



**PSGR KRISHNAMMAL COLLEGE FOR WOMEN**  
**College with Potential for Excellence**  
(An Autonomous Institution, Affiliated to Bharathiar University)  
(Reaccredited with 'A' Grade by NAAC, An ISO 9001:2008 Certified Institution)  
Peelamedu, Coimbatore-641004



## DEPARTMENT OF CHEMISTRY

### BACHELOR OF CHEMISTRY

2015 - 2018

## PSGR KRISHNAMMAL COLLEGE FOR WOMEN



**College with Potential for Excellence**  
(An Autonomous Institution, Affiliated to Bharathiar University)  
(Reaccredited with 'A' Grade by NAAC, An ISO 9001:2008 Certified Institution)  
Peelamedu, Coimbatore-641004



### PROGRAMME OUTCOMES

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

- PO1** : accept the common responsibility to preserve the environment and to contribute to the development of societal concerns.
- PO2** : acquire communication skill- written, verbal and digital.
- PO3** : demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to the subject areas namely organic, inorganic, physical, analytical chemistry, Mathematics, Physics and Biology.
- PO4** : apply such knowledge and understanding to the solution of qualitative and quantitative problems of familiar and unfamiliar.
- PO5** : handle chemical materials safely by taking into account their physical and chemical properties including any specific hazards associated with their use.
- PO6** : conduct standard laboratory procedures for the synthesis and analysis of organic, inorganic systems, monitor, record document in a reliable manner, chemical properties, events and changes by observation and measurement.

### PROGRAMME SPECIFIC OUTCOME

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** : be able 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.
- PSO3** : be able to apply the theoretical concepts of instruments that are commonly used in most chemistry fields as well as interpret and use data generated in instrumental chemical analyses.

**PSGR KRISHNAMMAL COLLEGE FOR WOMEN**



**College with Potential for Excellence**  
 (An Autonomous Institution, Affiliated to Bharathiar University)  
 (Reaccredited with 'A' Grade by NAAC, An ISO 9001:2008 Certified Institution)  
 Peelamedu, Coimbatore-641004



**DEPARTMENT OF CHEMISTRY**  
**2015 - 2018**

SE	Part	Subject Code	Title of the Paper	Instruction hours/book Contact hours	Tutoriaal hours	Duration of	Examination Marks			Credits	
							CA	ESE	TOTA		
I	I	TAM1401 HIN1401 FRE12401	Language T/H/F Paper I	6	86	4	3	25	75	100	3
	II	ENG1301/ ENG13F1	Language Through Literature Level I / Language Through Literature Functional Level	6	86	4	3	25	75	100	3
	IIIA	CE14C01	General Chemistry Paper -I	6	86	4	3	25	75	100 100	5
	IIIA	CE13CP1	Chemistry Practical - I	3	-	-	-	-	-	-	-
	IIIA	PS12A01/TH14A0	IDC Allied Physics/ Mathematical statistics paper-I	4/7	56/ 101	4	3	20/25	55/7 5	75/10 0	4/5
	IIIA	PS08A	Allied Practical Physics	3	-	-	-	-	-	-	22
	IV	NME14B1/A1/W S/NME12AS/ NME12SG	Basic Tamil/Advanced Tamil/Women Studies/Ambedhkar Studies/ Gandhian Studies	2	-	-	3	50/25/ 100	50/7 5/-	100	2
II	I	TAM1402 HIN1402 FRE1402	Language T/H/F Paper - II	6	86	4	3	25	75	100	3

II	ENG1302 ENG14F2	Language Through Literature Level II/ Language Through	6	86	4	3	25	75	100	3
IIIA	CE14C02	General Chemistry Paper -II	5	71	4	3	25	75	100	5
IIIA	CE13CPI	Chemistry Practical I	3	-	-	3	40	60	100	4
IIIA	PS12AO2/TH14A	IDC Allied Physics/ Mathematical.stat	5/8	71/ 116	4	3	20/25	55/7 5	75/ 100	4/5
IIIA	PS08AP1	Allied Practical Physics	3	-	-	3	20	30	50	2
IV	NME14B2/A2/ open course	Basic Tamil/Advanced Tamil/ Open course	2	-	-	3	50/25/25	50/7 5/75	100	2
IIIB	NM11GAW	Foundation Course –1 (General awareness)	Self study	-	-	Onlin e test	100	-	100	grade
III	TAM1403 HIN1403	Language T/H/F Paper III	6	86	4	3	25	75	100	3
II	ENG1303/ ENG13F3	English Language Through Literature Level III/	5	86	4	3	25	75	100	3
IIIA	CE14C03	General Chemistry Paper III	4	56	4	3	25	75	100	4
IIIA	CE13CP2	Chemistry Practical II	3	-	-	-	-	-	-	-
IIIA	TH12A09/PL13A0 1/	IDC Allied Maths/Botany/Zoology Paper - I	7*/4	101/56	4	3	25*/20	75*/ 55	100*/ 75	4
IIIA	PL13AP1/AS08A P1	Allied Practical Botany/Zoology	3	-	-	-	-	-	-	-
IV	SB13BC01	Skill based subject- Biochemistry I	3	-	-	-	-	-	-	-
IV	SB13BCP1	Skill based subject practical- Biochemistry Practical I	-	-	-	-	-	-	-	-
III B	NM11EVS	Foundation Course - II (Environmental studies)	Self-	-	-	-	-	-	-	-

	IIIB	NM11VED	Foundation course-III Value Education	2	-	-	3	100- TOTAL	75	100	2
	VI	JOB0507	Job Oriented Course		After 3 PM			Grade			
IV	I	TAM1404 HIN1404	Language T/H/F Paper IV	5	71	4	3	25	75	100	3
	II	ENG1304 / ENG13F4	Language Through Literature Level IV / Language Through Literature Functional Level	6	86	4	3	25	75	100	3
	IIIA	CE14C04	General Chemistry Paper IV	4	56	4	3	25	75	100	4
	IIIA	CE13CP2	Chemistry Practical II	3	90	-	3	40	60	100	4
	IIIA	TH12A14 PL12A02	IDC Allied Maths/ PL12A02	7*/5	101/	4	3	25*/20	75*/	100*/	75
	IIIA	PL08AP1 ASO9AP1	Allied Botany/Zoology Practical	2	-	-	3	20	30	50	2
	IV	SB13BC01	Skill based subject- Biochemistry I	3			3	25	75**	100	4
	IV	SB13BCP1	Skill based subject practical- Biochemistry Practical I				3	40	60	100	2
	III B	NM11EVS	Foundation Course - II (Environmental studies)	2	-	-	3	100- Total	75	100	2
	V		Extension activities NCC/NSS/YRC/Sports and Games/ecowatch/Yi	-	-	-	-	-	100	100	1
V	IIIA	CE14C05	Paper - V Inorganic Chemistry	4	56	4	3	25	75	100	4
	IIIA	CE14C06	Paper - VI Organic Chemistry	4	56	4	3	25	75	100	4
	IIIA	CE14C07	Paper VII Physical Chemistry	4	56	4	3	25	75	100	4
	III A	CE14 E01	AOS-I Polymer Chemistry	4	56	4	3	25	75	100	5
	IIIA	CE14E02	AOS-II Optional Analytical Chemistry	4	56	4	3	25	75	100	5

	III A	CE13AC1	ALC I-Optional Agro Industrial	Self Study	-	-	3	25	75	100*	5*
	III A	CE13AC3	ALC II-Optional Pharmaceutical	Self Study	-	-	3	25	75	100*	5*
	IIIA	CE13CP3	Chemistry Practical -III	5	-	-	-	-	-	-	-
	III A		<b>Project &amp; Viva Voce</b>	4	-	-	-	80	20	100	4
	VI		Information Security	2	-	-	-	-	-	Grade	-
	IV	SB13BC02	Skill based subject Biochemistry II	3	-	-	-	-	-	-	-
	IV	SB13BCP2	Skill based subject practical – Biochemistry II		-	-	-	-	-	-	-
	III A		Comprehensive Examination	-	-	-	1	-	100	100	grade
	VI		Supportive course								
	VI		Personality	-	-						
	VI		Internship	-	-	4 weeks		100	100		2
VI	III A	CE14C08	Paper – VIII Organic chemistry	6	86	4	3	25	75	100	5
	III A	CE14C09	Paper –IX Physical chemistry	5	71	4	3	25	75	100	5
	IIIA	CE14C10	Paper –X Physical methods and Chemical structure	6	86	4	3	25	75	100	5
	III A	CE14E03	AOS-III Dye Chemistry	5	71	4	3	25	75	100	4
	IIIA	CE13E04	AOS-IV(optional) Biological Chemistry								
	IIIA	CE13AC2	ALC III-optional chemistry of plant based products	Self Study	-	-	3	25	75	100*	5*

	IIIA	CE13AC4	ALC IV- optional Leather chemistry	Self Study	-	-	3	25	75	100*	5*
	IIIA	CE13CP3	Chemistry Practical - III	5.	150	-	6	40	60	100	5
	IV	SB13BC02	Skill based subject - Biochemistry II	3	-	-	3	25	75**	100	4
	IV	SB13BCP2	Skill based subject practical – Biochemistry II				3	40	60	100	2
										3800	140

**ALC - Advance Learner's course**

**\*Skill enhancement Programme -Internal component of value education**

**\*\* ESE marks for 50 equated to 75 for open course and skill based course**

**I B.Sc Chemistry**  
**I Semester**  
**General Chemistry Paper I**  
**CE14C01**

**Credits: 5**

**( 86Hrs)**

**Objectives :**

- To enable the students to understand the basic concepts in chemistry.
- To learn about the theories of bonding in molecules and their physical significance.
- To learn about the chemistry of s & p - block elements and Noble gases
- To gain knowledge about the polar effects and their importance in affecting the properties of compounds.
- To understand the terms in thermodynamics and thermo chemistry.

**Unit I**

**(17 hrs)**

**Chemical Bonding**

Covalent bonding - Valence bond theory and its limitations, Hybridisation - Types of overlap of atomic orbitals. Valence shell electron pair repulsion theory (VSEPR) to  $\text{NH}_3$ ,  $\text{H}_2\text{O}$ ,  $\text{ClF}_3$ ,  $\text{SF}_4$ . Bond strength and bond energy. Percentage of ionic character from dipole moment and electronegativity differences.

Ionic bonding- Factors influencing the formation of ionic bond. Ionic crystals  $\text{NaCl}$ ,  $\text{CsCl}$ . Lattice energy of ionic crystals, Born-Landé equation, Born-Haber cycle, Fajans rule. Co-ordinate covalent bond- Formation of hydronium ion. \*Comparison between ionic, covalent and coordinate bonding\*.

Hydrogen bonding-Types with examples.

**Unit II**

**(17 hrs)**

**s & p block elements**

s-block elements-Position of alkali metals and alkaline earth metals in the periodic table and their general characteristics-\* Electronic configuration, physical state, atomic volume, ionic radii, density, ionization energy,\* electropositive character, reducing properties and oxidation state. p-block elements: Anomalous behaviour of Li and diagonal relation between Li & Mg.

Position of group III-A elements in the periodic table and general characteristics – Physical and chemical properties. Anomalous properties of B and



diagonal relationship between B & Si. Chemistry of noble gases- Chemical properties of Noble gases, Chemistry of Xenon, Structure and bonding in Xenon compounds

**Unit III** (17 hrs)

### **Polar effects**

Inductive effect, comparing acid strengths – Halogen substituted acids. Basic strength of  $\text{RNH}_2$ ,  $\text{R}_2\text{NH}$ ,  $\text{R}_3\text{N}$  and aniline. Mesomeric effect (-CN,CO). Resonance effect- conditions for resonance, resonance energy calculation. Hyper conjugation- Baker Nathan effect, Hyper conjugative structures of toluene, ethylbenzene and iso-propylbenzene. \*Stability of primary, secondary and tertiary free radicals and primary, secondary and tertiary carbonium ions.\* Steric effect- examples and effect on reactivity.

### **Cycloalkanes**

Nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its limitations.

**Unit IV:** (17 hrs)

### **Gaseous state**

Derivation of gas laws from kinetic theory of gases, Gay-Lussac's law, \*Charles law, Boyle's law, \* and Dalton's law of partial pressure. Maxwell Boltzmann distribution of molecular velocities (derivation not needed). RMS, MP and Average velocities- Kinetic energy from Maxwell Boltzmann law-Problems.

### **Quantum mechanics**

de-Broglie equation, Heisenberg's uncertainty principle, Compton effect, Photoelectric effect, Schrodinger wave equation (Fundamentals only). Applications to particle in one-dimensional box, Orbit and Orbitals, significance of  $\Psi$  and  $\Psi^2$ .

### **MO theory**

Introduction, bonding and magnetic properties (for simple homo nuclear and hetero nuclear diatomic molecules)

**Unit V:** (18 hrs)

### **Thermodynamics**

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.

### \*self study portions

#### Text Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	P. L. Soni	Text book of inorganic Chemistry	S.Chand & Co	2000 Reprint
2	B.S. Bahl & Arun Bahl,	Advanced organic chemistry	S.Chand&Co	2009 Reprint
3	P.L. Soni	Text book of organic Chemistry	S.Chand & Co	1998, reprint
4	B.R. Puri, L.R. Sharma, M.S. Pathania	Principles of Physical chemistry	Vishal Publications	2012, 45 <sup>th</sup> Edn.

#### Reference books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	R. D Madan	Modern Inorganic chemistry	S.Chand & Co	2011,3 <sup>rd</sup> Edn

2	R.T. Morrison & R.W. Boyd	Organic chemistry	Pearson Hall Prentice	2011, 17 <sup>th</sup> Edn
3	B.S Bhal, Tuli G.D and Arun Bhal	Essentials of Physical Chemistry	S.Chand & Co	2009

**Question paper pattern**

**Section A: 2\*5= 10 marks**

(5 out of 8)

**Section B: 5\*5= 25 marks**

(5 questions with internal choice)

**Section C: 5\*8= 40 marks**

(5 out of 7)

**Total 75 marks**

**II Semester**  
**General Chemistry Paper II**  
**CE14C02**

**Credits: 5** **(71 hrs)**

**Objectives**

- To learn the fundamentals of analytical chemistry
- To gain knowledge about the mechanism of substitution and elimination reactions.
- To understand the importance of second law of thermodynamics.
- To know the types of colloids and liquid crystals.

**UNIT I** **(14 hrs)**

**Analytical Chemistry**

Role of analytical chemistry, classification of analytical methods - Classical & Instrumental. Types of instrumental analysis, selecting an analytical method, neatness and cleanliness, laboratory operations and practices, safety in analytical laboratory.

Analytical balance, techniques of weighing, errors, volumetric glasswares, cleaning and calibration of glasswares.

\* Sample preparations-dissolution and decomposition, equivalent weight, normality, molality, molarity.\*

**UNIT II** **(14hrs)**

**Alkyl and aryl halides**

Nomenclature, methods of formation, chemical reaction, mechanism of nucleophilic substitution of alkyl halides,  $SN^2$ ,  $SN^1$  and  $SN^i$  reactions with energy profile diagram. Methods of formation of aryl halides, nuclear and side chain reactions. Mechanism of elimination reactions of alkyl halides- $E^1$ ,  $E^2$  and  $E^1CB$ . Orientation of elimination- Saytzeff & Hofmann rules.

**UNIT III** **(14 hrs)**

**Benzene**

Structure of benzene, isomer number, resonance structure of benzene. Kekule structure, stability of phenyl ring, reactions of benzene, heat of hydrogenation and combustion, orbital picture of benzene, aromatic character- Huckel's rule, Non-benzenoid aromatic compounds.

Aromatic electrophilic substitution- nitration, sulphonation, halogenation, Friedel craft's acylation and alkylation,\*reactivity and orientation of monosubstituted benzene\*.

#### UNIT IV

(14 hrs)

**Colloidal State:** Definition of colloids, Classification of Colloids

Solids in Liquids (SOLS): Properties-kinetic, optical and electrical; stability of colloids, protective action, Hardy-Schulze law, gold number.

Liquids in Liquids (emulsions): types of emulsions, preparation, emulsifier

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

Liquid Crystals: difference between liquid crystal, solid and liquid. Classification, structure of nematic and Cholestric phases. Thermography and seven segment cell.

#### UNIT V

##### Thermodynamics

(15 hrs)

Second law of thermodynamics - Need for second law, different statements, entropy-definition, physical significance, entropy of an ideal gas, entropy changes in isothermal transformation, entropy changes in reversible and irreversible processes. Trouton's rule. 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.

##### \*Self study portion

##### Text books

S.N o.	Authors	Title of the Book	Publishers	Year of Publication
1	R.Gopalan, P.S.Subramanian, K.Rengarajan	Elements of Analytical chemistry	Sultan Chand & Sons	1986, I Edn.
2	B.S. Bahl & Arun Bahl,	Advanced organic chemistry	S.Chand&Co	2009 Reprint
3	P.L. Soni	Text book of organic Chemistry	S.Chand & Co	1998, reprint

4	B.R. Puri, L.R. Sharma, M.S. Pathania	Principles of Physical chemistry	Vishal Publications	2012, 45 <sup>th</sup> Edn.
---	---------------------------------------	----------------------------------	---------------------	-----------------------------

**ReferenceBooks:**

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	Douglas A.Skoog., Donald M.West, F.James Holler Stanely R.Crouch	Fundamentals of analytical chemistry	Cengage Learning India Pvt Ltd	2009, 8 <sup>th</sup> Edn
2	R.T. Morrison & R.W. Boyd	Organic chemistry	Pearson Hall Prentice	2011, 17 <sup>th</sup> Edn
3	B.S Bhal,Tuli G.D and Arun Bhal	Essentials of Physical Chemistry	S.Chand & Co	2009

**Question paper pattern**

**Section A: 2\*5= 10 marks**

(5 out of 8)

**Section B: 5\*5= 25 marks**

(5 questions with internal choice)

**Section C: 5\*8= 40 marks**

(5 out of 7)

**Total 75 marks**

**I & II Semester**  
**Chemistry Practical – I**  
**(CE13CP1)**

**Credits : 4**

**(90Hrs)**

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 : Pb, Cu, Zn, Mn, Co, Ni, Ca, Ba,  $\text{NH}_4$ , Mg

**Reference Books:**

<b>S.No.</b>	<b>Authors</b>	<b>Title of the Book</b>	<b>Publishers</b>	<b>Year of Publication</b>
1	V.V.Ramanujam	Inorganic semi micro qualitative analysis,	The National Publishing Co.	Revised 3 <sup>rd</sup> Edn.,

**SEMESTER I**  
**IDC – Allied Chemistry Paper –I**  
**(CE13A01)**

**Credits: 4**

**(56 Hrs)**

**Objectives:**

- To enable the students in gaining knowledge about the basic concepts involved in chemical bonding theories, aromaticity and a thorough knowledge regarding isomerism.
- To make the students to learn the different types of solutions.
- To enable the students to have a detailed exposure to phase rule.
- To learn about solar energy and its applications.

**UNIT – I**

**(11Hrs)**

**Bonding**

Covalent bonding – Orbital overlap, hybridization and geometry of CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>2</sub>, C<sub>6</sub>H<sub>6</sub> molecules. Hydrogen bonding - Inter and intra molecular, nature and its effect on structure and properties. Metallic bonding, Vander Waal's forces.\* Structure of graphite and diamond.\*

**UNIT – II**

**(11Hrs)**

**Organic reactions**

Types of organic reactions. Common electrophiles, nucleophiles and free radicals. Aromaticity - Huckel's rule, mechanism of nitration, halogenation, alkylation, acylation and sulphonation of benzene.

**Stereoisomerism**

Geometrical and optical isomerism. Conformation - a simple treatment of n-butane and cyclohexane. \*Tautomerism – Keto-enol tautomerism. \*

**UNIT- III**

**(11 Hrs)**

**Amino acids & Proteins**

Amino acids – Classification, preparation of  $\alpha$  - amino acids - Gabriel phthalimide synthesis, Erlen Meyer azlactone synthesis. Properties of  $\alpha$  - amino acids. Action of heat on  $\alpha$ ,  $\beta$ ,  $\gamma$  amino acids. Peptide synthesis. Proteins - Classification according to composition and functions, properties of proteins, \* colour reactions.\*



**UNIT – IV****(11 Hrs)****Solutions**

Liquid in liquid type, Raoult's law for ideal solutions. Positive and negative deviation from Raoult's law – Reasons and examples. \*Fractional distillation\* and azeotropic distillation.

**Phase rule**

Definitions of terms - Phase, component, degree of freedom. Phase rule. Application of phase rule to water system. Reduced phase rule and its application to a simple eutectic system (Pb- Ag). Freezing mixtures.

**UNIT – V****(12 Hrs)****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 - Zeolite process & demineralization process. Purification of water for domestic purpose - Disinfection by chlorine, ozone & UV light.

**\* Self study portions****Text Books:**

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	P.C Jain & Monika Jain	Engineering chemistry	Dhanpat Rai publishing Co Pvt Ltd.	Reprint 2003
2	V.Veeraiyan, A.N.S.Vasudevan	Text book of Allied Chemistry	Highmount Publishing House, 1 <sup>st</sup> Edn	2003

**Question paper pattern**

**Section A: 2\*5= 10 marks**

(5 out of 8)

**Section B: 3\*5= 15 marks**

( 5 questions with internal choice)

**Section C: 6\*5= 30 marks**

(5 out of 7)

**Total 55 marks**

**Semester – II**  
**IDC – ALLIED CHEMISTRY – PAPER – II**  
**(CE13A02)**

**Credits: 4** **(71 Hrs)**

**Objectives:**

- To enunciate the students in acquiring a general exposure towards Coordination chemistry, Industrial chemistry, Inorganic polymers and Dyes.
- To help the students in gaining knowledge in a broad areas of organic chemistry, chemotherapy and drugs.
- To understand the basics of chemical kinetics catalysis and electrochemistry

**Unit – I** **(14Hrs)**

**Coordination Chemistry**

Nomenclature - Mononuclear complexes. Theories- Werner, Sidgwick-EAN rule, Pauling theory - Postulates and examples. Chelation and its importance with reference to EDTA in analytical chemistry. \*Biological role of Chlorophyll and Hemoglobin\*.

**Unit – II** **(14Hrs)**

**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.

Polymers- Classifications. Preparation and uses of PVC, Teflon & Polyethylene. Inorganic Polymers - Synthesis, properties and uses of silicones.

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

**Synthetic drugs**

Introduction, classification of drugs – based on chemical structure and therapeutic action, 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, two 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**

**(14 Hrs)**

### **Chemical Kinetics**

Order of reactions and their determination. Activation energy, effect of temperature on reaction rate. Catalysis- types, mechanism of catalytic action, industrial applications. \*Emulsions and gels - Preparation, properties and applications\*.

### **Photochemistry**

Beer's law, Beer - Lambert law, Grother's - Draper Law, Stark - Einstein's law of photochemical equivalence, quantum yield.

## **Unit V**

**(15Hrs)**

### **Electrochemistry**

Electronic and electrolytic conductors, Faraday's law of electrolysis, Arrhenius theory of electrolytic dissociation. Ostwald's dilution law. Conductance - Specific and equivalent conductance and their determination, variation of conductance with dilution, Kohlrausch's law. Application of conductance measurements - Determination of degree of dissociation of weak electrolytes, conductometric titrations.

pH - Definition, determination by indicator method. Buffer solutions - types, buffer action, pH of buffer solutions. \*Importance of pH and buffers in the living systems\*.

### **\*Self study portions**

**Text Books:**

<b>S.No.</b>	<b>Authors</b>	<b>Title of the Book</b>	<b>Publishers</b>	<b>Year of Publication</b>
1	Rajbir Singh,	Synthetic drugs	Mittal Publications, 1 <sup>st</sup> Edn.	2002
2	V.Veeraiyan, A.N.S.Vasudevan	Text book of Allied Chemistry	Highmount Publishing House, 1 <sup>st</sup> Edn	2003

**Question paper pattern****Section A: 2\*5= 10 marks**

(5 out of 8)

**Section B: 3\*5= 15 marks**

(5 questions with internal choice)

**Section C: 6\*5= 30 marks**

(5 out of 7)

**Total 55 marks**

**Semester – II**  
**IDC – ALLIED CHEMISTRY – PRACTICAL**  
**(CE13AP1)**

**Credits:2**

**(90hrs)**

**1. Volumetric Analysis:**

- i. Estimation of sodium hydroxide using standard sodium carbonate.
- ii. Estimation of hydrochloric acid using standard oxalic acid.
- iii. Estimation of oxalic acid using standard sulphuric acid.
- iv. Estimation of ferrous sulphate using standard Mohr's salt solution.
- v. Estimation of potassium permanganate using standard oxalic acid.
- vi. 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 test. Phenols, Acids (mono and di), Aromatic primary amine, Amides (mono and diamide ) and Glucose.

**Reference Books**

<b>S.No.</b>	<b>Authors</b>	<b>Title of the Book</b>	<b>Publishers</b>	<b>Year of Publication</b>
1	N.S.Gnanapragasam, G.Ramamurthy	Organic Chemistry Lab Manual	S.Viswanathan Printers & Publishers Pvt Ltd	1996
2	A.I. Vogel	A text book of quantitative inorganic analysis	Longman publishers.	1978

**II SEMESTER**  
**Open Course for UG students**  
**Food Preservation and Food Adulteration**  
**(OPS1307)**

**Credits: 2** **(30 Hrs)**

**Objectives**

- To know about the additives and adulterants
- To assess about the food quality

**Unit I** **(6 Hrs)**

**Introduction to food science**

Functions of Food - energy yielding, body building, protection and regulation, maintenance of health. Food groups - basic four, basic five (ICMR), basic seven. Food guide pyramid.

**Cooking**

Objectives, limitations, preliminary preparations- cleaning, peeling and stringing, cutting and grating, sieving, soaking, processing, coating, blanching, marinating, sprouting, fermentation, grinding, filtering, roasting.

**Unit II** **(6Hrs)**

**Cooking methods**

Classification of cooking methods - Moist heat methods - Boiling, simmering, poaching, stewing, steaming, pressure cooking. Dry heat methods - Air as medium of cooking - Grilling, pan broiling, baking. Fat as medium of cooking - sautéing, shallow fat frying, deep fat frying. \*Microwave cooking - Advantages and disadvantages\*. Solar cooking -Advantages and disadvantages.

**Unit III** **(6 Hrs)**

**Food spoilage**

Microbiological spoilage - Moulds, yeasts, pseudo yeasts, viruses, bacteria. Biochemical spoilage - spoilage by insects, parasites and rodents. Mechanical spoilage, chemical spoilage. Changes in food constituents due to spoilage.

**Unit IV** **(6 Hrs)**

**Methods of food preservation**

Principles of food preservation.\*Preservation by low temperature - Freezing, slow freezing, quick freezing process, dehydro freezing, freezing foods,\* effect of

freezing and nutritive value. Preservation by high temperature - Pasteurization, canning. Preservation by preservatives, Preservation by high osmotic pressure, Preservation by dehydration and by irradiation.

### Unit V

(6 Hrs)

#### Food Additives

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

#### \* Self study portions

#### Text Books:

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	B.Srilakshmi	Food Science	New Age International Pvt Ltd, 3rd edition	2003
2	Vijaya Khader	Text Book on Food storage and Preservation	Kalyani Publishers, 1 <sup>st</sup> Edn	1999

#### Reference Books:

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	Alex V Ramani	Food Chemistry	MJP Publishers, 1 <sup>st</sup> Edn	2009
2	Cameron G.Allan Foxa Brian	Food Science	Nutrition and Health, EdwardArnold London Melbourne, Auckland.	1989
3	Meyer Lillian Hoagland	Food Chemistry	CBS Publishers and DistributorS, New Delhi.	1987

#### Question paper pattern

#### Section A: 4\*5= 20 marks

(4 out of 6)

#### Section B: 2\*15= 30 marks

(2 out of 3)

Total 50 marks



**III Semester**  
**General Chemistry Paper – III**  
**(CE14C03)**

**Credits : 4** **(56 Hrs)**

**Objectives :**

- To impart the students with a study of coordination compounds and chemistry.
- To familiarize the students regarding the organic name reactions and study of acids.
- To acquire knowledge about phase rule and its applications.

**UNIT I** **(11 Hrs)**

**Metallurgy**

General methods of extraction - Concentration, gravity separation, froth flotation, magnetic separation, chemical and electrolytic methods. Refining - Zone refining, Van Arkel refining and electrolytic refining.

**Inter halogen compounds**

ICl, ClF<sub>3</sub>, BrF<sub>5</sub>,\* IF<sub>7</sub>\* - Preparation, properties and structure.

**UNIT II** **(11 Hrs)**

**Co-ordination Chemistry**

Introduction - \*Types of ligands,\* co-ordination number, nomenclature of metal complexes, theories of coordination compounds -Werner's Theory, Sidgwick's theory, Valence bond theory, Crystal field theory - Postulates. Calculation of CFSE, splitting of d-orbitals in tetrahedral and octahedral complexes. Comparison of VBT & CFT.

**UNIT III** **(11 Hrs)**

**Aldehydes and ketones**

Reactions of aldehydes and ketones, nucleophilic addition of Grignard reagent, Aldol condensation, mixed aldol condensation, \*Perkin, Knoevenagel, Claisen, Dieckman,\* Reformatsky reactions. Reactions with LiAlH<sub>4</sub> and NaBH<sub>4</sub> - Wolf Kishner and MPV reductions - Cannizaro, crossed Cannizaro, Reimer-Tiemann, Gattermann, Schotten - Baumann reaction of phenol and aniline.

**UNIT IV****(11 Hrs)****Dicarboxylic acids**

Malonic, Glutaric, Adipic acid - Preparation with mechanism, properties and uses.

Unsaturated acid: Acrylic acid and Crotonic acid - Preparation, Properties and Uses

**Hydroxy acids**

Tartaric acid, \*citric acid\* - Preparation and properties.

**Dienes**

Dienes - \* Nomenclature and classification of dienes - Isolated, conjugated and cumulated dienes. Polymerization - 1,2 and 1,4 addition, Diel's - Alder reaction.

**UNIT V****(12 Hrs)****Phase rule**

Phase rule - Phase, component, degree of freedom. Derivation of Gibb's phase rule. Phase equilibria - Condition for equilibrium, stability of phase of a pure substance - Pressure dependence of U and T curves. Phase equilibria in one component system - Sulphur, Water and Carbon dioxide systems. Phase diagrams for two component system – Construction and thermal analysis of phase diagrams of Pb-Ag, Bi-Cd and \*Na-K systems\*.

**\*Self Study Portions**

## Text Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	B.S. Bahl & Arun Bahl	Organic chemistry	S.Chand & Co, 15 <sup>th</sup> Edn	2009
2	R. D Madan	Modern Inorganic chemistry	S. Chand & Co, 3 <sup>rd</sup> Edn,	2011
3	B.R. Puri, L.R. Sharma, M.S. Pathania	Principles of Physical chemistry	Vishal Publications, 44 <sup>th</sup> Edn.	2010

### Reference books

S.No	Authors	Title of the Book	Publishers	Year of Publication
1	B.S. Bahl & Arun Bahl	Essentials of Physical chemistry	S.Chand & Co, 1 <sup>st</sup> Edn	2009
2	R.T. Morrison & R.W. Boyd	Organic chemistry	Pearson Prentice Hall, 17 <sup>th</sup> Edn.	2011
3	A.Peter Sykes	A Guide book to Mechanism in Organic chemistry	Pearson Education Ltd, 6 <sup>th</sup> Edn	2009

#### Question paper pattern

**Section A: 2\*5= 10 marks**

(5 out of 8)

**Section B: 5\*5= 25 marks**

(5 questions with internal choice)

**Section C: 5\*8= 40 marks**

(5 out of 7)

**Total 75 marks**

**IV SEMESTER**  
**GENERAL CHEMISTRY PAPER – IV**  
**(CE14C04)**

**Credits: 4** **(56 Hrs)**

**OBJECTIVES**

- To gain knowledge about Lanthanides and Actinides
- To enable the students to know about the synthesis of phenols, esters and amines and their properties.
- To acquire knowledge about the colligative properties of solutions.

**UNIT I** **(11hrs)**

**Lanthanides**

Position of Lanthanides in the periodic table,\* occurrence of Lanthanides\*, extraction from Monazite, separation of individual Lanthanides (by Ion exchange method). General properties of Lanthanides, Lanthanide contraction - Consequences. Position of Actinides in the periodic table.

**UNIT II** **(11 Hrs)**

**Acids and bases:**

Definitions, different approaches - Arrhenius concepts, 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. Electro negativity and hardness and softness.  $\pi$  Bonding contributions.

**UNIT III** **(11 Hrs)**

**Phenols**

Preparation and properties of alpha and beta naphthols, dihydric and trihydric phenols, catechol, resorcinol, quinol, pyrogallol, \* phloroglucinol and hydroxy quinol.\*

**Esters**

Nomenclature, isomerism in esters, methods of preparation- Esterification, alcoholysis of acid chlorides and acid anhydrides, silver salt method, Tischenko

reaction. Physical and chemical properties, uses of esters. Malonic ester - Preparation, properties and synthetic uses.

#### UNIT IV

(11 Hrs)

##### Amines

Primary, secondary and tertiary amines preparation and reactions. Separation of aliphatic amines - Hofmann, Hinsberg methods. Comparison of their basicity. Aromatic amines - Commercial preparation of aniline, reactions - Ring substitution, diazotization, coupling reactions of aromatic amines. Diazomethane and Diazoacetic ester - Preparation, structure and \*synthetic applications\*.

#### UNIT V

(12 Hrs)

##### Solutions

Ideal and non-ideal solutions - Raoult's law, vapour pressure of non-ideal solutions, fractional distillation of binary liquid solutions, distillation of immiscible liquids, solubility of partially miscible liquids - Phenol - water system. Nernst distribution law and its applications. Colligative properties - Relative lowering of vapour pressure, elevation of boiling point, \* depression of freezing point and osmotic pressure - Measurement and their application.\*

#### \* Self Study Portions

##### Text Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	B.S. Bahl & Arun Bahl	Organic chemistry	S.Chand&Co, 15 <sup>th</sup> Edn.	2009
2	R. D Madan	Modern Inorganic chemistry	S. Chand & Co, 3 <sup>rd</sup> Edn	2011
3	B.R. Puri, L.R. Sharma, M.S. Pathania,	Principles of Physical chemistry	Vishal Publications, 44 <sup>th</sup> Edn.	2010

### Reference Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	I.L.Finar	Organic chemistry, Vol-I	Pearson education	Reprint 2007
2	S.Glasstone, Devan Nostrand	Text book of physical chemistry	Maxmillan Pub	1974
3	S.M Maran and C.F.Prutton	Principles of Physical chemistry	Oxford B.H, 4 <sup>th</sup> Edn.	
4	P.L. Soni	Textbook of Inorganic chemistry	S. Chand & Co	1976

### Question paper pattern

**Section A: 2\*5= 10 marks**

(5 out of 8)

**Section B: 5\*5= 25 marks**

( 5 questions with internal choice)

**Section C: 5\*8= 40 marks**

(5 out of 7)

**Total 75 marks**

**SEMESTER III & IV**  
**Chemistry Practical – II**  
**(CE13CP2)**

**Credits: 5**

**(90 Hrs)**

**Spectrophotometry:**

1. Determination of Ni as Nickel(II) dimethylglyoxime
2. Determination of Fe as Iron(III) thiocyanate
3. Determination of Mg by Eriochrome Black-T method

**Systematic analysis of an organic compound**

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

**Preparation of the following compounds:**

- (i) m-dinitro benzene (nitration)
- (ii) p-bromoacetanilide (bromination)
- (iii) Benzoic acid from Benzaldehyde (oxidation)
- (iv) Salicylic acid from methyl salicylate (Hydrolysis)
- (v) Benzanilide from aniline (Benzoylation)

**Determination of Melting / Boiling points**

**Preparation of standard solutions**

- (i) Standard oxalic acid
- (ii) Standard potassium dichromate

**Reference Books**

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	N.K. Vishnoi	Practical Organic Chemistry	Vikas Publishing House Pvt ltd. (II reprint)	2009
2	A.I Vogel	A text book of Quantitative Inorganic Analysis	ELBS & Longmann, Green and co Ltd, 3 <sup>rd</sup> Edn	1964

## SEMESTER V

### PAPER V– INORGANIC CHEMISTRY

(CE14C05)

**CREDITS 4**

**(56 Hrs)**

#### **OBJECTIVES**

- To enable the students to become familiar with structure of metals and alloys.
- Acquire knowledge in nuclear chemistry.
- Understand the nature of solvents, acids and bases.

#### **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 super conductors.

Types of alloys - Substitutional, interstitial solid and intermetallic solid solutions, classification of alloys. Hume – Rothery ratio rules - \* Characteristics of alloys\*.

#### **UNIT II**

**(11 Hrs)**

##### **Radioactive isotopes**

Nature of isotopes - Symbolic representation of isotopes. Structure of isotopes, detection & isolation of isotopes - Various methods.\*Importance of discovery of isotopes, uses of isotopes in various fields.\* Nuclear stability n/p ratio, magic numbers and C-14 dating and nuclear binding energies. Nuclear reactions, mechanism and different types of stellar energy.

#### **UNIT III**

**(11 Hrs)**

##### **Artificial radioactivity**

Artificial transmutation of new elements. Synthesis of radioisotope of elements. Theory of radioactive disintegration, radioactive series -  $4n+1$ ,  $4n+2$ ,  $4n+3$ . Nuclear fission and fusion. Nuclear reactors principles of working - production of



electrical energy, atomic energy projects in India.\* Safety measures, disposal of reactor waste – radioactive pollution.\* Detection and Measurement of radioactivity- Geiger-Muller Counter.

**UNIT IV (11 Hrs)**

Classification of solvents - Solubility of compounds. Effect of temperature on solubility -\* role of H<sub>2</sub>O as solvent, chemical structure and solubility - General behaviour \*- Properties of ionizing solvents - Types of reactions in solvents - Specific non aqueous solvents - Protonic solvents, NH<sub>3</sub>, HF. Aprotic solvents - SO<sub>2</sub>, BrF<sub>3</sub>. molten salt, carbonic solvents - Ethanol, ether.

**UNIT V (12 hrs)**

**Nanotechnology**

Introduction, properties of nanomaterials with examples, Applications in chemistry, biology and material science.

**Green Chemistry**

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

Sonochemistry: Introduction, Synthetic applications – Esterification, saponification, Hydrolysis, Substitution.

**\* Self Study portions**

**Text Books**

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	V.K. Ahluwalia, Renu Aggarwal	Organic Synthesis- Special techniques	Narosa Publishing House.	2001
2	H.J Arniker	Essentials of Nuclear Chemistry	New Age International P. Ltd Publishers, 4 <sup>th</sup> Edn	2001

3	Esmarch .S. Gilreath	Fundamental concepts of Inorganic chemistry	Mc Graw- Hill, Revised Edn	1976
4	Mark Ratner, Daniel Ratner	Nanotechnology	Pearson education, 1 <sup>st</sup> Edition	2008
5	S.Shanmugam	Nanotechnology	MJP Publisher	2010
6	B. Viswanathan	Nanomaterials	Narosa Publishing House	Reprint 2010
7	Wahid U.Malik, G.D. Tuli, R.D.Madan	Selected topics in Inorganic chemistry	S.Chand & Co. Ltd, 30 <sup>th</sup> Edn.	2010

**Reference Books**

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	James.E.Huhey, Ellen.A.Keiter, Richard L Keiter, Okhil K.Medhi	Inorganic Chemistry - Principle Sturcture and Reactivity	Pearson Publishers 9 <sup>th</sup> Edn	2011
2	P.B.Janarthan, B.Shivashankar	Text Book of Physical Chemistry	Oxford and IBH Publication &Co	1978
3	Richard Booker, Earl Boyren	Nanotechnology	John Wiley, 1 <sup>st</sup> Edition.	2005

**Question paper pattern**

**Section A: 2\*5= 10 marks**

(5 out of 8)

**Section B: 5\*5= 25 marks**

(5 questions with internal choice)

**Section C: 5\*8= 40 marks**

(5 out of 7)

**Total 75 mark**

**V SEMESTER**  
**PAPER VI- ORGANIC CHEMISTRY**  
**(CE14C06)**

**CREDITS: 4** **(56 Hrs)**

**OBJECTIVES**

To enable the students

- To know about chemistry of terpenoids and alkaloids
- To understand the stereochemistry of organic compounds
- To learn about organometallic chemistry

**UNIT I** **(11Hrs)**

**Terpenoids**

Classification, nomenclature, occurrence and general methods of structural determination, isoprene rule, general methods of structural elucidation and synthesis as applied to Geraniol,  $\alpha$ -Terpineol,  $\alpha$ -Pinene, Menthol and Dipentene.

**UNIT II** **(11Hrs)**

**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 III** **(11Hrs)**

**Fused polynuclear aromatic hydrocarbons and conformational analysis**

Preparation, properties and uses of Naphthalene, Anthracene and Phenanthrene\*.

conformational analysis- Ethane and n-butane. Conformations of cyclohexane - Axial and equatorial bonds and conformations of mono and disubstituted cyclohexanes.

**UNIT IV****(11Hrs)****Stereochemistry**

Concept Isomerism, Types of isomerism.

Optical isomerism- elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemisation.

Relative and Absolute Configuration, sequence rules, D&L and R-S systems of nomenclature.

Geometric isomerism- determination of configuration of geometric isomers. E&Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.

**UNIT V****(12Hrs)****Organometallic Compounds**

Organo magnesium compounds - Grignard reagents -Formation, structure and chemical reactions.

\*Organo zinc compounds - Formation and chemical reactions\*

Organosulphur compounds - Methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides, sulphaguanidine.

**\* Self Study portions****Text Books**

S.No	Authors	Title of the Book	Publishers	Year of Publication
1	B.S. Bahl & Arun Bahl	Advanced organic chemistry	S.Chand & Co, 15 <sup>th</sup> Edn.	2009
2	I.L. Finar	Organic Chemistry Vol I	Pearson education, 6 <sup>th</sup> Edn.	Reprint 2007

## Reference Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	I.L. Finar	Organic Chemistry Vol II	Pearson education, 5 <sup>th</sup> Edn.	Reprint 2009
2	R.T.Morrison & R.W. Boyd	Organic Chemistry	Pearson Prentice Hall, 17 <sup>th</sup> Edn	2011

### Question paper pattern

**Section A: 2\*5= 10 marks**

(5 out of 8)

**Section B: 5\*5= 25 marks**

( 5 questions with internal choice)

**Section C: 5\*8= 40 marks**

(5 out of 7)

**Total 75 marks**

**SEMESTER V**  
**PAPER-VII-PHYSICAL CHEMISTRY**  
**(CE14C07)**

**CREDITS: 4**

**(56 Hrs)**

**OBJECTIVES**

- To enable the students to gain knowledge about conduction in solutions and various theories.
- Understand the basic principles of electrochemical cells and fuel cells.
- To learn about the electrochemical corrosion and ionic equilibria.

**UNIT I**

**(11Hrs)**

**Theories of conductance**

Conduction in metals and in solutions - \* Migration of ions\* - Kohlrausch's law. Determination of equivalent conductance at infinite dilution of weak electrolytes. Arrhenius theory of dissociation. Ostwald's dilution law. An elementary treatment of Debye Huckel theory. Activity coefficients of electrolytes- activity coefficient, Mean ionic activity Coefficient, Ionic strength, Debye Huckel theory of mean ionic coefficient.

**UNIT II**

**(11 Hrs)**

**Conductance measurements**

Conductance at high fields and high frequencies. Transport number - Definition, determination by Hittorff's method and moving boundary method. Determination of degree of dissociation of weak acid.\* Determination of solubility\* and solubility product of sparingly soluble salt.

Conductometric titrations - Strong acid vs strong base, weak acid vs strong base, strong acid vs weak base, mixture of acids vs strong base.

**UNIT III**

**(11 Hrs)**

**Electrochemical Cells**

Electromotive force & its measurements - standard cells - cell reaction & EMF convention for cell representation & sign of EMF. Single electrode potentials –

Calculation of cell EMF from single electrode potentials. Thermodynamics & EMF -  $\Delta H$ ,  $\Delta S$  & the equilibrium constant  $K$  of a reaction from EMF data - Thermodynamics of electrode potentials - The Nernst equation. Classification of electrodes - Electrochemical cells - Chemical cells with and without transference - Concentration cells with and without transference - Liquid junction potential - Use of salt bridge.

#### UNIT IV

(11 Hrs)

##### Application of EMF measurements

Determination of pH – Using glass electrode - Quinhydrone electrode, Calculation of valency of ions, equilibrium constant of an electrochemical reaction, determination of solubility of sparingly soluble salts. Potentiometric titrations, polarization. Hydrogen overvoltage - Measurement and applications. Electrochemical corrosion - Mechanism, \* types\* - Prevention - Methods involved.

#### UNIT V

(12 Hrs)

##### Ionic Equilibria

Ionization constants of weak acids and weak bases - Ionic product of water, pH, pOH, pKa, buffer solutions - Generalized concepts of acids and bases. Hydrolysis of salts of weak acids and strong bases, strong acids and weak bases and weak acids and weak bases. Henderson's equation - Theory of indicators - Solubility and solubility product - Common ion effect - Application of solubility product in analytical chemistry.

##### \*self study portions

##### Text Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	B.R. Puri, L.R. Sharma, M.S. Pathania	Principles of Physical chemistry	Vishal Publications	2010, 44 <sup>th</sup> Edn
2	P.L.Soni, O.P.Dharmarha	Text Book of Physical Chemistry	Sultan Chand & Co	1976, 9 <sup>th</sup> Revised Edn.

### Reference Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	Gurdeep Raj	Advanced Physical Chemistry	Goel Publications	
2	S.Glasstone	Introduction to Electrochemistry	East-West Press Private Limited	1942, 10 <sup>th</sup> Printing
3	W.J Moore	Physical Chemistry	Longmans Publications	1976, 5 <sup>th</sup> Edn

### Question paper pattern

**Section A: 2\*5= 10 marks**

(5 out of 8)

**Section B: 5\*5= 25 marks**

(5 questions with internal choice)

**Section C: 5\*8= 40 marks**

(5 out of 7)

**Total 75 marks**



**SEMESTER V**  
**AOS-II POLYMER CHEMISTRY**  
**(CE14E01)**

**Credit: 5** **(56Hrs)**

**Objectives**

- The syllabus has been framed with a view to teach students about the need and importance of polymer chemistry.
- To impart knowledge about the manufacture and properties of polymers of industrial importance.
- To enable the students to understand the polymer stereochemistry.

**UNIT I** **(11Hrs)**

**Polymers**

Basic concepts such as monomers, polymers, polymerization, degree of polymerization, classification of polymers.

Plastics - Definition, thermoplastic, thermosetting plastics, reinforced plastic.

Elastomers - Definition, natural and synthetic rubber, smoked rubber, reclaimed rubber, foam rubbers, spongy rubber, laminate rubber.

Adhesives - Definition, thermosetting and thermo resins.

Polymerisation techniques: Bulk solution, suspension and emulsion polymerization.

**UNIT II** **(11Hrs)**

**Mechanism of polymerization**

Characteristics of step and chain growth polymerizations. Free radical, anionic and cationic mechanism of addition polymerization. Copolymerization, derivation of copolymer equation - Conditions of formation of block, alternate and random copolymers. \*Methods of formation of block and graft copolymers\*.

**UNIT III** **(11Hrs)**

**Polymer stereochemistry**

Stereospecific polymers -Factors influencing stereo regulations, tacticity of polymers - Tactic forms of polymers of mono substituted and 1,2- disubstituted

ethylenes, Zeigler-Natta catalysts. Mono metallic and bimetallic mechanisms of Zeigler - Natta polymerization, crystalline and amorphous state, methods of determination of degree of crystallinity, glass transition temperature - \*Factors influencing  $T_g$  - Determination of  $T_g$  - Glass transition temperature of copolymer, importance of  $T_g$ ,- Visco elastic state - Properties of elastomers\*.

#### **UNIT IV**

**(11Hrs)**

##### **Polymer characterization**

Molecular weights-definition - Determination of molecular weights by end group assay, ebullioscopy, cryoscopy, osmotic pressure, \*vapour pressure, light scattering-refractive index increment\*, ultracentrifuge and viscosity methods.

#### **UNIT V**

**(12Hrs)**

##### **Polymer technology**

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

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

##### **\*Self study portions**

##### **Text Books**

<b>S.No.</b>	<b>Authors</b>	<b>Title of the Book</b>	<b>Publishers</b>	<b>Year of Publication</b>
1	Fred. W. Billmeyer	Text book of polymer science	Wiley Eastern ltd	2002,3 <sup>rd</sup> Edn.
2	V.R. Gowariker, N.V.Viswanathan, Jayadev Sreedhar	Polymer science	New Age International Ltd	2005

### Reference Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	Bahadur and N.V. Sastry	Principles of polymer science	Narosa Publishers	2002, 1 <sup>st</sup> Edn,
2	M.P. Stevens	Polymer chemistry- An Introduction	oxford publications	2009, 3rd Edn
3	J.R. Fred	Polymer Science & Technology	Prentice Hall of India	2 <sup>nd</sup> Edn, 2003

### Question paper pattern

**Section A: 2\*5= 10 marks**

(5 out of 8)

**Section B: 5\*5= 25 marks**

( 5 questions with internal choice)

**Section C: 5\*8= 40 marks**

(5 out of 7)

**Total 75 marks**

**SEMESTER V**  
**AOS-I ANALYTICAL CHEMISTRY-I**  
**(CE14E02)**

**Credit : 5** **(56 Hrs)**

**Objectives**

- To gain knowledge about the basic principles of gravimetric, volumetric and thermal analysis.
- To enable the students to acquire knowledge about electro analytical techniques

**UNIT I** **(11Hrs)**

**Gravimetric and volumetric methods of analysis**

Theory of precipitation, theory of purifying the precipitates. Volumetric analysis – Preparation of solutions, theory of indicators, \*principles of acid-base, redox, complexometric and precipitation titrations\*.

**UNIT II** **(11Hrs)**

**Thermal methods of analysis**

Introduction - TGA - Types, principle & method, instrumentation, factors affecting TGA, applications. Derivative thermogravimetric analysis (DTA) - Principle and working, instrumentation, factors affecting DTA, applications. \*Thermometric titrations – Apparatus & applications\*.

**UNIT III** **(11Hrs)**

**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, \*application\*.

**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.

## Detectors in Atomic absorption spectroscopy

Optical system-detectors and indicators in AAS-\*Read out devices-Types of Burners\*-Analytical applications-Biochemical analysis-pollution analysis-interferences-cation interferences-anion interferences.

## UNIT V

(12Hrs)

### Polarography

Principles, working and \*applications\*

### Nephelometry

Principles, working and applications

### Turbidimetry

Principles, working and applications

### \* self study portions

#### Text Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
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	15 <sup>th</sup> Edn, 1996
3	H. Kaur	Instrumental methods of chemical analysis	Pragati Publication	2008, 4 <sup>th</sup> Edn.

#### Reference Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	S. M. Khopkar	Fundamental concepts of Analytical Chemistry	Wiley Eastern Publication	Reprint 1985

2	Mahinder singh	Analytical chemistry – Instrumental techniques	Dominant Publishers	2003, 1 <sup>st</sup> Edn
---	----------------	---	------------------------	------------------------------

**Question paper pattern**

**Section A: 2\*5= 10 marks**

(5 out of 8)

**Section B: 5\*5= 25 marks**

(5 questions with internal choice)

**Section C: 5\*8= 40 marks**

(5 out of 7)

**V - SEMESTER**  
**ALC –II (optional) AGROINDUSTRIAL CHEMISTRY**  
**(CE13AC1)**

**Credit: 5 \*\* (Self study)**

**Objectives**

- Provide information about water sources for agriculture.
- To enable the students to learn about synthetic and natural perfumes
- Acquire knowledge about fertilizers, pesticides.
- To impart a detailed study of sugar, oil, fats and waxes.

**UNIT I**

**Water sources for agriculture-Water Treatment &Water Analysis.**

Sources of water supply for agriculture. Hard and soft water. Water softening methods: lime soda process, phosphate conditioning, Permutit and ion-exchange processes. Water analysis; determination of hardness of water, acidity, alkalinity, pH value, amount of free carbon dioxide, fluoride content, chloride content and their estimations. Biological oxygen demand (BOD), chemical oxygen demand (COD), chlorine demand and their determinations. Recycling of water.

**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**

1. Effect of N, P, K, secondary nutrients and micro nutrients on plant growth and development.

2. Importance of nitrogenous fertilizers. Nitrogen cycle and fixation of atmospheric nitrogen. principle and manufacture of ammonium nitrate, ammonium sulphate, urea and nitrolim.

3. Phosphate fertilizers. preparation and uses of mono and diammonium phosphates, super phosphates, and triple super phosphates.

4. 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 and herbicides. General methods of preparation, application and toxicity. Insect attractants and repellants - Fluorine compounds, boron compounds, arsenic compounds, organomercuric compounds, DDT, BHC, Pyridine compounds.

## **UNIT IV**

### **Chemistry of sugar and fermentation**

1. Details of manufacture of sucrose from cane sugar-extraction of juice, purification, concentration, crystallization, separation and refining of crystals recovery of sucrose from molasses. Manufacture of sucrose from beetroot. Estimation of sucrose and inversion of sugar by polarimetry.

2. Manufacture of alcohol from molasses and starch by fermentation process.

## **UNIT V**

### **Oils, Fats and Waxes**

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



### Text Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	B.K. Sharma	Industrial Chemistry	Goel Publishing House	2008, 3 <sup>rd</sup> Edn.
2	M.C. Arora & M. Singh	Industrial Chemistry	Anmol publications	1994, 1 <sup>st</sup> Edn.

### Reference Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	S.S.Dara	Textbook of Engineering Chemistry	S.Chand & Co	1 <sup>st</sup> Edn, 1986
2	P.C.Jain, M.Jain	Engineering Chemistry	Dhanpat Raj Publishing Company Pvt Ltd	2007, 15 <sup>th</sup> Edn
3	B.Srilakshmi	Food Science	New Age Internationl Pvt Lts	2003, 3rd edition

### Question paper pattern

**Section A: 5\*5= 25 marks**

(5 out of 8)

**Section B: 5\*10= 50 marks**

(5 out of 8)

**Total – 75 marks**

## V - SEMESTER

### ALC – II (optional) PHARMACEUTICAL CHEMISTRY

(CE13AC3)

**Credit: 5 \*\* (Self study)**

#### **Objectives:**

- To enable the students to understand the technologies used in pharmaceutical chemistry.
- Acquire knowledge in analgesics antibiotics and anaesthetics.
- To understand the role of antiseptics and disinfectant.

#### **UNIT I**

##### **Basic Concepts**

1. Important terminologies used in pharmaceutical chemistry-definition of the following terms drug, pharmacology, pharmacognosy, pharmacy, therapeutics, toxicology, chemotherapy, pharmacopia (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.
2. Routes of drug administration - Local, enema, oral or external, parental- advantages and disadvantages oral and parental routes - Inhalation, intradermal, subcutaneous. Intramuscular, intravenous - Intrathecal - Intraarticular - Transcutaneous- Transmucosal.
3. Clinical chemistry a diagnostic test and one method of estimation of sugar, bilirubin and cholesterol in serum or plasma or urine. Biuret test for urea.
4. First aid to prevent bleeding and maintain breathing
5. Causes and symptoms of food poisoning, botulism - Mushroom and plant poisoning - First aid.

6. Causes and symptoms and treatment of anemia, diabetes, tuberculosis, asthma, jaundice, piles, leprosy, epilepsy, typhoid, malaria, cholera and filarial.
7. Indian medicinal plants and their importance. Spices and their medicinal uses.

## **UNIT –II**

### **Synthetic Drugs**

1. Analgesics – Definition – Different types of pain (superficial, deep non visceral, visceral, referred and psychogenic), classification - Morphine and its derivatives.
2. Synthesis assay and uses of pethidine and methadone-Antipyretic analgesics-Salicylic acid derivatives - Paracetamol, phenacetin - Propanoic acid derivative - Ibuprofen.
3. Antibiotics: Definition, microbial synthesis structure, assay and uses of Chloramphenicol and Penicillin. Structure and use of Streptomycin and Tetracyclines.
4. Sulphonamides: Definition, mechanism of action, classification, SAR - Synthesis and use of Sulphacetamide, Sulphathiazole, Phthalyl sulphathiazole - Sulphadiazine and Sulpha pyridine - assay.

## **UNIT –III**

### **Synthetic Drugs**

1. Antiseptics and disinfectants: Definition and distinction – phenol coefficient – examples - phenolic compounds, dyes, cationic surfactants and chloro compounds. Tranquilizers - definition and examples. Psychodelic drugs LSD and marijuana.
2. Anaesthetics: Definition – classification - volatile anaesthetics (nitrous oxide, ethers, haloalkanes, chloroform, haloethane) - Ferguson principle -

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

3. Definition of cancer and antineoplastic drugs-examples antimetabolite, natural substances hormones, alkylating agents, inorganic complexes and other compounds - definition of hypoglycemic drugs-types and cause for diabetic – examples(Sulphonyl ureas and biguanides).

#### **UNIT-IV**

##### **Medicinally important compounds**

1. Medicinally important compounds of Al, P, As, Hg and Fe. Uses of the following  $MgSO_4 \cdot 7H_2O$ , milk of magnesia, magnesium trisilicate - aluminium hydroxide gel, dihydroxy aluminium aminoacetate, aluminium acetate and aluminium monostearate - paroxon -phosphorine, cyclophosphamide – tricyclophos - preparation and use of thiotepa - sodium and copper cacodylates - preparation and uses of aromatic areseicals (carbosone, triparasomide, acetarsonide, neoarsphenamine, oxophenarisine)  $HgCl_2 / HgI_2$  and  $Hg(CN)_2$  as disinfectants - importance of organic mercury compounds - structure and uses of thiomersal, netromersal merbromine and mersaly acids – ferrous gluconate,  $FeSO_4$ , scale, scalepreparation (ferric ammonium acetate) Ferrous fumarate, ferrous succinate and ferrous chlorinate.
2. Organic pharmaceutical aids-definition – agents for kidney function (aminohippuric acid)-liver function (sulphobrophthalein 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.
3. AIDS-cause HIV-propagation-prevention and treatment.

#### **UNIT-V**

##### **Blood and Hematological agents**

1. Blood-composition - Grouping - Rh factor – Buffers in blood – Functions of plasma proteins-clotting mechanism –blood pressure.
2. Coagulants and anticoagulants-Definitions and examples.
3. Antianemic drugs (iron, vitamin B12, folic acid).
4. Cardiovascular drugs: definition and names of drugs for each of the following – cardiotoxic drugs - antiarrhythmic drugs - antihypertensive drugs - antianginal agents-vasodilators-lipids lowering agents – sclerosing agents.

**Text Books:**

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	R.S Satoskar & S.D.Bhandarkar	Pharmacology and Pharmatherapeutics, Vol 1 & 2	Popular Prakashan Mumbai	1989, 11 <sup>th</sup> Edn.
2	Ashutosh Kar	Medicinal Chemistry	New Age International	3 <sup>rd</sup> Edn 2005.

**Reference Books:**

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	G. Padrick	Medicinal Chemistry	Viva Books Pvt. Ltd	2002 2 <sup>nd</sup> Edn.
2	D. Sriram, P. Yogeewari	Medicinal Chemistry	Pearson education	2010, 2 <sup>nd</sup> Edn.
3	Jayashree ghosh	A Text book of pharmaceutical chemistry	S Chand & Co	Revised Edn 2003.

**Question paper pattern**

**Section A: 5\*5= 25 marks**

(5 out of 8)

**Section B: 5\*10= 50 marks**

(5 out of 8)

Total 75 mar

**SEMESTER VI**  
**PAPER –VIII ORGANIC CHEMISTRY**  
**(CE14C08)**

**Credit: 5**

**(86 Hrs)**

**Objectives**

To enable the students

- To understand the mechanism of rearrangements
- To learn the chemistry of heterocyclic compounds, vitamins, drugs and other chemotherapeutics
- To learn about aminoacids, proteins and nucleic acids

**UNIT I**

**Heterocyclic Compounds**

**(17Hrs)**

Preparation, properties and uses of Furan, Pyrrole, Thiophene and Pyridine – Methods of synthesis and chemical reaction with particular emphasis on mechanism of electrophilic substitution, mechanism of nucleophilic substitution in pyridine. Comparison of basicity of Pyrrole, Pyridine and t- amines

Quinoline, Isoquinoline and indole – With special reference to Skraup synthesis, Bischler- Napieralski synthesis and Fischer indole synthesis, chemical properties.

Derivatives of Indole-Oxindole, Indoxyl, Isatin and Indigo

**UNIT II**

**(17Hrs)**

**Carbohydrates**

Classification and nomenclature, preparation and properties of monosaccharides (Glucose and fructose), interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses, configuration of mono saccharides. Open chain structure and cyclic structure of D(+) Glucose. Introduction to disaccharides – Maltose, Sucrose, Lactose and Polysaccharides – Starch and cellulose (without involving structure determination).

### **UNIT III**

**(17Hrs)**

#### **Molecular rearrangements**

Types of rearrangements – Nucleophilic, electrophilic and free radical, inter and intramolecular. Normal and cross- over products- migrating aptitude of groups. Pinacol – pinacolone rearrangements, Claisen rearrangements (ortho and para rearrangement), Beckmann, Hofmann, Curtius, Benzilic acid and Lossen rearrangement.

### **UNIT IV**

**(17Hrs)**

#### **Vitamins and Drugs**

Introduction, importance of vitamins, structural elucidation, synthesis and deficiency diseases and sources of Retinol, Thiamine, Riboflavin and Ascorbic acid.

Introduction, classification of drugs, lethal dose, chemistry and application of sulpha drugs, antimalarials, amoebicidal drugs, antiseptics, antipyretics, analgesics and antibiotics, structure and uses of Pencillin, Streptomycin, Tetracycline and Chloromycetin.

### **UNIT V**

**(18Hrs)**

#### **Amino acids ,peptides,proteins and nucleic acids**

Aminoacids – definitions, \* classification,\* preparation – amination of halogen acids, Gabriel Phthalimide synthesis, Strecker synthesis, Erlen Meyer azlactone synthesis. Reactions of  $\alpha$  - amino acid – reactions of amino group and carboxylic group, action of heat on  $\alpha$ ,  $\beta$  and  $\gamma$  - amino acids.

Polypeptides - nomenclature, synthesis – Bergaman method and Fischer method, solid state peptide synthesis, N- terminal and C- terminal analysis of peptides

Proteins –Classification, properties and test for proteins. Primary, secondary and tertiary structure of proteins. Colour reactions of proteins, denaturation of proteins. \*Importance of proteins\*

Types of nucleic acids – RNA, DNA –Biological functions, DNA double helical structure only.

**\*Self study portions**

**Text Books**

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	Ashutosh kar	Medicinal Chemistry	New Age International Publishers, 3rd Edn.	2005
2	B.S. Bahl & Arun Bahl	Advanced organic chemistry	S.Chand&Co, 15 <sup>th</sup> Edn.	2009
3	I.L.Finar	organic Chemistry Vol I	Pearson Education, 6 <sup>th</sup> Edn.	2007

**Reference Books**

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	O.P. Agarwal	Chemistry of Natural Products, Vol I	Goel Publication Pvt Ltd, 28 <sup>th</sup> Edn.	2002
2	O.P. Agarwal	Chemistry of Natural Products, Vol II	Publication Pvt Ltd, 25 <sup>th</sup> Edn.	2001
3	I.L.Finar	Organic Chemistry, Vol II	Pearson Education, 6 <sup>th</sup> Edn.	2009

**Question paper pattern**

**Section A: 2\*5= 10 marks**

(5 out of 8)

**Section B: 5\*5= 25 marks**

(5 questions with internal choice)

**Section C: 5\*8= 40 marks**

(5 out of 7)

Total 75 marks



**SEMESTER VI**  
**CORE PAPER –IX PHYSICAL CHEMISTRY**  
**(CE14C09)**

**Credit: 5**

**(71 Hrs)**

**Objectives**

- To make the students know the basic principles of kinetics.
- To give a basic idea about photochemistry
- To learn about the types of adsorption and isotherms.

**UNIT I**

**(14Hrs)**

Empirical laws and experimental aspects – Order and molecularity of reactions. Setting up and solving simple differential equations for zero order, first order, second order and third order reactions. Derivation for half-life periods of first, second, third order and zero order. \*Determination of order of reactions\*. Fast reactions - methods to study fast reactions

**UNIT II**

**(14Hrs)**

Effect of temperature on the rate constant – Activation energy – Collision theory – Postulates, limitations and derivation of rate constant. Absolute reaction rate theory – assumptions – Derivation of the rate constants on the basis of partition function. \* Comparison of the two theories.\*

**UNIT III**

**(14Hrs)**

Significance of free energy of activation and entropy of activation. Theory of unimolecular reactions – Lindemann's theory, Hinshelwood Theory. Complex thermal reactions - \*Simultaneous, reversible\*, consecutive and chain reactions – The hydrogen-oxygen reaction – Explosion, conditions, consequences.

**UNIT IV**

**(14Hrs)**

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 V

(15 Hrs)

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\*, photosensitisation and chemiluminescence. (Elementary treatment only)

**\*Self study portions**

### Text Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	B.R. Puri, L.R. Sharma, M.S.Pathania	Principles of Physical chemistry	Vishal Publications, 44 <sup>th</sup> Edn.	2010
2	P.L. Soni, O.P. Dharmarha	Text Book of Physical Chemistry	Sultan Chand & Co., 9 <sup>th</sup> Revised Edn.	1976
3	Subhash Satish, K.L. Sindhvani	Advanced Physical Chemistry	J.P.Nath & Co., 1 <sup>st</sup> Edn	1976

### Reference Books

S.No	Authors	Title of the Book	Publishers	Year of Publication
1	Samuel Glasstone	Textbook of Physical Chemistry	Mc Millan Publications, 2 <sup>nd</sup> Edn.	1974

**Question paper pattern**

**Section A: 2\*5= 10 marks**

(5 out of 8)

**Section B: 5\*5= 25 marks**

( 5 questions with internal choice)

**Section C: 5\*8= 40 marks**

(5 out of 7)

Total 75 marks

**SEMESTER VI**  
**PAPER-X Physical methods and chemical structure**  
**(CE14C10)**

**Credit: 5**

**(86 Hrs)**

**Objective**

- To enable the students to gain knowledge about the fundamentals of various spectroscopy.
- To impart knowledge about the basic principles of XRD and enable students to know the crystalline point groups and space groups.
- To gain knowledge about the basic principles and applications of different chromatographic techniques.

**UNIT I**

**(17 Hrs)**

**Fundamental concepts**

\* Frequency, wavelength, wave number, electromagnetic radiations and spectrum\*,

Molecular energy levels, types of changes induced by the interaction of matter with electromagnetic radiation.

**Microwave spectra**

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

**IR spectra**

Theory of IR spectra for diatomic molecule as simple harmonic, and anharmonic oscillator, selection rule, vibrational frequencies - Vibrational modes of H<sub>2</sub>O and CO<sub>2</sub>. Applications of IR spectra –molecular constitution and hydrogen bonding.

## **UNIT II**

**(17 Hrs)**

**Raman spectroscopy** - Rayleigh and Raman scattering - Stokes and antistokes lines classical theory, instrumentation - block diagram – comparison of IR and Raman spectroscopy-Mutual exclusion principle and its applications.

### **UV –Visible spectroscopy**

Franck –Condon principle, \*Types of electronic transitions in organic molecules, Woodward Fieser rules for calculation of  $\lambda_{\max}$  of conjugated dienes, unsaturated ketones, predissociation. Determination of dissociation energy – Birge – Sponer method.

## **UNIT III**

**(17 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 ketone. Solvents used-applications , MR Imaging(application)

Magnetic properties of molecules - Magnetic permeability, magnetic susceptibility, determination by Gouy balance, application of susceptibility measurements for structural determination of free radicals and complexes.

## **UNIT IV**

**(17 Hrs)**

### **X –ray diffraction**

Fundamentals of XRD, Bragg's equation, \*powder and rotating crystal methods\*. Determination of lattice types, analysis of X-ray data for cubic system, NaCl, KCl and CsCl, Diamond and Graphite crystal systems. Bravais lattices, Miller indices & labeling of planes, symmetry properties - Crystallographic point groups and space groups.

**UNIT V****(18 Hrs)****Chromatography**

Paper chromatography – Principle, solvents used, development of chromatogram, ascending, descending and radial paper chromatography and applications. Paper electrophoresis – Separation of amino acids.

TLC- Principle, choice of adsorbents and solvents, preparation of chromatoplates,  $R_f$  values, factors affecting  $R_f$  values, significance of  $R_f$  values.

Column chromatography – Principle, types of adsorbents, preparation of the column, elution, recovery of substances and applications

**\*Self study portions****Text Books**

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	C.N.Banwell, E.M.McCash	Fundamentals of Molecular Spectroscopy	Tata Mcgraw Hill, 4 <sup>th</sup> Edn.	1995
2	B.R. Puri, L.R. Sharma, M.S. Pathania	Principles of Physical chemistry	Vishal Publications, 44 <sup>th</sup> Edn.	2010
3	V.K.Srivatsava	Introduction to Chromatography	S.Chand And Co.	1991

**Reference Books**

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	P.W Atkins	Physical Chemistry	Oxford University Press	1978

2	Raymond Chang	Basic principles of spectroscopy	Mc Graw Hill, Kogi Kushi Ltd, 2 <sup>nd</sup> Edn.	1971
3	Y.R Sharma	Elementary Organic Spectroscopy	S.Chand&CO	2009

**Question paper pattern**

**Section A: 2\*5= 10 marks**

(5 out of 8)

**Section B: 5\*5= 25 marks**

( 5 questions with internal choice)

**Section C: 5\*8= 40 marks**

(5 out of 7)

**Total 75 marks**

**SEMESTER –VI**  
**AOS III-DYE CHEMISTRY**  
**(CE14E03)**

**Credit: 4**

**(71 Hrs)**

**Objectives**

- To enable the students to understand the theories of colour and constitution.
- To acquire knowledge about the process of dyeing and mechanism of dyeing process.
- To know about the different types of dyes-their synthesis, characteristics and application.
- To gain knowledge about pigments and their uses in paints.

**UNIT I**

**(14 Hrs)**

**Fundamental concepts**

Colour and constitution: \* Colour of substances - Complementary colours\*- theories of colour and constitution- Otto - Witt theory- chromophores, auxochromes, bathochromic shift, hypochromic shift. Quinonoid theory, modern theories - valence bond theory and molecular orbital theory.

Classification of dyes - Chemical classification and classification according to applications- \*Process of dyeing\* .

**UNIT II**

**(14 Hrs)**

**Azodyes**

Azo dyes - Principles of azo coupling - Mechanism of diazotization - Coupling with amines and phenols. Mono azo and bis azo dyes - Synthesis and applications. Tautomerism in azo dyes.

Chemistry of Dyestuff Intermediates: Primaries, Intermediates, manufacture of Intermediates- Aliphatic compounds (alcohols, halogen compounds, carboxylic acids and esters, aldehydes and ketones, amines)

**UNIT III**

**(14 Hrs)**

**Di and tri phenyl methane dyes**



Synthesis, reactions 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 and Crystal violet. Hydroxy triphenyl methane dyes - Aurin, Chrome violet.

### Phthalein dyes

Phenolphthalein, phenosulpho-phthalein. \*xanthene dyes, acid xanthene dyes - Fluorescein, Eosin, Erythrocin\*. Xanthhydrol basic xanthene dyes - Rhodamine - B, Rhodamine-G, pyronine-G.

## UNIT IV

(14 Hrs)

### Other synthetic dyes

Synthesis, reactions and applications of quinone imine dyes - indophenols, indamines. Azine dyes - mauveine, 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, sulphur dye\*.

## UNIT V

(15 Hrs)

### Pigments

Requirements of a pigment - Organic and inorganic pigments and their uses in paints. Reactions of dyes with fibre and water. Fluorescent brightening agents. \*Applications of dyes in other areas – Medicine, chemical analysis, cosmetics, colouring agents, food and beverages\*.

**\* self study portions**

### Text books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	Gurdeep .R. Chatwal	Synthetic Dyes	Himalaya Publishers	1995
2	B.K. Sharma	Industrial Chemistry	Krishna Prakashan Mandir, 6 <sup>th</sup> Edn.	1994

3	O.D.Thyagi, M. Yadav	A Text Book of Synthetic Dyes	Anmol Publication Pvt Ltd	Reprint 2001
---	-------------------------	----------------------------------	------------------------------	--------------

**Reference books**

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	E.N. Abrahart	Dyes and their Intermediates	Edward Arnold Publishers, 2 <sup>nd</sup> Edn	1977
2	Pope Sine	Synthetic Dyes	Rajat Publications, 1 <sup>st</sup> Edn.	2003
3	Rajbir Singh	Synthetic Dyes	Mittal Publications, 1 <sup>st</sup> Edn	2002

**Question paper pattern**

**Section A: 2\*5= 10 marks**

(5 out of 8)

**Section B: 5\*5= 25 marks**

( 5 questions with internal choice)

**Section C: 5\*8= 40 marks**

(5 out of 7)

**Total 75 mark**

## AOS-IV BIOLOGICAL CHEMISTRY

(CE13E04)

**Credit: 4**

**(71 Hrs)**

### **Objectives**

- To enable the students to become familiar with different types of lipids.
- To acquire knowledge in biological role of lipids.
- To understand the reactions in living cells.

### **UNIT I**

**(14Hrs)**

Lipids – Introduction, occurrences, biological significance of fats, classification of lipids, simple lipids- chemical composition of fats, properties of fats – spreading of fats, emulsification, waxes-types.

### **UNIT II**

**(14 Hrs)**

Chemical properties of lipids – hydrolysis, auto oxidation, rancidity, addition reaction, hydrogenation, characterization and identification of fats – physical and chemical method (RM value, I<sub>2</sub> value and acetyl value)

### **UNIT III**

**(14 Hrs)**

Fatty acids – classification, properties, isomerism. Glycerol – Preparation, properties  
Compound Lipids – Phospholipids – Phosphoglyceride (Lecithin) – properties.  
Biological role of lipids

### **UNIT IV**

**(14 Hrs)**

Bioenergetics- energy metabolism – measurement of energy – respiratory quotient, basal metabolism, BMR – factors influencing BMR, determination of BMR.

High energy compounds-Types of energy rich compounds, structure of ATP, role of ATP.

### **UNIT V**

**(15 Hrs)**

Elements of biochemical genetics Mendelian inheritance, Law Of Genetic Segregation,

Law of independent assortment, Chromosomes and genes, normal and abnormal human chromosomes, Abnormalities of sex chromosomes.

### Text Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	Ambika Shanmugam	Fundamentals of Biochemistry for Medical Students	Nagaraj & Company Pvt Ltd, 6 <sup>th</sup> Edn	Reprint 2005.
2	L. Veerakumari	Biochemistry	MJP Publishers.	2004.

### Reference Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	A.C. Deb	Fundamentals of Biochemistry	New Central Book Agency, 8 <sup>th</sup> Edn	2004.
2	Rajbir Singh	Biochemistry	A Mittal Publication, 1 <sup>st</sup> Edn	2002.

### Question paper pattern

**Section A: 2\*5= 10 marks**

(5 out of 8)

**Section B: 5\*5= 25 marks**

( 5 questions with internal choice)

**Section C: 5\*8= 40 marks**

(5 out of 7)

**Total 75 marks**

**SEMESTER –VI**  
**ALC-III OPTIONAL – CHEMISTRY OF PLANT BASED PRODUCTS**  
**(CE13AC2)**

**CREDITS: 5\*\* (Self study)**

**OBJECTIVES**

- Gain knowledge about the chemistry of starch of plant based products
- Learn the principles and methods involved in the manufacture of paper
- Understand the pollution problems caused by industry based on starch, cellulose and proteins
- Understand the utilization of medicinal plants.

**UNIT I**

**Chemistry of starch**

Introduction, sources, manufacture, properties and uses of starch, structure of amylase and amylopectin. Types of starch modified and unmodified starch, preparation and uses, conversion of starch to edible and industrial glucose, corn syrup, application of starch in textile industry, fermentation to ethanol, butanol and acetone.

**UNIT II**

**Chemistry of cellulose**

Preparation chemical properties and uses of cellulose – structure of cellulose, solvents for cellulose, acid alkaline and enzymatic hydrolysis of cellulose, hemicellulose-pentosan, extraction of pentosan from wood, chemical properties and uses. Lignin –methods of separation of lignin from tissues, structural elucidation of lignin.

Cellulose derivatives like cellulose nitrate, cellulose acetate, ethyl methyl cellulose, sodium cellulose sulphate, sodium carboxy hydroxy methyl cellulose, regenerated cellulose.

**UNIT III**

**Chemistry of proteins**

Classification of proteins, properties of proteins – denaturation, isoelectric point, salting – in and salting out of proteins. Acid, alkaline and enzymatic hydrolysis of proteins, colour reactions of proteins, structure of proteins-primary and secondary, a brief account on the tertiary and quaternary structure. Protein isolates – general procedure for isolation and purification of protein isolates. Gelatin – manufacture and technological uses, casein and collagen – preparation and uses.

#### UNIT IV

Different methods of pulping – kraft pulping, soda pulping sulphite pulping semi chemical pulping mechanical and thermo mechanical pulping, new pulping processes

Manufacture and uses of different quality of paper products like cardboard, news print, writing paper, tissue paper and filter paper.

Short discussion of pollution problems and by – products utilization of industries based on starch, cellulose and proteins.

#### UNIT V

Indian medicinal plants- Hibiscus Rosa-sinesis, Adathoda Vasica, Ocimum Sanctum, Mangifera Indica, Azadirachta Indica phyllanthus Niruri, Solanum trilobatum Grasses, Greens-Active principles and medicinal values.

#### Text books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	B.K.Sharma	Industrial chemistry	Goel publishing House Meerut.	2008

#### Reference books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	O.P.Agarwal	Chemistry of Natural Products, Vol.I & II	Goel Publishers	

2	Jayashreee Ghosh	Fundamental concepts of Applied chemistry	S.Chand & Co Ltd	Reprint 2008
---	---------------------	---	------------------	--------------

**Question paper pattern**

**Section A: 5\*5= 25 marks**

(5 out of 8)

**Section B: 5\*10= 50 marks**

(5 out of 8)

## **ALC IV-LEATHER CHEMISTRY**

**(CE13AC4)**

**\*\* (Self study)**

**CREDITS: 5**

**OBJECTIVES:**

- ❖ To gain knowledge about the structure and composition of hides.
- ❖ To learn the different methods of tanning leather.
- ❖ To understand the pollution problems caused by tannery effluents.

### **UNIT I**

Introduction-chief process used in leather manufacture

Hides, Skins, Leather – An elementary knowledge of 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, bating, pickling and depickling.

### **UNIT II**

Types of tanning – vegetable and mineral tanning, different types of vegetable tanning–materials classification and chemistry of vegetable tanning. Factors and Physico-chemical principles involved in vegetable tanning, Fixation of vegetable tanning. Synthetic tanning – their classifications, general methods of manufacture and use.

### **UNIT III**

The preparation and chemistry of chrome tanning liquids, Olation, Oxolation and hydrolysis of chrome liquids. Effect 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 other tanning like Al, Zr and Te salts and their relative merit in contrast with chrome tanning. Chemistry of combination of tannages involving vegetable tanning aldehyde chrome and other tanning agents.



#### UNIT IV

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

#### UNIT V

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

#### Textbooks

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	P.C.Jain, M.Jain	Engineering Chemistry	Dhanpat Raj Publishing Company Pvt Ltd, 15 <sup>th</sup> Edn	2007
2	Jayashree Ghosh	Fundamental concepts of Applied chemistry	S.Chand & Co Ltd	Reprint 2008
3	B.K. Sharma	Industrial Chemistry	Goel publishing House, Meerut.	2008

#### Question paper pattern

**Section A: 5\*5= 25 marks**

(5 out of 8)

**Section B: 5\*10= 50 marks**

(5 out of 8)

**SEMESTER V & VI**  
**Chemistry Practical – III**  
**(CE13CP3)**

**Credits: 5**

**(150 Hrs)**

**Volumetric Analysis**

**Acidimetry and Alkalimetry**

1. Estimation of sulphuric acid using standard oxalic acid.
2. Estimation of sodium hydroxide using standard sodium carbonate.
3. Estimation of sodium carbonate and bicarbonate in a given mixture

**Permanganometry**

1. Estimation of oxalic acid using standard Mohr's salt solution.
2. Estimation of Mohr's salt solution using standard oxalic acid.
3. Estimation of Calcium by direct and indirect methods.

**Dichrometry**

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

**Iodometry & Iodimetry:**

1. Estimation of Potassium dichromate.
2. Estimation of Copper.
3. Estimation of  $\text{As}_2\text{O}_3$ .

**Physical Chemistry Experiments**

1. Rate constant of methyl acetate – Acid Hydrolysis
2. Determination of partition coefficient of Iodine between  $\text{CCl}_4$  & Water.
3. Determination of equilibrium constant of the reaction  $\text{KI} + \text{I}_2 \leftrightarrow \text{KI}_3$ .
4. Determination of the concentration of the given KI by partition method.
5. Critical solution temperature of phenol – water system.
6. Effect of impurity on the CST of phenol – water system.
7. Determination of the concentration of the given NaCl/Succinic acid from the study of CST of phenol – water system.
8. 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

5. Potentiometric titration – Acid - Base

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

1. Ba as BaSO<sub>4</sub>

2. Ba as BaCrO<sub>4</sub>

3. Ca as CaC<sub>2</sub>O<sub>4</sub>.H<sub>2</sub>O

#### **Water Quality Parameter Analysis**

1. Alkalinity

2. Hardness

3. Chloride

4. Dissolved Oxygen

#### **Estimation of TDS, TSS, TS and pH of the given water samples**

#### **Reference Books**

<b>S.No.</b>	<b>Authors</b>	<b>Title of the Book</b>	<b>Publishers</b>	<b>Year of Publication</b>
1	A.J. Findlay & Kitchener	Practical Physical Chemistry	Longman Publication, 1 <sup>st</sup> Edn.	1969
2	V.Venkateswaran, R. Veeraswamy and A.R. Kulandaivelu	Basic Principles of Practical Chemistry	S.Chand & Co	2012
3	B. Vishwanathan, P.S. Raghavan	Practical Physical Chemistry	Viva Books	Reprint 2009
4	A.I Vogel	A text book of Quantitative Inorganic Analysis	ELBS & Longmann , Green and co Ltd, 3 <sup>rd</sup> Edn	1964