dr.N.Gunavathy	Verified by HOD: Dr. N.Gunavathy
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal

SEMESTER VI VALUE ADDED COURSE CERTIFICATE COURSE

#### COURSE CODE: 23UCCCLM2

# TITLE OF THE COURSE: BASIC INTRODUCTION TO RESEARCH METHODOLOGY

#### **COURSE OBJECTIVES:**

- To Review Literature and Submission of Manuscripts for Publication.
- To Understand Error Analysis
- To Characterize Spectroscopic Analysis of the Research Work
- To Learn Paper Publication Relevant to Project Work
- To Gain Knowledge about Research Methodology

#### **SYLLABUS**

#### **Instructional Hours: 30**

6

#### **UNIT – I: LITERATURE SURVEY**

#### Hours

Literature Survey - Introduction to Research, Selection of a Research Topic, Reviewing the Literature, Preparing the Proposal and Design of Study. Experimentation and Interpretation of Results. Formation, Testing and Rejection of Hypothesis. Application of Microcal Origin and Chemdraw. Preparation and Presentation of Report;

## **UNIT – II: DISSERTATION WRITING**

Dissertation and Thesis Writing. Primary and Secondary Literature: Journals, Patents, Reviews, Chemical Abstracts, Treatises and Monographs. Printed Materials and Online Literature Search; Websites, Search Engine for Locating Information and Chemical Data Bases. E-Mail Operation and Online Submission of Manuscripts for Publication.

### **UNIT – III: ERROR ANALYSIS**

#### Hours

Error Analysis. Limitations of Analytical Methods, Accuracy, Precision and Minimization of Errors. Systematic and Random Errors and Reliability of Results. Replicate Determination and T-Test. Correlation, Linear Regression and Analysis of Variance.

### UNIT - IV: SPECTROSCOPIC ANALYSIS AND CHARACTERIZATION STUDIES

#### Hours

# 6 Hours

# 6

6

Spectroscopy Studies. Principles, Sampling Techniques and Application of UV-VIS, NMR, AFM, TEM, SEM, EDX, GCMS, Spectrophotometry, Far, Near and FTIR Spectrophotometry and ICP Spectrometry. Thermo Analytical Techniques: TGA, DTA, DSC and Thermometric Titrations. Magnetic Susceptibility and EPR Spectroscopy Measurements and Characterization of Samples.

# UNIT – V: PLAGIARISM TOOLS AND PUBLICATION 6 Hours

Plagiarism Tools - Project relevant published papers and comparative studies shall be provided to the students by the concerned guide to whom the students are allotted.

Literature survey and research methodology which forms the foundation for the project work to be carried out by the students in final year to be submitted

#### **TEXT BOOKS:**

- Rajammal P. Devadas. A Handbook of Methodology of Research. S.R.K. Vidyalaya Press, Chennai, (1976).
- 2. J. Anderson, B.H. DurstanAnd M. Poole. *Thesis and Assignment Writing*. Wiley Eastern, New Delhi, (1977).

#### **REFERENCES:**

- 1.. Jerry March. Advanced Organic Chemistry. 4th Edn. John Wiley & Sons, (1992).
- 2. Vogel's Textbook of Quantitative Chemical Analysis. 5th Edn. ELBS, (1978).
- H.H. Willard, L.L. Merritt, J.A. Dean and F.A. Settle. *Instrumental Methods of Chemical Analysis*. 6th Edn. CBS Publishers, New Delhi, (1986).
- 4. R. Stock and B.R. Rice. Chromatographic Methods. Chapman & Hall, (1974).
- 7. D.A. Skoog And J.J. Leary. *Principles of Instrumental Analysis*. 4th Edn., Saunders College Publishing, (1992).
- 8. R.S. Drago. *Physical Methods in Chemistry*. Saunders, (1999).

### **EVALUATION**

Theory	Practical	Total Marks
50	50	100

# ASSESSMENT TOOLS

S. NO	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Year
2	Practical – Hands on	Once in a Year

Course Designed by: Dr. P. Kalaivani	Verified by HOD: Dr. N. Gunavathy
Checked by CDC: Dr. G. Chitra	Approved by:
	Principal