



**PSGR**  
**Krishnammal College for Women**



Affiliated to Bharathiar University \ Autonomous \ College of Excellence \ Accredited with A++ Grade \ Ranked 9<sup>th</sup> in NIRF

College of Excellence, NIRF 2024-9<sup>th</sup> Rank  
Autonomous and Affiliated to Bharathiar University  
Reaccredited with A<sup>++</sup> grade by NAAC  
Peelamedu, Coimbatore-641004

**DEPARTMENT OF CHEMISTRY**

**CHOICE BASED CREDIT SYSTEM (CBCS)**

**&**

**LEARNING OUTCOMES - BASED CURRICULUM FRAMEWORK (LOCF)**

**BACHELOR OF SCIENCE CHEMISTRY**

**2023 – 2026 BATCH**

## **PROGRAMME LEARNING OUTCOMES (PLO's)**

After completion of the programme, the student will be able to

**PLO1** : accept the common responsibility to preserve the environment and to contribute to the development

**PLO2** : acquire in depth knowledge on core concepts of theoretical and practical chemistry to the subject areas namely organic, inorganic, physical, analytical and computational chemistry

**PLO3** : attain communication skill- written, verbal, logical and digital

**PLO4** : explore the relative choice of Generic Electives (GE), Skill Enhancement Courses (SEC) and Ability Enhancement Courses (AEC)

**PLO5** : enhance the ability to execute Laboratory procedures of organic, inorganic and physical systems and setting standard procedures

## **PROGRAMME SPECIFIC OUTCOMES (PSO's)**

The students at the time of graduation will

**PSO1** : possess skills in safe handling of chemicals taking into account their physical and chemical properties.

**PSO2** : able to apply the theoretical concepts of instrument that are commonly used in most chemistry fields as well as interpret and use data generated in instrumental chemical analyses.

**PSO3** : be capable to employ critical thinking and scientific inquiry in the performance, design, interpretation and documentation of laboratory experiments, at a level suitable to succeed at an entry-level position in chemical industry or a chemistry graduate program



**BACHELOR OF SCIENCE CHEMISTRY**  
**CHOICE BASED CREDIT SYSTEM (CBCS) & LEARNING OUTCOME BASED**  
**CURRICULUM FRAMEWORK (LOCF)**  
**SCHEME & SYLLABUS OF EXAMINATION**

SEM	Part	Course Code	Title of the Course		Instruction hours/week	Contact hours	Tutorial Hours	Duration of Examination	Examination Marks			Credits	
									CA	ESE	TOTAL		
I	I	TAM2301/ HIN2301/ FRE2301	Language T/H/F Paper I	L	6	88	2	3	25	75	100	3	
	II	ENG2301	English Paper-I	E	6	88	2	3	25	75	100	3	
	IIIA	CE23C01	General Chemistry Paper - I	CC	6	88	2	3	25	75	100	5	
	IIIA	CE23CP1	Chemistry Practical - I	CC	3	45	-	-	-	-	-	-	
	IIIA		PS23A01/	Physics Paper - I	GE	4	58	2	3	20	55	75	4
			TH23A01	Mathematical Statistics with R I		7	103	2	3	25	75	100	5
	IIIA		PS23AP1	Physics Practical	GE	3	45	-	-	-	-	-	-
IV		NME23B1/ NME23A1/ NME23WS/ NME23ES	Basic Tamil Paper -I / Advanced Tamil Paper-I/ Women Studies*/ NEN- Introduction to Entrepreneurship*	AEC	2	28	2	-	100	-	100	2	
					2*	30*	-	-	100	-	100	2	
II	I	TAM2302/ HIN2302/ FRE2302	Language T/H/F Paper - II	L	6	88	2	3	25	75	100	3	
	II	ENG2302	English Paper-II	E	5	73	2	3	25	75	100	3	
	IIIA	CE23C02	General Chemistry Paper - II	CC	6	88	2	3	25	75	100	5	

	III A	CE23CP1	Chemistry Practical I	CC	3	45	-	3	25	75	100	4
	III A	PS23A02	Physics Paper - II	GE	5	73	2	3	20 <sup>#</sup>	55 <sup>#</sup>	75 <sup>#</sup>	4
		TH23A02	Mathematical Statistics with R II		8	118	2	3	25	75	100	5
	III A	PS23AP1	Allied Physics Practical	GE	3	45	-	3	15 <sup>*</sup>	35 <sup>*</sup>	50 <sup>*</sup>	2
	IV	NME23B2/ NME23A2	Basic Tamil Paper-II /Advanced Tamil**	AEC	-	-	-	-	100	-	100	-
	V	23PEPS1	Professional English (Science /Management/ Humanities/Commerce	AEC	-	25	5	-	100	-	100	2
	IIIB	NM21GAW	Foundation Course –1 (General Awareness) (Online)	AEC	SS	-	-	-	-	-	-	Gr.
III	I	TAM2303/ HIN2303/ FRE2303	Language III – Tamil Paper III/ Hindi Paper III/ French Paper III	L	6	88	2	3	25	75	100	3
	II	ENG2303	English Paper - III	E	5	73	2	3	25	75	100	3
	III	CE23C03	General Chemistry Paper III	CC	4	58	2	3	25	75	100	4
	III	CE23CP2	Chemistry Practical - II	CC	3	45	-	-	-	-	-	-
	III	TH23A09/	Mathematics for Sciences I (or)	GE	7	103	2	3	25	75	100	5
		PL23A01/ AS23A01	Fundamentals of Botany - I / Invertebrata & Chordata		4	58	2	3	20	55	75	4
	III	PL23AP1/ AS23AP1	Botany Practical / Zoology Practical	GE	3	45	-	-	-	-	-	-
III /IV	III	CS23SBGP/ CE23SCE1	GEN-AI / Environmental Chemistry and Chemical Biology	SEC	3	45	-	-	100	-	100	3
III	IV	NM23DTG	Design Thinking	AEC	2	30	-	-	100	-	100	2
	IV	NM22UHR	Universal Human values and Human Rights #	AECC	SS	-	-	-	100	-	100	Gr.
	IV	JOB1334	Job Oriented Course- Instrumental Methods of Chemical Analysis		After 12.30 pm 60 h	-	-	-	-	-	-	Gr.

IV	I	TAM2304/ HIN2304/ FRE2304	Tamil Paper IV / Hindi Paper IV / French Paper IV	L	6	88	2	3	25	75	100	3
	II	ENG2304	English Paper IV	E	5	73	2	3	25	75	100	3
	III	CE23C04	General Chemistry Paper – IV	CC	4	58	2	3	25	75	100	4
	III	CE23CP2	Chemistry Practical II	CC	3	45	-	3	25	75	100	5
	III	TH23A14/	Mathematics for Sciences II/	GE	7	103	2	3	25	75	100	5
		PL23A02/	Fundamentals of Botany II/		5	73	2	3	20 <sup>#</sup>	55 <sup>#</sup>	75	4
		AS23A02	General Principles of Zoology		5	73	2	3	20 <sup>#</sup>	55 <sup>#</sup>	75	4
	III	PL23AP1/	Botany Practical/	GE	2	30	-	3	15 <sup>*</sup>	35 <sup>*</sup>	50	2
		AS23AP1	Zoology Practical		2	30	-	3	15 <sup>*</sup>	35 <sup>*</sup>	50	
III /IV	III	CS23SBGP/	GEN-AI /	SEC	3	45	-	-	100	-	100	3
		CE23SCE1	Environmental Chemistry and Chemical Biology									
IV	IV	NM23EI	Entrepreneurship and Innovation (Ignite X)	AECC	2	30	-	-	100	-	100	2
	IV	NM23EVS	Environmental Studies	AECC	SS	-	-	-	100	-	100	Gr.
	V	COCOACT	Co-Curricular Activity	GC	-	-	-	-	100	-	100	1
I-V	VI	COM15SER	Community Services 30 Hours	GC	-	-	-	-	-	-	-	-
I-V	VI	16BONL1 16BONL2	Online Course 1 Online Course 2	ACC	-	-	-	-	-	-	-	-

L - Language E - English

GE –Generic Elective

AEC – Ability Enhancement Courses

SEC - Skill Enhancement Courses

GC - General Courses

CC –Core Courses

ESE - End Semester Examination

AECC - Ability Enhancement Compulsory Courses

ACC - Additional Credit Courses

SS - Self Study

CA – Continuous Assessment

# CA conducted for 25 and converted to 20, ESE conducted for 75 and converted to 55

\* CA conducted for 25 and converted to 15, ESE conducted for 75 and converted to 35





**BACHELOR OF SCIENCE CHEMISTRY  
CHOICE BASED CREDIT SYSTEM (CBCS) &  
LEARNING OUTCOMES - BASED CURRICULUM FRAMEWORK (LOCF)  
SCHEME & SYLLABUS OF EXAMINATION**

SEM	Part	Course Code	Title of the Course	Course Type	Instruction hours/ week	Contact hours	Tutorial Hours	Duration of Examination	Examination Marks			Credits
									CA	ESE	Total	
VI	III	CE23C08	Organic Chemistry	CC	6	88	2	3	25	75	100	5
	III	CE23C09	Physical Chemistry	CC	5	73	2	3	25	75	100	5
	III	CE23C10	Physical Methods and Chemical Structure	CC	6	88	2	3	25	75	100	5
	III	CE23E03/ CE23E04	Dye Chemistry / Novel Inorganic Solids and Nanomaterials	DSE	5	73	2	3	25	75	100	5
	III	CE21SBP1	Computational Chemistry Practical	SEC	3	41	4	-	100	-	100	3
VI	III	CE21AC3/ CE21AC4	ALC - Food Chemistry and Technology / ALC - Leather Chemistry	ACC	SS	-	-	3	25	75	100	5
	III	CE23CP3	Chemistry Practical- III	CC	5	75	-	6	25	75	100	5
I-V	VI	16BONL1 16BONL2	Online Course Online Course	ACC	-	-	-	-	-	-	-	-
I-VI			TOTAL									140

CC – Core Courses  
ACC – Additional Credit Courses  
SEC - Skill Enhancement Courses  
SS- Self Study

CA – Continuous Assessment  
ESE - End Semester Examination  
DSE - Discipline Specific Elective

## Examination System

### Pattern:

Semester system will be followed. A semester consists of a minimum of 90 working days excluding the days of conduct of ESE. There will be Continuous Internal Assessment (CA) to evaluate the performance of students in each course and the End Semester Examination will be held at the end of every semester.

### Weightage assigned to various components of Continuous Internal Assessment

#### **Theory**

CIA Test	: 5 marks (conducted for 45 marks after 50 days)
Model Exam	: 7 marks (Conducted for 75 marks after 85 days)
Seminar/Assignment/Quiz	: 5 marks
Class Participation	: 5 marks
Attendance	: 3 marks
<b>Total</b>	<b>: 25 Marks</b>

#### **Practical**

Lab Performance	: 7 marks
Regularity	: 5 marks
Model Exam	: 10 marks
Attendance	: 3 marks
<b>Total</b>	<b>: 25 marks</b>

### Question Paper Pattern and distribution of marks

#### Language and English

Section A 5 x 1 (No choice)	: 5 Marks
Section B 4 x 5 (4 out of 6)	: 20 Marks (250 words)
Section C 2 x 10 (2 out of 3)	: 20 Marks (500 words)
<b>Total</b>	<b>: 45 Marks</b>

#### Core and Elective (first 3 units)

**CA Question Paper Pattern: 3 x 15 = 45 Marks**

*CA Question from each unit comprising of*

One question with a weightage of 2 Marks :  $2 \times 3 = 6$

One question with a weightage of 5 Marks (Internal Choice at the same CLO level):  $5 \times 3 = 15$

One question with a weightage of 8 Marks (Internal Choice at the same CLO level):  $8 \times 3 = 24$

#### Skill Based Subject Theory Courses

Test I	: 30 Marks (conducted for 50 Marks and converted to 30 Marks)
Test II	: 50 Marks

Assignment : 10 Marks  
Seminar : 10 Marks  
**TOTAL : 100 Marks**

*Students securing very low marks in internal assessment, only ESE marks will be considered as passing criteria from the third attempt and onwards*

### ALC

Section A (Paragraph answer) (4 out of 6) 4 x 4 : 16 Marks  
Section B (Essay type) 1 out of 2 : 9 Marks  
**Total : 25 Marks**

### Advanced Tamil / Basic Tamil

CIA Test : 25 marks (conducted for 50 marks after 50 days)  
Model Exam : 50 marks (Conducted for 75 marks after 85 days)  
Quiz : 15 marks  
Assignment : 10 marks  
**Total : 100 Marks**

### Introduction to Entrepreneurship

Quiz : 50 marks  
Assignment : 25 marks  
Project / Case Study : 25 marks  
**Total : 100 Marks**

### Professional English

Quiz (5 x 20 Marks) : 100 Marks

### General Awareness

GAW Test I (Quiz) : 100 Marks  
GAW Test II (Quiz) : 100 Marks  
GAW Test III (Quiz) : 100 Marks

*Average of all the three marks will be taken as the marks secured by the candidate for the subject.  
Passing minimum 40 %*

### Gen-AI

Quiz : 50 Marks (5 quizzes with each 10 marks)  
Case study : 25 Marks  
Online Exam : 25 Marks (Departments to plan and conduct the exam)  
**Total : 100 Marks**

### Design Thinking

Quiz : 50 marks  
Assignment : 25 marks

Project / Case Study : 25 marks  
**Total : 100 Marks**

**Environmental studies**

Assignment : 25 marks  
Project / Case study : 25 marks  
Quiz : 50 marks  
**Total : 100 Marks**

**Universal Human values and Human Rights**

Quiz : 50 marks  
Assignment : 25 marks  
Project/ Case study : 25 marks  
**Total : 100 marks**

**Entrepreneurship and Innovation (Ignite X)**

Quiz : 50 marks  
Assignment : 30 marks  
Project/ Case study : 20 marks  
**Total : 100 marks**

**Cyber Security I**

Quiz : 60 Marks  
Case Study : 20 Marks  
Poster : 20 Marks  
**TOTAL : 100 Marks**

**Field Work / Institutional Training**

Attendance : 10 Marks  
Work diary : 15 Marks  
Report : 50 Marks  
Viva Voce : 25 Marks  
**Total : 100 Marks**

**Project and Viva Voce**

Internal : 25 marks  
    Review I : 5 marks  
    Review II : 10 marks  
    Review II : 10 marks  
External : 75 marks  
**TOTAL : 100 Marks**

## **End Semester Examination**

### **Core and Elective**

**ESE Question Paper Pattern: 5 x 15 = 75 Marks**

*Question from each unit comprising of*

One question with a weightage of 2 Marks :  $2 \times 5 = 10$

One question with a weightage of 5 Marks (Internal Choice at the same CLO level):  $5 \times 5 = 25$

One question with a weightage of 8 Marks (Internal Choice at the same CLO level):  $8 \times 5 = 40$

### **ALC**

Section A : 5 questions out of 8 - open choice  $5 \times 5$  : 25 marks

Section B : 5 questions out of 8 - open choice  $5 \times 10$  : 50 marks

**Total : 75 marks**

### **Criteria for Attendance:**

3 Marks

(Attendance 75% - 80% - 1 Mark, 81% - 90% - 2 Marks, 91% - 100% - 3 Marks)

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CE23C01	GENERAL CHEMISTRY PAPER - I	THEORY	88	2	-	5

### Preamble

To enable the students to

- understand quantum mechanics as a mathematical model to produce wave functions and energies
- learn about the fundamental ideas, physical significance and theories of bonding in molecules
- gain knowledge about the polar effects and their importance in affecting the properties of compounds
- understand the principles of thermodynamics and thermochemistry
- explore Industry 4.0 through physical-to-digital-to-physical connection which potentially transform the chemical industry

### Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	understand the basics of quantum mechanics, bonding, reactive intermediates, thermodynamics and Industry 4.0	K1
CLO2	discuss the atomic structure, types of bonding, electronic effects on reactivity, stability of aromatic compounds and state / path function using thermodynamics	K2
CLO3	examine the periodic properties, strength of bonding, and apply the principles in identifying reaction mechanism. Apply laws of thermodynamics and learn the physical processes involved. Practice to understand the concepts of Industry 4.0	K3
CLO4	Analyze and perform calculations on periodic properties, Aromaticity, bonding theories, thermodynamic and thermochemistry principles.	K4

### Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	M	S	S
CLO3	S	S	S	S	S
CLO4	S	S	M	S	S

S -Strong; M-Medium;

**Unit I**

(18 hrs)

**Atomic Structure**

Wave mechanical concepts of Rutherford's Nuclear model of the atom and its limitations. Bohr's theory and its limitations, dual behaviour of matter and radiation, de Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Atomic orbitals. Schrodinger wave equation, Significance of  $\psi$  and  $\psi^2$  (no derivation required), shapes of s, p, d orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Quantum numbers - Electronic configuration of elements, effective nuclear charge.

**Periodic Properties**

Atomic and ionic radii, ionization energy, electron affinity and electronegativity – definition, factors determining ionization energy and electro negativity, and their applications.

**Unit II**

(18 hrs)

**Chemical Bonding & Molecular Structure**

Introduction to different types of Bonding- **Covalent bonding** - Valence bond theory and its limitations, Hybridisation - Types of overlap of atomic orbitals. Valence shell electron pair repulsion theory (VSEPR) to  $\text{BF}_3$ ,  $\text{NH}_3$ ,  $\text{H}_2\text{O}$ ,  $\text{ClF}_3$ ,  $\text{SF}_4$ ,  $\text{PF}_5$ ,  $\text{SF}_6$ .

Concept of resonance and resonating structures for  $\text{CO}_3$  and  $\text{CO}$ .

**MO theory**- Introduction, bonding and magnetic properties (for simple homo nuclear and hetero nuclear diatomic molecules)

**Ionic bonding**- Factors influencing the formation of ionic bonding. Ionic crystals  $\text{NaCl}$ ,  $\text{CsCl}$ . Lattice energy of ionic crystals, statement of Born-Landé equation for calculation of ionization energy, Born-Haber cycle and its application, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.

Hydrogen bonding-Types with examples. Vanderwaal's forces and London forces.

**Co-ordinate covalent bond**-with examples, Comparison between ionic, covalent and coordinate bonding.

### **Unit III**

**(17 hrs)**

#### **Thermodynamics-I**

Definitions of terms involved, extensive and intensive properties, path functions vs state functions, exact and inexact differentials. First law of thermodynamics, adiabatic and isothermal processes, reversible and irreversible processes - Work done, Joule- Thomson effect, Joule Thomson Coefficient –Problems.

#### **Thermo chemistry**

Heat of neutralization, heat of solution, heat of combustion. Bomb calorimeter, determination of heat of combustion, heat of dilution. Integral and differentials. Hess's law- calculation of bond energy, bond length, dissociation energy, Kirchoff's equation- applications.

### **Unit IV**

**(17hrs)**

#### **Fundamental aspects of Organic reaction mechanisms**

Nucleophiles and electrophiles, Reactive Intermediates: Carbocations, Carbanions and free radicals-Formation, structure and stability. Inductive Effect, Electromeric Effect, Resonance and Hyper conjugation, (Baker - Nathan effect), Steric effect-examples and effect on reactivity. Comparison of acid strength-halogen substituted acids. Basic strength of  $\text{RNH}_2$ ,  $\text{R}_2\text{NH}$ ,  $\text{R}_3\text{N}$  and aniline and stability of alkenes based on hyper conjugation.

Cycloalkanes-Nomenclature, methods of preparation, chemical reactions, Baeyer's strain theory and its limitations.

### **Unit V**

**(18hrs)**

#### **Aromaticity**

Structure of benzene, Dewar structure, isomer number, resonance structure of benzene. Kekule structure, resonance energy and stability of benzene, reactions of benzene, orbital picture of benzene, aromatic character- Huckel's rule, non-benzenoid aromatic compounds.

Aromatic electrophilic substitution- mechanism of nitration, sulphonation, halogenation, Friedel craft's alkylation, acylation and diazonium coupling.

#### **Industry 4.0**

Introduction to Industry 4.0- Need – Reasons for Adopting Industry 4.0 - Definition – Goals Technologies of Industry 4.0- Applications of Artificial Intelligence in chemistry for predicting the properties of molecular structure – Chem sketch, Chem Draw, MOPAC, Avagadro.

**Text Books**

S. No	Author	Title of the Book	Publishers	Year and Edition
1	ArunBahl B. S. Bahl	Advanced Organic Chemistry	S. Chand Sons Company Pvt Ltd	2016
2	Jagdamba Singh	Undergraduate Organic Chemistry Vol I	Pragathi Prakahasan	2010
2	P. L. Soni	Text Book of Inorganic Chemistry	Sultan Chand and Sons	2013
4	B. R. Puri, L. R. Sharma, M. S. Patania	Principles of Physical Chemistry	Vishal Publishing & Co	2017
5	P. Kaliraj, T. Devi,	Higher Education for Industry 4.0 and Transformation to Education 5.0		

**Reference Books**

S. No	Author	Title of the Book	Publishers	Year and Edition
1	B. R. Puri, L. R. Sharma, K. K. Kalia	Principles of Inorganic Chemistry	Milestone Publishers and Distributors	2011
2	R. T. Morrison and R. N. Boyd	Organic Chemistry	Pearson India Education Services	2010
3	R. D. Madan	Modern Inorganic Chemistry	S. Chand Sons Company Pvt Ltd	2014
4	Alasdair Gilchrist.	Industry 4.0: The Industrial Internet of Things, Apress Publications		

**Related Online References:**

1. Introduction to Industry 4.0 and Industrial Internet of Things by Prof. Sudip Mishra, IIT Kharagpur.
2. A Complete Guide to Industry 4.0-Udemy

**Pedagogy:**

Lecture by chalk and talk, power point presentation, e-content, Numerical exercise, group discussion, assignment, quiz, peer learning, seminar

**Course Designers**

1. Dr. N. Shyamala Devi
2. Dr. S. Jone Kirubavathy

**Question Paper Pattern  
End Semester Examination**

<b>SECTION</b>	<b>WORD LIMIT</b>	<b>MARKS</b>	<b>TOTAL</b>
A - 5 x 2 Marks (No Choice)	One or Two Sentences	10	75
B -5 x 5 Marks ( Internal Choice at same CLO Level)	300	25	
C – 5x 8 Marks ( Internal Choice at same CLO Level)	600-800	40	

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CE23A01	IDC - CHEMISTRY FOR BIOLOGISTS– I (Offered to B.Sc Botany/Zoology)	THEORY	58	2	-	4

### Preamble

To enable the students to

- gain knowledge about the nature of bonding and hybridization
- learn the importance of aromaticity and isomerism
- understand the preparation of standard solutions and chromatographic techniques
- acquire knowledge on the significance of amino acids and proteins
- familiarize the applications of solar energy and water treatment techniques

### Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	recall the types of bonding, organic reagents, amino acids and define the terms involved in analytical /environmental chemistry	K1
CLO2	Understand the concept of hybridization, classify aromatic/non-aromatic compounds, amino acids/proteins and demonstrate the preparation of standard solutions.	K2
CLO3	Interpret the structure & stereo isomerism of organic compounds and illustrate the importance of chromatographic techniques/renewable sources and water treatment technologies	K3
CLO4	Appraise the theories of bonding, conformational analysis and experiment the role of analytical techniques and softening process in various applications	K4

### Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	S	S	S
CLO4	S	S	S	S	S

S - Strong; M-Medium

**IDC – CHEMISTRY FOR BIOLOGISTS - I (CE23A01)**  
**(Offered to B.Sc Botany / Zoology)**

**(58 hrs)**

**UNIT I**

**(12 hrs)**

**Bonding**

Types of bonding - Covalent bond - nature, structure and hybridization of CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>2</sub> and C<sub>6</sub>H<sub>6</sub> molecule. Ionic bond - Nature of ionic bond, structure of NaCl and CsCl.

Hydrogen bonding - inter and intra molecular, nature and its effect on its structure and its consequences.

Shapes and hybridization of BeCl<sub>2</sub>, H<sub>2</sub>O, NH<sub>3</sub> and PCl<sub>5</sub> based on VSEPR theory.

**UNIT II**

**(12 hrs)**

**Organic reactions and Stereoisomerism**

Types of organic reagents - electrophiles, nucleophiles and free radicals.

Aromaticity - Huckel's rule, mechanism of nitration, sulphonation, halogenation, Friedel craft's alkylation and acylation of benzene.

Stereoisomerism - geometrical isomerism (cis - trans isomerism only), optical isomerism (lactic acid and tartaric acid). Conformation - a simple treatment of ethane and n-butane .

**UNIT III**

**(11 hrs)**

**Analytical Chemistry**

Role and importance of analytical chemistry - principle of volumetric analysis - calibration of glasswares, standardization - experimental requirements - concentration units (normality and molarity) - types and preparation of standard solutions (primary and secondary standards). Types of titrations - indicators for acid-base titrations. Chromatography - principle and classification - paper, column, thin layer, electrophoresis and ion-exchange chromatography and its applications.

**UNIT IV**

**(11 hrs)**

**Amino acids and Proteins**

Amino acids - classification, preparation of amino acids by Gabriel phthalimide synthesis, Erlen Meyer azlactone synthesis. Properties of amino acids and action of heat on  $\alpha$ ,  $\beta$ ,  $\gamma$  amino acids - dipeptide synthesis. Protein- classification according to composition and function, primary and secondary structures, properties and colour reactions of proteins.

**UNIT V****(12 hrs)****Solar energy and Water treatment**

Solar energy - renewable energy and non - renewable energy sources - solar energy - solar cells, solar heating, solar collector (flat plate collector only), applications.

Water treatment - hardness of water- temporary and permanent hardness, disadvantages of hard water. Softening methods - reverse osmosis, zeolite and demineralization process. Purification of water for domestic purpose - disinfection by chlorine, ozone and UV light.

**Text Books:**

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1.	Dr. V. Veeraiyan	Textbook of Allied Chemistry	High mount Publishing house, triplicane, Chennai.	Reprint 2006
2.	R. Gopalan. P.S. Subramanian and K. Rengarajan	Elements of Analytical Chemistry	Sultan Chand & Sons, Educational Publishers, New Delhi	Reprint 2013
3.	ArunBahl B. S. Bahl	Advanced Organic Chemistry	S. Chand Sons Company Pvt Ltd,	Reprint 2009
4.	P.C Jain & Monika Jain	Engineering chemistry	DhanpatRai Publishing Co Pvt Ltd.	Reprint 2003

**Pedagogy:**

Lecture by chalk and talk, power point presentation, e-content, numerical exercise, group discussion, assignment, quiz, peer learning, seminar

**Course Designers**

1. Dr.R.Revathi
2. Dr.N.Anusuya

**Question Paper Pattern  
End Semester Examination**

<b>SECTION</b>	<b>WORD LIMIT</b>	<b>MARKS</b>	<b>TOTAL</b>
A - 5 x 2 Marks (No Choice)	One or Two Sentences	10	75
B -5 x 5 Marks ( Internal Choice at same CLO Level)	300	25	
C – 5x 8 Marks ( Internal Choice at same CLO Level)	600-800	40	

COURSE CODE	COURSE TITLE	Category	L	T	P	Credit
CE23A03	IDC – ALLIED CHEMISTRY PAPER –I (offered to B.Sc Physics)	Theory	58	2	-	4

### Preamble

To enable the students to

- understand the concepts of organic chemistry
- gain knowledge about the theories of chemical bonding.
- understand the different terms in phase rule and its applications
- learn the concepts of chemical kinetics, photo chemistry, solid state chemistry.

### Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	recollect the types of bonding, classify organic reactions, types and examples of solutions, the terminologies in thermodynamics, and the basics on the rate of a chemical reaction	K1
CLO2	relate the electronic factors that influence organic reactions, the types of chemical bonding with its effect on structure and property, law of thermodynamics on systems, theories of chemical kinetics & photo chemistry, elements of symmetry in crystal lattice	K2
CLO3	apply the concept of hybridization to organic molecules, theories of bonding in predicting the structure of a molecule, laws of thermodynamics to analyze the feasibility of reactions, concept of energy of activation on reaction rate, laws in explain the ideal behavior of solutions	K3
CLO4	analyze the nature of the organic molecule based on its hybridization, electronic effect, predict the conducting behavior of materials, calculate the enthalpy, bond energy, entropy of a system, construct the phase diagram of simple eutectic system and analyze the typical crystal lattices	K4

### Mapping with Programme Learning Outcomes

CLOs	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	M	S	S	M	M	M
CLO2	M	S	S	M	M	M
CLO3	M	S	S	M	M	M
CLO4	M	S	S	M	M	M

S-Strong; M-Medium

**(For B.Sc Physics)****UNIT I****(12 Hrs)****Basics of Organic Chemistry**

Classification of organic compound- types of reagents- electrophiles, nucleophiles and free radicals, Classification of reactions - addition, substitution, elimination, condensation, polymerisation and rearrangements, polar effects, inductive effect, resonance, hyper-conjugation. steric effect.

Hybridization and geometry of organic molecules -  $\text{CH}_4$ ,  $\text{C}_2\text{H}_4$ ,  $\text{C}_2\text{H}_2$ ,  $\text{C}_6\text{H}_6$  molecules, structure of graphite and diamond.

**UNIT II****(12 Hrs)****Chemical Bonding**

Ionic bond- nature of ionic bond, structure of  $\text{NaCl}$ ,  $\text{KCl}$  and  $\text{CsCl}$ , factors influencing the formation of ionic bond. Covalent bond-nature of covalent bond, structure and shapes of  $\text{BeCl}_2$ ,  $\text{BF}_3$ ,  $\text{CH}_4$ ,  $\text{PCl}_5$ ,  $\text{NH}_3$ ,  $\text{H}_2\text{O}$ ,  $\text{IF}_7$  based on VSEPR theory and hybridization. Hydrogen bonding - inter and intra molecular, nature and its effect on structure and properties. Metallic bonding- semiconductors - intrinsic, extrinsic n-type and p-type semiconductors.

**UNIT III****(11 hrs)****Energetics**

Definition of certain terms - system, surrounding, reversible and irreversible process, First law of thermodynamics, limitations of I law, need for II law - different statements of II law - carnot cycle - efficiency - carnot theorem - thermodynamic scale of temperature –Joule-Thomson effect- enthalpy - bond energy – definitions of entropy and free energy.

**UNIT IV****(11 Hrs)****Chemical Kinetics & Photochemistry**

Chemical kinetics - order and molecularity, rate expression for I, II and III order (derivation not required), methods of determining order of a reaction.

Concept of energy of activation and Arrhenius equation, effect of temperature on reaction rate.

Catalysis- homogeneous and heterogeneous catalysis, theories of catalytic activity, catalyst used in industrial processes.

Photochemistry - comparison between thermal and photochemical reactions, Beer-Lambert's law, Grothaus-Drapper's law, Einstein's law, quantum yield. Phosphorescence, fluorescence, chemiluminescence and photosensitization - definitions with examples.

## UNIT V

(12 Hrs)

### Solutions and Solid State

Solution - types and examples of solutions - liquid in liquid, Raoult's laws, deviation from ideal behavior, vapour- pressure curve for a totally miscible binary liquid systems obeying Raoult's law, partially miscible liquid system (phenol-water system)

Solid state- typical crystal lattices - unit cell, elements of symmetry, Bragg's equation, Weiss Indices, Miller indices, simple body centered and face centered lattices

### Text Books

S.No	Authors	Title of the Book	Publishers	Year and Edition
1.	Dr. Veeraiyan V	Text book of Allied Chemistry	Highmount Publishing House, Chennai-14	Reprint 2006
2.	B.R.Puri, L.R.Sharma, L.S.Pathania	Principles of Physical chemistry	Vishal Publishing Co, Jalandhar, New Delhi	Reprint 2013
3.	SatyaPrakash, G.D. Tuli, S.K. Basu, R.D. Madan	Advanced Inorganic Chemistry – Vol. I	S.Chand & Co. Ltd.	Reprint 2012

### Pedagogy

Lecture by chalk and talk, power point presentation, e-content, numerical exercise, group discussion, assignment, quiz, peer learning, seminar

### Course Designers:

1. Dr.Sowmya Ramkumar
2. Dr.S.Charulatha

**Question Paper Pattern  
End Semester Examination**

<b>SECTION</b>	<b>WORD LIMIT</b>	<b>MARKS</b>	<b>TOTAL</b>
A - 5 x 2 Marks (No Choice)	One or Two Sentences	10	75
B - 5 x 5 Marks ( Internal Choice at same CLO Level)	300	25	
C – 5x 8 Marks ( Internal Choice at same CLO Level)	600-800	40	

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
<b>CE23CP1</b>	<b>CHEMISTRY PRACTICAL - I</b>	THEORY	-	-	90	4

### **Preamble**

To enable the students to

- learn the theoretical basis of qualitative inorganic analysis containing simple and interfering radicals and analyze a mixture containing two anions, one of which is interfering and two cations.
- Learn the quantitative estimations and calculation of pH

### **Course Outcomes**

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

<b>CLO Number</b>	<b>CLO Statement</b>	<b>Knowledge Level</b>
CLO1	identify, separate the cations into groups and report the acid and basic radicals	K1, K2
CLO2	estimate the percentage amount of chlorine, carbonates, Mg, Na in bleaching powder, hard water, detergent	K4
CLO3	estimate the percentage amount of chlorine, carbonates, Mg, Na in bleaching powder, hard water, detergent	K4

### **Mapping with Programme Learning Outcomes**

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	S	S	S

S- Strong,

## Chemistry Practical – I (CE21CP1)

(90 Hrs)

1. Analysis of mixture containing two anions one of which is interfering in nature and two cations:

The following cations and anions may be given:

Anions :  $\text{Cl}^-$ ,  $\text{CO}_3^{2-}$ ,  $\text{Br}^-$ ,  $\text{NO}_3^-$ ,  $\text{SO}_4^{2-}$ ,  $\text{F}^-$ ,  $\text{BO}_3^{2-}$ ,  $\text{C}_2\text{O}_4^{2-}$ ,  $\text{CrO}_3^{2-}$ ,  $\text{PO}_4^{3-}$

Cations :  $\text{Pb}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{NH}_4^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Cd}^{2+}$ ,  $\text{Sr}^{2+}$

### 2. GROUP EXPERIMENTS:

- (i) Estimation of available chlorine in bleaching powder
- (ii) Estimation of hardness of water

### 3. pH Measurements

- (i) Measurement of pH of different solutions like aerated drinks, fruit juices, shampoos and soaps using pH meter (Note: Use dilute solutions of soaps and shampoos)
- (ii) Preparation of buffer solutions
  - a. Sodium acetate-acetic acid
  - b. Ammonium chloride-Ammonium hydroxide

### Text Book

Lab Manual - Prepared by Faculty, Department of Chemistry, PSGRKCW

### Reference book:

S.No	Authors	Title of the Book	Publishers	Year and Edition
1	V. V. Ramanujam	Inorganic semi micro qualitative analysis,	The National Publishing Co.	Revised 3 <sup>rd</sup> Edn., 1974
2	Jain P. C and Jain M	Engineering Chemistry	Dhanpat Rai and Sons	16 <sup>th</sup> edition, 2013
3	Vogel A. I	Text Book of Practical Organic Chemistry	Prentice Hall	2011, 5 <sup>th</sup> edition
4	Khosla B D, Garg V C, Gulati A	Senior Practical Physical Chemistry	R Chand & Co	2011

### Pedagogy:

Demonstration and individual hands on practical's

### Course Designers

- 1. Dr. N. Shyamaladevi
- 2. Dr. S. Jone Kirubavathy

COURSE CODE	COURSE TITL	CATEGORY	L	T	P	CREDIT
CE23AP1	<b>IDC –CHEMISTRY PRACTICAL FOR BIOLOGISTS</b> (offered to B.Sc Botany / Zoology)	PRACTICAL	-	-	90	2

### Preamble

To enable the students to

- estimate the given substance volumetrically.
- analyse and identify the organic compounds qualitatively

### Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	define the various terms in volumetric analysis	K1
CLO2	perform the volumetric analysis and estimate the quantity present.	K2, K3
CLO3	identify and analyse organic compounds	K3

### Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	S	S	S

S- Strong M-Medium

**IDC –CHEMISTRY PRACTICAL FOR BIOLOGISTS (CE23AP1)**  
**(offered to B.Sc Botany /Zoology)**

**(90hrs)**

**1. Volumetric Analysis**

- i. Estimation of sodium hydroxide using standard sodium carbonate.
- ii. Estimation of Carbonate, bicarbonate mixture using sodium hydroxide
- iii. Estimation of hydrochloric acid using standard oxalic acid.
- iv. Estimation of oxalic acid using standard sulphuric acid.
- v. Estimation of ferrous sulphate using standard Mohr's salt solution.
- vi. Estimation of potassium permanganate using standard oxalic acid.
- vii. Estimation of hardness of water (Temporary and permanent).

**2. Organic Compound Analysis**

Systematic analysis of organic compounds containing one functional group and characterization by confirmatory tests and preparing suitable derivative - Phenols, Acids (mono and di), Aromatic primary amine, Amides (mono and diamide) and Glucose.

**Text Book:**

Lab Manual- Prepared by Faculty, Department of Chemistry, PSGRKCW

S.No.	Authors	Title of the Book	Publishers	Year and Edition
1	N.S.Gnanapragasam, G.Ramamurthy	Organic Chemistry Lab Manual	S.Viswanathan Printers & Publishers Pvt Ltd	3 <sup>rd</sup> Edn.,2011
2	A.I. Vogel	A text book of quantitative inorganic analysis	Longman publishers	12 <sup>th</sup> Edn., 2011

**Pedagogy**

Demonstration and individual hands on practical.

**Course Designers:**

1. Dr.R.Revathi
2. Dr.N.Anusuya

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CE23AP2	<b>IDC – ALLIED CHEMISTRY PRACTICAL</b> (offered for B.Sc Physics)	PRACTICAL	-	-	90	2

### Preamble

To enable the students to

- estimate the given substance volumetrically
- understand the principle and carry out potentiometric / conductometric titrations

### Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	define the various terms in volumetric analysis	K1
CLO2	perform the volumetric analysis and estimate the quantity present.	K2, K3
CLO3	Calculate the hardness of water samples	K4
CLO4	recall the various terms in conductometric and potentiometric experiments	K1

### Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	S	S	S
CLO4	S	S	S	S	S

S- Strong

**IDC – ALLIED CHEMISTRY PRACTICAL (CE23AP2)****(90hrs)**

(offered for B.Sc Physics)

**1. Volumetric Analysis**

- i. Estimation of sodium hydroxide using standard sodium carbonate.
- ii. Estimation of carbonate, bicarbonate mixture using sodium hydroxide
- iii. Estimation of hydrochloric acid using standard oxalic acid.
- iv. Estimation of oxalic acid using standard sulphuric acid.
- v. Estimation of ferrous sulphate using standard Mohr's salt solution.
- vi. Estimation of potassium permanganate using standard oxalic acid.
- vii. Estimation of hardness of water (temporary and permanent).

**2. Conductivity Experiments**

- i. Determination of cell constant
- ii. Determination of dissociation constant of a weak acid.
- iii. Conductometric titration: Acid – base

**3. Potentiometric Titration**

- i. Acid - base
- ii. Redox titration

**Text Book :**

Lab Manual- prepared by faculty, Department of Chemistry, PSGR Krishnammal College for Women, Coimbatore

**Reference Books**

S.No.	Authors	Title of the Book	Publishers	Year and Edition
1	V.Venkateswaran, R. Veeraswamy & A.R. Kulandaivelu	Basic Principles of Practical Chemistry	S.Chand & Co.	2012 Reprint 2 <sup>nd</sup> Edn.
2	B. Vishwanathan, P.S. Raghavan	Practical Physical Chemistry	Viva Books	2014 Reprint

**Pedagogy**

Demonstration and individual hands on Practicals

**Course Designers**

1. Dr.Sowmya Ramkumar
2. Dr.S.Charulatha

**FOUNDATION COURSE (NME23ES)**

**INTRODUCTION TO ENTREPRENEURSHIP**

**CREDITS: 2**

**TOTAL HOURS: 30**

**LECTURE HOURS: 30**

**Unit 1:(5 hrs)**

**Nature of Entrepreneurship:** (3 hrs)

Meaning –Need for Entrepreneurship –Qualities of Successful Entrepreneurs - Myths of Entrepreneurship

**Activity:** Assignment, Discussion (2 hrs)

**Unit 2: (6 hrs)**

**Role of Entrepreneurs** (4 hrs)

Significance of Entrepreneurship to the nation –Environmental Factors influencing Entrepreneurship – Entrepreneurial Process andFunctions- Challenges faced by Entrepreneurs

**Activity:** Quiz / Role Play (2 hrs)

**Unit 3: (6 hrs)**

**Formulation of Business Idea:** (4 hrs)

Business Idea Generation - Entrepreneurial Imagination and Creativity – Role of Innovation – Opportunity Evaluation

**Activity:**Business Idea Pitch (2 hrs)

**Unit 4: (6 hrs)**

**Business Planning:** (4 hrs)

Need for Market Study – Securing Finance from various Sources - Significance of Business plan – Components of Business plan

**Activity:** Schemes available for Entrepreneurs (2 hrs)

**Unit 5: (7 hrs)**

**Project:**

**Interface with Successful Entrepreneurs** – 4 hrs

**Business Plan Presentation** – 3 hrs

### **Reference Books**

1. D.F. Kuratko and T.V. Rao, *Entrepreneurship - South Asian Perspective*, 2016, Cengage Learning India Pvt. Ltd. Delhi.
2. Arya Kumar, *Entrepreneurship: Creating and Leading an Entrepreneurial Organization*, 2012, Pearson Education India

### **Evaluation Pattern**

#### **INTERNAL COMPONENT**

Quiz	50
Assignment	25
Project/Case Study	25
<b>TOTAL</b>	<b>100</b>

COURSE CODE	COURSE TITLE	Category	L	T	P	Credit	Category
CE23C02	GENERAL CHEMISTRY PAPER - II	Theory	88	2	-	5	Theory

### Preamble

To enable the students to

- escalate the variations in atomic and physical properties of the s & p-block elements
- recognize the relationships between constitutional (structural) isomers, conformational isomers, and geometric isomers
- understand the terminology, factors, similarities and differences of nucleophilic substitution reactions and elimination reactions
- gain knowledge on the types and properties of colloids and liquid crystals
- learn the concepts of 2<sup>nd</sup> law of thermodynamics

### Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	understand the basics of s & p-block elements, isomerism of organic compounds, halides, colloids and thermodynamics	K1
CLO2	infer the general trends of s & p-block elements, stereochemistry of organic compounds, mechanism of organic reactions and explain the significance of colloids/thermodynamics	K2
CLO3	Examine the uses of s & p-block compounds, various types of stereoisomerism, reactivity of alkyl/aryl halides, types of colloids and conditions of equilibrium and spontaneity	K3
CLO4	Analyze the properties of s & p-block elements, the configuration and conformations of organic compounds, halides, colloids and thermodynamic functions	K4

### Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	S	S
CLO2	S	S	M	S	S
CLO3	S	S	M	S	S
CLO4	S	S	M	S	S

S-Strong; M-Medium;

**Unit I****(18hrs)**

**s-block elements** : General characteristics, physical and chemical properties and uses , Compounds of s-block elements- oxides, hydroxides, peroxides, super oxides- preparation and properties-oxo salts-carbonates-bicarbonates-nitrates-halides and poly halides.Diagonal relationships (Li with Mg & BE with Al), salient features of hydrides, solvation and complexation tendencies. **P-block elements**– Comparative study (including diagonal relationship) of group 13 to 17 elements, compounds like hydrides, oxides, carbides (salt-like carbides, covalent carbides & interstitial carbides) and halides group 13 to 16. Hydrides of boron – diboranes (preparation and properties) and its structure.Basic properties of halogens, interhalogens (Type XY, XY<sub>3</sub>, XY<sub>5</sub> & XY<sub>7</sub>) and poly halides.

Concepts of virtual lab: flame test for s,p elements

**Unit –II****(18 hrs)****Stereochemistry of organic compounds**

Concepts of isomerism, types of isomerism. Optical isomerism – elements of symmetry, molecular chirality, enantiomers, stereogeniccentre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogeniccentres, properties of diastereomers, threo and erythrodiastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization. Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature.Geometric isomerism – determination of configuration of geometric isomers (dipole moment, boiling & melting points, formation of cyclic compounds). E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.Conformational isomerism – conformational analysis of ethane and n-butane: conformations of cyclohexane derivatives (Factors affecting the stability of conformations). Newman projection and Sawhorse formulae, Fischer and flying wedge formulae. Difference between configuration and conformation.

**Unit–III****(18 Hrs)****Alkyl and Aryl Halides**

**Alkyl Halides** – Types of Nucleophilic Substitution (SN<sup>1</sup>, SN<sup>2</sup> and SN<sup>i</sup>) reactions (mechanism & factors affecting the reactions).Preparation: from alkenes and alcohols.Reactions:hydrolysis,

nitrite & nitro formation, nitrile & isonitrile formation. Williamson's ether synthesis: Elimination vs substitution.

**Aryl Halides** –Preparation:(Chloro, bromo and iodo-benzene) from phenol, Sandmeyer&Gattermannreactions. Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism:  $\text{KNH}_2/\text{NH}_3$  (or  $\text{NaNH}_2/\text{NH}_3$ ).Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.

#### **UNIT IV**

**(17 hrs)**

##### **Colloidal State**

Definition of colloids, Classification of Colloids (on the basis of physical state of dispersed phase and dispersion medium, appearance & solvent affinity), Solids in Liquids (SOLS): Properties-kinetic, optical and electrical; stability of colloids, protective action, Hardy-Schulze law, gold number.

Liquids in Liquids (emulsions): types of emulsions, preparation, emulsifier. Liquids in Solids(Gels): Classification, preparation and properties, inhibition, general applications of colloids

Liquid Crystals: difference between liquid crystal, solid and liquid. Classification (of thermotropic liquid crystals), structure of nematic and Cholestricphases. Thermography and seven segment cell.

#### **UNIT V**

**(17 hrs)**

##### **Thermodynamics –II**

Second law of thermodynamics – Need for second law, different statements, entropy-definition, physical significance (measure of the disorder of the system & measure of probability), entropy of an ideal gas, entropy changes in isothermal transformation, entropy changes in reversible and irreversible processes. Trouton'srule.Entropy as a function of T and V, entropy as a function of T and P. Entropy of mixing of ideal gas.General conditions of equilibrium and spontaneity-Conditions of equilibrium and spontaneity under constraints, definition of A and G, physical significance of A and G. Maxwells relations. Temperature and pressure dependence of G, Gibbs – Helmholtz equation.

**Text Books**

S. No	Author	Title of the Book	Publishers	Year and Edition
1	ArunBahl B. S. Bahl	A Text Book of Organic Chemistry	S. Chand Sons Company Pvt Ltd	2016
2	P. L. Soni	Text Book of inorganic Chemistry	Sultan Chand and Sons	2013
3	B. R. Puri, L. R. Sharma, M. S. Patania	Principles of Physical Chemistry	Vishal Publishing & Co	2017
4	D. Nasipuri	Stereochemistry of Organic Compounds	New Age International Ltd	2004

**Reference Books**

S. No	Author	Title of the Book	Publishers	Year and Edition
1	ArunBahl B. S. Bahl	Advanced Organic Chemistry	S. Chand Sons Company Pvt Ltd,	2009
2	Jagdamba Singh, L. D. S. Yadhav	Advanced Organic Chemistry	PragathiPrakahasan	2013
3	J.D Lee	Concise Inorganic Chemistry	English Language Book Society	2008
4	James E Huheey	Inorganic Chemistry	Pearson India Education Services	2015
5	R. T. Morrison and R. N. Boyd	Organic Chemistry	Pearson India Education Services	2010
6	K. S. Tewari, N. K. Vishnoi	A Textbook of Organic Chemistry	Vikas Publishing House	2017
7	P. S. Kalsi	Stereochemistry	New Age International	2000
8	B. R. Puri, L. R. Sharma, K. K. Kalia	Principles of Inorganic Chemistry	Milestone Publishers and Distributors	2011
9	R. D. Madan	Modern Inorganic Chemistry	S. Chand Sons Company Pvt Ltd	2014

**Pedagogy:**

Lecture by chalk and talk, power point presentation, e-content, numerical exercise, group discussion, assignment, quiz, peer learning, seminar

**Course Designers**

1. Dr. N. Shyamaladevi
2. Dr. S. Jone Kirubavathy

**Question Paper Pattern  
End Semester Examination**

<b>SECTION</b>	<b>WORD LIMIT</b>	<b>MARKS</b>	<b>TOTAL</b>
A - 5 x 2 Marks (No Choice)	One or Two Sentences	10	75
B - 5 x 5 Marks ( Internal Choice at same CLO Level)	300	25	
C – 5x 8 Marks ( Internal Choice at same CLO Level)	600-800	40	

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CE23A02	IDC – CHEMISTRY FOR BIOLOGISTS - II (Offered to B.Sc Botany/Zoology)	THEORY	73	2	-	4

### Preamble

To enable the students to

- learn the nomenclature, applications of coordination compounds and their significance in bioinorganic chemistry
- analyze the chemistry behind fuels, fertilizers and polymers.
- gain knowledge about the functions of various drugs and important terms in the chemistry of dyes.
- understand the basic concepts of chemical kinetics and catalysis.
- familiarize the importance of pH and Buffer

### Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	recall thenomenclature of coordination compounds, types of fuel gases, polymers, synthetic drugs, dyes, catalysis and buffer	K1
CLO2	compare various theories to explain the formation of coordination compounds, uses of different fuels, polymers and drugs. Recognize the theories of kinetics and significance of pH / buffer	K2
CLO3	examinethe applications of chelating compounds, polymers, dyes and catalytic enzymes. Calculate the degree of hydrolysis using various methods	K3
CLO4	Appraise the importance of inorganic metal, inorganic polymers, pH and buffer in the living system. Categorize polymer, drugs based on mode of action and analyze the mechanism of catalytic action	K4

### Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	S	S
CLO2	S	S	M	S	S
CLO3	S	S	S	S	S
CLO4	S	S	S	S	S

S- Strong; M-Medium

**IDC – CHEMISTRY FOR BIOLOGISTS - II (CE23A02)** **(73 hrs)**  
**(Offered to B.Sc Botany/Zoology)**

**Unit I** **(15 hrs)**

**Coordination and Bioinorganic Chemistry**

Nomenclature - mononuclear complexes. Theories- Werner, Sedgwick-EAN rule, Pauling's theory - postulates and examples. Applications of coordination compounds - in qualitative and quantitative analysis. Chelation and its industrial importance with reference to EDTA in analytical chemistry. Structural features and biological functions of Chlorophyll, Haemoglobin, Rubredoxin and Ferredoxin.

**Unit II** **(15 hrs)**

**Industrial Chemistry**

**Fuel gases** - Natural gas, water gas, semi water gas, carbureted water gas, producer gas and oil gas (manufacturing details not needed) composition and uses only.

**Fertilizers**-Primary and secondary nutrients, need and requirements of fertilizers - preparation, properties and uses of urea, super phosphate of lime, ammonium sulphate, triple super phosphate and potassium nitrate. Pesticides - classification with examples.

**Polymers** – Classification -preparation and uses of PVC, Teflon & Polyethylene. Inorganic polymers - synthesis, properties and uses of silicones.

**Unit III** **(15hrs)**

**Synthetic drugs and Synthetic dyes**

**Synthetic drugs** -Introduction, classification - based on chemical structure and therapeutic action and requirements of a drug. Sulpha drugs and mode of action. Hypnotics, sedatives, anticonvulsants, antidepressants, antipyretics, anaesthetics, antihistamines, anticoagulant, analgesics, diuretics, antimalarial, antifungal, antibacterial, antitubercular and antileprosy - definition, examples and side effects.

**Synthetic dyes** - Introduction, chromophore, auxochrome, chromogen, bathochromic, hypsochromic, hyperchromic and hypochromic shifts. Azo dyes, vat dyes, mordant dyes. Food colours- general treatment.

**Unit IV** **(14hrs)**

**Chemical Kinetics and Catalysis**

**Chemical Kinetics** - Definition - order and molecularity - rate of reaction-expression for first,

second and third order reactions( derivation not required only equation).Effect of temperature on reaction rate – Arrhenius equation – concept of activation energy -collision theory (elementary treatment only) - failures of collision theory.

**Catalysis** - types, mechanism of catalytic action - homogeneous, heterogeneous and enzyme catalysis, industrial applications of enzymes.

## Unit V

(14hrs)

### Importance of pH and Buffer

pH, pH scale, buffer solutions - types - buffer mixture of weak acid and its salt - buffer mixture of weak base and its salt. Importance of pH and buffer in the living system.

Hydrolysis of salts – types (strong acid vs strong base, weak acid vs strong base, strong acid vs weak base, weak acid vs weak base)- hydrolysis constant ( $K_h$ ) - relation between  $K_h$ ,  $K_a$  and  $K_w$ - degree of hydrolysis and determination - indirect method, electrical conductance method (Bredig's method), freezing point depression and from distribution law.

### Text Books:

S.No.	Authors	Title of the Book	Publishers	Year and Edition
1.	Dr. V.Veeraiyan	Text book of Allied Chemistry	2 <sup>nd</sup> Edn, High mount Publishing house, triplicane, Chennai.	Reprint 2005
2.	B.S.Bahl, ArunBahl and G.D.Tuli	Essentials of Physical Chemistry	S Chand & Company Ltd, New Delhi.	Reprint 2000
3.	B.K.Sharma	Industrial Chemistry	GOEL Publishing House	Reprint 2000

### Pedagogy:

Lecture by chalk and talk, power point presentation, e-content, numerical exercise, group discussion, assignment, quiz, peer learning, seminar

### Course Designers

1. Dr.R.Revathi
2. Dr.N.Anusuya

**Question Paper Pattern  
End Semester Examination**

<b>SECTION</b>	<b>WORD LIMIT</b>	<b>MARKS</b>	<b>TOTAL</b>
A - 5 x 2 Marks (No Choice)	One or Two Sentences	10	75
B - 5 x 5 Marks ( Internal Choice at same CLO Level)	300	25	
C – 5x 8 Marks ( Internal Choice at same CLO Level)	600-800	40	

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>Category</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>CE23A04</b>	<b>IDC – ALLIED CHEMISTRY PAPER –II (For B.Sc Physics)</b>	<b>Theory</b>	73	2	-	4

### Preamble

To enable the students to

- understand the concepts of aromaticity, isomerisms and nuclear chemistry
- understand the concepts of electrochemistry
- gain knowledge about the basics of surface chemistry
- know the basics of fuels, polymers and water treatment methods

### Course Outcomes

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

<b>CLO Number</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
<b>CLO1</b>	recall the fundamental subatomic particles, criteria for aromaticity, terms in electrochemistry, mole concept, chemistry of fuels, polymers	<b>K1</b>
<b>CLO2</b>	relate the stability of a nucleus, property of different structural and stereo isomers, theories of electrochemistry on conductance measurements, importance of pH and buffers in the living systems, ions responsible for temporary and permanent hardness of water	<b>K2</b>
<b>CLO3</b>	apply the laws of nuclear chemistry in calculating nuclear binding energy, element of symmetry for predicting the isomers, principles of chromatographic techniques, relate the structure of polymers on its application	<b>K3</b>
<b>CLO4</b>	analyse the modes of radioactive decay, conformational analysis of cyclic and acyclic systems, to solve problems related to conductance, categorize the solution based on its pH, techniques for softening of hard water	<b>K4</b>

### Mapping with Programme Learning Outcomes

<b>CLOs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>
CLO1	M	S	S	M	M	M
CLO2	M	S	S	M	M	M
CLO3	M	S	S	M	M	M
CLO4	M	S	S	M	M	M

S-Strong; M-Medium

**IDC – Allied Chemistry Paper –II (For B.Sc Physics) CE23A04 (73Hrs)**

**UNIT I (14 Hrs)**  
**Nuclear Chemistry**

Fundamental particles of nucleus, isobars, isotones and isomers, differences between chemical reactions and nuclear reaction, fusion and fission, mass defect, derivation of  $1\text{amu} = 931\text{ MeV}$ - nuclear binding energy and calculation - packing fraction, n/p ratio, magic numbers-radioactive series-  $4n+1$ ,  $4n+2$ ,  $4n+3$ , group displacement law- modes of radioactive decay- half-life period- applications of radio isotopes- carbon dating and rock dating.

**UNIT II (14Hrs)**

**Organic Chemistry**

Aromatic compounds- aromaticity, Huckel's rule, aromatic electrophilic substitution, mechanism of nitration, sulphonation, halogenation, Friedel-Craft's alkylation and acylation.

Isomerisms- optical isomerism, elements of symmetry, polarized light and optical activity, isomerism of lactic acid and tartaric acid, racemisation and resolution, Geometrical isomerism- cis-trans isomerism, keto-enol tautomerism, conformational analysis of ethane, n-butane and cyclohexane.

**UNIT III (15 Hrs)**

**Electrochemistry**

Electronic and electrolytic conductors, Arrhenius theory of electrolytic dissociation. conductance-specific & equivalent conductance and their determination, variation of conductance with dilution, Ostwald's dilution law. Kohlrausch's law & application - determination of degree of dissociation of weak electrolytes, conductometric titrations.

Faraday's law of electrolysis, Galvanic cells: EMF and its origin, standard electrode potentials, electrochemical series and its applications, formation of standard cells, cell reaction and calculation of EMFs,  $\Delta G$  and spontaneity of a reaction.

**UNIT IV (15 Hrs)**

**Solution**- mole concept, mole fraction, molality, molarity, normality. Primary and secondary standards- preparation of standard solutions, principle of volumetric analysis (with simple problems), acid-base of redox titration.

**Ionic product of water**- pH, pKa, pKb - definition, determination of pH by indicator method. **Buffer solutions**- types, buffer action, pH of buffer solutions, importance of pH and

buffers in the living systems.

**Surface chemistry**- emulsions, gels - preparation, properties and applications, **Chromatography** – basic principles of column, paper and thin layer chromatography.

## UNIT V

(15 Hrs)

### Industrial Chemistry

Fuels- classification-gaseous fuels like water gas, producer gas, liquefied petroleum gas, gobar gas, compressed natural gas

Polymers- classifications, preparation and uses of PVC, Teflon & Polyethylene, bakelite, synthesis, properties and uses of silicones.

Hardness of water- temporary and permanent hardness, disadvantages of hard water -softening of hard water - Zeolite process, demineralization process and reverse osmosis - purification of water for domestic use: use of chlorine, ozone and UV light.

### Text Books

S. No	Authors	Title of the Book	Publishers	Year and Edition
1.	H.J.Arniker	Essentials of Nuclear Chemistry	New Age International Pvt., Ltd., Publishers	2011 4 Edn
2.	Dr. Veeraiyan V	Text book of Allied Chemistry	Highmount Publishing House, Chennai-14	Reprint 2006
3.	B.R.Puri, L.R.Sharma, L.S.Pathania	Principles of Physical chemistry	Vishal Publishing Co, Jalandhar, New Delhi	Reprint 2013

### Pedagogy

Lecture by chalk and talk, power point presentation, e-content, numerical exercise, group discussion, assignment, quiz, peer learning, seminar

### Course Designers

1. Dr. Sowmya Ramkumar
2. Dr. S. Charulatha

**Question Paper Pattern**  
**End Semester Examination**

<b>SECTION</b>	<b>WORD LIMIT</b>	<b>MARKS</b>	<b>TOTAL</b>
A - 5 x 2 Marks (No Choice)	One or Two Sentences	10	75
B - 5 x 5 Marks ( Internal Choice at same CLO Level)	300	25	
C – 5x 8 Marks ( Internal Choice at same CLO Level)	600-800	40	

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>Category</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>23PEPS1</b>	<b>PROFESSIONAL ENGLISH FOR PHYSICAL SCIENCES (I B Sc Physics, Chemistry, Mathematics)</b>	<b>AEC</b>	<b>25</b>	<b>5</b>	<b>-</b>	<b>2</b>

### **Preamble**

To enable the students to

- develop the language skills of students by offering adequate practice in professional contexts.
- enhance the lexical, grammatical and socio-linguistic and communicative competence of first year physical sciences students
- focus on developing students' knowledge of domain specific registers and the required language skills.
- develop strategic competence that will help in efficient communication
- sharpen students' critical thinking skills and make students culturally aware of the target situation.

### **Course Learning Outcomes**

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

<b>CLO Number</b>	<b>CLO Statement</b>	<b>Knowledge Level</b>
CLO1	recognize their own ability to improve their own competence in using the language	K1
CLO2	use language for speaking with confidence in an intelligible and acceptable manner	K2
CLO3	read independently unfamiliar texts with comprehension and understand the importance of reading for life	K3
CLO4	understand the importance of writing in academic life	K3
CLO5	write simple sentences without committing error of spelling or grammar	K3

## **UNIT 1: COMMUNICATION**

**5 hours**

**Listening:** Listening to audio text and answering question

Listening to Instructions

**Speaking:** Pair work and small group work.

**Reading:** Comprehension passages –Differentiate between facts and opinion

**Writing:** Developing a story with pictures.

**Vocabulary:** Register specific - Incorporated into the LSRW tasks

## **UNIT 2: DESCRIPTION**

**5 hours**

**Listening:** Listening to process description.-Drawing a flow chart.

**Speaking:** Role play (formal context)

**Reading:** Skimming/Scanning- Reading passages on products, equipment and gadgets.

**Writing:** Process Description –Compare and Contrast Paragraph-Sentence Definition and Extended definition- Free Writing.

**Vocabulary:** Register specific -Incorporated into the LSRW tasks.

## **UNIT 3: NEGOTIATION STRATEGIES**

**5 hours**

**Listening:** Listening to interviews of specialists / Inventors in fields (Subject specific)

**Speaking:** Brainstorming. (Mind mapping).

Small group discussions (Subject- Specific)

**Reading:** Longer Reading text.

**Writing:** Essay Writing (250 words)

**Vocabulary:** Register specific - Incorporated into the LSRW tasks

## **UNIT 4: PRESENTATION SKILLS**

**5 hours**

**Listening:** Listening to lectures.

**Speaking:** Short talks.

**Reading:** Reading Comprehension passages

**Writing:** Writing Recommendations

Interpreting Visuals inputs

**Vocabulary:** Register specific - Incorporated into the LSRW tasks

## **UNIT 5: CRITICAL THINKING SKILLS**

**5 hours**

**Listening:** Listening comprehension- Listening for information.

**Speaking:** Making presentations (with PPT- practice).

**Reading:** Comprehension passages –Note making.

Comprehension: Motivational article on Professional Competence, Professional Ethics and Life Skills)

**Writing:** Problem and Solution essay– Creative writing –Summary writing

**Vocabulary:** Register specific – Incorporated into the LSRW tasks

**Textbook**

<b>S. No.</b>	<b>Authors</b>	<b>Title of the Book</b>	<b>Publishers</b>	<b>Year and Edition</b>
1	TamilNadu State Council for Higher Education (TANSCHÉ)	English for Physical Sciences Semester 1	--	--

**Reference Books**

<b>S. No.</b>	<b>Authors</b>	<b>Title of the Book</b>	<b>Publishers</b>	<b>Year and Edition</b>
1	Sreedharan, Josh	The Four Skills for Communication	Foundation books	2016
2	Pillai, G Radhakrishna, K Rajeevan, P Bhaskaran Nair	Spoken English for you	Emerald	1998
3	Pillai, G radhakrishna, K Rajeevan, P Bhaskaran Nair	Written English for you	Emerald	1998

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CE23C03	GENERAL CHEMISTRY PAPER-III	THEORY	58	2	-	4

### Preamble

To enable the students to

- gain knowledge about the characteristics and metallurgy of d-block elements.
- understand the chemistry of inter halogen compounds.
- learn the concepts of acids and bases.
- familiarize the organic reactions of aldehydes, ketones, Carboxylic acids and esters.
- acquire insight into phase rule and its applications.

### Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	describe the extraction and refining methods of metals, examine the concepts of acids and bases, recognize the naming reaction and purification techniques	K1
CLO2	compare the properties of d-block elements, predict the mechanism of oxidation/condensation reactions, identify the ideal & non-ideal solutions	K2
CLO3	illustrate the chemistry of inter halogen compounds, interpret the hardness, softness and properties of dicarboxylic acid, sketch the phase diagram for one/two component system	K3
CLO4	analyze the metallurgy of d block elements, examine the synthesis of aldehydes, ketones, and hydroxy acids	K4

### Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	S	S	S	S	S	M
CLO2	S	S	S	S	S	M
CLO3	S	S	S	S	S	S
CLO4	S	S	S	S	S	S

S-Strong ; M-Medium

## GENERAL CHEMISTRY PAPER–III (CE23C03)

(58 Hrs)

### Unit–I

(11 Hrs)

#### *d-block elements*

Introduction, position, general characteristics-metallic character, atomic volume and densities, melting point and boiling point, atomic radii, ionic radii, ionization potential, standard reduction potential, magnetic property, catalytic property and formation of alloys. Horizontal comparison of Fe, Co, Ni and Zn, Cd and Hg groups.

Metallurgy, properties and uses of Ti, V, Mo and W.

*Inter halogen compounds:* ICl, ClF<sub>3</sub>, BrF<sub>5</sub>, IF<sub>7</sub> - Preparation, properties, structure and uses.

### Unit–II

(11 Hrs)

#### *Acids and Bases*

Definitions, different approaches - Arrhenius concept, Bronsted-Lowry concept, solvent system definition, Lewis definition. Relative strength of acids and bases. Acidity and basicity of solvolytic reaction. HSAB - Principle. Application & limitations of HSAB concept. Symbiosis, theoretical basis of hardness and softness. **Electronegativity, hardness and softness.  $\pi$ -bonding contributions.**

#### *Nonaqueous Solvents*

Classification-protic and aprotic solvents, liquid ammonia (acid-base, precipitation, complex formation, ammonolysis and solvolysis reactions) and liquid sulphur dioxide (acid-base, solvolytic, metathetical, complex formation and amphoteric reactions).

### Unit–III

(12 Hrs)

#### *Carbonyl Compounds*

Nomenclature, classification and reactivity, general methods of preparation of aldehydes and ketones. Mechanism of nucleophilic additions to carbonyl group - addition of HCN, alcohols, thiols, sodium bisulfite, Grignard reagents. Oxidation reactions - Tollens' reagent, KMnO<sub>4</sub>, hypochlorite, SeO<sub>2</sub> and per acids. Reduction reactions - H<sub>2</sub>/Ni, H<sub>2</sub>-Pd-C, NaBH<sub>4</sub>, LiAlH<sub>4</sub>, MPV,

Clemmensen and Wolff-Kishner reductions. Condensation reactions with ammonia and its derivatives- **Aldol, Perkin, Knoevenagel, Reformatsky and Cannizzaro reactions.**

#### **Unit-IV**

**(12 Hrs)**

*Carboxylic acids and their functional derivatives*

Nomenclature and classification of aliphatic and aromatic carboxylic acids. Preparation, properties and uses of Dicarboxylic acids (Oxalic, Malonic, Glutaric, Adipic acid) and Unsaturated acids (Acrylic acid and Crotonic acid).

**Hydroxy acids - Preparation, properties and uses of Tartaric acid and Citric acid.**

*Esters* - Nomenclature, Isomerism, General methods of preparation - Esterification, alcoholysis of acid chlorides and acid anhydrides, silver salt method, Tischenko reaction. Properties and uses. **Active methylene compounds - acetoacetic ester, and malonic ester- preparation, properties and uses.**

#### **Unit-V**

**(12 Hrs)**

*Solutions of Non electrolytes*

Ideal and non-ideal solutions - Raoult's law, vapour pressure of non-ideal solutions, fractional distillation of binary liquid solutions, distillation of immiscible liquids, Nernst distribution law and its applications. Azeotropic distillation, solubility of partially miscible liquids - Phenol - water system, **Nicotine-water system and Triethylamine- water system.**

*Phase Equilibria*

Concepts of phase, component and degrees of freedom. Gibbs' phase rule – derivation. One component system - Water and sulphur. Two component system-Simple eutectic: Lead-silver system, **Formation of compound with congruent melting point- Mg-Zn system, incongruent melting point - Ferric chloride – water system.**

**Text Books:**

S. No.	Authors	Title of The Book	Publishers	Year & Edition
1	B.S. Bahl & Arun Bahl	Organic Chemistry	S.Chand & Co	2009 & 15th Edn
2	R. D Madan	Modern Inorganic Chemistry	S. Chand & Co	2011 & 3 <sup>rd</sup> Edn
3	B.R. Puri, L.R. Sharma, M.S. Pathania	Principles Of Physical Chemistry	Vishal Publications	2011 & 45 <sup>th</sup> edn

**Reference Books:**

S.No.	Authors	Title of the Book	Publishers	Year and Edition
1	B.S. Bahl & Arun Bahl	Essentials Of Physical Chemistry	S. Chand & Co,	2014 & 22nd Edn
2	R.T. Morrison & R.W. Boyd	Organic Chemistry	Pearson Prentice Hall,	2011 & 17th Edn
3	A. Peter Sykes	A Guide Book To Mechanism In Organic Chemistry	Pearson Education Ltd,	2009 & 6th Edn

**Pedagogy:**

Lecture by chalk and talk, power point presentation, e-content, group discussion, assignment, quiz, peer learning, student seminar, problem solving exercise

**Portion marked in Bold – Blended Learning****Course Designers:**

1. Dr. N.Arunadevi
2. Dr. G.Subashini

### Blended Learning

UNITS	Topic	Contents
I	Preparation, properties, structure and uses - ICl, CIF <sub>3</sub>	<a href="https://youtu.be/-Bcur3XLDQU">https://youtu.be/-Bcur3XLDQU</a>
	Preparation, properties, structure and uses - BrF <sub>5</sub> , IF <sub>7</sub>	<a href="https://www.youtube.com/watch?v=C19ey2rpIco">https://www.youtube.com/watch?v=C19ey2rpIco</a>
II	Electronegativity, hardness and softness	<a href="https://www.youtube.com/watch?v=75GXQCq_r1A">https://www.youtube.com/watch?v=75GXQCq_r1A</a>
	$\pi$ -bonding contributions	<a href="https://www.youtube.com/watch?v=Kju_gywu1WM">https://www.youtube.com/watch?v=Kju_gywu1WM</a>
III	Aldol, Perkin, Knoevenagel, Reformatsky and Cannizaro reactions.	<a href="https://youtu.be/a0e6Pq64yMY">https://youtu.be/a0e6Pq64yMY</a> <a href="https://youtu.be/a0e6Pq64yMY">https://youtu.be/a0e6Pq64yMY</a> <a href="https://youtu.be/a0e6Pq64yMY">https://youtu.be/a0e6Pq64yMY</a>
IV	Hydroxy acids - Tartaric acid and Citric acid - preparation, properties and uses.	<a href="https://www.youtube.com/watch?v=x23GJC4jL0">https://www.youtube.com/watch?v=x23GJC4jL0</a> <a href="https://www.youtube.com/watch?v=UK08PRtK6Qk">https://www.youtube.com/watch?v=UK08PRtK6Qk</a>
	Active methylene compounds - acetoacetic ester, and malonic ester - preparation, properties and uses.	<a href="https://www.youtube.com/watch?v=1ApGSzDdQnM&amp;t=533s">https://www.youtube.com/watch?v=1ApGSzDdQnM&amp;t=533s</a> <a href="https://www.youtube.com/watch?v=W66zGnXvyy4">https://www.youtube.com/watch?v=W66zGnXvyy4</a> <a href="https://www.youtube.com/watch?v=JgmzmehMiWM">https://www.youtube.com/watch?v=JgmzmehMiWM</a>
V	Nicotine-water system – Triethylamine - water system.	<a href="https://www.youtube.com/watch?v=BmURRyJsK9c">https://www.youtube.com/watch?v=BmURRyJsK9c</a> <a href="https://www.youtube.com/watch?v=rZWeTR0JqF4">https://www.youtube.com/watch?v=rZWeTR0JqF4</a>
	Formation of compound with congruent melting point- Mg-Zn	<a href="https://www.youtube.com/watch?v=XTIpebEOQbch">https://www.youtube.com/watch?v=XTIpebEOQbch</a> <a href="https://www.youtube.com/watch?v=wc9g_tchL7c">https://www.youtube.com/watch?v=wc9g_tchL7c</a>
	Incongruent melting point - Ferric chloride – water system.	<a href="https://www.youtube.com/watch?v=S4tQ0Gp6juo">https://www.youtube.com/watch?v=S4tQ0Gp6juo</a> <a href="https://www.youtube.com/watch?v=YyOFH1ZN9Zs">https://www.youtube.com/watch?v=YyOFH1ZN9Zs</a>

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CE23CP2	CHEMISTRY PRACTICAL – II	PRACTICAL	-	-	90	5

### Preamble

Enable the students to

- identify functional groups in organic compounds
- develop skill in quantitative analysis of solutions volumetrically
- analyze colorants and adulterants in foods and milk/milk products

### Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Identify the preliminary tests of organic compounds	K1
CLO2	calculate the strength of unknown solutions by titrimetric methods	K4
CLO3	identify the various colorants and adulterants in foods and beverages	K3
CLO4	analyze organic compounds systematically and prepare suitable derivatives	K4

### Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	M	S	S
CLO3	S	S	S	S	M
CLO4	S	S	S	S	M

S-Strong; M-Medium

### **Systematic Analysis - Organic Compounds**

Preliminary tests, detection of elements, nature of the functional group, confirmatory tests and preparation of derivatives – acids, phenols, aldehydes, ketones, amines, amides, carbohydrates, esters and nitro compounds.

### **Volumetric Analysis**

#### **Acidimetry and Alkalimetry**

1. Estimation of sulphuric acid using standard oxalic acid.
2. Estimation of sodium hydroxide using standard sodium carbonate.

#### **Permanganimetry**

3. Estimation of oxalic acid using standard Mohr's salt solution.
4. Estimation of Mohr's salt solution using standard oxalic acid.

#### **Dichrometry**

5. Estimation of  $\text{Fe}^{2+}$  ions using internal indicator.
6. Estimation of  $\text{Fe}^{3+}$  ions using internal indicator after reduction.

#### **Complexometric titrations**

7. Estimation of zinc using EDTA
8. Estimation of magnesium using EDTA

#### **Iodometry**

9. Estimation of Potassiumdichromate.

### **Qualitative Analysis of Natural Food Colours (Group Experiments)**

Caramel, Cochineal, Turmeric, Annatto, Chlorophyll and Betanin

### **Detection of Adulteration in milk and milk products (Group Experiments)**

Urea, Glucose, Starch, Cellulose, Carbonates & Caustic Soda, Detergent, Salt, Hydrogen Peroxide.

#### **Text Book:**

Hand Book for Organic Practical's, prepared by Faculty, Department of Chemistry, PSGR Krishnammal College for Women

**Reference Books:**

S.No.	Authors	Title	Publishers	Year and Edition
1.	Brian S Furniss, Antony J Hannaford, Peter.W.G. Smith, Austin R. Tatchell	Vogel's Textbook of Practical Organic Chemistry	Longman Scientific & Technical	1989 5 Edn.
2.	G H Jeffery, J Bassett, JMendham, R CDenney	Vogel's Textbook of Quantitative Chemical Analysis	Bath Press, Great Britan	1989 5 Edn.
3.	Ministry of Health and Family Welfare Board	Manuals of Methods of Analysis of Foods	Food Safety and Standards - Authority of India, Ministry of Health and Family Welfare, Government of India, New Delhi	2015

**Pedagogy:** Demonstration and individual hands on practical

**Course Designers**

1. Dr. N.Arunadevi
2. Dr. G.Subashini

Course Code	Course Name	Category	L	T	P	Credit
CS23SBGP	SBS I - Gen-AI	Practical	-	1	44	3

### Preamble

The objective of this course is to understand the breadth and depth of Generative Artificial Intelligence (Gen AI) and to impart knowledge on its ethical implications, practical applications, and emerging trends.

### Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the fundamental concepts and ethical considerations of Generative AI.	K2
CLO2	Apply AI principles in practical settings using basic AI tools and platforms	K3
CLO3	Develop advanced skills in specialized AI applications such as text analysis, natural language processing, and image recognition.	K3
CLO4	Explore emerging trends in AI, integrating advanced AI tools into diverse professional practices.	K4

### Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	M
CLO2	S	S	S	S	S
CLO3	S	S	M	S	S
CLO4	S	M	S	M	S

S- Strong; M-Medium

**Unit 1: Introduction to Gen AI****(9 hours)**

Understanding Gen AI: Definition and scope of Gen AI - Overview of its applications in various fields - Introduction to essential skills needed for Gen AI. Ethical Considerations: Discussion on ethical guidelines and responsible use of AI - Understanding the impact of AI on society and individuals.

**Hands-on Activity: Exploring AI Tools**

1. Working with appropriate content creation Gen-AI tools to engage with ChatGPT to explore various subjects, simulate interviews, or create imaginative written content.
2. Working with appropriate writing and rephrasing Gen-AI tools to drafting essays on designated topics and refining the content with improved clarity, coherence, and correctness.

**Unit 2: Basic AI Concepts****(8 hours)**

Introduction to AI: Basic concepts and terminology of artificial intelligence - Examples of AI in everyday life - Real-world examples of AI applications in different domains. Machine Learning Basics: Understanding the principles of machine learning - Overview of supervised and unsupervised learning.

**Hands-on Activity: Simple AI Projects**

1. Working with appropriate educational content creation Gen-AI tools to generate quizzes and flashcards based on classroom material.
2. Working with appropriate language learning Gen-AI tools to practice and enhance language skills through interactive exercises and games across multiple languages.

**Unit 3: AI in Practice****(9 hours)**

Text Analysis and Natural Language Processing (NLP): Introduction to NLP concepts and techniques - Hands-on exercises analyzing text data and extracting insights. Image Recognition and Processing: Basics of image recognition algorithms and techniques - AI Tools for Text and Image Processing

**Hands-on Activity: Text and Image Projects**

1. Working with appropriate image processing Gen-AI tools to experiment with AI-generated images.
2. Working with appropriate object recognition Gen-AI tools to identify various objects such as text, images, products, plants, animals, artworks, barcodes, and QR codes.

**Unit 4: AI for Productivity and Creativity****(9 hours)**

AI-enhanced Productivity and creativity Tools: Overview of productivity and creativity tools enhanced with AI capabilities - Tips for integrating AI into daily tasks and workflows. AI and Jobs: Exploring how AI impacts jobs and industries - Discussion on opportunities and challenges - Exploration of AI-powered creative tools and applications.

**Hands-on Activity: Productivity and Creativity**

1. Working with appropriate content creation Gen-AI tools to generate interactive videos / blog posts / art / drawing / music and storytelling experience.
2. Working with appropriate resume generation Gen-AI tools to create professional resumes efficiently.

## **Unit 5: Future of Gen AI and Final Project**

**(9 hours)**

Emerging Trends in Gen AI - Applications of Generative AI - Ethical and Societal Impact of Gen AI - Future Directions and Challenges - Case Studies in Generative AI.

### **Hands-on Activity: Trends in Gen AI**

1. Working with appropriate speech generation Gen-AI tools to customize synthetic speech for virtual assistance across different applications.
2. Working with appropriate data analysis Gen-AI tools to perform data analysis, visualization, and predictive modeling tasks.
3. Working with appropriate Gen-AI design tools to simplify the creation of visually appealing presentations.
4. Working with appropriate website builder Gen-AI tools to develop professional websites with AI assistance.

### **Pedagogy**

Demonstration of AI Tools, Lectures and Case studies.

### **Course Designer**

Mrs. S. Ponmalar

### **Evaluation pattern for Gen-AI**

Quiz	: 50 Marks (5 quizzes with each 10 marks)
Case study	: 25 Marks
Online Exam	: 25 Marks (Departments to plan and conduct the exam)
Total	: <b>100 Marks</b>

**Job Oriented Course**  
**Instrumental Methods of Analysis**

**JOB1334**

**40 Hrs**

**Unit – I**

**(8 Hrs)**

**Sample handling for analytical techniques:** Sampling procedure, sampling in different physical state – gases, liquids, solids, sample storage, handling of chemicals & equipments, hazards, safety measures, laboratory hygiene & safety.

**Separation techniques:** Crystallization, Precipitation, solvent extraction, extraction by chemically active solvents, Continuous extraction, Soxhlet extraction.

**Purification Techniques:** Recrystallisation, Sublimation, Distillation - Fraction distillation, Steam Distillation, Azeotropic distillation & Vacuum distillation.

**Unit II**

**(8 Hrs)**

**Analytical Chemistry:** Chemical analysis, Qualitative & Quantitative analysis. Types of chemical analysis – proximate, partial, trace constituents & complete analysis. Analytical balance.

**Instrumental methods of chemical analysis:** Introduction, analytical perspective, selecting an analytical method, evaluating analytical data.

**Method Validation:** Precision, bias, linearity, detection limit, robustness, selectivity. Proficiency testing – purpose of inter laboratory tests, benefits of laboratory, laboratory performance. Analysis of PT result – Z – Scores, Youden diagram.

**Unit III**

**(8 Hrs)**

**UV-Vis Spectrometer:** Radiation source, monochromator, sample cells or cuvette, detectors, general tips, Application of UV.

**IR spectrometer:** Introduction, Principle, Instrumentation, sampling techniques, solid – pelleting techniques. Liquids and polymers. Interpretation to common functional groups.

**Unit IV****(8 Hrs)****Chromatography** – Introduction, types.**HPLC:** Types, theory –retention time, capacity factor, retention volume, selectivity, resolution, efficiency, asymmetry. Instrumentation – degassing unit, filters, HPLC pump, HPLC column, mobile phase, detectors – general tips.**Atomic Absorption Spectrometer:** Principle, instrumentation and applications.**Sonicator:** Sonication principle, description of components, functions of controls and keys. Operation instruction, preparation of Prussian blue using sonication technique**Unit-V****(8 Hrs)****Iron and steel Industry:** Iron-Composition, Ferrous and non-Ferrous alloys.

Testing the purity of steel &amp; testing of iron by Spark method.

Determination of Carbon by combustion method, Determination of Sulphur by volumetric method, Determination of phosphorus by Alkalimetric method, Determination of Silicon by Gravimetric method, Determination of Chromium by persulphate oxidation method.

Analysis of Ferrous and Non-Ferrous alloys by optical Emission Spectrophotometric method.

Management of solid waste in Iron and steel industry.

**References**

S.No	Authors	Title of the Book	Publishers	Year and Edition
1	R. Gopalan, P. S. Subramaniam and P. S. Rangarajan	Elements of analytical chemistry	S. Chand and Co,	2004, 3 <sup>rd</sup> edn
2	B. K. Sharma	Instrumental methods of analysis	Goel publication	1996, 15 <sup>th</sup> edn
3	H. Kaur	Instrumental methods of chemical analysis	Pragati Publication	4 <sup>th</sup> edition, 2008
4	Y. R. Sharma	Elementary Organic Spectroscopy	S.Chand & Co.	Reprint 2009

## Practical

20 Hrs

1. Analysis of iron and steel – Analysis of ferrous and non – ferrous alloy – optical emission spectrometry.
2. Determination of carbon by combustion method.
3. Determination of sulphur by volumetric method.
4. Determination of phosphorus by alkalimetric method.
5. Determination of silicon by gravimetric method.
6. Determination of Chromium by persulphate – oxidation method.
7. Determination of nickel by DMG method.
8. Determination of principle components and trace elements in iron and steel.
9. Identification of components of Ink using paper chromatography.
10. Separation of organic mixture using TLC.
11. Separation of mixture of organic compounds by column chromatography.
12. pH measurement of acidic and basic solution.
13. Solvent distillation using Rotavapour.
14. Preparation of Prussian blue by sonication technique.

### References:

S.No	Authors	Title of the Book	Publishers	Year and Edition
1	R. Gopalan, P. S. Subramaniam and P. S. Rangarajan	Elements of analytical chemistry	S. Chand and Co,	2004, 3 <sup>rd</sup> edn
2	B. K. Sharma	Instrumental methods of analysis	Goel publication	1996, 15 <sup>th</sup> edn
3	H. Kaur	Instrumental methods of chemical analysis	Pragati Publication	4 <sup>th</sup> edition, 2008
4	Y. R. Sharma	Elementary Organic Spectroscopy	S.Chand & Co.	Reprint 2009

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CE23C04	GENERAL CHEMISTRY PAPER - IV	Theory	58	2	-	4

#### Preamble

To enable the students to

- acquire knowledge about the chemistry of lanthanides and actinides
- learn the concepts and theories of coordination chemistry
- familiarize the preparation and properties of nitrogen containing compounds
- understand the basic concepts and theories of chemical kinetics.

#### Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	describe the significance of lanthanides and actinides, coordination compounds, nitro compounds, food science and chemical kinetics	K1
CLO2	illustrate the extraction of lanthanides and actinides, theories of coordination compounds, preparation of nitro compounds, types of food additives and basics of chemical kinetics	K2
CLO3	interpret the properties of lanthanides and actinides, coordination compounds, nitro compounds, food adulteration and determination of rate of a reaction	K3
CLO4	compare and contrast lanthanides & actinides, high spin –low spin complexes, mono, di & trinitro compounds, food additives, theories of kinetics	K4

#### Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	M	S	S
CLO4	S	S	S	M	S

S- Strong; M-Medium

**GENERAL CHEMISTRY PAPER - IV CE23C04 (58 Hrs)**

**Unit - I (12 Hrs)**

**Lanthanides and Actinides**

Lanthanides: Lanthanide series, abundance and natural isotopes, lanthanide contraction, similarity in properties, occurrence, oxidation states, chemical properties of Ln(III) cations, magnetic properties. Colour and electronic spectra of lanthanide compounds, lanthanide contraction. Extraction of lanthanides from monazite, separation of individual lanthanides by ion exchange method. Lanthanum - occurrence, metallurgy, physical and chemical properties. Actinides: Actinide series, abundance and natural isotopes, occurrence, oxidation states, preparation & properties of actinides and actinide contraction. Uranium - occurrence, metallurgy, physical and chemical properties.

**Comparison of lanthanides and actinides. Updation of periodic table from Web.**

**Unit - II (12 Hrs)**

**Coordination Chemistry**

Introduction - Types of ligands; coordination sphere; coordination number; nomenclature of mononuclear and dinuclear complexes; chelate effect. **Isomerism: linkage, ionization, hydrate, coordination, coordination position isomerism, geometrical and optical isomerism.** Theories - Sidgwick theory - EAN and stability, Valence bond theory - hybridization, geometry, magnetism, drawbacks of VBT. Crystal field theory - crystal field effects, assumptions of crystal field theory, crystal field splitting in octahedral and tetrahedral geometries - high - spin and low- spin complexes, **factors affecting CFSE.**

**Unit - III (12 Hrs)**

**Nitrocompounds, Amines and Diazonium Salts**

**Nitrocompounds:** Aliphatic and aromatic nitro compounds - general methods of preparation, properties and uses.

**Amines**

Primary, secondary and tertiary amines preparation and reactions. Separation of aliphatic amines - Hofmann and Hinsberg methods. Comparison of their basicity. Aromatic amines - commercial preparation of aniline, reactions - ring substitution, diazotization, coupling reactions of aromatic amines.

**Diazonium salts:Preparation from aromatic amines. Reactions: conversion to benzene,phenol, dyes.**

**Unit - IV (11 hrs)**

### **Chemical Kinetics-I**

Empirical laws and experimental aspects - order and molecularity of reactions. Setting up and solving simple differential equations for zero, first, second & third order reactions. Derivation for half-life periods of first, second, third and zero order. **Determination of order of reactions.** Arrhenius equation & concept of energy of activation. Collision theory & derivation of rate constant for bimolecular reactions-theory of absolute reaction rates- derivation for the rate constant in terms of partition functions.

**UNIT V (11 Hrs)**

### **Introduction to Food Science**

Functions of food - energy yielding, body building, protection and regulation, maintenance of health. Food groups, food guide pyramid, food in relation to health.

### **Food Additives**

Definition, need for additives, classification - preservatives, antioxidants, sequestrants, surface acting agents, bleaching and maturing agents, starch modifiers, flavoring agents and flavour enhancers, non-nutritive dietary sweeteners, nutrient supplements, food colours, stabilizers and thickeners, functions and uses of food additives.

### **Food Adulteration and Testing**

**Introduction, legal aspects and prevention, common food adulterants, analysis of various food adulterants in oils, ghee, coffee powder, chili powder, turmeric powder and meat.** Harmful effects of the adulterants. Food additives- sweeteners, preservatives, flavors, colorants, pesticide contaminants and toxicants.

### Text Books

S.No.	Authors	Title of the Book	Publishers	Year and Edition
1	B.S. Bahl, Arun Bahl	Organic Chemistry	S.Chand & Co.,	2009 15 Edn
2	R. D Madan	Modern Inorganic Chemistry	S. Chand & Co.,	2011 3 Edn
3	B.R. Puri, L.R. Sharma, M.S. Pathania,	Principles of Physical Chemistry	Vishal Publications	2011 45 Edn
4	B. Srilakshmi	Food Science	NewAge International Pvt., Ltd.,	2003 3 Edn
5	VijayaKhader	Text Book on Food Storage and Preservation	Kalyani Publishers	1999 1 Edn

### Reference Books

S. No.	Authors	Title of the Book	Publishers	Year and Edition
1	Morrison, Boyd Bhattacharjee	Organic Chemistry	Pearson education	2011 7 Edn
2	Gardon M Barrow	Physical Chemistry	Tata Mcgraw Hill	2010 5 Edn
3	Puri, Sharma, Kalia	Principles of Inorganic Chemistry	Vishal Publishing Co.,	2016 33 Edn

**Pedagogy:** Lecture by chalk and talk, power point presentation, e-content, group discussion, assignment, quiz, peer learning, student seminar, problem solving exercise

### Portion marked in Bold – Blended Learning

#### Course Designers:

1. Dr. N. Arunadevi
2. Dr. G. Subashini

## Blended Learning

### UNIT-I

Unit No	Topic	Contents
I	Comparison of lanthanides and actinides,	You Tube Video <a href="https://www.youtube.com/watch?v=AE7aKG-tWqM">https://www.youtube.com/watch?v=AE7aKG-tWqM</a> <a href="https://www.youtube.com/watch?v=m45zQIEQJws">https://www.youtube.com/watch?v=m45zQIEQJws</a>
	Updation of periodic table from Web.	Google <a href="https://letstalkscience.ca/educational-resources/stem-in-context/newest-elements-on-periodic-table">https://letstalkscience.ca/educational-resources/stem-in-context/newest-elements-on-periodic-table</a>
II	Isomerism: linkage, ionization, hydrate, coordination, coordination position isomerism, geometrical and optical isomerism.	<a href="https://www.youtube.com/watch?v=n-lAbWjiNKA">https://www.youtube.com/watch?v=n-lAbWjiNKA</a> <a href="https://www.youtube.com/watch?v=FLVG08FjcoI">https://www.youtube.com/watch?v=FLVG08FjcoI</a> <a href="https://www.youtube.com/watch?v=PO9NYeb0Tdc">https://www.youtube.com/watch?v=PO9NYeb0Tdc</a>
	Factors affecting CFSE.	<a href="https://www.youtube.com/watch?v=qSvsEMxjPAY">https://www.youtube.com/watch?v=qSvsEMxjPAY</a> <a href="https://www.youtube.com/watch?v=5AG35BALLBI">https://www.youtube.com/watch?v=5AG35BALLBI</a>
III	Diazonium salts: Preparation from aromatic amines, reactions - conversion to benzene and phenol.	<a href="https://www.youtube.com/watch?v=8hjySbRvOHs">https://www.youtube.com/watch?v=8hjySbRvOHs</a> <a href="https://www.youtube.com/watch?v=jcMbEujYMmU">https://www.youtube.com/watch?v=jcMbEujYMmU</a>
IV	Determination of order of reactions.	<a href="https://www.youtube.com/watch?v=4wOb58n5eJA">https://www.youtube.com/watch?v=4wOb58n5eJA</a> <a href="https://www.youtube.com/watch?v=hovN5YQEzbQ">https://www.youtube.com/watch?v=hovN5YQEzbQ</a> <a href="https://www.youtube.com/watch?v=N2bLOeYkubg">https://www.youtube.com/watch?v=N2bLOeYkubg</a>
V	Food Adulteration and Testing Introduction, legal aspects and prevention, common food adulterants, analysis of various food adulterants in oils, ghee, coffee powder, chili powder, turmeric powder and meat.	<a href="https://www.youtube.com/watch?v=ue9cE7YdjNU">https://www.youtube.com/watch?v=ue9cE7YdjNU</a> <a href="https://slideplayer.com/slide/6081032/">https://slideplayer.com/slide/6081032/</a> <a href="https://www.youtube.com/watch?v=mSi-0P7gUIw">https://www.youtube.com/watch?v=mSi-0P7gUIw</a>

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CE23CP2	CHEMISTRY PRACTICAL – II	PRACTICAL	-	-	90	5

#### Preamble

To enable the students to

- identify functional groups in organic compounds
- develop skill in quantitative analysis of solutions volumetrically
- analyze colorants and adulterants in foods and milk/milk products

#### Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Identify the preliminary tests of organic compounds	K1
CLO2	calculate the strength of unknown solutions by titrimetric methods	K4
CLO3	identify the various colorants and adulterants in foods and beverages	K3
CLO4	analyze organic compounds systematically and prepare suitable derivatives	K4

#### Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	M	S	S
CLO3	S	S	S	S	M
CLO4	S	S	S	S	M

S-Strong; M-Medium

**Systematic Analysis of Organic Compounds**

Preliminary tests, detection of elements, nature of the functional group, confirmatory tests and preparation of derivatives – acids, phenols, aldehydes, ketones, amines, amides, carbohydrates, esters and nitro compounds.

**Volumetric Analysis**

**Acidimetry and Alkalimetry**

1. Estimation of sulphuric acid using standard oxalic acid.
2. Estimation of sodium hydroxide using standard sodium carbonate.

**Permanganimetry**

1. Estimation of oxalic acid using standard Mohr's salt solution.
2. Estimation of Mohr's salt solution using standard oxalic acid.

**Dichrometry**

1. Estimation of  $\text{Fe}^{2+}$  ions using internal indicator.
2. Estimation of  $\text{Fe}^{3+}$  ions using internal indicator after reduction.

**Complexometric titrations**

1. Estimation of zinc using EDTA
2. Estimation of magnesium using EDTA

**Iodometry**

1. Estimation of Potassiumdichromate.

**Qualitative Analysis of Natural Food Colours (Group Experiments)**

Caramel, Cochineal, Turmeric, Annatto, Chlorophyll and Betanin

**Detection of Adulteration in milk and milk products (Group Experiments)**

Urea, Glucose, Starch, Cellulose, Carbonates & Caustic Soda, Detergent, Salt, Hydrogen Peroxide.

**Text Book:**

Hand Book for Organic Practical's, prepared by Faculty, Department of Chemistry, PSGR Krishnammal College for Women

**Reference Books:**

S.No.	Authors	Title	Publishers	Year and Edition
1.	Brian S Furniss, Antony J Hannaford, Peter.W.G. Smith, Austin R. Tatchell	Vogel's Textbook of Practical Organic Chemistry	Longman Scientific & Technical	1989 5 Edn.
2.	G H Jeffery, J Bassett, J Mendham, R C Denney	Vogel's Textbook of Quantitative Chemical Analysis	Bath Press, Great Britain	1989 5 Edn.
3.	Ministry of Health and Family Welfare Board	Manuals of Methods of Analysis of Foods	Food Safety and Standards - Authority of India, Ministry of Health and Family Welfare, Government of India, New Delhi	2015

**Pedagogy:** Demonstration and individual hands on practical

**Course Designers**

1. Dr. N.Arunadevi
2. Dr. G.Subashini

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
<b>CE23C05</b>	<b>INORGANIC CHEMISTRY</b>	<b>THEORY</b>	58	2	-	4

### **Preamble**

To enable the students to

- familiarize with metals, alloys and types of conductors
- acquire knowledge about isotopes and nuclear reactions
- learn the chemistry of metallic carbonyls and silicon compounds
- gain vivid insight into Bioinorganic Chemistry/Nanotechnology

### **Course Learning Outcomes**

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

<b>CLO Number</b>	<b>CLO Statement</b>	<b>Knowledge Level</b>
CLO1	recall the basic concepts of metals and alloys; nuclear forces; binding energy; metal ions in biology; preparation and types of metallic carbonyls/silicon compounds and nanomaterials	K1
CLO2	examine band and MO theories; nuclear models; modes of radioactive decay; characteristics of metalloproteins and enzymes; properties of metallic carbonyls and silicon compounds; techniques of synthesizing nanoparticles	K2
CLO3	interpret the conducting properties of metals; radioactive series; synthesis of radioisotopes; role of metal ions in biological systems and applications of isotopes, metallic carbonyls and nanomaterials	K3
CLO4	categorize and analyze the types of alloys; Atomic Power Projects; features of biological pigments; structures and uses of silicates; characterization techniques of nanoparticles	K4

### **Mapping with Programme Learning Outcomes**

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
CLO1	M	S	S	M	M
CLO2	S	S	S	M	M
CLO3	S	S	S	M	M
CLO4	S	S	S	M	M

S-Strong; M-Medium

## **Inorganic Chemistry CE23C05 (58 Hrs)**

### **UNIT I**

**(11Hrs)**

#### **Metals and Alloys**

Structure of Metals - Electrical, Optical & Mechanical properties of metals. Valence Bond Theory, MO theory. Conductors, Insulators and Semiconductors - Intrinsic and Extrinsic semiconductors, High Temperature Superconductors.

Types of Alloys - Substitutional, Interstitial and Intermetallic solid solutions, Classification of Alloys. Hume – Rothery ratio rules - Characteristics of Alloys

### **UNIT II**

**(11Hrs)**

#### **Radioactive Isotopes**

Introduction- Nuclear stability-Mass defect- Binding energy- n/p ratio, Nuclear reactions.Nuclear models- Liquid Drop/ Shell models - Magic numbers. Modes of Radioactive Decay- Half-life period

Isotopes - Nature, symbolic representation, structure, isolation of isotopes - Various methods. Uses of isotopes in various fields.

#### **Artificial Radioactivity**

Artificial transmutation.Synthesis of Radioisotopes. Radioactive series -  $4n+1$ ,  $4n+2$ ,  $4n+3$ . Nuclear reactors - Working Principle and Instrumentation.Atomic Power Projects in India. Safety measures, disposal of Reactor wastes. Detection and Measurement of Radioactivity-Geiger-MullerCounter.

### **UNIT III**

**(12 Hrs)**

#### **Bioinorganic Chemistry**

Metal ions in biology and their vital role in the active site, Structure and functions of metalloproteins and enzymes. Structure & characteristic features of Hemoglobin, myoglobin Chlorophyll.

Elements of Life: Essential major, trace & ultratrace elements. Basic chemical reactions in the biological systems and the role of metal ions specially  $\text{Na}^+$  ,  $\text{K}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$  ,

$\text{Cu}^{2+/+}$  and  $\text{Zn}^{2+}$  transport across biological membranes -  $\text{Na}^+$  &  $\text{K}^+$  ion pump, ionophores

#### UNIT IV

(12Hrs)

##### **Metallic Carbonyls and Compounds of Silicon**

Metallic Carbonyls: Types, Preparation, properties, EAN Rule; Carbonyls of Chromium, Manganese, Iron, Nickel and Cobalt – Preparation, properties and uses.

Silicon Compounds: Silicic acids, sodium silicates, silicon tetrachloride, hydrofluorosilicic acids – Preparation, properties and uses. Silicates – Classification and Structure

#### UNIT V

(12 Hrs)

##### **Nanotechnology**

Introduction, properties of nanomaterials with examples. Techniques to synthesize nanoparticles- Physical methods-Physical vapour deposition (evaporation and sputtering) – Laservapourization, chemical/reduction methods. Characterization of nanoparticles – SEM & TEM (Elementary ideas only). Applications in chemistry & biology.

##### **Text Books:**

S. No	Authors	Title	Publishers	Year & Edition
1	H.J. Arniker	Essentials of Nuclear Chemistry	New Age International Pvt Ltd	2011 4 Edn
2	B. Viswanathan	Nanomaterials	Narosa Publishing House	2014 Reprint
3	Wahid U.Malik, G.D.Tuli, R.D.Madan	Selected Topics in Inorganic Chemistry	S.Chand & Co., Ltd.,	2010 30 Edn
4	Asim K. Das	Bioinorganic Chemistry	Books and Allied Pvt., Ltd.,	2013 Reprint
5	R. D. Madan	Modern Inorganic Chemistry	S.Chand & Co.,	2011 3 Revised Edn

**Reference Books:**

S.No.	Authors	Title	Publishers	Year and Edition
1	James.E.Huheey, Ellen.A.Keiter, Richard L Keiter, OkhilK.Medhi	Inorganic Chemistry - Principle Structure and Reactivity	Pearson Publishers	2011 9 Edn.
2	Richard Booker, Earl Boysen	Nanotechnology	John Wiley	2005 1 Edn
3	Mark Ratner, Daniel Ratner	Nanotechnology: A Gentle Introduction to the NextBig Idea	Pearson Education	2008 1 Edn
4	F.Albert Cotton, Geoffrey Wilkinson, Paul. L. Gaus	Basic Inorganic Chemistry	John Wiley & Sons Pvt., Ltd.,	1995 3 Edn

**Pedagogy:** Lecture by chalk and talk, power point presentation, e-content, group learning, group discussion, assignment, quiz, peer learning, student seminar.

**Course Designers:**

1. Dr. P.Kanchana
2. Dr. N. MuthulakshmiAndal

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
<b>CE23C06</b>	<b>ORGANIC CHEMISTRY</b>	<b>THEORY</b>	<b>58</b>	<b>2</b>	<b>-</b>	<b>4</b>

### Preamble

To enable the students to

- learn the chemistry of carbohydrates, terpenoids and alkaloids
- acquire knowledge about synthesis and applications of polynuclear hydrocarbons and heterocyclic compounds
- familiarize about retrosynthesis and green chemistry

### Course Learning Outcomes

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

<b>CLO Number</b>	<b>CLO Statement</b>	<b>Knowledge Level</b>
CLO1	recall the natural products and their synthesis	K1
CLO2	classify and distinguish the natural products and their various synthetic methods	K2
CLO3	illustrate and elucidate the functions , structures of natural products and to employ suitable synthetic routes	K3
CLO4	analyze the structure, synthesis and feasible approaches towards organic compounds	K4

### Mapping with Programme Learning Outcomes

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
CLO1	S	S	S	M	S
CLO2	S	S	S	S	S
CLO3	S	S	S	S	S
CLO4	S	S	S	M	S

S-Strong; M-Medium

## Organic Chemistry CE23C06 (58 Hrs)

### UNIT I (11Hrs)

#### Carbohydrates

Classification and nomenclature, preparation and properties of monosaccharides (Glucose and Fructose), interconversion of Glucose and Fructose, chain lengthening & chain shortening of aldoses, configuration of monosaccharides. Open chain structure & cyclic structure of D (+) Glucose. Introduction to disaccharides, properties, structure of Sucrose.

### UNIT II (11Hrs)

#### Terpenoids

Classification, nomenclature, occurrence and general methods of structure determination, isoprene rule, structural elucidation and synthesis - Geranial, Terpineol, Pinene, Menthol and Dipentene.

### UNIT III (12 Hrs)

#### Alkaloids

Definition, nomenclature and physiological action, occurrence, isolation, general methods of structure elucidation, degradation, classification based on nitrogen heterocyclic ring, structural elucidation and synthesis of Coniine, Nicotine, Piperine and Papaverine.

### UNIT IV (12 Hrs)

#### Fused polynuclear aromatic hydrocarbons and Heterocyclic Compounds

Preparation, properties and uses of Naphthalene, Anthracene and Phenanthrene, Benzanthracene and Pycene.

Preparation, properties and uses of Furan, Pyrrole, Thiophene and Pyridine – Methods of synthesis & chemical reaction with particular emphasis to mechanism of electrophilic substitution. Nucleophilic substitution in pyridine. Comparison of basicity of pyrrole & pyridine. Quinoline, Isoquinoline and Indole – with special reference to Skraup synthesis, Bischler- Napieralski synthesis and Fischer indole synthesis, chemical properties.

**UNIT V****(12Hrs)****Reterosynthesis**

Terminology-Disconnection, Synthons, Synthetic Equivalent(SE), Functional Group Interconversion (FGI), retro synthetic analysis-Linear, convergent and combinatorial synthesis, Target molecule (TM). Guide lines for choosing disconnections-guideline (1, 2, 3). Reterosynthesis of the following molecules: 4-methyl acetophenone, benzocaine, chlorobenzide, hex-3-ene-1-ol.

**Green Chemistry**

Microwave induced organic synthesis: Introduction, Advantages, Limitations & Applications- Esterification, Deacetylation.

Sonochemistry: Introduction, Synthetic Applications – Esterification, Saponification, Hydrolysis, Substitution.

**Text Books:**

S.No.	Authors	Title	Publishers	Year & Edition
1	B.S. Bah l & ArunBahl	Advanced Organic Chemistry	S Chand & Co.,	2014 15 Edn
2	I.L. Finar	Organic Chemistry Vol I	Pearson India	2012 6 <sup>th</sup> Edn
3	Jagdamba Singh & L.D.S. Yadav	Organic Synthesis	Pragati Prakashan	2016 11 Edn
4	V.K. Ahluwalia, Renu Aggarwal	Organic Synthesis- Special Techniques	Narosa Publishing House	2012 2 Edn

**Reference Books**

S.No.	Authors	Title	Publishers	Year & Edition
1	I.L. Finar	Organic Chemistry Vol II	Pearson Education	2011 5 Edn
2	R.T.Morrison & R.W. Boyd	Organic Chemistry	Pearson Prentice Hall	2011 17 Edn
3	N.Tewari	Advanced Organic Chemistry	Books and Allied Pvt., Ltd.,	2016 Reprint

**Pedagogy:** Lecture by chalk and talk, power point presentation, e-content, group learning, group discussion, assignment, quiz, peer learning, student seminar, problem solving exercise

**Course Designers:**

1. Dr. E.Kayalvizhy
2. Dr. G.Selvi

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
<b>CE23C07</b>	<b>PHYSICAL CHEMISTRY</b>	<b>THEORY</b>	<b>58</b>	<b>2</b>	<b>-</b>	<b>4</b>

### Preamble

Enable the students to

- understand the theories of chemical kinetics
- acquire insight into photochemical laws and reactions
- learn the types of adsorption isotherms / theories of catalysis
- gain knowledge about the various symmetry elements
- understand the principles of quantum chemistry

### Course Learning Outcomes

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

<b>CLO Number</b>	<b>CLO Statement</b>	<b>Knowledge Level</b>
CLO1	Relate and illustrate the concepts of kinetics ,various laws of photo/surface chemistry and recognize the principles of group theory and quantum chemistry	K1
CLO2	Relate and compare the theories of kinetics , photochemical and photo physical processes, isotherms and molecular-crystallographic symmetry	K2
CLO3	Utilize the kinetics of complex, fast , photochemical reactions and apply adsorption isotherms, symmetry behaviors of various molecules	K3
CLO4	Analyze and examine the theories of kinetics, photo physical processes ,catalysis , One and Three Dimensional boxes	K4

### Mapping with Programme Learning Outcomes

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	S	S	S
CLO4	M	S	S	S	S

S-Strong ; M-Medium

## PHYSICAL CHEMISTRY CE23C07 (58 Hrs)

### Unit - I (11Hrs)

#### Chemical Kinetics-II

Theories of unimolecular reactions – Lindemann's theory, Hinshelwood Theory. Kinetics of complex reactions – opposing or reversible, consecutive & chain reactions. Kinetics of reactions in solution-diffusion controlled reactions. Influence of ionic strength and Solvent on reaction rates in solutions. Kinetics of fast reactions – stopped flow, flash photolysis and pulse radiolysis techniques.

### Unit - II (12 Hrs)

#### Photochemistry

Absorption of light and photochemical processes. Differences between thermal and photochemical reactions – Lambert Beer's law. Grotthus-Draper law – Stark-Einstein law. The hydrogen-bromine reaction, The hydrogen-chlorine reaction, comparison between the above two photochemical and thermal reactions, decomposition of acetaldehyde. Photophysical processes – Jablonski diagram - Fluorescence, Phosphorescence, photosensitization and chemiluminescence. (Elementary treatment only).

### Unit – III (12 Hrs)

#### Surface Chemistry

Adsorption vs absorption – Different types - Differences between physisorption and chemisorption - Adsorption isotherms and isobars. The Freundlich and Langmuir adsorption isotherms only.

Catalysis – Types. Theories – intermediate adsorption theory, modern adsorption theory. Industrial applications.

### Unit - IV

#### Group Theory (11 Hrs)

Symmetry elements-symmetry operations-point groups of simple molecules (Water, Ammonia, Benzene) - Identification & determination. Comparison of molecular & crystallographic symmetry. Group multiplication table-Matrix representation of symmetry operations.

### Unit-V (12Hrs)

#### Quantum Chemistry

Principles of quantum chemistry - Postulates of quantum mechanics (only statements). Concepts of operators, Eigen functions, Eigen values, Schrodinger equation. Particle in one dimensional box – derivation for energy. . Applications to particle in a box model – Quantization effects – Electronic spectra - particle in a three-dimensional box -separation of variables – degeneracy.

#### Text Books

S.No.	Authors	Title	Publishers	Year and Edition
1.	B.R. Puri, L.R. Sharma, M.S. Pathania	Principles of Physical Chemistry	Vishal Publications	2016 47 Edn
2.	P.L.Soni, O.P.Dharmarha & U.N.Dash	Text Book of Physical Chemistry	Sultan Chand & Co.,	2016 Revised
3.	S. Swarnalakshmi, T. Saroja, R. M. Ezhilarasi	A Simple Approach to Group Theory in Chemistry	University Press Publishers	2008 1 Edn
4.	A.K Chandra	Quantum Chemistry	Tata McGraw	2017 4 Edn
5.	P.W. Atkins, J. D. Paula	Physical Chemistry	Oxford University Press	2017 11 Edn

#### Reference Books

S.No.	Authors	Title	Publishers	Year and Edition
1.	ArunBahl, B. S.Bahl, G. D. Tuli	Essentials of Physical Chemistry	S. Chand & Co.	2014 & 5 <sup>th</sup> Edn.
2.	Gurdeep Raj	Advanced Physical Chemistry	ParkatiPrakasa m Publishers	2019 & 22 <sup>nd</sup> Edn.
3.	K.J. Laidler	Chemical Kinetics	Pearson Education Pvt. Ltd	2014 & 3 <sup>rd</sup> Edn.
4.	K. V. Raman	Group Theory and its Applications to Chemistry	Tata McGraw- Hill Publishing Co.	2004 & 3 <sup>rd</sup> Edn.
5.	R.K. Prasad Quantum Chemistry New Age	R.K. Prasad Quantum Chemistry New Age	R.K. Prasad Quantum Chemistry New Age	2020 & 4 <sup>th</sup> Edn.

**Pedagogy:** Lecture by chalk and talk, power point presentation, e-content, Numerical exercise, group discussion, assignment, quiz, peer learning, seminar

**Course Designers:**

**1. Dr. N.Shyamaladevi**

**2. Dr. C.Nithya**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
<b>CE23E01</b>	<b>POLYMER CHEMISTRY</b>	<b>THEORY</b>	<b>58</b>	<b>2</b>	<b>-</b>	<b>4</b>

### Preamble

To enable the students to

- learn the basic concepts and classification of polymers
- impart knowledge about polymerization techniques/mechanism
- understand the stereochemistry and molecular weight determination methods of polymers
- familiarize the different polymer processing techniques

### Course Learning Outcomes

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

<b>CLO Number</b>	<b>CLO Statement</b>	<b>Knowledge Level</b>
CLO1	recall the basic concepts and know the importance of stereochemistry, polymer additives, and specialty polymers	K1
CLO2	understand the classification and properties of polymers, polymer modification and recycling processes	K2
CLO3	identify the stereochemistry, mechanism and manufacturing methods of polymers along with its modification	K3
CLO4	analyze stereochemical aspects, characterisation methods and polymer processing techniques of polymers	K4

### Mapping with Programme Learning Outcomes

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
CLO1	S	S	M	S	S
CLO2	S	S	M	S	S
CLO3	S	S	M	S	S
CLO4	S	S	M	S	S

S-Strong ; M-Medium

**UNIT-I****(12 Hrs)****Polymers**

Introduction and Properties, Basic concepts - monomers, polymers, polymerization, degree of polymerization, classification of polymers. Characteristics of step and chain growth polymerizations.

**Mechanisms of Polymerization**

Free radical, anionic and cationic -mechanisms of addition polymerization. Copolymerization, derivation of copolymer equation -Conditions of formation of block, alternate & random copolymers. Methods of formation of block &graft copolymers.

**UNITII****(11 Hrs)****Polymer Stereochemistry**

Stereospecific polymers -Factors influencing stereo regulations, tacticity of polymers - Tactic forms of polymers of mono substituted & 1,2- disubstituted ethylenes, Zeigler-Natta catalysts. Monometallic and bimetallic mechanisms of Zeigler - Natta polymerization (only mechanism), crystalline and amorphous states, methods of determination of degree of crystallinity, glass transition temperature - Factors influencing  $T_g$  - Determination and importance of  $T_g$ .

**UNIT-III****(12 Hrs)****Chemical Modification of Polymers**

Chemical Modification of Polymers – aminolysis, hydrolysis, vulcanization, cyclisation, hydrogenation, epoxidation, sulphonation, grafting and crosslinking of polystyrene.

**Polymer Technology**

Polymer processing techniques, calendaring, film casting, extrusion, compression moulding, injection moulding, blow moulding and foaming.

**Polymer Additives**

Introduction to plastic additives – fillers, plasticizers, UV stabilizers & absorbers, antioxidants, flame retardants, colourants, shaping and finishing, curing agents and photostabilizers

**UNIT-IV****(12 Hrs)****Polymer Characterization**

Molecular Weights-definition - Determination of molecular weights by End Group Assay, Ebullioscopy, Cryoscopy, Osmotic Pressure, Vapour Pressure, gel permeation chromatography. Thermal analysis (TGA, DTA, DSC of polymers), Light Scattering-Refractive Index increment, Ultracentrifuge and Viscosity methods.

**UNIT-V****(11 Hrs)****Manufacture of Polymers**

Manufacture of typical polymers - Polyethylene, PVC, Polystyrene, Nylon, Polyester, Phenolic resins, Teflon.

**Specialty Polymers**

Conducting polymers - Introduction, conduction mechanism, application. Applications of Polymer colloids, microgels, biomedical polymers. Recycling of polymers - Steps involved in recycling - Advantages and disadvantages.

**Text Books:**

S.No	Authors	Title	Publishers	Year & Edition
1	Fred. W. Billmeyer	Text book of Polymer Science	Wiley Eastern Ltd.,	2009 3 Edn
2	V.R. Gowariker, N.V.Viswanathan, Jayadev Sreedhar	Polymer Science	New Age International Ltd.,	2015 2 Edn

**Reference Books:**

S.No	Authors	Title	Publishers	Year & Edition
1	Bahadur & N.V. Sastry	Principles of Polymer Science	Narosa Publishers	2007 5 Edn
2	M.P. Stevens	Polymer Chemistry- An Introduction	Oxford Publications	2009 3 Edn
3	J.R. Fred	Polymer Science & Technology	Prentice Hall of India	2014 3 Edn

**Pedagogy** Lecture by chalk and talk, power point presentation, e-content, group discussion, assignment, quiz, peer learning, seminar

**Course Designers:**

1. Dr. S. JoneKirubavathy

2. Dr. P.Amutha

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CE23E02	ANALYTICAL CHEMISTRY	THEORY	58	2	-	4

#### Preamble

To enable the students to

- gain knowledge about the basic principles of gravimetric, volumetric and thermal analysis
- analyse the industrial applications of atomic absorption spectroscopy
- acquire knowledge about electroanalytical techniques

#### Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	explain the theories of gravimetric and volumetric analyses	K1
CLO2	compare the principles of thermal methods of analyses and illustrate their applications	K2
CLO3	outline the principles and applications of flame photometry and polarimeter	K3
CLO4	elaborate the theories and industrial importance of atomic absorption spectroscopy, principles, applications and working of polarography, nephelometry and turbidimetry	K4

#### Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	M
CLO3	S	S	S	S	M
CLO4	S	S	S	S	M

S-Strong; M-Medium

**UNIT I****(11Hrs)****Gravimetric and Volumetric Methods of Analysis**

Theories of precipitation, purification of precipitates. Volumetric analysis – Preparation of solutions, theories of indicators, principles of acid-base, redox, complexometric & precipitation titrations.

**UNIT II****(12Hrs)****Thermal Methods of Analysis**

Introduction - TGA - Types, principle & method, instrumentation, factors affecting TGA, applications. Differential Thermogravimetric analysis (DT) - Principle and working, instrumentation, factors affecting DTA, applications – calcium oxalate monohydrate, calcium acetate monohydrate & copper sulphate pentahydrate. Thermometric titrations – Apparatus & applications

**UNIT III****(12 Hrs)****Polarimetry & flame photometry**

Polarization of light - Specific rotation, measurement of rotatory power, polarimeter, applications of polarimetry.

Flame photometry - Principle, flame temperature, metallic spectra in flames, instrumentation and applications.

**UNIT IV****(11Hrs)****Atomic Absorption Spectroscopy**

Principle, preparation of samples, measurement of atomic absorption, methods of calibration, instrumentation, sources, devices for the formation of an atomic vapour. Optical system-detectors and indicators in AAS-Read out devices. Types of Burners. Analytical applications-Biochemical analysis-pollution analysis. Interferences-cation & anion interferences.

**UNIT V****(12Hrs)****Electroanalytical Methods**

**Polarography** - Principles, dropping mercury electrode, advantages and disadvantages, instrumentation. Applications – qualitative & quantitative analysis.

**Nephelometry & Turbidimetry** - Introduction, working principles, instrumentation, factors affecting measurement & applications

**Fluorimetry** - Principle and applications

**Text Books:**

S.No.	Authors	Title of the Book	Publishers	Year and Edition
1.	R. Gopalan, P. S Subramaniam & P. S Rangarajan	Elements of Analytical Chemistry	S. Chand & Co.	2013 & 3 <sup>rd</sup> Edn
2.	B. K Sharma	Instrumental Methods of Analysis	Goel Publishing House	2011 & 27 <sup>th</sup> Edn
3.	H. Kaur	Instrumental Methods of Chemical Analysis	PragatiPrakashan	2012 Reprint

**Reference Books:**

S.No.	Authors	Title of the Book	Publishers	Year and Edition
1.	S. M. Khopkar	Fundamentals of Analytical Chemistry	New Age International (Pvt) Ltd.	2008 & 3 <sup>rd</sup> Edn.
2.	Mahindersingh	A Text Book of Analytical Chemistry – Instrumental Techniques	Dominant Publishers & Distributors (Pvt) Ltd.	2005 & 2 <sup>nd</sup> Edn

**Pedagogy:** Lecture by chalk and talk, power point presentation, e-content, group discussion, assignment, quiz, peer learning, student seminar, problem solving exercise.

**Course Designers:**

1. Dr. S. Jone Kirubavathy

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
<b>CE21AC1</b>	<b>ALC– AGROINDUSTRIAL CHEMISTRY</b>	<b>THEORY</b>			<b>Self-study</b>	<b>5</b>

### **Preamble**

To enable the students to

- become familiar with water analysis and treatment
- acquire knowledge about the extraction of perfumes
- recognize the roles of fertilizers and pesticides
- understand the chemistry of sugar, oil, fats and waxes

### **Course Learning Outcomes**

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

<b>CLO Number</b>	<b>CLO Statement</b>	<b>Knowledge Level</b>
CLO1	describe the importance of water treatment, manufacture of perfumes, fertilizers, sugars, oils, fats & waxes	K1
CLO2	outline the quality parameters (water) and manufacturing techniques, perfumes, fertilizers, sugars, oils, fats & waxes	K2
CLO3	Illustrate the commercially important properties of water, perfumes, fertilizers, sugars, oils, fats & waxes	K3
CLO4	analyze the chemistry of water, perfumes, fertilizers, sugars, oils, fats & waxes	K4

### **Mapping with Programme Learning Outcomes**

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
CLO1	S	S	M	S	S
CLO2	S	S	M	S	S
CLO3	S	S	M	S	S
CLO4	S	S	M	S	S

S-Strong; M-Medium

## **ALC –I AGROINDUSTRIAL CHEMISTRY CE21AC1**

### **UNIT I**

#### **Water Treatment & Analysis**

Sources of water supply for agriculture. Hard & soft water. Water softening methods: lime soda process, phosphate conditioning, permutit and ion-exchange processes. Water analysis; determinations of hardness, acidity, alkalinity, pH value, amount of free carbon dioxide, fluoride content, chloride content & their estimations. Biological Oxygen Demand (BOD), chemical oxygen demand (COD), chlorine demand and their determinations. Impact of heavy metals (Pb, Cd & Hg) Treatment of industrial effluents (primary and secondary processes).

### **UNIT II**

**Synthetic Perfumes** Introduction, ingredients of perfumes – vehicle, fixatives, odoriferous substance (definition, examples only). Manufacture of perfume – flowchart. Extraction with volatile solvent, prickling. Important essential oils (examples only).

**Natural Perfumes** - Production of natural perfumes, flower perfumes, fruit flavours.

### **UNIT III**

#### **Fertilizers**

Effect of N, P, K, secondary nutrients & micro nutrients on plant growth / development. Importance of nitrogenous fertilizers. Nitrogen cycle and fixation of atmospheric nitrogen. Principle and manufacture of ammonium nitrate, ammonium sulphate, urea and nitrolim. Phosphate fertilizers. Preparation and uses of mono / diammonium phosphates, super phosphates, and triple super phosphates. Potassium fertilizers-potassium nitrate, potassium chloride, potassium sulphate. Mixed fertilizers. Methods of compost in green manuring, concentrated organic manures and their chemical composition. Oil cakes, horn and hoof meal.

#### **Pesticides**

Classification – Insecticides, fungicides & herbicides. General methods of preparation, application & toxicity. Insect attractants & repellants - Fluorine compounds, boron compounds, arsenic compounds, organomercuric compounds, DDT, BHC, Pyridine compounds.

## UNIT IV

### Chemistry of Sugar and Fermentation

Details of manufacture of sucrose from cane sugar-extraction of juice, purification, concentration, crystallization, separation & refining of crystals, recovery of sucrose from molasses. Manufacture of sucrose from beetroot. Estimation of sucrose & inversion of sugar by Polarimetry. Manufacture of alcohol from molasses & starch by fermentation process.

## UNIT V

### Oils, Fats and Waxes

Classification of oils, fats & waxes. Distinction between oils, fats & waxes. Essential oils - Isolation and its uses. Hydrogenation of oils - Principle & manufacture. Definition & determination of saponification value, acid value, iodine value, RM value and Hehner value & their significance. Elaiden test for oils. Some common waxes like spermaceti, bees wax, bayberry wax & their uses. Soap & its manufacture: toilet & transparent soaps. Cleansing action of soaps & detergents

### Text Books:

S.No.	Authors	Title	Publishers	Year and Edition
1	B.K.Sharma	Industrial Chemistry	Goel Publishing House	2014 3 Edn.
2	M.C. Arora & M. Singh	Industrial Chemistry	Anmol Publications	2004 Reprint

### Reference Book:

S.No.	Authors	Title	Publishers	Year and Edition
1	S.S.Dara	Textbook of Engineering Chemistry	S Chand & Co.,	2014 3 Edn
2	P. C. Jain & M.Jain	Engineering Chemistry	Dhanpat Raj Publishing Company Pvt., Ltd.,	2009 18 Edn
3	B. Srilakshmi	Food Science	New Age International Pvt., Ltd.,	2015 6 Edn

### Course Designer:

1. Dr. N. Anusuya

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CE21AC2	ALC-PHARMACEUTICAL CHEMISTRY	THEORY		Self-study		5

### Preamble

Enable the students to

- Understand the basic concepts of chemistry and routes of drug administration
- Acquire knowledge about medicinally important compounds and cardiovascular drugs
- Know the role of synthetic drugs and organic pharmaceutical aids

### Course Learning Outcomes

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

CLO Number	CO Statement	Knowledge Level
CLO1	Identify the chemistry of drug molecules	K1
CLO2	classify illustrate the routes of drug administration	K2
CLO3	Illustrate the different types of synthetic drugs	K3
CLO4	Analyse the medical importance of compounds & explain the importance of organic compounds in pharmaceuticals	K4

### Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	S	S	S	M	M	M
CLO2	S	S	S	M	M	M
CLO3	S	S	S	M	M	M
CLO4	S	S	S	M	M	M
CLO5	S	S	S	M	M	M

S-Strong ; M-Medium

## ALC - PHARMACEUTICAL CHEMISTRY CE21AC2 (Self study)

### UNIT I

#### Basic Concepts of Drugs

Definition- drug, pharmacology, pharmacognosy, pharmacy, therapeutics, toxicology, chemotherapy, pharmacopeia (BP, IP, USP), national formulary, pharmacophore, bacteria, virus, vaccines, toxoids, primary immunization, additive effect, synergism, antagonism, placebo, LD<sub>50</sub>, ED<sub>50</sub> and therapeutic index. Sources, routes, biotransformation, prolongation & excretion of drugs, drug toxicity.

### UNIT II

#### Synthetic Drugs-I

**Analgesics** - Definition -Different types of pain (superficial, deep non visceral, visceral, referred & psychogenetic), classification-Morphine & its derivatives. Synthetic assay & uses of Pethidine and Methadone

**Antipyretic Analgesics** - Salicylic acid derivatives - Paracetamol, phenacetin - Propanoic acid derivative - Ibuprofen.

**Antibiotics** - Definition, microbial synthesis structure, assay & uses of Chloramphenicol & Penicillin. Structure & uses of Streptomycin and Tetracyclines.

**Sulphonamides** - Definition, mechanism of action, classification, SAR, synthesis & uses of Sulphacetamide, Sulphathiazole, Phthalylsulphathiazole - Sulphadiazine and Sulpha pyridine - assay.

### UNIT III

#### Synthetic Drugs – II

**Antiseptics and Disinfectants** - Definition and disinfection – phenol coefficient – examples – phenolic compounds, dyes, cationic surfactants & chloro compounds. Tranquilizers-definition & examples. Psychedelic drugs- LSD and marijuana.

**Anaesthetics** - Definition – classification - volatile anaesthetics (nitrous oxide, ethers, halohydrocarbons, chloroform, haloethane)- Ferguson principle-intravenous anaesthetics-

structure of thiopental sodium – local anaesthetic cocaine - source & structure-preparation & uses of procaine orthocaine and benzocaine.

**Cancer and Antineoplastic Drugs** - Antimetabolite, natural substances, hormones, alkylating agents, inorganic complexes & other compounds - Definition of hypoglycemic drugs - types & cause for diabetic – examples (Sulphonylureas and biguanides).

## UNIT IV

### Medicinally Important Compounds

Al, P, As, Hg & Fe. Uses of  $MgSO_4 \cdot 7H_2O$ , milk of magnesia, magnesium trisilicate, aluminium hydroxide gel, dihydroxyaluminiumaminoacetate, aluminium acetate and aluminium mono stearate - paroxon -phosphorine, cyclophosphamide – tricyclophos - preparation & uses of thio tepa-sodium and copper cacodylates-preparation and uses of aromatic arsine (carbosone, tryparsamide, acetarsonide, neoarsphenamine, oxophenaridine)  $HgCl_2$  /  $HgI_2$  &  $Hg(CN)_2$  as disinfectants – importance of organic mercury compounds, structure & uses of thiomersal, netro mersalmer bromine & mersalylacids, ferrous gluconate,  $FeSO_4$ , scale preparation (ferric ammonium acetate) ferrous fumarate, ferrous succinate & ferrous chlorinate.

## UNIT V

### Organic Pharmaceutical Aids

Definition, agents for kidney function (aminohippuric acid) – liver function (sulphobrothalein sodium, rose Bengal), Corneal ulcer detection (Fluorescein sodium), Blood volume determinations (Evans blue) pituitary function (metyrapone), Ointment bases, preservatives – antioxidants - sequestrants, colouring, sweetening, flavouring, emulsifying and stabilizing agents.

### AIDS

Causes of HIV, Propagation, Prevention & Treatment.

### Cardiovascular Drugs

Blood-composition - grouping-Rh factor-buffers in blood-Functions of plasma proteins-clotting mechanism-blood pressure. Definition & names of following drugs - Coagulants and anticoagulants- Cardiotonic drugs, Antiarrhythmic drugs, Antihypertensive drugs, Antianginal agents, Vasodilators, Lipids lowering agents, Sclerosing agents.

**Text Books:**

<b>S.No.</b>	<b>Authors</b>	<b>Title</b>	<b>Publishers</b>	<b>Year and Edition</b>
1	R.S Satoskar & S.D.Bhandarkar	Pharmacology and Pharmatherapeutics, Vol 1 & 2	Popular Prakashan	2009 21 Edn
2	Ashutosh Kar	Medicinal Chemistry	NewAge International	2005 3 Edn

**Reference Books:**

<b>S.No</b>	<b>Authors</b>	<b>Title</b>	<b>Publishers</b>	<b>Year and Edition</b>
1	G.Patrick	Medicinal Chemistry	Viva Books Pvt., Ltd.,	2002 1 Edn
2	D. Sriram, P.Yogeeswari	Medicinal Chemistry	Pearson Education	2010 2 Edn
3	Jayashree Ghosh	A Text Bookof Pharmaceutical Chemistry	S. Chand &Co.	2012 Revised

**Course Designer:**

1. Dr.G.Subashini

**Project and Viva Voce (CE23PROJ)****Hours: 60****Credit: 5****CIA: 25 Marks****ESE: 75 Marks****Total: 100 Marks****Objectives**

Make the students to

- understand the importance of experimental analysis, scientific approach in solving problems related to the environment and society
- educate and motivate the students to write scientific papers.

**Group Project and Viva Voce**

Each faculty will be allotted 5 students. A specific problem will be assigned to the students. The topic/area of work will be finalized at the end of IV semester, allowing scope for the students to gather relevant literature during the vacation. The research work will be carried out in the chemistry laboratory. Viva Voce/presentation will be conducted by a panel comprising of HOD, internal examiners. A power point presentation by the student group will be evaluated on the basis of students' response to the questions.

**Area of Work**

Synthetic Organic Chemistry, Coordination Chemistry, Corrosion Studies, Environmental Chemistry, Polymer Chemistry, Phytochemistry, Nanochemistry, Physical Chemistry.

**Methodology**

Each project should contain the following details:

Brief introduction on the topic

Review of Literature

Materials and Methods

Results and Discussions – evidences in the form of figures, tables and photographs

Conclusion / Summary

Bibliography

The above contents should not exceed 50 pages

**Evaluation - Total - 100 Marks (Internal –25 marks, External – 75 marks)****Internal****Total -25 marks**

I Review – Selection of the field of study, Topic & Literature collection - 5 marks

II Review – Research Design and Data Collection - 10 marks

III Review – Analysis & Conclusion, Preparation of rough draft - 10 marks

**External****Total – 75 marks****Project****25 marks****Viva Voce****50 marks**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
CE23SB01	Skill Based Subject Computational Chemistry	THEORY	41	4	-	3

### **Preamble**

To enable the students to understand the basic concepts in computational chemistry, hard and soft drugs & the applications of open source tools in chemistry to stimulate molecular structures

### **Course Learning Outcomes**

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

<b>CLO Number</b>	<b>CLO Statement</b>	<b>Knowledge Level</b>
CLO1	recall the fundamentals of computers and computational chemistry tools	K1
CLO2	identify the biological databases for various application, the DNA sequencing methods, develop chemical structure representations using open source tools	K2
CLO3	sketch GUI display of chemical structure, perform text and structure based searches, determine the relative score made by matching two characters in a sequence alignment	K3
CLO4	analyse chemical structure representations using open source tools, recognize the challenges and opportunities in bioinformatics	K4

### **Mapping with Programme Learning Outcomes**

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
CLO1	S	S	S	S	M
CLO2	S	S	S	S	M
CLO3	S	S	S	S	M
CLO4	S	S	S	M	M

S-Strong; M-Medium

**Skill Based Subject**  
**Computational Chemistry CE23SB01 (41 Hrs)**

**Unit I** **(8 Hrs)**

**Fundamentals of Computers in Chemistry**

Introduction to computers- Data and information, Computer system organisation, representation of numbers. Computer software's in chemistry- Introduction, Chemical Inventory System (CIS), Material Safety Data Sheet (MSDS), Electronic handbooks, Database.

**Unit II** **(8 Hrs)**

**Introduction to Cheminformatics**

Introduction- History & evolution, uses & prospects. Computer representation of chemical structure-graph, theoretical representation of chemical structures, connection tables and linear notations. Structure & substructure searching.

**Unit III** **(9 Hrs)**

**Cheminformatics tools**

Chemical structure representation (SMILES and SMARTS); Chemical databases: CSD, ACD, WDI, Chembank, PUBCHEM, Chemical structure file formats- SDF, Mol, XYZ, PDB; Structure visualization. Open source tools – Chem office, Chem draw, chem doodle, Chemistry 4D, Computational chemistry software sites.

**Unit IV** **(8Hrs)**

**Introduction to Molecular Modeling**

Molecular Modeling and Pharmaco-informatics in Drug Design, Phases of Drug Discovery,

**Molecular interaction**

Bond structure and bending angles – electrostatic, vander Waals and non\_bonded interactions, hydrogen bonding, Inter and intramolecular interactions: Weak interactions in drug molecules; hydrogen bonding in molecular mechanics

**Unit V** **(8Hrs)**

**Virtual Screening:** Introduction, “Drug likeness” and compound filters, Structure based virtual screening – protein-ligand docking, scoring function for protein-ligand docking.

**Properties of drugs:** Concept of hard and soft drugs; Chemistry of ADME and toxicity properties of drugs. Lipinski rule.

### Textbooks

S.No	Authors	Title of the Book	Publishers	Year and Edition
1	Ramesh Kumari	Computers & their Applications to Chemistry	Narosa Publishing House Pvt Ltd	2007, 2 Edn
2	Kishor Arora	Computers Applications in Chemistry	Anmol Publication Pvt Ltd	2004, 1 Edn

### Reference books

S.No	Authors	Title of the Book	Publishers	Year and Edition
1	Rajarsha Guha & Andreas Bender	Computational Approaches in Cheminformatics & Bioinformatics	Wiley India Pvt Ltd	2012 1 edn

### Pedagogy

Lecture by chalk and talk, power point presentation, e-content, group learning, group discussion, assignment, quiz, peer learning, student seminar, problem solving exercise

### Course Designers

1. Dr. G. Sathya Priyadarshini
2. Dr Sowmya Ramkumar

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
<b>CE23C08</b>	<b>ORGANIC CHEMISTRY</b>	<b>THEORY</b>	<b>88</b>	<b>2</b>	<b>-</b>	<b>5</b>

#### **Preamble**

To enable the students to understand the structure and functions of carotenoids and anthocyanins, acquire knowledge about amino acids, peptides, proteins, enzymes and nucleic acids; learn the chemistry of vitamins, drugs, chemotherapeutics and mechanism of organic rearrangements

#### **Course Learning Outcomes**

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

<b>CLO Number</b>	<b>CLO Statement</b>	<b>Knowledge Level</b>
CLO1	reproduce the importance of phyto and biologically important compounds, rearrangement reactions	K1
CLO2	recognize and extend the synthesis of carotenoids, anthocyanins, amino acids, peptides, hormones, enzymes, nucleic acids, vitamins and drugs	K2
CLO3	identify the nature and uses of pigments, amino acids, peptides, hormones, enzymes, nucleic acids, vitamins and drugs	K3
CLO4	analyze and predict the mechanistic pathways of biologically important compounds and rearrangement reactions	K4

#### **Mapping with Programme Learning Outcomes**

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
CLO1	S	S	M	S	S
CLO2	S	S	M	S	S
CLO3	S	S	M	S	S
CLO4	S	S	M	S	S

S-Strong; M-Medium;

## ORGANIC CHEMISTRY - CE23C08 - 88 HRS

### UNIT I

(17 Hrs)

#### Carotenoids and Anthocyanins

Carotenoids - Introduction, carotenes -  $\alpha$ ,  $\beta$  and  $\gamma$  carotene, lycopene

Anthocyanins - general nature and structure of the anthocyanins. Flavone - introduction, Kostanecki and Baker Venkatraman synthesis. Quercetin and isoflavones. Biosynthesis of flavonoids.

### UNIT II

(18 Hrs)

#### Amino acids, Peptides, Proteins and Hormones

Aminoacids – definition, classification, preparation – amination of halogen acids, Gabriel phthalimide synthesis, Strecker synthesis, Erlenmeyer azlactone synthesis. Reactions of  $\alpha$  - amino acid – reactions of amino and carboxylic groups, action of heat on  $\alpha$ ,  $\beta$  and  $\gamma$  amino acids. Polypeptides - nomenclature, synthesis - Bergaman & Fischer methods, solid state peptide synthesis, N- terminal and C- terminal analysis of peptides.

Proteins – classification, properties & tests. Primary, secondary & tertiary structures. Colour reactions, denaturation & importance.

Hormones - thyroxine, oxytonin, insulin and thyrotropin

### UNIT III

(18Hrs)

#### Enzymes and Nucleic acids

Enzymes - properties, classification, mechanism of enzyme action, co-enzyme - mechanism of coenzyme action, examples of coenzyme, factors influencing enzyme action - Temperature, pH concentration of enzymes, concentration of substrate. Michaleis-Menton equation, state of oxidation, effect of light, radiation and temperature.

Nucleic acids - spectra of pyrimidine and purine bases, structure of nucleosides and nucleotides - RNA and DNA

### Unit IV

(17 Hrs)

#### Vitamins and Drugs

Vitamins - introduction, importance of vitamins, structural elucidation, synthesis, deficiency diseases & sources of retinol, thiamine, riboflavin & ascorbic acid.

Drugs - introduction, classification, lethal dose, chemistry & application of sulpha drugs.

Indian knowledge system on medicines - traditional medicines an overview. Ayurvedic and

allopathic medicines used as antimalarial, amebicides, antiseptics, antipyretics, analgesics and antibiotics.

## Unit V

(18 Hrs)

### Molecular Rearrangements

Types of rearrangements – nucleophilic, electrophilic & free radical, inter and intramolecular. Normal and cross-over products, migrating aptitude of groups. Pinacol – pinacolone, Claisen (ortho and para rearrangement), Beckmann, Hofmann, Curtius, Benzilic acid, Lossen, Hydroperoxide, Wagner-Meerwein rearrangements, Baeyer-Villiger oxidation and Dakin reaction.

#### Text Books:

S.No.	Authors	Title	Publishers	Year and Edition
1	B. S. Bahl, Arun Bahl	Advanced Organic Chemistry	S.Chand	2012 5 Edn.
2	Ashutosh Kar	Medicinal Chemistry	New Age International	2007 4 Edn.
3	V.K. Ahluwalia	Organic Reaction Mechanisms	Narosa	2007 3 Edn.

#### Reference Books:

S.No.	Authors	Title	Publishers	Year and Edition
1	O.P. Agarwal	Organic Chemistry Natural Products, Vol.I	Goel Publishers	2013 42 Edn.
2	O.P. Agarwal	Organic Chemistry Natural Products, Vol.II	Goel Publishers	2014 41 Edn.
3	I.L. Finar	Organic Chemistry Vol.I&Vol.II	Pearson Education	2011 5 Edn.

#### Pedagogy:

Lecture by chalk and talk, power point presentation, e-content, group learning, group discussion, assignment, quiz, peer learning, student seminar, problem solving exercise

#### Course Designers:

1. Dr. E. Kayalvizhy
2. Dr. G. Selvi

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
<b>CE23C09</b>	<b>PHYSICAL CHEMISTRY</b>	<b>THEORY</b>	<b>73</b>	<b>2</b>	<b>-</b>	<b>5</b>

### **Preamble**

To enable the students to learn about the fundamental concepts of electrolytes and electrolytic dissociation, understand the basic concepts of electro chemical cells, calculations of cell potential, electrochemical series and its application, gain knowledge about various applications of EMF measurements and equip learners with concepts of ionization constants, indicators, principles, classification and application of batteries, fuel cells and corrosion

### **Course Learning Outcomes**

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

<b>CLO Number</b>	<b>CLO Statement</b>	<b>Knowledge Level</b>
CLO1	recall the basics of electrochemistry	K1
CLO2	understand the various theories of Conductance, Working principles and techniques of Electrochemical system.	K2
CLO3	apply the concepts of Electrochemistry in the determination of Conductivity measurements, EMF of the cell, thermodynamic parameters and magnetic properties.	K3
CLO4	analyze the Electrochemical behavior of various electrochemical systems	K4

### **Mapping with Programme Learning Outcomes**

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
CLO1	M	S	S	S	S
CLO2	M	M	S	S	S
CLO3	S	S	S	S	S
CLO4	S	S	S	S	S

S-Strong; M-Medium;

## PHYSICAL CHEMISTRY- CE23C09 - 73 HRS

### UNIT I

(15 Hrs)

#### Electrical Conductance and Measurements

Metallic and electrolytic conductors – specific, equivalent and molar conductance, measurement of conductance, variation of conductance with dilution for strong and weak electrolytes. Transport number and its determination by Hittorff and moving boundary method. Kohlrausch law and its applications, Arrhenius theory of dissociation, Ostwald's dilution law. Applications of conductivity measurements – degree of dissociation of weak electrolytes, determination of solubilities and solubility product of sparingly soluble salts and conductometric titrations.

Theory of strong electrolytes – Debye-Huckel-Onsager theory.

### UNIT II

(15 Hrs)

#### Electrochemical cells

Electrochemical cell: Definition, example, significance features. Electrolytic cell, difference between electrochemical and electrolytic cell, schematic representation.

Electrode potentials: Single and standard electrode potentials. Weston standard cell, reversible cell, irreversible cell. Types of electrodes (definition and derivation of EMF for each electrode), problems. Determination of standard electrode potentials of Zinc and Copper electrodes. Reference electrodes – measurements of standard electrode potential of  $Zn/Zn^{2+}$  and  $Cu/Cu^{2+}$  electrodes. Electrochemical series – applications, problems. Activity and activity coefficients of electrolytes, Problems.

### UNIT III

(15 Hrs)

#### Electrochemical reactions

Thermodynamics of electrochemical reactions: Derivation of Nernst equation and its use in calculating EMF of cells and different activities of individual electrodes. Relationship between EMF and change in free energy, enthalpy, entropy occurring in electrochemical reactions. Equilibrium constants for electrochemical reactions. Classification: Chemical cells and concentration cells with and without transference. Definition and derivation of EMF of each cell - liquid junction potential.

### **Applications of EMF and its measurements**

Applications of EMF: Calculation of valency of ions - free energy, enthalpy and entropy changes in electrochemical reactions - solubility product of sparingly soluble salt-transport number of ions. pH and its determination using hydrogen, quinhydrone and glass electrodes.

Potentiometric titrations – acid-base, redox and precipitation titrations, Advantages. Problems.

### **UNIT IV**

**(14 Hrs)**

#### **Ionic Equilibria**

Generalized concepts of acids and bases - dissociation of weak acids and weak bases - ionic product of water, pH, pOH, pKa - common ion effect - buffer solutions (weak acid and its salt-weak base and its salt) - Henderson's – Hasselbalch equation. Hydrolysis of salts of weak acids & strong bases, strong acids & weak bases, weak acids & weak bases - determination of degree of hydrolysis. Acid - base indicators, acid-base titrations - solubility and solubility product - applications of solubility product. Problems.

### **UNIT V**

**(14 Hrs)**

#### **Batteries**

Types, characteristics. Primary batteries – dry cells, metal-air batteries,  $\text{Ag}_2\text{O}$ -Zn batteries. Secondary batteries – Pb-acid battery.

#### **Fuel cells**

Classification,  $\text{H}_2$  –  $\text{O}_2$  fuel cell, Hydrocarbon – Oxygen fuel cell, Phosphoric acid fuel cells.

#### **Corrosion**

Types & importance of corrosion. Passivation of metals – Electrochemical principles of corrosion

**Electrodeposition:** Principle and applications

**Text Books:**

S.No	Authors	Title	Publishers	Year and Edition
1	B.R. Puri, L.R. Sharma, M.S. Pathania	Principles of Physical Chemistry	Vishal Publications	2010 44 Edn.
2	P.L. Soni, O.P. Dharmarha & U. N. Dash	Text Book of Physical Chemistry	Sultan Chand & Co.,	2016 Revised
3	Arun Bahl, B.S. Bahl, G.D. Tuli	Essentials of Physical Chemistry	Sultan Chand & Co.,	2014 5 Edn.

**Reference Books:**

S.No	Authors	Title	Publishers	Year and Edition
1	Gurdeep Raj	Advanced Physical Chemistry	Goel Publishing House	2014 34 Edn.
2	S. Glasstone	Introduction to Electrochemistry	East-West Press Pvt., Ltd.,	2014 Revised
3	W.J. Moore	Physical Chemistry	Longmans Publications	1999 Reprint 5 Edn.
5	P.W. Atkins, J.D. Paula	Elements of Physical Chemistry	Oxford University Press	2017 7 Edn.

**Pedagogy:**

Lecture by chalk and talk, power point presentation, e-content, group discussion, assignment, quiz, peer learning, seminar.

**Course designers:**

1. Dr. D. Nalini
2. Dr. N. Muthulakshmi Andal

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CE23C10	PHYSICAL METHODS AND CHEMICAL STRUCTURE	THEORY	88	2	-	5

#### Preamble

To enable the students to gain knowledge about the fundamental concepts of various spectroscopic techniques; understand the basic principles of XRD, analyze the significance of crystallographic point groups and crystal systems and basic principles, applications of different chromatographic techniques

#### Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	define the fundamental properties of electromagnetic spectrum; identify the importance of chromatographic techniques.	K1
CLO2	understand the concepts and selection rules of spectral techniques, symmetry properties and principles of chromatography	K2
CLO3	interpret and compare the theories of spectral techniques like Microwave, IR, Raman, Electronic, NMR, Mass and X-Ray Diffraction	K3
CLO4	analyze the spectra problems with stretching frequencies, $\lambda_{\max}$ values, chemical shift values, fragmentation pattern, labeling of planes.	K4

#### Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	S
CLO2	S	M	S	S	S
CLO3	S	M	S	S	S
CLO4	S	M	S	S	S

S-Strong; M-Medium;

## PHYSICAL METHODS AND CHEMICAL STRUCTURE - CE23C10 - 88 HRS

### UNIT I

(18 Hrs)

**Fundamental Concepts** Regions of electromagnetic spectrum - properties of electromagnetic radiations-concept of frequency, wavelength, wave number. Molecular energy levels, types of changes induced by the interaction of matter with electromagnetic radiation.

#### **Microwave Spectroscopy**

Theory (for diatomic molecule as rigid rotor), selection rules, isotopic substitution, intensity of spectral lines, instrumentation, application.

#### **IR Spectroscopy**

Theory for diatomic molecule as simple harmonic and anharmonic oscillator, selection rule, types of molecular vibrations, Vibrational modes of H<sub>2</sub>O and CO<sub>2</sub>- functional groups. IR spectra of alkanes, alkenes, simple alcohols, aldehydes, ketones. Applications – molecular constitution and hydrogen bonding.

### UNIT II

(17 Hrs)

#### **Raman Spectroscopy**

Rayleigh and Raman Scattering - Stokes and anti-Stokes lines. Classical theory, instrumentation - block diagram – comparison of IR and Raman spectroscopic techniques - mutual exclusion principle and its applications.

#### **UV –Visible Spectroscopy**

Fundamental laws of spectroscopy and selection rules, Beer-Lambert's law. Types of electronic transitions in organic molecules, chromophore, auxochrome, bathochromic and hypsochromic shifts. Woodward Fieser rules for calculation of  $\lambda_{\max}$  of conjugated dienes, unsaturated ketones, Franck-Condon principle-predissociation. Determination of dissociation energy – Birge – Sponer method.

### UNIT III

(18 Hrs)

#### **NMR Spectroscopy**

NMR-principle, instrumentation-NMR active nuclei, chemical shift -  $\delta$  and  $\tau$  scale & factors affecting chemical shift. Splitting of signals, spin-spin splitting. NMR spectrum of simple molecules such as acetone, anisole, benzaldehyde, ethyl acetate, ethylamine, ethylbromide, toluene and isopropylphenyl ketones, solvents used.

## Mass Spectrometry

Basic principles-instrumentation-representation of mass spectra-molecular ion-identification of parent ion-isotopic peaks-determination of molecular formula-meta stable peak. General fragmentation - Mc lafferty, retro diels alder rearrangements. Mass spectra of ethylbenzene, acetophenone, 1-propanol, Propanoic acid. Structural elucidation of simple organic compounds using IR, NMR, and Mass.

### UNIT IV

(17 Hrs)

## X-ray Diffraction

Fundamentals, Bragg's equation, powder & rotating crystal methods. Determination of lattice types, X-ray diffraction data for cubic crystal system - NaCl, KCl, CsCl, diamond and graphite. Bravais lattices, miller indices & labeling of planes, symmetry properties, crystallographic point groups & space groups.

### UNIT V

(18 Hrs)

## Chromatography

Column chromatography – principle, types of adsorbents, column preparation, elution, recovery of substances & applications. Paper chromatography – principle, solvents used, development of chromatogram, ascending, descending, radial paper chromatography & applications. Paper electrophoresis – separation of amino acids. Thin layer chromatography - principle, choice of adsorbents and solvents, preparation of chromatographic plates,  $R_f$  values - factors affecting and its significance.

### Text Book:

S.No.	Authors	Title	Publishers	Year and Edition
1	C. N. Banwell, E. M. McCash	Fundamentals of Molecular Spectroscopy	Tata McGraw Hill	2019 4 Edn.
2	B. R. Puri, L.R. Sharma, M.S. Pathania	Principles of Physical Chemistry	Vishal Publications	2020 48 Edn.
3	V. K. Srivatsava	Introduction to Chromatography	S.Chand Company &	1981 2 Edn.
4	Y.R Sharma	Elementary Organic Spectroscopy	S.Chand Company &	2021 Reprint 5 Edn.

**Reference Books:**

<b>S.No.</b>	<b>Authors</b>	<b>Title</b>	<b>Publishers</b>	<b>Year and Edition</b>
1	P.W Atkins	Physical Chemistry	Oxford university press	2014 10 Edn.
2	Jag Mohan	Organic spectroscopy, principles and applications	Alpha science international ltd.,	2009 4 Edn.
3	B K Sharma	Instrumental methods of chemical analysis	Goel publishing house	2014 26 Edn.
4	Anthony R West	Solid state chemistry and its applications	Wiley student edition	2014 2 Edn.

**Pedagogy:**

Lecture by chalk and talk, power point presentation, e-content, numerical exercise, group discussion, assignment, quiz, peer learning, seminar

**Course Course Designers:**

1. Dr. N. Arunadevi
2. Dr. S. Jone Kirubavathy

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
<b>CE23E03</b>	<b>DYE CHEMISTRY</b>	<b>THEORY</b>	<b>73</b>	<b>2</b>	<b>-</b>	<b>5</b>

### Preamble

To enable the students to familiarize the theories of colour and constitution /classification of dyes, acquire knowledge about the process of dyeing, gain vivid insight into the types of dyes - their synthesis, characteristics/applications; understand about pigments and their uses in paints

### Course Learning Outcomes

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

<b>CLO Number</b>	<b>CLO Statement</b>	<b>Knowledge Level</b>
CLO1	relate the types, classifications - colour & constitution, azo dyes, diphenyl methane dyes, pigments	K1
CLO2	examine the principles of colour formation, methods of azo coupling, synthesis of triphenyl methane dyes and azine dyes, reactions of dyes	K2
CLO3	classify dyes, azodyes, synthesis of phthalein dyes, thiazine dyes-mechanism, FBA	K3
CLO4	appraise the theories of colours, dyestuff intermediates, synthesis of xanthene, cyanin and phthalocyanin dyes, applications of non-textile dyestuffs	K4

### Mapping with Programme Learning Outcomes

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
CLO1	S	M	S	S	M
CLO2	S	M	S	M	M
CLO3	S	M	S	S	S
CLO4	S	M	S	S	S

S-Strong; M-Medium;

## DYE CHEMISTRY - CE23E03 - 73 HRS

### UNIT I

(14 Hrs)

#### Fundamental Concepts

Colour and constitution - colour of substances, complementary colours, chromophores, auxochromes, bathochromic shift, hypsochromic shift. Quinonoid theories of colour and constitution, Otto-Witt theory, modern theories - valence bond theory and molecular orbital theory. Classification of dyes - chemical classification & classification according to applications. Process of dyeing - direct dyeing, vat dyeing, mordant dyeing, substantive dyeing, disperse dyeing, dyeing with reactive dyes, cross dyeing.

### UNIT II

(15 Hrs)

#### Azo Dyes

Azo Dyes - principles of azo coupling, mechanism of diazotization - coupling with amines & phenols. Monoazo & bisazo dyes - synthesis & applications. Tautomerism in azo dyes. Chemistry of dyestuff intermediates - primaries, intermediates. Manufacture of intermediates - aliphatic compounds (alcohols, halogen compounds, carboxylic acids and esters, aldehydes & ketones, amines).

### UNIT III

(15 Hrs)

**Di and Triphenyl Methane Dyes** - synthesis and applications of diphenylmethane dyes - Auramin'O', Auramin G. Triphenyl methane dyes - leuco bases - pseudo bases - dye salts. Amino triphenyl methane dyes - Malachite green, Rosaniline & Crystal violet. Hydroxy triphenyl methane dyes - Aurin, Chrome violet.

**Phthalein Dyes** - phenolphthalein, phenosulpho - phthalein.

**Xanthene dyes** - acid xanthene dyes - Fluorescein, Eosin, Erythrocin. Xanthhydroly, basic xanthene dyes - Rhodamine - B, Rhodamine - G, Pyronine - G.

### UNIT IV

(14 Hrs)

#### Supplementary Dyes

Synthesis & applications of quinone imine dyes - indophenols, indamines. Azine dyes - Safranin -T, oxazine dyes, Meldola's blue, gallocyanine. Thiazine dyes - Methylene blue. Thiazole dyes - Pimuline, Thioflavin-T. Cyanine dyes - quinoline blue - Astrazone pink FG, Astrazone yellow

3G. Phthalocyanine dyes, acridine dyes. Indigo and Thioindigo.

## UNIT V

(15 Hrs)

### Pigments

Introduction, requirements of a pigment – organic / inorganic pigments & their uses in paints. Reactions of dyes with fibre & water. Fluorescent brightening agents - characteristic properties, classification. Non-textile uses of dyestuffs –leather dyes, paper dyes, food colours, solvent dyes, wood dyes, medicinal dyes, cosmetic dyes, photography, coloured smokes and camouflage colours.

#### Text Book:

S.No.	Authors	Title	Publishers	Year and Edition
1	Gurdeep R. Chatwal	Synthetic Dyes	Himalaya Publishing House Pvt., Ltd.,	2016 4 Edn.
2	B. K. Sharma	Industrial Chemistry	Goel Publishing House	2008 14 Edn.
3	O. D. Thyagi, M. Yadav	A Textbook of Synthetic Dyes	Anmol Publication Pvt., Ltd.,	2002 2 Edn.

#### Reference Books:

S. No.	Authors	Title	Publishers	Year and Edition
1	NIIR Board	The Complete Technology Book on Dyes and Dye Intermediates	National Institute of Industrial Research, New Delhi	2004
2	Pope Sine	Synthetic Dyes	Neha Publishers	2016 1 Edn.
3	Rajbir Singh	Synthetic Dyes	Mittal Publications	2002 1 Edn.
4	E. N. Abrahart	Dyes and their Intermediates	Edward Arnold Publishers	1977 2 Edn.

**Pedagogy:** Lecture by chalk and talk, power point presentation, e-content, group learning, group discussion, assignment, quiz, peer learning, student seminar.

#### Course Designers:

1. Dr. P. Kanchana
2. Dr. P. Amutha

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
<b>CE23E04</b>	<b>NOVEL INORGANIC SOLIDS AND NANOMATERIALS</b>	<b>THEORY</b>	<b>73</b>	<b>2</b>	<b>-</b>	<b>5</b>

### **Preamble**

To enable the students to reproduce the methods of synthesizing inorganic solids and learn their importance, understand the classification, composition and applications of nano materials; gain knowledge about applications of engineering materials and polymer composite materials.

### **Course Learning Outcomes**

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

<b>CLO Number</b>	<b>CLO Statement</b>	<b>Knowledge Level</b>
CLO1	Recall the applications of polymer, ceramics, Nano and composite materials	K1
CLO2	Classify the polymers, nanomaterial and composites based on its preparation and properties	K2
CLO3	Employ various techniques for the synthesis of Inorganic solids, engineering materials, ceramics and refractory	K3
CLO4	Compare and contrast the properties of metals and their alloys, polymers & their composites, natural& artificial nanomaterials	K4

### **Mapping with Programme Learning Outcomes**

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
CLO1	S	S	S	M	M
CLO2	S	S	S	M	M
CLO3	S	S	S	M	M
CLO4	S	S	S	M	M

S-Strong; M-Medium;

## **NOVEL INORGANIC SOLIDS AND NANOMATERIALS - CE23E04 - 73 HRS**

### **Unit I (15 Hrs)**

#### **Synthesis of Inorganic Solids**

Conventional heat & beat methods, co-precipitation, hydrothermal, ion-exchange & intercalation methods.

#### **Technologically Important Inorganic Solids**

Solid electrolytes – cationic & anionic. Mixed inorganic pigments – coloured solids, white and black pigments. Molecular materials & chemistry – one dimensional metals, molecular magnets, inorganic liquid crystals.

### **Unit II (15 Hrs)**

#### **Nanomaterials**

Overview of nanostructures & nanomaterials - classification, preparation of gold & silver nanoparticles, self-assembled nanostructures-control of nanoarchitecture-one dimensional control. Carbon nanotubes & inorganic nanowires. Bio-inorganic nanomaterials, DNA & nanomaterials, natural & artificial nanomaterials, bionanocomposites.

### **Unit III (14 Hrs)**

#### **Engineering Materials for Mechanical Construction**

Introduction, composition, mechanical & fabricating characteristics, applications of various types of cast irons, plain carbon and alloy steels, copper, aluminium & their alloys - duralumin, brasses & bronzes, cutting tool materials, super alloys, thermoplastics & thermosets.

### **Unit IV (14 Hrs)**

#### **Composite Materials**

Introduction, limitations of conventional engineering materials, role of matrix in composites, classification, matrix materials, reinforcements, metal-matrix composites, polymer-matrix composites, fibre-reinforced composites, environmental effects & applications.

### **Unit V (15 Hrs)**

#### **Special Polymers**

Conducting polymers - Introduction, conduction mechanism, polyacetylene, polyparaphenylene & polypyrrole, applications. Ion-exchange resins & their applications. Ceramics & refractory -

introduction, classification, properties, raw materials, manufacturing & applications.

**Text Books:**

S.No	Authors	Title	Publishers	Year and Edition
1	Peter Atkins, Tina Overton, Jonathan Rourke, Mark Weller & Fraser Armstrong	Shriver & Atkins Inorganic Chemistry	Oxford University Press	2012 4 Edn.
2	Ulrich Muller	Inorganic Structural Chemistry	John Wiley & Sons	2007 2 Edn.

**Reference Book:**

S.No	Authors	Title	Publishers	Year and Edition
1	C. P. Poole & F. J. Owens	Introduction to Nanotechnology	John Wiley & Sons	2010 1 Edn.
2	G. E. Rodger	Inorganic and Solid State Chemistry	Cengage Learning	2002
3	Faiz Mohammed	Speciality Polymers: Materials and Applications	I.K. International Publishing Pvt., Ltd.,	2007
4	D.M. Adam	Inorganic Solids: Introduction to Concepts in Solid-State Structural Chemistry	Wiley-Blackwell	1974 1 Edn.

**Course Designer**

1. Dr. S. Charulatha

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
<b>CE21SBP1</b>	<b>Computational Chemistry Practical</b>	<b>PRACTICAL</b>	<b>-</b>	<b>4</b>	<b>41</b>	<b>3</b>

### **Preamble**

To enable the students to understand the essential features and tools of cheminformatics; design chemical structures using chemical software

### **Course Learning Outcomes**

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

<b>CLO Number</b>	<b>CLO Statement</b>	<b>Knowledge Level</b>
CLO1	recognize the tools used in cheminformatics software	K1
CLO2	represent the SMILE string for the chemical structure and vice versa	K2
CLO3	sketch out the code for chemical structures	K3
CLO4	interpret the minimum energy configuration and the hypothetical properties of chemical structures	K4

### **Mapping with Programme Learning Outcomes**

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
CLO1	S	S	S	S	M
CLO2	S	S	S	S	M
CLO3	S	S	S	M	M
CLO4	M	S	M	M	M

S-Strong; M-Medium

## Computational Chemistry Practical I - CE21SBP1 - 45 HRS

1. Graphical user interface display - Draw chemical structures using open source tools: Chem Sketch, Chem Draw, G Chempaint
2. Interconversion of name / SMILES code to structure and vice-versa using Chemdraw.
3. Optimization of chemical structures for minimum energy configuration.
4. Analysis of molecular properties of chemical structures – molecular formula, molecular weight, composition, molar volume, density and specific refractivity using Chem Sketch.
5. Output in different file formats – SDF file, mol File, XYZ coordinates, PDB.
6. Finding the Pharmacophore properties using Rule of Thumb.
7. Studies on active site structural features using Autodock.

### Textbook

S.No	Authors	Title of the Book	Publishers	Year and Edition
1.	Muthukumarasamy Karthikeya and Renu Vyas	Practical Cheminformatics	Springer	2014

### Pedagogy

Demonstration, hands on training

### Course Designers

1. Dr. G. Sathya Priyadarshini
2. Dr. Sowmya Ramkumar

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
<b>CE21AC3</b>	<b>FOOD CHEMISTRY AND TECHNOLOGY</b>	<b>THEORY</b>			<b>Self-Study</b>	<b>5</b>

### **Preamble**

To enable the students to learn the functions of food and different techniques for water purification, understand the functions of food constituents and its method of analysis, study the manufacturing process of modern foods and constituents of beverages; gain knowledge about the importance of balanced diet, study the need for food preservation and specific standards in quality control

### **ALC - FOOD CHEMISTRY AND TECHNOLOGY- CE21AC3 Self-Study**

#### **UNIT I**

**Food** - Source, functions of food, food groups, food guide, basic five food groups, usage of the food guide, food in relation to health, objectives of cooking.

**Components of foods** - Introduction to food science, need and scope of food science. Classification and components of foods – macro and micro constituents – properties and significance.

#### **UNIT II**

##### **Food Constituents and Analysis**

**Proteins** - Analysis of proteins – principles in the determination of moisture content, ash content, nitrogen content – Kjeldahl’s method. Separation of proteins by electrophoresis.

**Enzymes** - enzymes used in food processing. Enzymic & non-enzymic browning - measurement of enzyme activity- principles.

**Carbohydrates** - classification, structure, processing & storage. Principles involved in the analysis of carbohydrates – glucose, starch, Benedict’s, anthrone and Neilson–Somoyogi methods.

**Minerals and Vitamins** - minerals - sources, functions, bioavailability & deficiency of the following minerals - calcium, iron, iodine, fluorine, sodium & potassium (elementary treatment).

Vitamins - sources, classification, functions & deficiencies of fat-soluble vitamins – (A, D, E

and K), water-soluble vitamins – (C, thiamin, niacine, riboflavin, B complex - B<sub>6</sub>, Folic acid & B<sub>12</sub>).

### **UNIT III**

#### **Modern Food & Beverages**

Modern Food - mushroom cultivation and types, spirulina composition. Snack foods. Production of bread, bun and biscuits - raw materials, methods and machinery required. Candy manufacturing, caramelization, fast foods, instant foods, dehydrated foods. Oleoresin of spices, condiments.

Beverages - soft drinks, soda, fruit juices and alcoholic beverages (types and content of alcohol) examples, carbonation. Composition of soft drinks. Addiction to alcohol, social problems.

### **UNIT IV**

**Nutrition** - Calorific value of food stuff – Respiratory Quotient (RQ) of food – basal metabolic rate – factors influencing BMR (Basal Metabolic Rate), specific dynamic action (SDA) of food.

**Balanced Diet** - Energy requirements of individuals – diet and its components – protein requirements – biological & supplementary value of proteins. Diseases associated with protein malnutrition.

Nutritional value of carbohydrates – fibers in the diet, dietary sugars – nutritional aspects of lipids.

### **UNIT V**

#### **Methods of Food Preservation and Quality Control**

**Microbial Growth** - Growth curve of bacteria. Effects of environmental factors on growth of microorganisms – pH, water activity, oxygen availability, temperature. Beneficial effect of microorganisms. Food borne illness – bacteria, virus, moulds and parasites (any two illness each).

**Food Preservation and Processing** - food deterioration, methods of preservation and processing.

**Preservation by chemical** - use of preservative in foods: chemical and biopreservative including antibiotics, antimicrobial agents.

**Quality Control** - specifications and standards – PFA, FPO, FDA, drug license, WHO

standards, ISI specifications, packing and label requirements, essential commodities act, consumer protection act, AGMARK.

### Text Books:

S.No.	Authors	Title	Publishers	Year and Edition
1	B. Srilakshmi	Food Science	New Age International Publishers	2014 7 Edn.
2	B. Siva Sankar	Food Processing and Preservation	Hall of India (Pvt)Ltd	2004 1 Edn.
3	S. Ramakrishnan, K .G. Prasannan & R. Rajan	Text Book of Medical Biochemistry	Orient Black Swan Publishers	2001 3 Revised Edn.
4	N. Shakuntala Manay, M. Shadaksharaswamy	Foods: Facts and Principles	New Age International Publishers	2008 3 Edn.

### Reference Books:

No.	Authors	Title	Publishers	Year and Edition
1	M. Swaminathan	Advanced Text Book on Food and Nutrition Vol. I & II	Bapcco Ltd.,	2015
2	Norman N. Potter & Joseph H. Hotchkiss	Food Science	CBS Publishers	2007
3	Lillian Hoagland Meyer	Food Chemistry	Reinhold Publishers	2008 3 Edn.
4	Owen R. Fennema	Food Science	Marcel Dekker Publishers	2007 4 Edn.
5	M. R. Adams & Maurice O. Moss	Food Microbiology	RSC Publishers	2007 3 Edn.

### Course Designer:

1. Dr. N. Arunadevi

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
<b>CE21AC4</b>	<b>LEATHER CHEMISTRY</b>	<b>THEORY</b>	<b>Self-Study</b>			<b>5</b>

### **Preamble**

To enable the students to study the composition of leather, understand the chemistry behind tanning and its types; learn various methods involved in dyeing, gain knowledge about the waste disposal

### **LEATHER CHEMISTRY - CE21AC4 - Self-Study**

#### **UNIT I**

##### **Basic Principles and Leather Constituents**

Introduction, chief process involved in leather manufacture - elementary knowledge about the structure and composition of hides and skins. Proteins and their characteristics. Anatomy and histology of protein constituents of leather (an elementary concept). Basic principles involved in pre-tanning such as soaking, liming, deliming, bathing, pickling and depickling.

#### **UNIT II**

##### **Tanning Methods and Applications**

Types of tanning – vegetable and mineral tanning – classification, factors and physio- chemical principles involved, fixation of vegetable tanning. Chrome tanning process. Synthetic tanning – classifications, general methods of manufacture and its uses.

#### **UNIT III**

##### **Chemistry and Preparation of Tanning Agents**

Preparation and chemistry of chrome tanning liquids, ololation, oxolation and hydrolysis of chrome liquids. Effects of adding tanning agents – Role of pH in the reaction of chromium complexes with hide proteins. Factors governing chrome tanning- chemistry of neutralization process. A brief survey of chemistry of tanning like Al, Zr and Te salts & their relative merits in contrast with chrome tanning. Estimation of shrinkage temperature leathers of different tannage – cost evaluation of the prepared leather. Chemistry of combination of tannages involving vegetable tanning, aldehydes, chrome & other tanning agents.

## UNIT IV

### Curing and Dyeing Methods

Chemical methods of curing & preservation - hides & skins in acid & alkaline solutions. Principles of analytical methods employed in curing, liming, deliming, bathing, pickling. Analysis of vegetable tanning materials & extract. Process of dyeing leather – use of mordant, dyeing, auxiliaries such as leveling, wetting and dispersing agents – dye fixations.

## UNIT V

### Animal Wastes and Treatment Processes

Animal by-products – their collection, handling & preservation methods (hair, blood, bones, glands, keratinous materials & their utilization). Tannery effluents & treatment -Types of water pollution – physical, chemical, physiological & biological. Different types of tannery effluents & waste - beam-house waste, liquors, tanning & finishing yard waste liquors, solid waste – origin & disposal.

### Text Books:

S. No.	Authors	Title	Publishers	Year and Edition
1	P.C. Jain & Monika Jain	Engineering Chemistry	Dhanpat Rai Publishing Co., (Pvt) Ltd	2016 16 Edn.
2	Jayashree Ghosh	Fundamental Concepts of Applied Chemistry	S. Chand & Co. Ltd.	2010
3	B. K. Sharma	Industrial Chemistry	Goel Publishing House	2008 14 Edn.

### Reference Books:

S.No.	Authors	Title	Publishers	Year and Edition
1	Anthony D. Covington	Tanning Chemistry: The Science of Leather	RSC Publishing	2011
2	O'Flaherty. Fred, William T. Roddy & Robert M. Lollar	The Chemistry and Technology of Leather	Reinhold Publishing Co.	1956 1 Edn.

3	Guven Kizilkaya	Pocket Book for the Leather Technologist Link: <a href="https://www.academia.edu/32384925/Book_for_Leather_BASF_pdf">https://www.academia.edu/ 32384925/Book_for_Leathe r_BASF_pdf</a>	BASF	2007 4 Edn.
---	--------------------	---	------	----------------

**Course Designer:**

1. Dr. V. S. Angulakshmi

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CE23CP3	CHEMISTRY PRACTICAL – III	THEORY	-	-	150	5

### Preamble

Enable the students to

- construct the phase diagram of two components systems
- understand the principle and carry out conductometric titrations
- estimate the given substance employing volumetric / gravimetric methods
- determine the rate constant of first order reaction
- analyze the water quality parameters

### Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understanding the principles of gravimetric, conductivity, eutectic, CST and water quality parameters analyze the amount by titrimetric and gravimetric methods	K2
CLO2	Calculate the amount of inorganic compounds quantitatively by gravimetric method	K3
CLO3	Analyze the water quality parameters using volumetric method and purity of the prepared organic compounds	K4
CLO4	Determine the rate constant, CST, dissociation constant and eutectic composition of given samples	K4

### Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	S	S
CLO2	S	S	M	S	S
CLO3	S	S	M	S	S
CLO4	S	S	M	S	S

S-Strong; M-Medium

**SEMESTER V & VI**  
**Chemistry Practical – III - CE23CP3 - 150 Hrs**

**Physical Chemistry Experiments**

1. Rate constant of methyl acetate – Acid Hydrolysis
2. Critical solution temperature of phenol – water system.
3. Effect of impurity on the CST of phenol – water system.
4. Determination of concentration of the given NaCl/Succinic acid from the study of CST -phenol – water system.
5. Phase diagram – simple eutectic system.

**Conductivity Experiments**

1. Determination of cell constant
2. Determination of  $\lambda_{\infty}$  of a strong electrolyte using Debye Huckel Onsager equation.
3. Determination of dissociation constant of a weak acid.
4. Conductometric titration-Acid – Base

**Preparation of the following Compounds:**

- (i) p-bromoacetanilide (bromination)
- (ii) Salicylic acid from methyl salicylate ( Hydrolysis)

**Gravimetric Determination of the following using sintered glass crucible**

1. Estimation of Barium as Barium sulphate.
2. Estimation of Calcium as Calcium oxalate monohydrate
3. Estimation of Nickel as Nickel DMG

**Water Quality Parameter Analysis**

1. Alkalinity
2. Hardness
3. Chloride
4. Dissolved Oxygen
5. TDS, TSS, TS and pH of the given water samples

**Text Book**

LAB MANUAL - Prepared by Faculty, Department of Chemistry, PSGRKCW

**Reference Books**

S.No.	Authors	Title	Publishers	Year and Edition
1.	J.A Findlay & Kitchener	Practical Physical Chemistry	Longmann Publication	1973 9 Edn
2.	V.Venkateswaran, R. Veeraswamy & A.R. Kulandaivelu	Basic Principles of Practical Chemistry	S Chand & Co.,	2012 2 Edn
3.	B. Vishwanathan, P.S. Raghavan	Practical Physical Chemistry	Viva Books	2014 Reprint

4.	A.I Vogel	A Text Book of Quantitative Inorganic Analysis	ELBS & Longmann , Green & Co., Ltd.,	2011 9 Edn
----	-----------	--	--------------------------------------	---------------

**Pedagogy:** Demonstration and individual Hands on Practicals

**Course Designers:**

1. Dr. C. Nithya
2. Dr. P. Amutha