

RAJAH SERFOJI GOVERNMENT COLLEGE (AUTONOMOUS)

THANJAVUR – 613 005

(Re-Accredited with 'A' Grade by NAAC & Affiliated to Bharathidasan University)

B.Sc., CHEMISTRY - SYLLABUS

(Under Choice Based Credit System - CBCS)
For Candidates admitted from the year 2018 – 19 onwards



Finalized (for the I to VI Semester) in the
BOARD OF STUDIES MEETING HELD ON 18.04.2018

&

APPROVED BY THE ACADEMIC COUNCIL ON _____

PG & RESEARCH DEPARTMENT OF CHEMISTRY

RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS), THANJAVUR – 600 005

COURSE STRUCTURE FOR B.A., / B.Sc., / B.Com, / B.B.A., UNDER CBCS

U.G. PROGRAMMES – CHEMISTRY

(Applicable to the Candidates admitted from the Academic Year 2018 – 2019 onwards)

PART	CODE	COURSE	TITLE	HRS	MARKS		TOTAL	CREDIT	Page No.
					IE	WE			
<i>I SEMESTER</i>									
I	S1T1	LT	PART I Tamil – I	6	25	75	100	3	
II	S1E1	LE	PART II English – I	6	25	75	100	3	
III	S1CH1	CC 1	General Chemistry – I	6	25	75	100	4	5
III	S2CHP1	CC 3	Running Paper - Volumetric Analysis Practical - I	3	-	-	-	-	8
III	S1AM1 S1AZ1	Allied 1	Allied Mathematics - I / Allied Zoology – I	4	25	75	100	4	
III	S2AM3 S2AZP	Allied 3	Running Paper – Allied Mathematics - III Allied Zoology Practical – I	3	-	-	-	-	
IV	S1VE	VE	Value Education	2	50	50	100	2	
Total				30	150	350	500	16	
<i>II SEMESTER</i>									
I	S2T2	LT	PART I Tamil – II	6	25	75	100	3	
II	S2E2	LE	PART II English – II	6	25	75	100	3	
III	S2CH2	CC2	General Chemistry – II	6	25	75	100	5	10
III	S2CHP1	CC3	Volumetric Analysis Practical – I (3 Hrs)	3	40	60	100	5	8
III	S2AM2 S2AZ2	Allied 2	Allied Mathematics –II Allied Zoology – II /	4	25	75	100	4	
III	S2AM3 S2AZP	Allied 3	Allied Mathematics - III Allied Zoology Practical – I(3Hrs)	3	40/ 25	60/ 75	100	4	
IV	S2ES	ES	Environmental Studies	2	50	50	100	2	
Total				30	230/ 215	470/ 485	700	26	

PART	CODE	COURSE	TITLE	HRS	MARKS		TOTAL	CREDIT	Page No.
					IE	WE			
III SEMESTER									
I	S3T3	LT	PART I Tamil – III	6	25	75	100	3	
II	S3E3	LE	PART II English – III	6	25	75	100	3	
III	S3CH3	CC4	General Chemistry – III	6	25	75	100	5	12
III	S4CHP2	CC6	Running Paper - Inorganic Qualitative Analysis Practical - II	3	-	-	-	-	15
III	S3AP1	Allied 4	Allied Physics – I	4	25	75	100	4	
III	S4APP	Allied 6	Running Paper - Allied Physics Practical	3	-	-	-	-	
IV	S3SB1M	SB1	Skill Based – 1- Food and Nutrition	2	50	50	100	2	16
Total				30	150	350	500	17	
IV SEMESTER									
I	S4T4	LT	PART I Tamil – IV	6	25	75	100	3	
II	S4E4	LE	PART II English – IV	6	25	75	100	3	
III	S4CH4	CC5	General Chemistry – IV	6	25	75	100	5	17
III	S4CHP2	CC6	Inorganic Qualitative Analysis Practical - II (3 Hrs)	3	40	60	100	5	15
III	S4AP2	Allied 5	Allied Physics – II	4	25	75	100	4	
III	S4APP	Allied 6	Allied Physics Practical (3 Hrs)	3	40	60	100	4	
IV	S4SB2M	SB2	Skill Based – 2- Dying Techniques and Water Treatment	2	50	50	100	2	20
Total				30	230	470	700	26	

PART	CODE	COURSE	TITLE	HRS	MARKS		TOTAL	CREDIT	Page No.
					IE	WE			
V SEMESTER									
III	S5CH5	CC7	Inorganic Chemistry – I	5	25	75	100	5	22
III	S5CH6	CC8	Organic Chemistry – I	5	25	75	100	4	24
III	S5CHP3	CC9	Organic Chemistry Practical – III (3 Hrs)	3	40	60	100	4	26
III	S6CHP5	CC10	Running Paper - Physical Chemistry Practical - V	3	-	-	-	-	27
III	S5CHEL1A	MEC1	Physical Chemistry - I	5	25	75	100	4	28
	S5CHEL1B		Forensic Chemistry						31
	S5CHEL1C		Bio Chemistry						33
III	S5CHEL2A	MEC2	Analytical Chemistry	5	25	75	100	4	35
	S5CHEL2B		Pharmaceutical Chemistry						38
	S5CHEL2C		Polymer Chemistry						40
III	S5PHELO1	NMEC1	Medical physics	4	25	75	100	3	
IV	S5SSD	SS	Soft Skill Development	2	50	50	100	2	
IV	S5SB3M	SB3	Skill Based – 3- Agricultural Chemistry	2	50	50	100	2	42
Total				30	265	535	800	28	
VI SEMESTER									
III	S6CH7	CC11	Inorganic Chemistry – II	5	25	75	100	5	43
III	S6CH8	CC12	Organic Chemistry – II	5	25	75	100	5	45
III	S6CHP4	CC13	Gravimetric Analysis Practical - IV (3 Hrs)	5	40	60	100	4	48
III	S6CHP5	CC10	Physical Chemistry Practical – V (3 Hrs)	5	40	60	100	4	27
III	S6CHEL3A	MEC3	Physical Chemistry – II	4	25	75	100	4	49
	S6CHEL3B		Materials & Nano Chemistry						52
	S6CHEL3C		Chemistry in Everyday Life						54
III	S6MELO2	NMEC2	Operation research, statistics and numerical methods	4	25	75	100	3	
V	S6GS	GS	Gender Studies	2	50	50	100	1	
V	S6EA	Ext. Activities	NSS / NCC / SPORTS / RED CROSS	-	-	-	-	1	
Total				30	230	470	700	27	
GRAND TOTAL							3900	140	

RAJAH SERFOJI GOVT. COLLEGE (AUTONOMOUS), THANJAVUR – 600 005**COURSE STRUCTURE FOR B.A., / B.Sc., / B.Com, / B.B.A., UNDER CBCS****U.G. PROGRAMMES – CHEMISTRY****(Applicable to the Candidates admitted from the Academic Year 2018 – 2019 onwards)****Course Structure**

PART	COURSE TITLE	NO. OF PAPERS	TOTAL CREDITS
PART - I	TAMIL	4X3	12
PART - II	ENGLISH	4X3	12
PART - III	CORE	8X5 = 40 5X4 = 20	60
	ELECTIVES	3X4	12
	ALLIED	6X4	24
	NON MAJOR	2X3	6
PART - IV	ES,VE	2X2	4
	SKILL BASED	3X2	6
	SSD	1X2	2
PART - V	GS	1X1	1
	EXT.ACTIVITIES	-	1
TOTAL PAPERS – 39			TOTAL CREDIT - 140

Separate passing minimum is prescribed for Internal and External

- The passing minimum for CIA shall be 40% out of 25 Marks. (i.e., 10 Marks)
- The passing minimum for Autonomous Examinations shall be 40% out 75 Marks. (i.e. 30 Marks)

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Core Course – I (Major Theory)

Credits : 3
 Hours / Week : 6
 Medium of Instruction : Both Tamil and English

Code: S1CH1

SEMESTER – I

(For students admitted from 2018 onwards)

General Chemistry – I

Objectives
<ul style="list-style-type: none"> ❖ To learn about chemical bonding. ❖ To acquire the knowledge of Boron and carbon families. ❖ To study the various concepts and applications of volumetric analysis. ❖ To understand the Basic concepts in organic chemistry and Gaseous state in Physical Chemistry.
Learning Outcomes
<p>At the completion of this course the student will be able to</p> <ul style="list-style-type: none"> ❖ Understand the structure of atoms and will apply the periodic laws to predict chemical and ❖ Physical properties of the elements. ❖ Comprehend the nature of compounds, and chemical equations and apply them in stoichiometric calculations.

UNIT – I (Inorganic Chemistry)

Chemical bonding

- 1.1. Lattice energy and Born – Haber Cycle
- 1.2. Pauling and Mulliken's scales of electronegativity.
- 1.3. Polarising power and Polarisability – Partial ionic character from electronegativity – Transition from ionic to covalent character and vice-versa – Fajan's rules – concept of hard and soft acids and bases.
- 1.4. VSEPR Theory: Shapes of simple inorganic molecules (BeCl_2 , BF_3 , SiCl_4 , PCl_5 , SF_6 , IF_7 , H_2O , NH_3 , XeF_6) containing lone pair and bond pairs of electrons – Lewis structures .
- 1.5. Hydrogen bonding – Its nature, types, effect on properties.
- 1.6. Intermolecular forces – London forces and van der Waals forces.

UNIT –II (Inorganic Chemistry)

2.1. Boron Family:

Comparative study of boron family elements: Compounds of boron – diborane structure discussion – borax, boron nitride, boron carbide and borazole.

2.2. Carbon Family

2.2.1. Comparative study of carbon family elements and their compounds (hydrides, halides and oxides).

- 2.2.2. Chemistry of cyanogens, hydrocyanic acid, cyanic acid, thiocyanic acid, ammonium thiocyanate and carbon disulphide.
- 2.2.3. Structures of graphite, diamond and fullerene.

2.3 Volumetric Analysis :

Basic requirements of titration reaction – concentration terms – standard solutions – primary and secondary standards – types of titrimetric reactions – redox and precipitation titrations – indicators – effect of change in pH – neutralization – mixed and fluorescent indicators.

UNIT –III (Organic Chemistry)

- 3.1. Basic concepts in organic chemistry - catenation
 - 3.1.1. Hybridization and geometry of molecules – methane, ethane, ethylene and acetylene (sigma and pi bonds, bond lengths, bond angles, bond energy)
 - 3.1.2. Electron displacement effects – Inductive, inductometric, electromeric, mesomeric, resonance (localized and delocalized chemical bond), hyperconjugation and steric effects.
 - 3.1.3. Cleavage of bonds – homolytic and heterolytic fission of carbon – carbon bonds.
 - 3.1.4. Reaction intermediates – free radicals, carbocations and carbanions, carbenes, nitrenes and arynes – their stability.
- 3.2. Nomenclature of organic compounds – IUPAC naming of simple and substituted aliphatic, aromatic and alicyclic compounds. Priorities of functional group suffixes in polyfunctional groups.

3.3.

UNIT –IV (Organic Chemistry)

- 4.1. Alkanes :
 - 4.1.1. Mechanism of free radical substitution in alkanes.
 - 4.1.2. Conformation of ethane and n-butane with energy diagrams – dihedral angle – torsional strain.
- 4.2. Alkenes
 - 4.2.1. Properties of alkenes – electrophilic and free radical addition, addition reactions with hydrogen bromide (peroxide effect), sulphuric acid, water, hydroboration, ozonolysis, hydroxylation with KMnO_4 – allylic substitution by NBS (with mechanisms of all the above reactions)
- 4.3. Alkynes.
 - 4.3.1. Acidity of alkynes, formation of acetylides, addition of water with HgSO_4 catalyst, addition of hydrogen halides and halogens, oxidation, ozonolysis and hydroboration. (with mechanisms of above reactions)
 - 4.3.2. Problems and conversions

UNIT –V (Physical Chemistry)

- 5.1. Gaseous state.
 - 5.1.1. The Gas constant “R” in different units - deviation from ideal behaviors - van der Waal’s equation for real gases.
 - 5.1.2. Critical Phenomena – PV isotherms of real gases, critical temperature, continuity of state relation between critical constants and van der Waals constants- Determination of critical volume – the law of corresponding states – reduced equation of state.
 - 5.1.3. Molecular velocities – Root mean square, average and most probable velocities (derivation from Maxwell-Boltzmann distribution equation)-Maxwell – Boltzmann

distribution of molecular velocities (no derivation) - Collision number and mean free path – Collision diameter.

- 5.1.4. Preliminary idea on transport properties of gases – (Thermal conductivity, viscosity, and diffusion)

References:

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company 2Ltd., 2000.
2. G.S.Manku – Theoretical Principles of Inorganic Chemistry Tata McGraw Hill, New Delhi.
3. Paula Yurkanis Bruice- Organic Chemistry, Prentice Hall
4. J.D.Lee , Concise Inorganic Chemistry . 5th Edition., Blackwell Science Ltd, Oxford, 2002
5. Bahl, B.S. and Bahl, A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010).
6. Puri B.R., Sharma L.R. and Pathania M.S. Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin chand and Co. (2013)

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25 Answer All Questions (Either Or type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Core Course – III (Major Practical)

Credits : 5 Code: S2CHP1
 Hours / Week : 3
 Medium of Instruction : Both Tamil and English

SEMESTER – I & II
(For students admitted from 2018 onwards)

PRACTICAL – I: VOLUMETRIC ANALYSIS
(Examination at the End of Semester – II)

Objectives
<ul style="list-style-type: none"> ❖ To impart knowledge on Quantitative analysis especially volumetric analysis. ❖ To gain the depth knowledge in different types of volumetric analysis.
Learning Outcomes
<ul style="list-style-type: none"> ❖ At the completion of this course the student will be able to understand the principle of volumetric analysis such as acidimetry and alkalimetry, permanganimetry, dichrometry, iodo and iodimetry, argentometry and complexometry.

VOLUMETRIC ANALYSIS

I. Acidimetry And Alkalimetry

II. Permanganimetry.

1. Estimation of Ferrous iron in Mohr's salt.
2. Estimation of Ferrous and Ferric iron in a mixture.
3. Estimation of Oxalic acid.
4. Estimation of Calcium.

III. Dichrometry

5. Estimation of Ferrous Iron.
6. Estimation of Ferric Iron – by using both internal and external indicators.

IV. Iodo and Iodimetry.

7. Estimation of Copper.
8. Estimation of Potassium Dichromate.
9. Estimation of Arsenious Oxide.

V. Argentometry.

10. Estimation of Chloride (in neutral and acid media)

VI. Complexometric Titrations.

11. Estimation of Zn, Mg and Ca ions using EDTA.

Note: EDTA and acidimetry - alkalimetry experiments to be included in the END Semester Examinations .

Procedure writing at the beginning along with the principles of calculations and equations	: 05 Marks
Record	: 05 Marks
Practical	: 50 Marks
CIA	: 25 Marks
Total	: 100 Marks

Error Based Marks for the Practical (55 Marks)

Upto 1%	: 55 Marks
1 to 2%	: 45 Marks (deduce 1 mark for 0.1%)
2 to 3%	: 30 Marks (deduce 1.5 mark for 0.1%)
3 to 4%	: 10 Marks (deduce 2 marks for 0.1%)
Above 4%	: 02 Marks

For wrong Calculation deduce 5 Marks from the total marks awarded

For Shabby presentation deduce 3 marks from the total marks awarded

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Core Course – II (Major Theory)

Credits	: 5	Code: S2CH2
Hours / Week	: 6	
Medium of Instruction	: Both Tamil and English	

SEMESTER – II
(For students admitted from 2018 onwards)

General Chemistry – II

Objectives
<ul style="list-style-type: none"> ❖ To acquire the knowledge of Boron and carbon families. ❖ To learn about Dienes and cycloalkanes of organic compounds. ❖ To study the various concepts and applications of solid state in physical chemistry. ❖ To understand the basic knowledge of Liquid state, Colloidal state and Macromolecules in physical chemistry.
Learning Outcomes
<p align="center">At the completion of this course the student will be able to</p> <ul style="list-style-type: none"> ❖ Understand the nature and variety of forms of matter and list the physical properties ❖ Understand the structure of atoms ,predict chemical and physical properties of the elements

UNIT – I (Inorganic Chemistry)

- 1.1. Oxidation and reduction reactions – oxidation number concept, balancing redox equations by oxidation number method and ion-electron method – equivalent weight of oxidizing and reducing agents.
- 1.2. Halogen family – comparative study of halogens and their compounds.
 - 1.2.1. Oxides and oxy acids of halogens (structure only) – estimation of available chlorine in bleaching powder.
 - 1.2.2. Interhalogen compounds – preparation, properties and uses
 - 1.2.3. Pseudo-halogens – Preparation, properties and uses of cyanogens and thiocyanogen comparison with halogens
 - 1.2.4. Basic properties of halogens – Anomalous properties of fluorine

UNIT –II (Inorganic Chemistry)

- 2.1. Oxygen family – comparative study. Oxygen fluorides.
- 2.2. Ozone – Preparation, properties, structural elucidation and uses. Green-house effect, ozone hole and protection of ozone layer
- 2.3. Hydrogen peroxide – Preparation, properties, estimation, structure and uses.
- 2.4. Peracids of sulphur – their preparation, properties, uses and structures.
- 2.5. Thionic acids – their preparation, properties, uses and structures.
- 2.6. Sodium hyposulphite and sodium thiosulphate – Preparation, properties, uses and structures.

UNIT –III (Organic Chemistry)

- 3.1. **Dienes**
 - 3.1.1. Types of dienes – conjugated, isolated and cumulated.
 - 3.1.2. Stability and chemical reactivity – 1,2 and 1, 4 additions, kinetic and thermodynamic controls of a reaction. Diels-Alder reaction.
 - 3.1.3. Synthesis of dienes – 1, 3 Butadiene, isoprene and chloroprene.
- 3.2. **Cycloalkanes.**

- 3.2.1. Preparation using Wurtz's reaction, Dieckmann's ring closure and reductions of aromatic hydrocarbons.
- 3.2.2. Substitution and ring opening reactions.
- 3.2.3. Bayer's strain theory and theory of strainless rings.
- 3.3. Problems and conversions involving the reactions of alkynes and dienes.

UNIT –IV (Physical Chemistry)

4.1. Solid state.

- 4.1.1. Isotropic and anisotropic solids.
- 4.1.2. Nature of the solid state – seven crystal systems – Bravais lattice, unit cell, law of rational indices (Weiss indices) Miller indices, symmetry elements in crystals (for cubic system only in detail).
- 4.1.3. X-Ray diffraction by crystals – derivation of Bragg's equation — Bragg method-powder method crystal structure of NaCl, KCl, ZnS and CsCl – radius ratio and packing in crystals – determination of Avogadro's number.
- 4.1.4. Vitreous state – Brief studies.

UNIT –V

5.1. Liquid state:

- 5.3.1. Liquid crystals – classification, structure, properties and applications.

5.2. Colloidal state.

- 5.2.1. Size of colloidal particles – Peptization, stability of colloids, coagulation and protection. Reverse Osmosis and desalination of sea water. Donnan – Membrane equilibrium. Electrophoresis and separation of proteins.
- 5.2.2. Gels and emulsions.

5.3. Macromolecules

- 5.3.1. Number average and weight average molecular weight of macromolecules – determination of molecular weight by osmometry (number average), ultra centrifuge (weight average), Viscometry and light scattering

References:

1. S.S.Dara – A text book of environmental chemistry and pollution control – S.Chand and Co.
2. D.N.Bajpai – Advanced physical chemistry – S.Chand and Co.
3. Bruce H.Mahan , “ University Chemistry ,” Narosa Publishers , NewDelhi.1989.
4. R.T Morrison and R.N.Boyd , “ Organic Chemistry ,” 6 th Edition
5. R.D. Madan, “Modern Inorganic Chemistry”, 2nd edition, S. Chand & Company 2Ltd., 2000.
6. G.S.Manku – Theoretical Principles of Inorganic Chemistry Tata McGraw Hill, NewDelhi.
7. Paula Yurkanis Bruice- Organic Chemistry, Prentice Hall
8. J.D.Lee , Concise Inorganic Chemistry . 5 th Edition., Blackwell Science Ltd, Oxford, 2002
9. Bahl, B.S. and Bahl, A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010).
10. Puri B.R., Sharma L.R. and Pathania M.S. Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin chand and Co. (2013)

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25 Answer All Questions (Either Or type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018– 19
Core Course – IV (Major Theory)

Credits	: 5	Code: S3CH3
Hours / Week	: 6	
Medium of Instruction	: Both Tamil and English	

SEMESTER – III

(For students admitted from 2018 onwards)

General Chemistry – III

Objectives
<ul style="list-style-type: none"> ❖ To learn about Nitrogen and zero group families. ❖ To acquire the knowledge of Conformational Analysis and Aromaticity in organic compounds. ❖ To study the various concepts of Electrophilic substitution reactions and Polynuclear hydrocarbons in aromatic compounds. ❖ To understand the various postulates of Quantum Theory ,Atomic and Molecular Spectra & Electric and Magnetic Properties of Matter
Learning Outcomes
<p>At the completion of this course the student will be able to</p> <ul style="list-style-type: none"> ❖ Understand and apply the principles of gas behavior, properties of aqueous solutions ❖ Apply the principles of chemical equilibrium

UNIT – I (Inorganic Chemistry)

1.1. Nitrogen family:

- 1.1.1. Comparative study of nitrogen family elements and their compounds (oxides, halides, hydrides and oxyacids)
- 1.1.2. Chemistry of hydrazine, hydrazoic acid, hydroxyl amine and sodium bismuthate.
- 1.1.3. Non aqueous solvents – classification – Liquid ammonia as solvent.

1.2. Zero group elements

Position in the periodic table - isolation of noble gases from the atmosphere and Uses - Compounds of xenon – XeF₂, XeF₄, XeF₆, XeO₃ and XeOF₄ – Preparation, Properties, structure and uses.

1.3 Principles of Qualitative Analysis: Solubility product – principle of eliminating interfering radicals, common ion effect, complexation reactions including spot tests in qualitative analysis.

UNIT – II (Organic Chemistry)

2.1. Conformational Analysis.

- 2.1.1. Newmann projection, sawhorse formulae, Fischer projection, perspective formula, conformers of cyclohexane (boat, chair and skew-boat forms) – Axial and equatorial bonds – Ring Flipping – conformations of methylcyclohexane and dimethyl cyclohexanes.

2.2. Aromatic Hydrocarbons And Aromaticity.

2.2.1. Structure and stability of benzene ring – resonance in benzene – delocalized pi-electron cloud in benzene.

2.2.2. Aromaticity – Huckel's Rule ($4n + 2$) and examples – Cyclopropenyl cation – Benzene, Naphthalene, anthracene, furan, pyrrole, thiophene pyridine and Ferrocene.

UNIT – III (Organic Chemistry)

3.1. Electrophilic substitution reactions in aromatic compounds.

3.1.1. General mechanism of electrophilic substitution reactions – Effect of substituents – activating and deactivating groups – orientation.

3.1.2. Nitration, sulphonation, halogenation, Friedel – Craft's alkylation and acylation reactions – Nuclear and side chain halogenation.

3.2. Polynuclear hydrocarbons

3.2.1. Naphthalene and Anthracene – Isolation, properties, structure and uses.

3.2.2. Aromatic nucleophilic substitution – Benzyne mechanism and intermediate complex formation mechanism – effect of substituents on reactivity.

UNIT – IV (Physical Chemistry)

4.1. Quantum Theory And Atomic Spectra

4.1.1 Bohr's model of atoms. Bohr's theory of hydrogen atom and spectral lines. Limitations of Bohr model. Sommerfeld's extension.

4.1.2 Photoelectric effect and Compton Effect. De Broglie's equation and verification. (Davisson and Germer experiment).

4.1.3 Heisenberg's uncertainty principle – Schrodinger wave equation – Eigen values and eigen functions – Significance of ψ and ψ^2 - Radial and angular distribution function – Concept of orbitals and shapes of orbitals.

4.2. Chemical Bonding And Molecular Structure.

4.2.1. V.B.Theory – postulates – application to the formation of simple molecules like hydrogen and helium. Overlap of atomic orbitals and principles of hybridization.

4.2.2. M.O.Theory – bonding and antibonding molecular orbitals – MO diagrams of simple homonuclear diatomic molecules. (H_2 , H_2^+ , He_2 , He_2^+ , Li_2 , Be_2 , B_2 , N_2 , O_2 & F_2) and hetero nuclear diatomic molecules – HF and CO.

4.2.3. Comparison of V.B. and M.O. Theories

UNIT –V (Physical Chemistry)

5.1. Electric Properties of Matter.

5.1.1. Electric properties of molecules – polarization, polarizability and dipole moment. Atomic, induced and orientation polarization – Mosotti – Clausius equation – measurement of molar polarization.

5.1.2. Dipole moment – determination by Temperature, Refractivity and Dilute solution methods. Dipole moment of diatomic and polyatomic molecules – Bond moments.

Applications of dipole moment measurements:

- in determining the percent ionic character of bonds.
- shapes of simple inorganic and organic molecules (BCl_3 , H_2O , CO_2 , NH_3 , CCl_4).
- dipole moment of substituted benzenes – o, m & p-dichlorobenzene.

5.2. Magnetic Properties of Matter.

- 52.1. Magnetic flux – magnetic permeability – magnetic susceptibility. Diamagnetism, paramagnetism, ferro and anti-ferro magnetism – Curie temperature.
- 52.2. Determination of magnetic susceptibility – Guoy's method – Number of unpaired electrons – spin only magnetic moment value. Application to structural problems. $K_3Fe(CN)_6$, $K_4Fe(CN)_6$, $Ni(CO)_4$.

References:

1. P.L.Soni & Mohankatyal, Text Book of Inorganic Chemistry 20th revised edition, Sultan Chand 1992.
2. R.B.Puri & L.R.Sharma, "Principles of Inorganic Chemistry", Sultan Chand, 1989.
3. P.L.Soni & H.M.Chawla "Text book of Organic Chemistry" Sultan Chand & Sons 1994, Delhi.
4. K.S.Tewari, S.N.Mehrotra and N.K.Vishnoi, "A Text Book of Organic Chemistry".
5. M.K.Jain, "Organic Chemistry" Shoban Lal Nagin Chand and Co.,
6. Puri B.R., Sharma L.R. and Pathania M.S. Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin chand and Co. (2013)
7. Vogel's "Text Book of Quantitative Chemical Analysis" E.L.B.S.
8. R.D.Madan, "Modern Inorganic Chemistry", 1987, S.Chand and Company (Private) Ltd.,
9. Bahl, B.S. and Bahl, A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010).
10. D.A Mc Quarrie, "Quantum Chemistry," University Science Books

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25 Answer All Questions (Either Or type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005

B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19)

Core Course – VI (Major Practical)

Credits : 5

Code: S4CHP2

Hours / Week : 6

Medium of Instruction : Both Tamil and English

SEMESTER – III & IV

(For students admitted from 2018 onwards)

PRACTICAL – I : INORGANIC QUALITATIVE ANALYSIS

(Examination at the End of Semester - II)

Objectives

- ❖ To impart knowledge on Qualitative analysis of Inorganic salt mixture

Learning Outcomes

- At the completion of this course the student will be able to
- ❖ Understand Qualitative analysis of inorganic salt mixtures.

Analysis of a mixture containing two cations and two anions of which one will be an interfering ion.

Semi micro methods using the conventional scheme with hydrogen sulphide may be adopted.

Cations To Be Studied:

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

Anions To Be Studied:

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

Note :

Record	: 5 Marks
Practical	: 55 Marks
CIA	: 40 Marks
Total	: 100 Marks

All the Four Radicals with systematic Procedure : 55 Marks

Only Three Radicals with systematic Procedure : 40 Marks

Only Two Radicals with systematic Procedure : 25 Marks

Only One Radical with systematic Procedure : 15 Marks

If all the four Radicals are incorrect : 00 Marks

Mere Reporting a Radical with wrong/without Procedure : 02 Marks

For the Record a minimum of 3 Marks may be given

If the student appears for the first time for that particular Practical Examination he should be permitted only if he submits the duly signed Bona fide Record Note Book; otherwise the examiners should not permit him for that practical examination.

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Skill Based Elective I (SB 1)

Credits : 3 **Code: S3SB1M**
 Hours / Week : 6
 Medium of Instruction : Both Tamil and English

SEMESTER – III
(For students admitted from 2018 onwards)

FOOD AND NUTRITION

OBJECTIVES

- To learn the importance of food and nutrition.
- To know the chemical composition and importance of balanced diet.
- To learn the food adulterants and identification of them.

UNIT I: FOOD, NUTRITION AND HEALTH

The meaning of food, nutrition, nutritional care and health-nutritional problems in India

UNIT II: BIOLOGICAL IMPORTANCE OF FOOD

Nutritional classification of food-nutrients as body constituents-digestion and absorption of food. Types of food, caloric content and dieting

UNIT III: BASIC CHEMICAL CONSTITUENTS OF FOOD

Biological functions of carbohydrates, proteins, fats, vitamins, minerals and water

UNIT IV: FOOD ADULTERATION TESTING

Common adulterants in food-testing methods of all food adulterants (Ghee, Chilli powder, Oil, Milk, Turmeric powder)

UNIT V: HEALTH PROBLEMS OF FOOD ADULTERATION

Principal adulterants and its effect on health.

REFERENCES

1. Alex Ramani V, Food Chemistry, MJP Publishers, Triplicane, Chennai, 2009
2. Thangamma Jacob, Food adulteration, Macmillan company of India limited, New Delhi, 1976
3. Jeyaraman J, Laboratory manual in biochemistry, Wiley Eastern limited, New Delhi, 1981

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25 Answer All Questions (Either Or type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Core Course – V (Major Theory)

Credits : 5 **Code: S4CH4**
 Hours / Week : 6
 Medium of Instruction : Both Tamil and English

SEMESTER – IV

(For students admitted from 2018 onwards)

General Chemistry – IV

Objectives
<ul style="list-style-type: none"> ❖ To learn about Alkali And Alkaline Earth Metals, Transition Metals and Inner transition Metals ❖ To acquire the knowledge of Aliphatic nucleophilic substitutions and Elimination reactions. ❖ To study the various concepts and applications of Chemical Kinetics especially Catalysis and Adsorption. ❖ To understand the various laws and reactions in Photochemistry.
Learning Outcomes
<p>. At the completion of this course the student will be able to</p> <ul style="list-style-type: none"> ❖ Write the name and formula for any ionic or binary covalent compound, as well as using these to complete a balance chemical equation. ❖ Use stoichiometric data to make calculations with balanced equations. ❖ Apply the principles of thermo chemistry to solve problems involving heat transfer.

UNIT – I (Inorganic Chemistry)

1.1. Alkali And Alkaline Earth Metals

- 1.1.1. Comparative study of alkali metal and alkaline earth metal compounds (oxide, halides, hydroxides, carbonates, sulphates).
- 1.1.2. Diagonal relationship between lithium and magnesium.
- 1.1.3. Preparation, properties and uses of lithium aluminium hydride and sodium borohydride

1.2. Coinage Metals.

- 1.2.1. Comparative study of coinage metals and Chemistry of photography.

1.3. Transition Metals And Their Compounds

- 1.3.1. Group study of titanium, vanadium, chromium, manganese.
- 1.3.2. Metallurgy and uses of V, W and Mo.
- 1.3.3. Steel and alloy steels. Heat treatment of steel.

UNIT –II (Inorganic Chemistry)

1.3.2.1.1. Inner Transition Elements:

- 1.3.2.1.1.1. Lanthanides – occurrence – general study of lanthanides involving electronic configuration, oxidation states, magnetic properties and complexation behaviour.
- 2.1.2. Lanthanides – separation by ion exchange and solvent extraction methods – lanthanide contraction.

- 2.1.3. Actinides – Occurrence – electronic configuration, oxidation states, magnetic properties and complexation behaviour.
- 2.1.4. Comparison of lanthanides and actinides and their position in the periodic table.
- 2.1.5. Elements with atomic number 104 and 105; preparation and their position in the periodic table.
- 2.1.6. Chemistry of thorium and uranium – occurrence, ores, extraction and uses.

UNIT – III (Organic Chemistry)

- 3.1. Grignard reagents and their synthetic uses.
- 3.2. Aliphatic nucleophilic substitutions – mechanism of SN^1 , SN^2 and SNi reactions, effect of solvents, leaving groups, nucleophiles and structure of substrates.
- 3.3. Elimination reactions – Hofmann and Saytzeff's eliminations – cis-trans eliminations. Mechanism of E_1 and E_2 reactions.
- 3.4. Relative reactivity of ethyl, vinyl, allyl and benzyl halides.
- 3.5 Ethers**
 - 3.6. Methods of preparation of aliphatic and aromatic ethers – reactions of ethers – 1,4-dioxin – Preparation and uses – Epoxides – Preparation and reactions. Acid-base mechanism of cleavage of epoxides
 - 3.7. Thioethers – Preparation and uses

UNIT – IV (Physical Chemistry)

Chemical Kinetics

- 4.1. Rates of reactions, rate laws, rate constant, order and molecularity of reactions. Rate equations for zero, first, second and third order reactions. Fractional order reactions. Examples: Half life period, Pseudo first order reactions examples.
- 4.2. Methods of determining the order of reactions. Integration, graphical, half-life and Oswald's isolation methods. Experimental.
- 4.3. Temperature dependence of reaction rates – Arrhenius parameters and calculations.
- 4.4. Theories of reaction rates – simple collision theory – limitations – steady state approximation – Lindeman's hypothesis of unimolecular reactions – Theory of absolute reaction rates. (elementary treatment only)

UNIT – V (Physical Chemistry)

- 5.1. **Catalysis and Adsorption.**
 - 5.1.1. Homogeneous and heterogeneous catalysis – Gibb's adsorption isotherm – statement only – Langmuir adsorption isotherm – statement and application to surface area calculations. Intermediate complex and adsorption theories. Types of catalysis promoters and poisons (Inhibitors).
 - 5.1.2. Enzyme catalysis – mechanism – factors affecting enzyme catalysis - Michaelis – Menton equation.
- 5.2. Photochemistry.
 - 5.2.1. Grothus – Draper Law, Lambert – Beer's Law, Stark-Einstein's Law of photochemical equivalence – Quantum yield – Examples of low and high quantum yield (Decomposition of HI, Formation of HCl and HBr – Actinometry. Comparison of thermal and photochemical reactions of HBr.
 - 5.2.2. Photochemical chain reactions – primary and secondary processes. $H_2/C1_2$ reaction – photolysis of aldehydes and ketones. Photosensitization – photosynthesis – Photodimerisation of anthracene.
 - 5.2.3. Luminescence, fluorescence, phosphorescence, Chemiluminescence and bioluminescence.

References:

1. R.Gopalan, P.S.Subramanian, K.Rengarajan – “Elements of Analytical Chemistry” Sultan Chand & Sons.
2. V.S.Parmar & H.M.Chawla – “Principles of reaction mechanisms in Organic Chemistry”.
3. P.L.Soni & Mohan Katyal, “Text Book of Inorganic Chemistry”.
4. I.L.Finar, “Organic Chemistry, Volume I” E.L.B.S. LONDON.
5. Bahl, B.S. and Bahl, A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010).
6. Puri B.R., Sharma L.R. and Pathania M.S. Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin chand and Co. (2013)
7. R.D. Madan, “Modern Inorganic Chemistry”, 2nd edition, S. Chand & Company 2Ltd., 2000.

Question Paper Pattern**Maximum Marks: 75****Exam duration: Three Hours****Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)****Part B – 5 X 5 = 25 Answer All Questions (Either Or type -Two questions from each unit)****Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)****Signature of the HOD**

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Skill Based Elective II

Credits	: 3	Code: S4SB2M
Hours / Week	: 6	
Medium of Instruction	: Both Tamil and English	

SEMESTER – IV
(For students admitted from 2018 onwards)
DYEING TECHNIQUES AND WATER TREATMENT

OBJECTIVES

- To develop the skills in dyeing.
- To understand the water qualities and treatments.
- To know the sewage treatments.

UNIT-I

1.1. Textile fiber pretreatments: Sizing and desizing, purpose, desizing methods (Hot water, Acid and enzymatic) - their merits and demerits - Scouring: classification , method of Kier boiling process.

1.2 Dye chemistry: Witt's theory of colour –important dye stuff intermediates their names- Difference between dye and pigments.

1.3. Chromophore – auxo chromes –batho chromic shift and hypso chromic shift - classification of dyes based on application.

UNIT-II

2.1 Technical terms in dyeing: M.L. ratio – % of shade – % of exhaustion – equilibrium absorption.

2.2 Dyeing machineries: Description and uses of Padding mangle and Jigger.

2.3. Textile dyeing processes I: Direct cotton dyeing – effect of temperature, Acid dyeing – effect of electrolytes in acid dyeing.

UNIT-III

3.1 Textile dyeing processes II: Vat dyeing, Pre – mordant dyeing, Post - mordant dyeing.

3.2 Fastness properties – Definition of Light, Washing Rubbings, Perspiration and sublimation fastness - Evaluation procedures for Light and Washing fastness.

UNIT-IV

4.1. Sewage & Domestic wastes and their effects - concepts of BOD and COD.

4.2. Eutrophication and their effects - Biological magnification. 4.3 Water treatment methods: General methods of water treatment – Sewage treatment methods: preliminary, Primary, Secondary, Tertiary treatments

UNIT-V

- 5.1. Industrial effluents: Nature of effluents of Chemical, Food, Drug and material industries.
- 5.2. Industrial waste water treatment: preliminary, Primary, Secondary (Biological) treatment. Aerobic process (Lagooning, Trickling Filters, activated Sludge, oxidation ditch).
- 5.3. Anaerobic digestion – advantages of Anaerobic process – Disposal of sludge – draw backs and effective steps and Tertiary treatments (adsorption, ionexchange and ultra-filtration).

REFERENCES :

- FOR UNITS I TO III 1. Venkataraman . K. The chemistry of synthetic dyes Vol, I, II, III & IV-, Academic Press N.Y., 1949.
2. Shenai, V.A. ,Chemistry of Textile fibres, vol.I, Sevak publication , Mumbai
 3. Shenai, V.A. ,Chemistry of Dyes and Principles of dyeing , vol.II, Sevak publication, Mumbai
- FOR UNITS IV & V 4. H.Kaur “Environmental Chemistry” 7th Edition, Pragati Prakashan publisher, 2013 5. A.K.De “Environmental Chemistry” 3rd Edition ,New Age International (P) Ltd.Publisher,1997. *****

Question Paper Pattern**Maximum Marks: 75****Exam duration: Three Hours****Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)****Part B – 5 X 5 = 25 Answer All Questions (Either Or type -Two questions from each unit)****Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)****Signature of the HOD**

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Core Course – VII (Major Theory)

Credits	: 5	Code: S5CH5
Hours / Week	: 6	
Medium of Instruction	: Both Tamil and English	

SEMESTER – V

(For students admitted from 2018 onwards)

Inorganic Chemistry – I

Objectives
<ul style="list-style-type: none"> ❖ To learn about Coordination Compounds and its Isomerism ❖ To acquire the knowledge Biologically important coordination compounds and Metal carbonyls ❖ To study the various concepts and applications of metal ions in biological system Binary and Organometallic compounds. ❖ To understand the various Fossil fuels
Learning Outcomes
<p style="text-align: center;">At the completion of this course the student will be able to</p> <ul style="list-style-type: none"> ❖ To classify the types of mechanism involved in coordination compounds reactions. ❖ To explain the bond formation of coordination compounds according to Valence bond theory, Crystal Field Theory and Molecular Orbital Theory

UNIT – I Coordination Compounds

- 1.1. Types of ligands. IUPAC nomenclature
- 1.2. Theories of coordination compounds – Werner, Sidgwick, Valence bond, Crystal field, molecular orbital and ligand field theories.

UNIT – II Isomerism

- 2.1. Isomerism – stability of complexes – factors affecting the stability of complexes
- 2.2. Unimolecular and bimolecular nucleophilic substitution reactions in octahedral and square Planar complexes – Trans effect.
- 2.3. Application of coordination compounds – Detection of potassium ions, separation of copper and cadmium ions. Estimation of nickel using DMG and aluminium using oxine.
- 2.4. Structure of EDTA and its complexes. Complexometric titrations – principles and applications.

UNIT – III biologically and Metal carbonyls

- 3.1. Biologically important coordination compounds – Chlorophyll, haemoglobin, vitamin B12 – their structure, application (Elucidation is not required)
- 3.2. Metal carbonyls – Mono and poly nuclear carbonyls of Ni, Fe, Cr, Co and Mn – synthesis, reactions, structure and uses.
- 3.3. Nitrosyl compounds – classification, preparation, properties and structure of nitrosyl chloride and sodium nitroprusside.

UNIT – IV Binary and Organometallic compounds

- 4.1. Binary compounds – hydrides, borides, carbides and nitrides classification - preparation, properties and uses.
- 4.2. Organometallic compounds of alkenes, alkynes and cyclopentadiene

UNIT – V Fossil fuels

- 5.1. Fossil fuels – varieties of coal and petroleum- Petroleum refineries in India.
- 5.2. Fertilisers- Manufacture of N,P,K and mixed fertilisers. Micronutrients and their role in plant life.
- 5.3. Safety matches fire works and explosive, paints and varnishes.
- 5.4. Effluents and their treatment (Dye, cement, tannery, distillery units)- Factory visit recommended.

References:

1. P.L.Soni,: Text Book of Inorganic Chemistry, S.Chand & Co., New Delhi (1999)
2. B.R.Poori, & L.R.Sharma : Principles of Inorganic Chemistry, Shoban Lal, Nagin Chand & Co., New Delhi (2000)
3. B.R. Puri, L.R. Sharma, K.C. Kalia, 'Principles of Inorganic Chemistry', 21st edition, Vallabh Publications, 2004-2005.
4. J.D.Lee : Concise Inorganic Chemistry, E.L.B.S., IV Edn,m (1991)
5. Jeffery et al : "Vogel Text Book of Inorganic Quantitative Analysis", Longman (1984)
6. D.A.Skoog and D.M.West : "Fundamentals of Analytical Chemistry W.B.Saunders, New York (1983)
7. P.K.Bhattacharya : Chemical Applicationas of Group Theory, Himalaya Publishing House, Mumbai. (1998)
8. F.A.Cotton, Chemical Application of Group Theory," Third Edition, JohnWiley and Son , New York, 2002
9. M.S.Gopinath and V.Ramakrishnan : Group Theory and Applications (1988)
10. D.F.Shriver and P.W .Atkins, " Inorganic chemistry " III rd Edition, Oxford University Press, 1999
11. Gopalan R, Text Book of Inorganic Chemistry, 2nd Edition, Hyderabad, Universities Press, (India), 2012

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25 Answer All Questions (Either 0r type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Core Course – VIII (Major Theory)

Credits	: 4	Code: S5CH6
Hours / Week	: 5	
Medium of Instruction	: Both Tamil and English	

SEMESTER – V

(For students admitted from 2018 onwards)

Organic Chemistry – I

Objectives
<ul style="list-style-type: none"> ❖ To learn about optical and Geometrical isomerisms in organic compounds. ❖ To acquire the knowledge of Reactions of Carbonyl Compounds. ❖ To study the various concepts and applications of Acids And Acid Derivatives ❖ To understand the various 5&6 membered Heterocyclic Compounds
Learning Outcomes
<p style="text-align: center;">At the completion of this course the student will be able to</p> <ul style="list-style-type: none"> ❖ Identify ,classify and draw strctures of organic molecules. ❖ Apply the basic rules of organic nomenclature to interrelate between structures and names of organic compounds.

UNIT – I

Stereoisomerism - I

- 1.1. Stereoisomerism – Definition – Classification into optical and Geometrical isomerisms.
- 1.2. Optical isomerism – Optical activity – Optical and specific rotation conditions for optical activity in solid, liquid and gaseous phases – criteria for optical activity. Asymmetric centre Chirality – Achiral molecule – Meaning of + and – and D and L notations – Elements of symmetry – Racemization – Methods of Racemization (by substitution and tautomerism) Resolution – Methods of Resolution (Mechanical separation, seeding, biochemical and conversion to diastereoisomers) – Asymmetric synthesis partial and Absolute asymmetric synthesis) – Walden inversion, Vant Hoff rule of superposition – Freudenberg's rule of shift.
- 1.3. Notations for optical isomers – Cahn – Ingold – Prelog rules – R/S.notations for optical isomer with one asymmetric carbon – Erythro and Threo representations . Fischer projection, Sawhorse, Newmann projection representation of molecules with two asymmetric carbon atoms.

UNIT – II

Stereoisomerism – II

- 2.1. Optical activity in compounds containing no asymmetric carbons – Biphenyls, Allenes and Spiranes. Optical activity on symmetric & asymmetric system (Lactic acid) dissymmetric system (1,2 trans cyclopropanedicarboxylic acid) symmetric – system – (Meso tartaric acid)
- 2.2. Geometrical isomerism – cis-trans, Syn – Anti and E-Z notations – Geometrical isomerisms in Maleic and Fumaric acids and in unsymmetrical ketoximes – Methods of distinguishing geometrical isomers (Dipole moment, Dehydration, Heat of Hydrogenation, cyclization, Melting points) – Methods of determining the configuration of geometrical isomers (No details required). Geometrical and optical isomerism in three membered rings.

UNIT – III

Reactions of Carbonyl Compounds

- 3.1. Carbonyl Polarization – Reactivity of carbonyl group – Acidity of alpha Hydrogen.

- 3.2. Mechanisms of Aldol, Perkin, Knoevenagel and Benzoin condensation Mechanisms of Claisen, Reformatsky, Wittig and Cannizzaro reactions.
- 3.3. Mechanisms of Reduction (Sodium borohydride, LiAlH_4 Wolff – Kishner and MPV reductions) – Mechanisms of Haloform reaction and Michael addition and Oppenauer Oxidation.
- 3.4. Photochemistry of carbonyl compounds – Norrish I and II Types. Problems and Conversion wherever applicable.

UNIT – IV

Acids And Acid Derivatives

- 4.1. Ionization of carboxylic acids – Acidity constant – comparison of acid strengths of substituted halo acids – Acid strength of substituted Benzoic acids – Hammett equation. Hell-volhard- Zelinski reaction
- 4.2. Dicarboxylic acids – Preparation and properties of oxalic, malonic, succinic, glutaric and adipic acids, unsaturated acids and hydroxy acids
- 4.3. Malonic and Acetoacetic esters – Characteristics of reactive methylene group – Synthetic uses of Malonic and acetoacetic esters.
- 5.2. Tautomerism – Definition – Keto Enol Tautomerism (identification, Acid and base catalysed Interconversion Mechanism, Preparations, Amido – imido and Nitro – Acinitro tautomerisms (Just inter – conversions shown).
- 4.5. Nucleophilic acyl substitutions, acid –base catalysed hydrolysis of ester, hydrolysis of amides and transesterification.

UNIT - V

Heterocyclic Compounds

- 5.1. Aromatic characteristics of heterocyclic compounds.
- 6.2. Preparation, Properties and uses of Furan, Pyrrole Thiophene.
- 5.3. Synthesis and reactions of pyridine and piperidine-comparative basic characters of pyrrole, pyridine and piperidine with amines.
- 5.4. Synthesis and reactions of Quinoline, Isoquinoline and Indole with special reference to Skraup, Bischler Napieralski and Fischer indole synthesis. Structural elucidation of Pyridine, Quinoline and isoquinoline.

References :

1. B.S.Bahl and Arun Bahl, Advanced Organic Chemistry : S.Chand & Co, New Delhi.(1988)
2. P.L.Soni and H.M.Chawla : Text book of Organic Chemistry – 28th Edition (1999) – Sultan Chand. New Delhi.
3. Ravi Bhushan : Stereoisomerism of carbon compounds – CBS – Publishers, Delhi – Revised edn.(1998)
4. P.S.Kalsi : Stereochemistry, conformation and mechanism, Willey Eastern Limited, New Delhi.
5. O.P.Agarwal : Chemistry of Natural Products, Volume 1 & 2.
6. D.Nasipuri, Stereochemistry of Organic Compounds, Wiley Eastern Ltd., New Delhi (1992)
7. I.L.Finar, Organic Chemistry Volume 1, E.L.B.S., London, (1998) Seyhan Ege , “Organic Chemistry – Structure and reactivity” –AITBS Publishers
8. Bahl, B.S. and Bahl, A., Advanced Organic Chemistry, (12th edition), NewDelhi, Sultan Chand & Co., (2010)
9. P.S.Kalsi, ” Organic Reactions and their Mechanism, ” New Age International Publishers
10. Seyhan N. Ege, Organic Chemistry, (5th edition) New York, Houghton Mifflin Co., (2005).
11. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7th edition), Pearson India, (2011)

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25 Answer All Questions (Either 0r type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19)
Core Course – IX (Major Practical)

Credits	: 4	Code: S5CHP3
Hours / Week	: 3	
Medium of Instruction	: Both Tamil and English	

SEMESTER – V

(For students admitted from 2018 onwards)

Organic Chemistry Practical – III

Objectives
<ul style="list-style-type: none"> ❖ To gain the depth knowledge in Single stage preparation of organic compounds ❖ To impart knowledge on Qualitative analysis of organic compounds
Learning Outcomes
<p>At the completion of this course the student will be able to</p> <ul style="list-style-type: none"> ❖ Understand the basic principles of qualitative analysis of organic compounds. ❖ To Prepare organic compounds in a single stage.

Organic Chemistry Practical's (100 Marks)

Record Note Book	: 5 marks
Practical Examination	: 55 marks
CIA	: 40 marks
Total	: 100 marks

1. Preparation involving

- a. oxidation,
- b. reduction
- c. hydrolysis
- d. nitration
- e. sulphonation
- f. halogenations
- g. diazotization.

2.Characterization of organic compounds by their functional groups and confirmation by preparation of derivatives

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Core Course – X (Major Practical)

Credits : 4 Code: S6CHP5
 Hours / Week : 5
 Medium of Instruction : Both Tamil and English

SEMESTER –V & VI
(For students admitted from 2018 onwards)
Physical Chemistry Practical – V

Objectives
To gain the depth knowledge in Physical Chemistry Practical especially Distribution law, Kinetics, Heterogeneous equilibrium and Electrochemistry.
Learning Outcomes
At the end of the course, the student will be able to ❖ Understand the principles of partition coefficient, equilibrium constant, rate constant, molecular weight and electrochemistry.

- I. Distribution law:**
- a. Partition coefficient of Iodine between carbon tetrachl and water
 - b. Equilibrium constant of the reactions.

$$I_2 + I^- \rightarrow I_3^-$$
- II. Kinetics:**
 Acid catalysed hydrolysis of an ester (Methyl acetate or Ethyl acetate)
- III. Molecular weight :**
 Rast's method : Naphthalene, m-dinitrobenzene and diphenyl as solvents.
- IV. Heterogeneous equilibrium**
- a. Critical solution temperature of phenol-water system- effect of impurity on C.S.T. (2% NaCl or 2 % succinic acid solutions).
 - b. Simple eutectic system : Naphthalene – Biphenyl, Napthalene Diphernylamine.
 - c. Determination of transition temperature : Sodium acetate..H₂O, Na₂S₂O₃.5H₂O, SrCl₂.6H₂O & MnCl₂.4H₂O.
- V. Electrochemistry**
- Conductivity:
 Cell constant
 Equivalent conductivity
 Conductometric titrations
 Potentiometry
 Potentiometric titrations.

Note :

Procedure writing with formula	: 10 Marks
Record	: 05 Marks
Practical	: 45 Marks
CIA	: 40 marks
Total	: 100 marks

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19)
Core Course – MEC1 (Major Elective)

Credits	: 4	Code: S5CHEL1A
Hours / Week	: 5	
Medium of Instruction	: Both Tamil and English	

SEMESTER – V
(For students admitted from 2018 onwards)

Physical Chemistry – I

Objectives
<ul style="list-style-type: none"> ❖ To learn about Definition of thermodynamics and its Applications. ❖ To acquire the knowledge of Phase Rule . ❖ To study the various law concepts and its applications of Solutions.
Learning Outcomes
<p>At the completion of this course the student will be able to</p> <ul style="list-style-type: none"> ❖ State and apply the laws of thermodynamics ❖ Perform calculations with ideal and real gases. ❖ Predict chemical equilibrium and spontaneity of reactions by using thermodynamic principles. ❖ Construct phase diagrams.

UNIT – I

Chemical thermodynamics (18 Hours)

- 1.1. Definition of thermodynamic terms : Systems and surrounding – isolated, closed, and open systems – Homogeneous & Heterogeneous systems, State of the system intensive and extensive variables. Thermodynamic process – cyclic processes, reversible and irreversible, isothermal and adiabatic processes – State and Path functions, exact and inexact differentials, concept of heat and work. Work of expansion at constant pressure and free expansion.
- 1.2. Laws of Thermodynamics: The zeroth law and the first law of thermodynamics :
 - 1.2.1. First law of thermodynamics – statements, Definition of internal energy (U), enthalpy (H) and Heat capacity. U and H as thermodynamic properties. Relation between C_p and C_v ; calculation of W, Q, ΔU and ΔH for expansion of ideal and real gases under isothermal and adiabatic conditions for reversible and irreversible processes.
 - 1.2.2. Joule – Thomson effect, Joule – Thomson experiment. Relationship between μ_{JT} and other thermodynamic quantities. Calculation of μ_{JT} for ideal and real gases. Joule Thomson coefficient and inversion temperature. The Zeroth law of thermodynamic and absolute scale of temperature.
- 1.3. Thermochemistry :
 - 1.3.1. Internal energy and enthalpy changes in chemical reactions. Relation between ΔU and ΔH Relation between enthalpy of reaction at constant volume (Q_v) and at constant pressure (Q_p). Thermochemical equations, laws of thermochemistry – Hess's law and its applications.
 - 1.3.2. Standard states – Standard enthalpy of formation. Enthalpy of combustion, enthalpy of Neutralization, integral and differential heats of solution and dilution. Bond dissociation energy - its calculation from thermochemical data. Temperature dependence of $-\Delta H$ Kirchoff's equation.

UNIT – II**Second Law of Thermodynamics. (18 Hours)**

- 2.1. Second Law of Thermodynamics : Need for the law. Different statements of the law. Heat engine – Carnot's cycle and its efficiency. Refrigeration cycle – Carnot's theorem – Thermodynamic scale of temperature.
- 2.2. Concept of Entropy: Entropy as a state function – Entropy as a function of P, V and T. Entropy changes in phase changes. Entropy of mixing – Clausius inequality – entropy as a criterion of spontaneous and equilibrium processes in isolated systems.
- 2.3. Gibbs and Helmholtz functions: Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities - UA and UG as criteria for thermodynamic equilibrium and spontaneity – their advantage over entropy change. Variation of UA and UG with P, V and T Gibbs – Helmholtz equations and their applications. Thermodynamic equation of state. Maxwell's relations.

UNIT – III**Applications of Second Law of Thermodynamics & Third Law of Thermodynamics**

- 3.1. Equilibrium constants and free energy change. Thermodynamic derivation of Law of Mass Action. Equilibrium constants in terms of pressure and concentration – NH_3 , PCl_5 , CaCO_3 . Thermodynamic interpretation of Le Chatelier's principle. (Concentration, temperature, pressure and addition of inert gases.)
- 3.2. Equilibrium between different phases – System of variable composition – Partial molar quantities – Chemical Potential of component in an ideal mixture – Gibbs Duhem equation – Variation of chemical potential with T, P, and X (mole fraction).
- 3.3. Reaction isotherm – van't Hoff's equation – van't Hoff's isochore. Clapeyron equation and Clausius Clapeyron equation – Applications.
- 3.4. Third Law of Thermodynamics: Need for the law. Nernst heat theorem. III law of thermodynamics – statement and concept of residual entropy. Evaluation of absolute entropy from heat capacity data. Exception to third law. (Ortho & Para Hydrogen, CO , N_2O and Ice).

UNIT – IV**Phase Rule**

- 4.1. Meaning of the terms – Phase, Component and Degree of Freedom. Derivation of Gibb's phase rule. Phase equilibria of one component systems – water, CO_2 and sulphur systems.
- 4.2. Phase equilibria of two component systems – Solid – Liquid equilibria – Simple Eutectic systems – Bi- Cd and Pb-Ag systems – Desilverisation of lead.
- 4.3. Compound formation with congruent melting points (Mg-Zn) and incongruent melting points (Na-K). NaCl – water and FeCl_3 – water systems – Freezing mixtures. Gas – Solid Equilibria – (CuSO_4 – water system). Efflorescence and Deliquescence.
- 4.4. Symmetry elements – symmetry operations – mathematical group multiplication tables, point group of simple molecules (H_2 , HCl , CO_2 , H_2O , BF_3 and NH_3

UNIT – V**Solutions**

- 5.1. Ideal binary liquid mixtures: Ideal liquid mixtures – (Benzene and Toluence)- Raolt's law and Henry's law – Deviation from Raolt's law and Henry's law. Activity and activity coefficient. Duhem – Margule's equation –its application to fractional distillation of binary miscible liquids – Non ideal systems – Azeotropes – (HCI – water & Ethanol – water systems). Applications of Azeotropes in organic chemistry.
- 5.2. Partially miscible liquid pairs – Phenol – Water, Triethanol amine – Water and Nicotine – Water systems – Lower and Upper CSTs. Effect of impurities on CST.
- 5.3. Immiscible liquids – Principle and applications of steam distillation. Nernst Distribution Law - Derivation and applications.
- 5.4. Dilute solutions and colligative properties: Determination of molecular weights – Relative lowering of vapour pressure. Laws of Osmosis – Osmotic pressure and its applications. Elevation of Boiling point and Depression of Freezing point – Thermodynamic derivation. Determination by experimental methods. Relation between colligative properties and molecular mass. Abnormal molecular mass. Vant Hoff factor, Degree of dissociation and association of solutes.

References:

1. Principles of Physical Chemistry, B.R.Pruhi & Sharma.
2. Text book of Physical Chemistry, P.L.Soni.
3. Advanced Physical Chemistry , Gurdeep Raj
4. Essentials of Physical Chemistry, B.S.Bahl., G.D.Tuli & Arun Bahl, S.Chand & Co., New Delhi. (1999)
5. Thermodynamics for Chemists, Samuel Glasstone.
6. Simplified course in Physical Chemistry, R.L.Madan, G.D.Tuli.S.Chand & Co., N.Delhi (1999)
7. Thermodynamics for students of Chemistry, Rajaram and Kuriacose.
8. P.W.Atkins, Physical Chemistry, ELBS , Oxford Univ. Press , 1998.
9. Puri B.R., Sharma L.R. and Pathania M.S. Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin chand and Co. (2013)
10. Sangaranarayanan, M.V., Mahadevan, V., Text Book of Physical Chemistry, 2nd Edition, Hyderabad, Universities Press, (India) 2011.

Question Paper Pattern**Maximum Marks: 75****Exam duration: Three Hours****Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)****Part B – 5 X 5 = 25 Answer All Questions (Either 0r type -Two questions from each unit)****Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)****Signature of the HOD**

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19)
Core Course – MEC1 (Major Elective)

Credits	: 4	Code: S5CHEL1B
Hours / Week	: 5	
Medium of Instruction	: Both Tamil and English	

SEMESTER – V
(For students admitted from 2018 onwards)

FORENSIC CHEMISTRY

Objectives :

To give the students the importance of forensic chemistry and an exposure to find, analyse and find a suitable method to detect the crime .

UNIT 1 : FOOD ADULTRATION

1.1 Contamination of wheat, rice, dhal, milk, butter, etc. With clay, sand, stone, water and toxic chemicals (e.g. Kasserri dhal with mentanil yellow).

1.2 Food poisons: natural poisons (alkaloids, nephrotoxins), pesticides (DDT, BHC, Follidol), Chemical poisons (KCN). First aid and Antidotes for poisoned persons.

1.3 Heavy metal (Hg, Pb, Cd) Contamination of Sea food. Use of neutron activation analysis in detecting poisoning (e.g., As in human hair)

UNIT 2: TRANSPORTAION

2.1 Drunken driving: brath analyzer for ethanol. Incendiary and timed bombs in road and railway tracks. Defusing live bombs.

2.2 Hit -and-go traffic accidents : paint analysis by AAS. Soill of toxic and coorosive chemicals (e.g., conc.acids) from tankers.

UNIT 3: CRIME DETECTION

3.1 Accidental explosions during manufacture of matches and fire-works (as in Sivakasi). Human bombs, possible explosives (gelatin sticks,RDX). Metal detector devices and other security measures for VVIP. Composition of bullets and detection of powder burns.

3.2. Scene of crime: finger prints and their matching using compuetr records. Smell tracks and police dogs. Analysis of blood and other body fluids in rape cases. Typing of blood. DNA finger printing for tissue identification in disembered bodies. Blood stains on clothing. Cranial analysis (head and teeth).

UNIT 4: FORGERY and COUNTERFEITING

4.1. Detecting forgery in bank cheques / drafts and educational records (mark lists, certificates), using UV-light. Alloy analysis using AAS to detect counterfeit coins. Checking silverline water mark in currency notes.

4.2. Jewellery : detection of gold purity in 22 carat ornaments, detecting gold plated jewels, authenticity of diamonds (natural, synthetic, glassy).

UNIT 5: MEDICAL ASPECTS

5.1. AIDS : Cause and prevention . Misuse of scheduled frugs. Burns and their treatment by plastic surgery.

5.2. Metabolite analysis, using mass spectrum - gas chromatography. Detecting steroid consumption among athletes and race horses.

Question Paper Pattern**Maximum Marks: 75****Exam duration: Three Hours****Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)****Part B – 5 X 5 = 25 Answer All Questions (Either 0r type -Two questions from each unit)****Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)****Signature of the HOD**

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Core Course – MEC1 (Major Elective)

Credits	: 4	Code: S5CHEL1C
Hours / Week	: 5	
Medium of Instruction	: Both Tamil and English	

SEMESTER – V

(For students admitted from 2018 onwards)

BIO CHEMISTRY

Objectives :

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

UNIT 1: Amino acids and Proteins

- 1.1 **Living Cell** – Plant and Animal cell. Cell membrane – organelles – functions of subcellular components – Anabolism and catabolism and their relation to metabolism.
- 1.2 **Amino acids** – classification – Synthesis of α -amino acids and their identification.
- 1.3 Peptide bond- stereochemistry, synthesis of peptides by solution and solid phase techniques.
- 1.4 **Proteins** – classification – properties-3D structure-determination of amino acid sequence –denaturation and renaturation of protein molecules.
- 1.5 Separation and purification of proteins – dialysis – gel filtration - electrophoresis.
- 1.6 Catabolism of amino acids: Transamination, oxidative deamination, decarboxylation. The urea cycle and other possibilities of detoxification of ammonia.

Self study: Rare amino acids of proteins, tertiary structure of globular proteins. Plasma proteins.

UNIT 2 : Enzymes

Nomenclature, classification and properties-specificity, factors influencing enzyme action. Mechanism of enzyme action – Lock and Key model and induced fit models. Coenzymes – cofactors – prosthetic groups of enzymes (TPP, NAD, NADP, FAD, ATP). Their importance in enzyme action. Mechanism of inhibition (competitive, non- and uncompetitive and allosteric). Immobilization of enzymes. Enzyme specificity,

Self study:

Kinetics of mono and disubstrate enzyme catalyzed reactions. Serum enzymes and isoenzymes-their diagnostic value.

UNIT 3: Lipids

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

Self study:

Reaction of lipases on triacylglycerols in aqueous and organic solvents. Steroid hormones, vitamin D, lipoproteins.

UNIT 4: Carbohydrates

- 4.1 Classification – reducing and non-reducing sugars. Glucose: structure-conformation – stability
- 4.2 Carbohydrates of the cell membrane – starch, cellulose and glycogen. (Structure and utility)
- 4.3 Metabolism: Glycolysis and its reversal; TCA cycle. Relation between glycolysis and respiration. Principles of bioenergetics, electron transport chain and oxidative phosphorylation.

Self study:

Gluconeogenesis, pentose phosphate pathway.

UNIT 5 Nucleic Acids

- 5.1 Nucleosides and nucleotides – purine and pyrimidine bases. Nucleic acids Difference between DNA and RNA. Classification of RNA.
- 5.2 Biosynthesis of DNA: Replication. Biosynthesis of mRNA: Transcription.
- 5.3 Genetic code – mutations and mutants. DNA repair. Biosynthesis of proteins.
- 5.4 DNA sequencing and PCR, recombinant DNA technology, DNA polymorphism.

Self Study:

Strategies for screening DNA libraries. Blood composition. Blood coagulation. Haemoglobin - its role in chemistry of respiration.

Text books

1. Lehninger, Principles of Biochemistry, Fourth Edition, by David L. Nelson and Michael M. Cox, Worth Publishers, New York, 2005.
2. L. Veerakumari, Biochemistry, MJP publishers, Chennai, 2004.
3. Lubert Stryer, Biochemistry, W. H. Freeman and company, New York, 1975.

Reference books

4. Robert L.Caret, Katherine J. Denniston, Joseph J. Topping, Principles and Applications of organic and biological chemistry, WBB publishers, USA, 1993.
5. J. L. Jain, Biochemistry, Sultan Chand and Co.1999
6. A. Mazur and B. Harrow, Text book of biochemistry, 10th Edition, W.B. Saunders Co., Philadelphia, 1971.
7. Paula Yurkanis Bruice, Organic chemistry, 3rd Edition, Pearson Education, Inc. (Singapore), New Delhi, reprint, 2002.
8. P. W. Kuchel and G. B. Ralston, Shaum Series, Theory and Problems of Biochemistry, McGraw-Hill Book Company, New York, 1988.

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25 Answer All Questions (Either 0r type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Core Course – MEC2 (Major Elective)

Credits : 4 Code: S5CHEL2A
 Hours / Week : 5
 Medium of Instruction : Both Tamil and English

SEMESTER – V
(For students admitted from 2018 onwards)
Analytical Chemistry

Objectives
<ul style="list-style-type: none"> ❖ To learn about Laboratory Hygiene and Safety. ❖ To acquire the knowledge of Separation and Purification Techniques. ❖ To study the various concepts and applications of Thermo analytical Methods, Colorimetric Analysis and Organic Estimations. ❖ To gain the depth knowledge in computer C programming. With chemistry.
Learning Outcomes
<p style="text-align: center;">At the completion of this course the student will be able to</p> <ul style="list-style-type: none"> ❖ Understand the principles of analytical chemistry. ❖ Use statistical method for evaluating and interpreting data. ❖ Understand the principles of chromatographic methods

UNIT –I

1.1 Laboratory Hygiene And Safety

Storage and handling of corrosive, flammable, explosive, toxic, carcinogenic and poisonous chemicals.

1.2 Simple First Aid Procedure For Accidents

Acid in eye, alkali in eye, acid burns, bromine burns, poisoning, inhalation of gases, cut by glasses and heat burns.

1.3 Errors in chemical analysis, classification of errors, instrumental errors, personal errors, constant errors and proportional errors – Correction of determinate errors -Random errors. Precision, accuracy and rejection of data questioned. Significant - Figures. Mean deviation and standard deviation. Curve fitting, Method of least squares.

UNIT- II

2.1 Separation And Purification Techniques

General principles involved in the separation of precipitates. Solvent extraction.

2.2 Chromatography

Principles in adsorption, partition and ion exchange, paper, thin layer, column, gas liquid chromatography. Electro-phoresis- Applications.

2.3 Desiccants Vacuum drying, distillation, fractional distillation, steam distillation, Azeotropic Distillation, crystallization and sublimation – Principles and Techniques.

UNIT – III**3.1 Thermo analytical Methods**

Principles involved in thermogravimetric analysis and differential thermal analysis-instrumentation.

Characteristics of TGA (CaC_2O_4 , H_2O , $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) and DTA curves ($\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$). Factors affecting TGA and DTA curves.

3.2 Thermometric titration of HCL Vs NaOH.**3.3 Analytical Electrochemistry**

Redox potential – measurement and application, interpretation of chemical behaviour. Electrolytic separations. Principles of electrode deposition. Electro-gravimetry (estimation of copper and silver.)

3.4. Basic concepts of paleography technique.**UNIT – IV****4.1 Colorimetric Analysis**

Laws of colorimetry – instrumentation. Nessler's and photo electric colorimetric method – operation and applications. Estimation of Ni, Cu and Fe.

4.2 Basic principles of flame photometry – Atomic absorption – Spectrophotometry – Estimation of Na, K and Ca.**4.3 Organic Estimations**

Principle and methods to estimate glucose, ascorbic acid, phenol, aniline, ketone, oils and fats. Iodine value, saponification value, R.M value and acetyl value.

UNIT – V**5.1 Elementary features of C programming.****5.2 Structure, data types, variables, constants, keywords operators, expressions and Library Functions****5.3 Control structures in C –if, if – else, go to, while, do...while loop.****5.4 Examples of simple chemistry programs.**

a. Conversion of Celsius temperature to Kelvin temperature. Conversion of Celsius to Fahrenheit and vice versa.

b. Application of Beer Lambert Law.

c. ΔE for atomic spectral transition using Rydberg equations.

d. Rate constant for a first order reaction.

e. pH of a buffer solution using Henderson equations.

Reference:

1. R.Gopalan, P.S.Subramanian and K. Rengarajan: "Elements of Analytical Chemistry, "Sultan Chand & sons, New Delhi. (1995)
2. B.K.Sharma ; Instrumental Methods of chemical analysis, Goel Publishing House, Meerut (1999).
3. S.M.Khopkar ; Basic Concepts of Analytical Chemistry New Age International (P)Ltd, New Delhi (1998)
4. Gurdeep Chatwal, Sham Anand; Instrumental methods of Chemical Analysis, Himalaya Publishing House, Mumbai (1998).
5. R.A Day and A.L Underwood. " Quantitative analysis " Prentice Hall of India, New Delhi

6. D.A.Skoog & D.M.West; Fundamentals of Analytical Chemistry W.B.Saunders, New York,(1982).
7. K.V.Raman; Computers in chemistry Tata Mc Graw Hill Co., New Delhi(1993).
8. B.G.Gottfried; BASIC Programming Mc Graw Hill International Ltd.,(1987).
9. B.G.Gottfried; C Language Programming Mc Graw Hill International Ltd.,(1987).
10. E.Balagurusamy; C Programming Tata Mc Graw Hill Co., New Delhi(1997).
11. H.Schildt; C and C++ Programming, Mc Graw Hill International Ltd.,(1998).
12. K.V.Raman Chemistry Education, New Delhi july (1992).
13. K.B.Baliga, S.M.Shetty : College Analytical Chemistry, Himalaya Publishing House (1998).
14. A.I.Vogel : Text Book of Quantitative Inorganic Analysis, Longman(1984).
G.W.Ewing : Instrumental Methods of Chemical Analysis, Mc Graw Hill(1988).

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25 Answer All Questions (Either Or type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Core Course – MEC2 (Major Elective)

Credits	: 4	Code: S5CHEL2B
Hours / Week	: 5	
Medium of Instruction	: Both Tamil and English	

SEMESTER – V

(For students admitted from 2018 onwards)

PHARMACEUTICAL CHEMISTRY

OBJECTIVES

1. To study the principles and functioning of drugs.
2. To know the importance and functioning of antibiotics.
3. To study the impact of poisons.

UNIT I DRUGS TERMINOLOGY

Terminology: Drugs, pharmacy, pharmacology, pharmacognosy , therapeutics, toxicology, chemotherapy, pharmacopoeia - first aid for bleeding for blood, maintain breathing, Cuts, Abrasions and Bruises, Fractures, Burns and Fainting. First aid box for accident, plaster of paris. Symptoms treatment for Anemia, Diabetics, T.B, Asthma, Jaundice, Piles, Leprosy, Typhoid, Malaria, Cholera, Filariasis. Medicinally important compound Aluminum, phosphorus, Arsenic, Mercury, Iron, Milk of magnesia, Aluminum Hydroxide gel.

UNIT II ANTIBIOTICS

Antibiotics: Introduction, classification – based on biological action, chemical structure- Biosynthesis and degradation of penicillin. an account of semi synthetic penicillin, different types of penicillium, SAR chloroamphenicol, synthesis, SAR and Assay – chloroamphenicol, Streptomycin – structure assay– structure Activity relationship.

UNIT III ANALGESIC AND ANTIPYRETICS

Analgesic and Antipyretics: Analgesic - Narcotic analgesics, synthetic analgesics pethidine and methadone, Narcotic antagonist, Nalorphine, Nonnarcotic- antipyretic analgesics. Pyrazole, salicylic acid, P- amino phenol derivative aspirin and Ibuprofen, Ketoprofen, Naproxen.

UNIT IV ANAESTHETICS, ANTISEPTICS AND DISINFECTANTS

Anaesthetics : Definition, classification of anaesthetics, Ethers, Halohydrocarbons, chloroform, Halo ethane, Fentanyl principle- Intravenous anaesthetics. Structure of thiopental sodium – Local anaesthetics – cocaine- source and structure – preparation and uses of procaine. Amethocaine and Benzocaine. Antiseptics and Disinfectants – phenol co-efficient. Phenolic component tranquilizers – definition and example. Psychedelic drugs. LSD and Marijuana,

AIDS HIV, propagation prevention and treatment. Definition– cancer – and antineoplastics drugs– antimetabolite – Natural substance, alkylation agent. Definition Hyperglycemic drug type and causes for diabetics.

UNIT V POISONS

Poisons: Poison Investigation Definition kinds of poison – Accidental suicidal andomocidal death – action of poison – general condition that control action of poison – general condition that control action of poison Hints of Investigation. Industrial gases and volatile poison, synthetic gases – carbon di sulphide – petroleum distillate, aromatic compounds, chlorinated hydro carbons.

REFERENCES

1. Lakshmi S, pharmaceutical chemistry 2011.
2. Jaya shree Ghosh, A text book of pharmaceutical chemistry, 3rd ed., S.Chand & Company Ltd., New Delhi (2008)

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25 Answer All Questions (Either 0r type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19)
Core Course – MEC2 (Major Elective)

Credits	: 4	Code: S5CHEL2C
Hours / Week	: 5	
Medium of Instruction	: Both Tamil and English	

SEMESTER – V

(For students admitted from 2018 onwards)

POLYMER CHEMISTRY

OBJECTIVES

1. To know the chemistry of polymers.
2. To study the importance of polymers.
3. To study the concepts of polymerization and techniques.

UNIT 1 INTRODUCTION TO POLYMERS AND RUBBERS

Basics of polymers – monomers and polymers - definition .classification of polymers on the basis applications - thermosetting and thermoplastics -distinction among plastics. Functionality -. Copolymers. Degree of polymerization. Types of polymerization reactions – chain polymerization –free radical and ionic polymerization – coordination and step polymerization reactions- polyaddition and polycondensation – miscellaneous reactions: ringopening and group transfer polymerization. Basics of rubbers: types - vulcanization of rubber- ebonite- uses of rubbers.

UNIT II PROPERTIES AND REACTIONS OF POLYMERS

Properties: Glass transition temperature (T_g) -definition – factors affecting T_g. Relationship between T_g and molecular weight. Importance of T_g. Molecular weight of polymers: number average (M_n), weight average (M_w), sedimentation and viscosity average molecular weights. Reactions: Hydrolysis – hydrogenation– addition – substitutions – cross linking and cyclisations reaction. Polymer degradation- thermal, photo and oxidation degradation of polymers (basics only)

UNIT III POLYMERIZATION TECHNIQUES AND MOULDING TECHNIQUE

Polymerization techniques: bulk, solution, emulsion, melt condensation and interfacial polycondensation polymerization. Moulding technique: Injection,compression, extrusion, rotational and calendaring.

UNIT IV CHEMISTRY OF COMMERCIAL POLYMERS

Preparation, properties and uses of the polymers: Polyethylene, polypropylene,polystyrene, PVC, teflon and polymethylmethacrylate, polycarbonate,polyurethanes, polyamides (Kevlar), phenol-formaldehyde, urea-formaldehyde resin, epoxy resins, rubber-styrene and neoprene rubbers.

UNIT V ADVANCES IN POLYMERS

Biopolymers – biomaterials. Polymers in medical field - High temperature and fire – resistant polymers. Silicones - conducting polymers- carbon fibers.(basic idea only) and polymer composites.

TEXT BOOK :

Billmeyer F.W., Text book of polymer science, Jr. John Wiley and Sons, 1984.

BOOKS FOR REFERENCE

1. Gowariker V.R., Viswanathan N.V. and Jayadev Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi, 1978.
2. Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989.
3. Arora M.G., Singh M. and Yadav M.S., Polymer Chemistry, 2nd Revised edition, Anmol Publications Private Ltd., New Delhi, 1989.

Question Paper Pattern**Maximum Marks: 75****Exam duration: Three Hours****Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)****Part B – 5 X 5 = 25 Answer All Questions (Either 0r type -Two questions from each unit)****Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)****Signature of the HOD**

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Skill Based Elective III

Credits : 3 **Code: S5SB3M**
 Hours / Week : 6
 Medium of Instruction : Both Tamil and English

SEMESTER – V

(For students admitted from 2018 onwards)

AGRICULTURAL CHEMISTRY

OBJECTIVES

- To know the properties of soil and the importance of plant nutrients.
- To know the significance of fertilizers and pesticides.

UNIT I : ORIGIN OF SOIL :Origin of soils, their properties, acid, alkali and saline soils- diagnosis – remediation of acid and salt affected soils – methods of reclamation and after care.

UNIT II : CHEMISTRY ASPECTS OF SOIL :Soil testing – concept, objectives and basis – soil sampling, tools, collection processing, despatch of soil samples – soil organic matter – its decomposition and effect on soil fertility.

UNIT III: PLANT NUTRIENTS: Plant nutrients – macro and micro nutrients – their role in plant growth – sources - forms of nutrient absorbed by plants – factors affecting nutrient absorption - deficiency symptoms in plants – corrective measures – chemicals used for correcting nutritional deficiencies – nutrient requirement of crops – their availability fixation and release of nutrients.

UNIT IV: FERTILIZERS :Fertilizers – classification of NPK fertilizers – sources - natural and synthetic – straight – complex – liquid fertilizers, their properties, use and relative efficiency secondary and micronutrient fertilizers – mixed fertilizers.

UNIT V : PESTICIDES AND FUNGICIDES :Pesticides : definition – Classification – organic and inorganic pesticides – mechanism of action – characteristics safe handling of pesticides – impact of pesticides on soil, plants and environment. Fungicides : Definition – Classification – mechanism of action – sulphur, copper, mercury compounds, dithanes, dithiocarbamate.

REFERENCES :

1. Biswas T.D and Mukherjee S.K. Text book of soil science 1987.
2. Daji A.J. A text book of soil science, Asia publishing House, Madras – 1970.
3. Tisdale S.L. Nelson W.L. and Beaton J.D. Soil fertility and fertilizers, Macmillon Pub Co New York 1990.
4. Hesse P.R, A text book of soil chemical analysis John Murray, NewYork, 1971.
5. Buchel K.H, Chemistry of Pesticides, John Wiley & Sons New York 1983. 6. Sree Ramulu V.S Chemistry of Insecticides and Fungicides, Oxford and IBH Publishing Co., New Delhi 1979.

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25 Answer All Questions (Either 0r type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Core Course –XI (Major Theory)

Credits	: 5	Code: S6CH7
Hours / Week	: 5	
Medium of Instruction	: Both Tamil and English	

SEMESTER – VI
(For students admitted from 2018 onwards)
Inorganic Chemistry – II

Objectives
<ul style="list-style-type: none"> ❖ To learn about Nuclear chemistry, Radioactivity And Nuclear Transformations ❖ To acquire the knowledge of Metallic State ❖ To study the various concepts and applications of Some Special Classes of Compounds. ❖ To understand the various Gravimetric Analysis
Learning Outcomes
<p>At the end of the course, the student will be able to,</p> <ul style="list-style-type: none"> ❖ To understand the stereochemistry of coordination compounds. ❖ To differentiate between the inert and labile complexes ❖ Applications of nuclear chemistry

UNIT – I Nuclear chemistry

- 1.1 Introduction – composition of nucleus and nuclear forces.
- 1.2 Nuclear stability – n / p ratio, mass defect, binding energy, packing fraction and magic numbers, shell and liquid drop models.
- 1.3 Isotopes – detection and separation. Isotopic constitution of elements and whole number rule. Deviation of atomic weights from whole numbers. Isobars, isotones and isomers.

UNIT – II Radioactivity And Nuclear Transformations

- 2.1 Radioactivity – discovery, detection and measurements (Wilson cloud chamber). Radioactive emanations. Disintegration theory – modes of decay – Group displacement law – Rate of disintegration – Half life and average life – Radioactive series.
- 2.2 Nuclear transformations – use of projectiles – nuclear reactions – fission and fusion. Nuclear reactors. Applications of radio isotopes – Carbon dating – Radio active waste disposal.
- 2.3 Radiolysis of water and hydrated electron.

UNIT – III Metallic State

- 3.1 Packing of atoms in metal (BCC,FCC (CCP), HCP)
- 3.2 Theories of metallic bonding – electron gas, Pauling and band theories.
- 3.3 Structure of alloys – substitutional and interstitial solid solutions – Hume Rothery ratios – crystal defects.
- 3.4 Semi conductors – Extrinsic and intrinsic – n-type and p-type- composition, structure and uses in electronic industry.

UNIT – IV Some Special Classes Of Compounds.

- 4.1 Clathrates- examples and structures. Interstitial compounds and non-stoichiometric compounds.
- 4.2 Silicones – composition, raw materials, manufacture, structures, properties and uses.
- 4.3 Metal alkyls, co-ordination polymers and phosphonitrilic polymers.
- 4.4 Silicates – Classification into discrete anions, one. Two and three dimensional structures with typical examples composition, properties and uses of beryl, asbestos, talc, mica, zeolites and ultramarines.

UNIT – V Gravimetric Analysis:

- 5.1. Characteristics of precipitating agent – choice of precipitants – specific and selective precipitant. Condition of precipitation. Types of precipitates. Purity of precipitates. Co-precipitation and post precipitation. Precipitation from homogeneous solution. Digestion and washing of precipitate. Ignition of the precipitate. Use of sequestering agents.

References:

1. P.L.Soni, Mohan Katyal, 'Text Book of Inorganic Chemistry', 20th revised edn., Sultan Chand, 1992.
2. Esmarch S.Gilreath, 'Fundamental concepts of Inorganic Chemistry', International students edn., Mcgraw-Hill Kogakusha, Ltd., 1958.
3. Gurdeep Chatwal and M.S.Yadu, 'Co-ordination Chemistry', First edn., Himalaya Publishing House, 1992.
4. B.R.Puri and L.R.Sharma, 'Principles of Inorganic Chemistry', Shoban Lal Nagin Chand and Co., 1989.
5. Cotton and Wilkinson, 'Advanced Inorganic Chemistry', 5th edn.,
6. R.D.Madan, 'Modern Inorganic Chemistry'.
7. S.Glasstone, 'Source Book on Atomic Energy', 3rd edn., Affiliated East West Press, 1967

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25 Answer All Questions (Either Or type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Core Course –CC-XII (Major Theory)

Credits	: 4	Code: S6CH8
Hours / Week	: 4	
Medium of Instruction	: Both Tamil and English	

SEMESTER – VI
(For students admitted from 2018 onwards)
Organic Chemistry – II

Objectives
<ul style="list-style-type: none"> ❖ To learn about Nitro compounds and amines, Amino acids and proteins of organic compounds. ❖ To acquire the knowledge of Phenols, Dyes and Pharmaceuticals. ❖ To study the various concepts and applications of Carbohydrates and Natural products. ❖ To understand the various Molecular Rearrangement
Learning Outcomes
<p>At the end of the course, the student will be able to</p> <ul style="list-style-type: none"> ❖ .Apply the principles of radical reactions to write a mechanism for these reaction ❖ Write equations for reactions involving alcohols, ethers, and aromatic compounds. ❖ Apply the principles of organic chemistry to determine the advantages and disadvantage of biochemical molecules in the human body.

UNIT-I

1.1 Nitrocompounds and amines.

- 1.1.1 Conversion of nitrobenzene to ortho, para and Meta dinitrobenzenes. TNT – Aromatic Nitro Compounds – Reduction in neutral, acidic and alkaline media
- 1.1.2 Relative basic characters of Aliphatic and Aromatic amines.
- 1.1.3 Ring substitution in aromatic amines. Diazotisation and its mechanism synthetic applications of diazonium salts.
- 1.1.4 Diazomethane and diazoacetic ester-preparation, structure and their synthetic uses.
- 1.1.5 Phenylene diamines.
- 1.1.6 Sulphanilic acid, sulphanilamide, saccharin, chloramine T.
- 1.1.7 Diamide- preparation, properties and uses of urea and thiourea.

1.2 Amino acids and proteins.

- 1.2.1 Classification of aminoacids. Essential and non-essential amino acids.
- 1.2.2 Preparation of α - amino acids. Properties and reactions. Zwitter ions, Isoelectric points, peptide syntheses. Structure determination of polypeptides. End group analysis.
- 1.2.3 Proteins – Classification based on physical and chemical properties and based on physiological Functions. Primary and secondary structures of proteins. Helical and sheet structures (elementary treatment only) Denaturation of proteins.

- 1.2.4** Nucleic acids: Structures of nucleobases-adenine, guanine, thymine, uracil and cytosine-nucleosides- nucleotides- polynucleotides-types of nucleic acids-DNA and RNA-biological functions.

UNIT – II

2.1. Phenols

- 2.1.1 Acidic character of phenols, Explanation on the basis of Resonance stabilisation.
 2.1.2 Ring substitution in phenols – orientation of phenolic group towards electrophiles. Esterification, nitration, sulphonation, halogenation coupling with diazonium salts, Kolbe's reaction, Reimer-tiemann Reactions, Gattermann, Lederer Manasse and Hoesch reactions.
 2.1.3 Cresols, Nitro and Aminophenols, Di and Trihydric phenols. Alpha and Beta naphthols preparation and properties.

2.2 Dyes

- 2.2.1 Theory of colour and constitution.
 2.2.2 Classification – according to structure and application
 i) Azodyes – methyl orange and Bismark brown; ii) Triphenyl methane dyes – Malachite green; iii) Phthalein dyes – phenolphthalein and fluorecein. iv) Vat dye – Indigo v) Anthraquinone dye – Alizarin.

2.3. Pharmaceuticals- Explanation with two examples each for

- i) Analgesics ii) Antibacterial iii) Anti-inflammatory iv) Antipyretic ,
 v) Antibiotic, vi) Antitubercular vii) Antiviral viii) Antitussive ix)
 Antiallergic x) Antidiabetics xi) antihypertensive xii) Antiepileptics xiii)
 Tranquilizers, xiv) Antiseptic and disinfectant xv) Antimalarial
 xvi) Anaesthetics (local and general). SAR (structure activity relationship) of Chloramphenicol and Phenacetin

UNIT – III

Carbohydrates

- 3.1 Classification, constitution of glucose and fructose. Reactions of glucose and fructose oxazone formation, Mutarotation, and its mechanism, cyclic structure, pyranose and furanose forms. Determination of ring size, formula, configuration of monosaccharides. Epimerisation, chain lengthening, and chain shortening of aldoses. Inter conversion of aldoses and ketoses-Haworth, Fischer and chair conformations of glucose – stability of α and β –glucose—structures of ribose and deoxyribose
 3.2 Disaccharides – Reactions and structure of maltose, lactose and sucrose. Starch and cellulose structure of starch and cellulose (Haworth) structural elucidation not necessary

UNIT – IV

Natural products

- 4.1 Terpenes, isoprene rule Occurrence and structural elucidation of Geraniol, Nerol, Menthol, and α -terpineol
 4.2 Alkaloids – General methods of isolation and general methods of structure determination conine, piperine and Nicotine.
 4.3 Vitamins-Thiamine, Riboflavin, pyridoxine and ascorbic acid occurrence and biological importance. Structural elucidations of pyridoxine and ascorbic acid.

UNIT – V

Molecular Rearrangement

- 5.1 Classification (anionotropic, cationotropic) Intermolecular and intramolecular.
 5.2 Pinacol – Pinacolone rearrangement (Mechanism, Evidence for carbonium ion intermediate formation – Migratory aptitude) Beckmann, Benzidine, Hofmann, Curtius, Benzilic acid rearrangements (mechanisms only) Claisen Rearrangement (sigmatropic rearrangement) – Evidence for intramolecular nature and allylic carbon attachment para-Claisen rearrangement, Cope and oxycope rearrangements Fries rearrangement (Two mechanisms).

References:

1. P.L.Soni and H.M.Chawla, "Text Book of Organic Chemistry", 27th edn., Sultan Chand 1997.
2. V.S.Parmar and H.M.Chawla, "Principles of reaction mechanism in Organic Chemistry", 2nd Edn., Sultan Chand 1978.
3. Subash Chandra Rastogi, Satis Kumar Agarwala Ashok Kumar Sharma, "Chemistry of Natural products" Vol.1 & Vol. II, I Edition 1974-75. Jai Prakash Nath & Co. Leading Educational Publishers.
4. Ernest L Eliel "Stereochemistry of Carbon Compounds", 19th Reprint 1995 Tata McGraw Hill Publishing company Ltd.
5. M.K.Jain "Organic Chemistry", 12th Edn., Shoban Lal Nagin Chand and Co.

Question Paper Pattern**Maximum Marks: 75****Exam duration: Three Hours****Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)****Part B – 5 X 5 = 25 Answer All Questions (Either 0r type -Two questions from each unit)****Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)****Signature of the HOD**

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Core Course – XIII (Major Practical)

Credits	: 4	Code: S6CHP4
Hours / Week	: 5	
Medium of Instruction	: Both Tamil and English	

SEMESTER – VI
(For students admitted from 2018 onwards)
GRAVIMETRIC ANALYSIS – IV

Objectives
<ul style="list-style-type: none"> ❖ To impart knowledge on Quantitative analysis especially Gravimetric Analysis ❖ To gain the depth knowledge in Determination of melting and boiling points of simple organic compounds.
Learning Outcomes
<p>At the end of the course, the student will be able to</p> <ul style="list-style-type: none"> ❖ Prepare organic compounds of gravimetric analysis ❖ To determine the melting point and boiling point of simple organic compounds.

I. Gravimetric Analysis

1. Estimation of calcium as calcium oxalate
2. Estimation of barium as barium sulphate
3. Estimation of barium as barium chromate
4. Estimation of lead as lead sulphate
5. Estimation of lead as lead chromate
6. Estimation of nickel as nickel dimethylglyoxime complex
7. Estimation of Mg as oxinate.

II. Determination of melting and boiling points of simple organic compounds.
 (Without H₂SO₄ medium)

Procedure writing with equations	: 05 marks
Record Note Book	: 05 marks
Practical Examination	: 50 marks
CIA	: 40 marks
Total	: 100 marks

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Core Course –MEC3 (Major Theory)

Credits : 4
 Hours / Week : 5
 Medium of Instruction : Both Tamil and English

Code: S6CHEL3A

SEMESTER – VI
(For students admitted from 2018 onwards)
Physical Chemistry – II

Objectives
<ul style="list-style-type: none"> ❖ To learn about Electrical conductance ,acids & bases ❖ To acquire the knowledge of Equilibrium in Electrochemical Cells. ❖ To study the various concepts and applications of different spectroscopic techniques
Learning Outcomes
<p>At the end of the course, the student will be able to,</p> <ul style="list-style-type: none"> ❖ Relate macroscopic thermodynamic properties to microscopic states by using the principles of statistical thermodynamics. ❖ Relate reaction kinetics to potential reaction mechanisms. ❖ Calculate the temperature dependence of rate constant and relate it to activation energy.

UNIT – I Electrical conductance:

- 1.1. Measurement of equivalent conductance using Kohlrausch's bridge. Variation of equivalent conductance with concentration.
- 1.2. Migration of ions-Kohlrausch's law and its applications. The elementary treatment of the Debye-Huckel Onsager equation for strong electrolytes. Evidence for ionic atmosphere. The conductance at high fields (Wien effect) and high frequencies (Debye-Falkenhagen effect). Transport number and Hittorf's rule-determination by Hittorf's method and moving boundary method.
- 1.3. Application of Conductance Measurements. Determination of λ of a strong electrolyte and acids. Determination of K_a of acids. Determination of solubility product of a sparingly soluble salt. Common ion effect. Conductometric titrations.

UNIT – II Acids and Bases:

- 2.1. Modern theories of acids and bases – Bronsted-Lowry concept and Lewis concept, factors that influence the strength of acids and bases. Definition of pH and pKa.
- 2.2. Buffers-mechanism of buffer action- Henderson-Hasselbauch equations. Determination of pH by Colorimetric method.
- 2.3. Hydrolysis of Salts: Neutralisation, Hydrolysis constant, Relations between K_h, K_a, K_w and K_b . Degree of hydrolysis. pH of hydrolysed salt solutions. Calculation of hydrogen ion concentration-salts of strong and weak acids with weak bases.

UNIT – III Equilibrium In Electrochemical Cells:

- 3.1. Electrolytic and galvanic cells. Reversible and irreversible cells. Conventional representation of Electrochemical cells. Electromotive force of a cell and its measurements. Computation of cell e.m.f. calculation of thermodynamic quantities of cell reactions. (ΔG , ΔH , ΔS and K). Applications of Gibbs Helmholtz equation, concentration and E.M.F. Nernst equation.
- 3.2. Types of reversible electrodes – Gas/metal ion, metal/metal ion, metal/insoluble salt/anion and Redox electrodes. Electrode reactions. Nernst equation- derivation of cell EM.F. and single electrode potentials. Standard hydrogen electrode – reference electrodes- standard electrode potentials – sign conventions – Electrochemical series and its significance.
- 3.3. Concentration cell with and without transport. Liquid junction potential. Application of concentration cells- Valency of ions, solubility product and activity co-efficient, potentiometric titrations. Determination of pH using hydrogen, quinhydrone and glass electrodes. Determination of P_{ka} of acids by potentiometric methods.
- 3.4. Corrosion – general theory – Electrochemical theory- passivity – prevention of corrosion.

UNIT – IV – Spectroscopy - I

- 4.1. Definition of spectrum. Electromagnetic radiation, interaction of electromagnetic radiation with molecules and quantization of different forms of energies in molecules. (translational, rotational, vibrational and electronic).
- 4.2. Microwave spectroscopy- condition-molecular rotation-theory of microwave spectroscopy- Selection rule. Effect of isotopic substitution and calculation of moment of inertia and bond length of diatomic molecules.
- 4.3. Infra red spectroscopy – condition-molecular vibration- modes of vibration of linear and non-linear molecules, modes of vibration of diatomic, triatomic linear (CO_2) & non-linear triatomic (H_2O) molecules-Stretching & bending vibrations – selection rules, expression for vibrational frequency (derivation not needed). Calculation of force constant – isotope effect – Applications of I.R.spectra (group frequencies, finger printing and Hydrogen bonding only).
- 4.4. Raman spectroscopy – condition – Raleigh and Raman scattering – stokes and ant stokes lines- Difference between Raman and I.R. Spectroscopy – Rotational Raman spectra of non-centro symmetric molecule (HCl only). Application to covalent compounds. Mutual exclusion principle.
- 4.5. U.V.-Visible spectroscopy – condition – theory of electronic spectroscopy – types of electronic transitions – Frank – Condon principle – predissociation – Applications.

UNIT – V - Spectroscopy - II

- 5.1. N.M.R.Spectroscopy – magnetic and non-magnetic nuclei – condition – principle of nuclear magnetic resonance – ring current effect – shielding mechanism – chemical shift – Number of signals – spin – spin. Coupling – coupling constant (J) – splitting of signals –NMR spectra of simple organic compounds. NMR spectrum of ethylalcohol in detail.
- 5.2. E.S.R. Spectroscopy – condition – theory of ESR spectra – Hyperfine splitting – ESR spectra of Simple radicals CH_3 methyl, CD_3 , naphthalene, negative ion only).
- 5.3. Mass spectroscopy – Basic principles of mass spectroscopy, molecular ion peak, base peak, Isotopic peak and metastable peak – Nitrogen rule and ring rule. Mass spectrum of simple organic compounds. (Acetaldehyde. Ethylalcohol, CH_3NH_2 & Toluene)

Reference:

1. B.R.Puri & L.R.Sharma. Principles of physical chemistry.
2. R.P.Varma & Pradeep. Physical chemistry.
3. C.N.Banwell, Fundamental molecular spectroscopy. Tata McGraw Hill publications, New Delhi 11th reprint 1991.
4. William Kemp, Organic spectroscopy, ELBS, Second edition 1987.
5. Dr.S.Jain & S.P.Jankar, physical chemistry, principles & problems, Tata McGraw Hill, New Delhi, 1990.
6. B.K.Sen "Quantum chemistry", spectroscopy"
7. K.V.RAMAN "Spectroscopy and mathematics of Quantum chemistry in print.
8. R.Chang "Basic principles of spectroscopy"
9. Dyer "Organic Application of Spectroscopy"
10. Y.R.Sharma. Elementary organic spectroscopy. Principles and Applications. S.Chand. New Delhi (1992).

Question Paper Pattern**Maximum Marks: 75****Exam duration: Three Hours****Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)****Part B – 5 X 5 = 25 Answer All Questions (Either 0r type -Two questions from each unit)****Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)****Signature of the HOD**

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Core Course – MEC3 (Major Elective)

Credits	: 4	Code: S6CHEL3B
Hours / Week	: 5	
Medium of Instruction	: Both Tamil and English	

SEMESTER – V
(For students admitted from 2018 onwards)
MATERIALS & NANO CHEMISTRY

OBJECTIVES

1. To study the types of ionic crystals and defects in solids.
2. To learn the different kinds magnetic properties.
3. To learn the basic concepts of nanomaterial's and their applications.

UNIT I- IONIC CONDUCTIVITY AND SOLID ELECTROLYTES

Types of ionic crystals – alkali halides – silver chloride-alkali earth fluovider –simple stoichiometric oxides. Types of ionic conductors – halide ion conductors – oxide ion conductors – solid electrolytes – applications of solid electrolytes. Electrochemical cell – principles – batteries, sensors and fuel cells –Inorganic solids – colour, magnetic and optical properties.

UNIT II MAGNETIC MATERIALS

Ferrites : Preparation and their applications in microwave –floppy disk – magnetic bible memory and applications. Insulating Materials: Classification on the basis of temperature – Polymer insulating materials and ceramic insulating materials. Ferro electric materials: examples – applications of ferroelectrics.

UNIT III MODERN ENGINEERING MATERIALS

Metallic glasses – introduction –composition, properties and applications. Shape memory alloys: introduction – examples – application of SMA – advantages and disadvantages. Biomaterials :Introduction –metals and alloys in biomaterials –ceramic biomaterials, composite biomaterials-polymer biomaterials.

UNIT IV NANOPHASE MATERIALS

Introduction – techniques for synthesis of nanophase materials–sol gel synthesis electrodeposition–inert gas condensation-mechanical alloying and applications of nanophase materials-composite materials: Introduction –types.

UNIT V NANO TECHNOLOGY

Introduction –importance –various stages of nanotechnology –nanotube technology – nanoparticles –fullerenes-nano dendrimers –nano pore channels, fibres and scaffolds –CVD diamond technology –FCVA technology and its applications – nano imaging techniques.

REFERENCES

1. Aathony R. West, Solidstate chemistry and its applications, John Wiley & Sons(1989).
2. Raghavan V.R., Materials Science and Engineering, Printice Hall (India) Ltd., (2001).
3. Kenneth J. Klabunde, Nanoscale materials in chemistry, A. John Wiley and Sons Inc. Publication

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25 Answer All Questions (Either 0r type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Core Course –MEC3 (Major Theory)

Credits : 1 Code: S6CHEL3C
 Hours / Week : 2
 Medium of Instruction : Both Tamil and English

SEMESTER – VI

(For students admitted from 2018 onwards)

Chemistry In Every Day Life

Objectives
<ul style="list-style-type: none"> ❖ To learn about Cleaning agents and Water pollution ❖ To acquire the knowledge of Food-importance and Cosmetics ❖ To study the various concepts of Corrosion. ❖ To understand the various Building materials and Fertilizers
Learning Outcomes
<ul style="list-style-type: none"> ❖ At the end of the course, the student will be able to Understand the basic concept of applicable of chemistry in day today life.

UNIT – 1

Cleaning agents – soaps- detergents- types–composition-manufacture –foaming, colouring and building agents . shampoo, washing powder and bleaching powder.
 Water-types-hardness of water- types. Water pollution, causes, prevention.

UNIT – II

Food-importance-spoilages-causes, preservation-additives – colouring, flavouring agents, beverages. Soft drinks, aerated water-manufacturing .
 Fruits,vegetables,dairy products-storage,preservation. Minerals in food - toxins and anti oxidants.

UNIT – III

Cosmetics- Face powder-constituents uses-side effects. Nail polish, hairdye- composition and side effects . Tooth powder- composition and manufacturing .
 Medicines in day- to-day life - analgesics, anti pyretics, anti inflammatory, antibiotics, antiseptic and disinfectants- definition, examples and uses.

UNIT – IV

Corrosion-definition,control. Paints and varnishes-constituents, manufacturing-medium - binder –pigments- types of paints -requirements of a good paints, Polymers-types-plastics.Rubber- vulcanization -application .. Adhesives- composition, manufacturing and uses.

UNIT – V

Building materials –cement- composition –manufacturing- mixture, concrete,RCC- use of steel .
 Fertilizers- fertilizer industries in India .Manufacture of ammonium salts, urea, super phosphates.

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25Answer All Questions (Either 0r type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
First Allied Course – I (Allied Theory)

Credits	: 3	Code: S1ACH1
Hours / Week	: 4	
Medium of Instruction	: Both Tamil and English	

SEMESTER – I

(For students admitted from 2018 onwards)

I B.Sc., - Maths, Zoology, Biochemistry and II B.Sc., Physics Major Students
Allied chemistry – I

Objectives
<ul style="list-style-type: none"> ❖ To acquire the knowledge of. Acids and bases,buffer action. ❖ To learn about Polar Effects, Halogen Containing Compounds and Types Of Solvents. ❖ To study the various concepts of Aromatic Compounds, Organic Reactions and Chemotherapy ❖ To get knowledge in Solid State, Energetic, Phase Rule, Chemical Equilibrium, Chemical Kinetics, and Catalysis
Learning Outcomes
<p>At the end of the course, the student will be able to apply the principles of kinetics in calculating reaction rates, activation energies, and order of reactions. Apply the principles of equilibrium in calculations involving gases, acids-bases, slightly soluble ionic compounds, and electrochemistry</p> <p>Understand the concept pH</p>

UNIT – I

- 1.1. **Acids and Bases** : Arrhenius concept and limitations-Bronsted- lowry concept-conjugate acid and conjugate base -limitations– Lewis concept-examples of lewis acids and bases. Strength of acids and bases – strength of aliphatic acids- solvent that influence the strength of acids and bases - Defintion of pH pOH and Pka – ionic product of water – buffer solutions - buffer action - Henderson- Hasselbauch equations - Determination of pH by Colorimetric method.

UNIT – II

- 2.1. **Polar Effects:** Inductive effect- Relative strength of aliphatic monocarboxylic acid and aliphatic amines - Resonance- conditions for resonance, consequences of resonance-resonance energy. Basic property of aniline and acidic property of phenol - Hyper conjugation - consequences of hyperconjugation- Heat of hydrogenation, bond length and dipolemoment. Steric effect – steric accelerated reaction and steric inhibited reaction.
- 2.2. **Halogen Containing Compounds:** Important chlorohydrocarbons used as solvents and pesticides(Dichloromethane, chloroform, carbontetrachloride, DDT, BHC) Fluorocarbons (freons)- preparation , properties and uses
- 2.3. **Types Of Solvents** – polar , nonpolar- dissolving nature .

Unit – III

- 3.1. **Aromatic Compounds:** Structure , stability , resonance and aromaticity of benzene - Typical substitution reaction- i) Nitration ii) Halogenation iii) alkylation.
- 3.2. **Chemotherapy:** Explanations with two examples each for i) Analgesics ii) Antibacterial iii)Anti-inflammatory, iv) Antipyretic , v) Antibiotic, vi)Antitubercular vii)Antiviral viii) Antitussive ix) Antiallergic x) Antidiabetics xi) antihypertensive xii) Antiepileptics xiii) Tranquilizers, xiv) Antiseptic and disinfectant xv)Antimalarial xvi) Anaesthetics (local and general). Structures not necessary.

Unit – IV

- 4.1. **Solid State:** Typical crystal lattices – unit cell. Elements of symmetry. Bragg`s equation, Weiss indices, Miller indices, simple, body centered and face centered cubes.
- 4.2. **Energetic:** Review of first law of thermodynamics- state and path functions- need for the second law- Carnot`s cycle.
- 4.3. **Phase Rule:** Phase, component, degrees of freedom, and phase rule definition. One component – water system. Reduced phase rule - two components – Pb-Ag system.

UNIT – V

- 5.1. **Chemical Equilibrium:** Criteria of homogeneous and heterogeneous equilibria. Decomposition of HI, N₂O₄, CaCO₃ and PCl₅
- 5.2. **Chemical Kinetics:** Order of reactions and their determinations. Activation energy, effect of temperature on reaction rate.
- 5.3. **Catalysis :** Definition and examples: Positive and negative catalyst, homo and heterogeneous catalysis, auto catalysis, enzyme catalysis. Industrial application of Ni, Fe, NO catalyst.

References:

1. R.D.Madan, J.S.Tiwari and G.L.Mudhara – A text book of First Year B.Sc.Chemistry – S.Chand & Co.
2. G.S.Manku – Theoretical Principles of Inorganic Chemistry Tata McGraw Hill, New Delhi.
3. Paula Yurkanis Bruice- Organic Chemistry, Prentice Hall
4. D.N.Bajpai – Advanced physical chemistry – S.Chand and Co.

Question Paper Pattern**Maximum Marks: 75****Exam duration: Three Hours****Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)****Part B – 5 X 5 = 25 Answer All Questions (Either 0r type -Two questions from each unit)****Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)****Signature of the HOD**

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Second Allied Course – II (Allied Theory)

Credits	: 4	Code: S2ACH2
Hours / Week	: 4	
Medium of Instruction	: Both Tamil and English	

SEMESTER – II

(For students admitted from 2018 onwards)

I B.Sc., - Maths, Zoology, Biochemistry and II B.Sc., Physics Major Students

Allied Chemistry – II

Objectives
<ul style="list-style-type: none"> ❖ To learn about Coordination Chemistry, Metallic Bond, Compounds of Sulphur in inorganic compounds. ❖ To acquire the knowledge of Carbohydrates, Amino Acids and Proteins, ❖ To study the various concepts and applications of Synthetic Polymers, Heterocyclic Compounds and Stereoisomerism. ❖ To understand the various ideas of Solid State, Energetic, Phase Rule, Chemical Equilibrium, Chemical Kinetics and Catalysis
Learning Outcomes
<p>At the end of the course, the student will be able to</p> <p>Exhibit good work ethic and study skills as evidenced by their record of showing up to class on time and having all objectives and key terms identified within the chapter.</p> <p>Use the vocabulary of chemistry, both language and mathematical, to explain concepts.</p> <p>Utilize safe and course-appropriate laboratory techniques.</p> <p>Produce writing that shows original thinking, depth of analysis, and comprehension of basic course content. Identify examples of how chemistry affects the quality of their lives.</p>

UNIT – I

- 1.1. **Coordination Chemistry:** Nomenclature of mononuclear complexes – Werner, Sidgwick, and Pauling's theories. Chelation and its industrial importance to EDTA. Biological role of hemoglobin and chlorophyll.
- 1.2. **Metallic Bond:** Electron gas, Pauling and band theories. Semiconductors- intrinsic, n –type and p-type.
- 1.3. **Compounds of Sulphur :** Peroxides of sulphur and sodium thiosulphate

UNIT – II

- 2.1. **Carbohydrates:** Classification- glucose and fructose- preparation and properties of glucose- configuration of glucose – Fischer and Haworth cyclic structures. Sucrose, starch and cellulose –structure, properties and uses.
- 2.2. **Amino Acids and Proteins:** Amino acids- classification based on structure and essential and non-essential amino acids preparation and properties – peptides (elementary treatment)- proteins- classification based on physical properties and biological functions. Structures of proteins-primary and secondary (elementary treatment)

UNIT III

- 3.1. **Synthetic Polymers:** Teflon, alkyd and epoxy resins, poly esters – general treatment only.
- 3.2. **Heterocyclic Compounds:** Furan, thiophen, pyrrole and pyridine – preparation and properties- basic properties of pyridine and Pyrrole.
- 3.3. **Stereoisomerism:** Optical isomerism- lactic and tartaric acid-racemic mixture and resolution. Geometrical isomerism – maleic and fumaric acids. Meaning of E, Z, R,S,D, L, and meso in stereochemistry.

UNIT IV

- 4.1. **Colloids:** Emulsions, gels- preparation, properties and applications. Electrophoresis, chromatography- coloumn, paper and thin layer chromatography
- 4.2. **Photochemistry:** Laws of photochemistry - lambert's law,lambert-beer law,Grothus- Drapper law,Einstein law of photochemical equivalence- photo synthesis- photoelectric effect.

UNIT - V

- 5.1. **Electrochemistry:** Specific conductance, equivalent conductance and their determination using kohlraush bridge – effect of dilution on conductivity. An elementary idea about ionic theory- Ostwald's dilution law, Kohlrausch law, conductometric titrations(weak acid vs strong base only)
- 5.2. **pH and Buffer:** Importance of pH and buffers in living systems – pH determination using H electrode and glass electrode

References:

1. R.D.Madan, J.S.Tiwari and G.L.Mudhara – A text book of First Year B.Sc.Chemistry – S.Chand & Co.
2. G.S.Manku – Theoretical Principles of Inorganic Chemistry Tata McGraw Hill, New Delhi.
3. B.R..Puri, L.R.Sharma and Madan S.Pathania, “Principles of Physical Chemistry” Shoban Lal Nagin Chand and Co., Delhi.
4. R.D.Madan, “Modern Inorganic Chemistry”, 1987, S.Chand and Company (Private) Ltd.,
5. P.L.Soni, “Text book of Organic Chemistry, Sultan Chand & Co., New Delhi.

Question Paper Pattern

Maximum Marks: 75

Exam duration: Three Hours

Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)

Part B – 5 X 5 = 25Answer All Questions (Either 0r type -Two questions from each unit)

Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19)
Allied Course – III (Allied Practical)

Credits	: 4	Code: S2AChP / S4AChP
Hours / Week	: 3	
Medium of Instruction	: Both Tamil and English	

SEMESTER – I & II
(For students admitted from 2018 onwards)
PRACTICAL – I : Volumetric & Organic Analysis
(Examination at the End of Semester - II)

(For the B.Sc., Mathematics / Biochemistry / Physics / Zoology Major candidates admitted from the academic year 2018 - 2019 onwards)

Objectives
<ul style="list-style-type: none"> ❖ To impart knowledge on Quantitative analysis especially volumetric analysis. ❖ To gain the depth knowledge in different types of volumetric analysis. ❖ To understand the knowledge on Qualitative analysis of organic compounds
Learning Outcomes
<p>At the end of the course, the student will be able to</p> <p>To understand the principle of volumetric analysis such as acidimetry, alkalimetry, permanganometry, and iodometry.</p> <p>Prepare to identify the organic compounds.</p>

I. Volumetric Analysis

1. Acidimetry and alkalimetry
 - a) Strong acid vs strong base
 - b) Weak acid vs strong base
 - c) Determination of hardness of water
2. Permanganimetry
 - a) Estimation of ferrous sulphate
 - b) Estimation of oxalic acid
3. Iodometry
 - a) Estimation of copper
 - b) Estimation of potassium dichromate
 - c) Estimation of potassium permanganate

II. Organic Analysis

A study of the reactions of the following organic compounds

1. Carbohydrate
2. Amide
3. Aldehyde
4. Ketone
5. Acid
6. Amine
7. Phenol

The students may be trained to perform the specific reactions like tests for elements (nitrogen only), aliphatic or aromatic, saturated or unsaturated and functional group present and record their observations.

Note:	Org – Qual – Practical	:	30 marks
	Volumetric Procedure writing	:	05 marks
	Volumetric	:	25 marks
	Record (Vol. & Org. Qual.)	:	10 marks*
	CIA	:	30 marks
	Total	:	100 marks

***Minimum of 5 marks may be given**

Signature of the HOD

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Core Course – NMEC1 (Non Major Elective)

Credits	: 3	Code: S5CHELO1
Hours / Week	: 4	
Medium of Instruction	: Both Tamil and English	

SEMESTER – V
(For students admitted from 2018 onwards)
SOIL SCIENCE

UNIT- I Soil Formation

- 1.1 Soil formation – soil forming processes- profile development – definition of soil – soil composition.
- 1.2 Soil physical properties – soil texture and structure – soil air, soil temperature, soil water, soil consistence – significance of physical properties to plant growth.
- 1.3 Soil chemical properties –soil colloids – Inorganic colloids-clay minerals-amorphous-Ion exchange reactions-organic colloids-soil organic matter-Decomposition-Humus formation-significance on soil fertility, soil reaction-Biological properties of soil-nutrient availability.

UNIT – II Fertilizer

- 2.1 Fertilizer – definition – fertilizer recommendation based on soil testing – fertility index – Effect of Nitrogen on plant growth and development. Phosphate fertilizers – effects of Phosphorous on plant growth and development – super phosphate & Bone meal. Potassium fertilizers – functions of potassium on plant growth.
- 2.2 Secondary and micronutrients fertilizers – complex and mixed fertilizers – sources, manufacture, properties and reactions in soils – slow release fertilizers.

UNIT – III Mannurs

- 3.1. Bio fertilizers - nitrogen fixing bio fertilizers – rhizobium, azospirillum – phosphate mobilizing bio fertilizer – bacteria – bacillus, pseudomonas, fungi – aspergillus, penicillium
- 3.2. Green manures – green leaf manure – bulky organic and concentrated organic manures – compost – enriched farmyard manures, composting of coir pith ; sugarcane trash, leaf litters and farm wastes – oil cakes, bone meal, fish meal, guano poultry manures.

UNIT – IV Pest management and control

- Pesticides – formulations – emulsifiable concentrate, water miscible liquids, wettable powders dusts, granules, classification of pesticides – mode of pesticides in soil and plants – impacts of pesticides mode of action – characteristics – uses – impact of pesticides on environment – safety measure in the analysis and handling of pesticides.
- 4.1 Insecticides – plant products – Nicotine, pyrethrum, rotenone, petroleum oils. Inorganic pesticides – Arsenical fluorides, borates. Organo chlorine compounds – D.D.T, B.H.C, methoxychlor, chloredane, endosulfon.

UNIT – V**Fungicides And Herbicides**

- 5.1. Fungicides – Inorganic – Sulphur compounds – Copper compounds - Mercuric Compounds, Organic – dithiocarbomates – Dithane, M.Boredeaux mixture.
- 5.2. Herbicides: Inorganic herbicides – Arsenical compounds Boron Compounds – Cyanmides – Cyanides and thio cyanates, Chlorates and sulphomates. Organic herbicides & Nitro compounds – Chlorinated compounds – 2 -4D – Pyridine Cmpounds –Trizine compounds – Propionic acid derivatives – urea herbicides, Alachlor.
- 5.3. Acaricides – Rodenticides – Attactance – Repellants- Fumigaus Defoliant.

Reference:

1. N.C. Brady, the Nature and properties of soils Eurasia publishing house, (P) Ltd. 9th Ed 1984.
2. Biswas, T.D and Mukeherjee S.K. 1987 Text book of soil science.
3. A.J Daji (1970) A Text book of soil science – Asia publishing house, Madras.
4. Donahue, R.L Miller, R.W. and shickluna, J.C.1987. Soils – An introduction to soils and plant Growth – Pretice Hall of India (P) Ltd., New Delhi.
5. Colling, G.H. 1955, Commercial fertilizers – McGraw Hill Publishing Co., New York.
6. Tisdale, S.L. Nelson, W.L. and Beaton, J.D 1990, Soil fertility and fertilizers. Macmillan publishing company, New York.
7. Hesse, P.R. 1971. A Text book of soil chemical Analysis. Prentice Hall of India, New Delhi.
8. Jackon, M.L 1958, Soil Analysis. Pretice Hall of India (P) Ltd., New Delhi.
9. Buchel, K.H.1983 Chemistry of Pesticides – Jhon wiley & sons, New York.
10. Melnikov, N. N 1971. Chemistry of pesticides Vol.36 of Residue Review- springer verlac.
11. Sree Ramula, U.S. 1979, Chemistry of Insecticides and fungicides – Owford and IBH publishing. Co., New Delhi.

Question Paper Pattern**Maximum Marks: 75****Exam duration: Three Hours****Part A – 10 X 2 = 20 Answer All Questions (Two questions from each unit)****Part B – 5 X 5 = 25 Answer All Questions (Either 0r type -Two questions from each unit)****Part C – 3 X 10 = 30 Answer Any THREE (One question from each unit)****Signature of the HOD**

Rajah Serfoji Govt. College (Autonomous), Thanjavur – 613 005
B.Sc., Chemistry – CBCS Pattern (From the academic year 2018 – 19
Core Course – NMEC2 (Non Major Elective)

Credits : 3 **Code: S6CHELO2**
 Hours / Week : 4
 Medium of Instruction : Both Tamil and English

SEMESTER – VI
(For students admitted from 2018 onwards)
Industrial Chemistry

UNIT – I

Basic ideas about chemical industries:

Flow charts- chemical conversion – Batch versus continuous processing – chemical process economics – market survey – plant location.

Water treatment:

pollution of water by fertilizer, detergent and pesticide industries – BOD, COD – water treatment – reverse osmosis.

UNIT – II

Cement:

Manufacture, Hot process and dry process – types – setting of cement – reinforced concrete – cement industries in India.

Glass:

Types – composition – manufacture of optical glass, coloured glass and neutron absorbing glass - Fertilizers: Fertiliser industries in India – preparation of urea, super phosphate, triple super phosphate and potassium salts.

UNIT – III

Sugar: Preparation of sugar from molasses, sugar industries in India.

Cleansing agents:

Preparation of toilet and washing soaps- synthetic detergents – sodium lauryl sulphate. Paints and Varnishes: Primary constituents of paints – dispersion medium (solvent) – binders' pigments- oil based paints – latex paints – requirements of a good paint.

UNIT – IV

Rubber industries:

Natural rubber – synthetic rubber – synthetic rubber polymerization – butadiene, styrene co polymers – neoprene – urethane rubber.

Plastics:

Preparation of plastics PVC, bakelite – condensation polymerization – polyamides – nylon 66, polyester and tereylene.

UNIT – V

Coal : Origin and importance of coal – types – composition – coal mines in India.

Petroleum : Origin – refining – cracking – knocking – and octane number – LPG.

Fuel gases : Composition – storage – hazards and uses of coal gas, water gas and producer gas and oil gas.

References:

1. B.N. Chakrabarty, Industrial chemistry, Oxford & IBH publishing Co., New Delhi, 1981
2. B.K. Sharma industrial chemistry, geol publishing House, Meerut.
3. P.P. Singh, T.M. Joseph and R.G. Dhavale, College Industrial chemistry, Himalaya publishing House, Bombay, 4th Ed., 1983
4. R. Norrish sherve and Joseph A. Brink Jr., Chemical Process industries, McGraw Hill Industrial Book Company, London
5. A.C.S. Brain, Production and properties of industrial Chemicals, Reinhold, NY.

Question Paper Pattern

Maximum Marks: 75

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