



ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN

(Autonomous)

(Re-Accredited with 'A' Grade by NAAC)

**(A Government Aided College - Affiliated to Mother Teresa Women's University,
Kodaikanal)**

CHINNAKALAYAMPUTHUR (PO), PALANI -624 615.

DEPARTMENT OF CHEMISTRY



SYLLABUS

2016-2019

**COMMON ACADEMIC STRUCTURE IN AUTONOMY
CBCS**

Effect from the academic year 2016-17 and onwards

Semester	Hour	Subject	Internal	External	Total	Credit
I	6	Part I Tamil	25	75	100	3
	6	Part II English	25	75	100	3
	4	Part III Core Paper – I Inorganic & Physical Chemistry – I	25	75	100	4
	4	Core paper – II Organic Chemistry - I	25	75	100	4
	2	Core Practical	----	--	--	--
	5	Allied I - Mathematics Theory Paper I	25	75	100	5
	2	Part IV SBC – Water & Sanitation Chemistry	25	75	100	2
	1	Value Education –Yoga & Meditation - Theory	---	--	--	----
	30	Total			600	21
II	6	Part I Tamil	25	75	100	3
	6	Part II English	25	75	100	3
	7	Part III Core Paper – III Inorganic & Physical Chemistry - II	25	75	100	4
	3	Core Practical	40	60	100	4
	5	Allied PaperII Mathematics	25	75	100	5
	2	Part IV SBC – Leather Chemistry	25	75	100	2
	1	Value Education – Yoga & Meditation - Practicals	25	75	100	2
	30	Total			700	23
	III	6	Part I Tamil	25	75	100
6		Part II English	25	75	100	3
6		Part III: Core Paper – IV Inorganic, Organic & Analytical Chemistry	25	75	100	4
3		Core Practical	--	--	--	--
3		Allied II -Physics	25	75	100	3

	2	Allied Practical	--	--	--	--
	2	Part IV: SBC- Polymer Chemistry	25	75	100	2
	2	NME I	25	75	100	2
	30	Total			600	17
IV	6	Part I Tamil	25	75	100	3
	6	Part II English	25	75	100	3
	4	Core paper V Organic Chemistry - III	25	75	100	5
	4	Core paperVI Physical Chemistry	25	75	100	4
	3	Core Practical II	40	60	100	4
	3	Allied II - Physics	25	75	100	3
	2	Allied Practical	40	60	100	4
	2	Part IV SBC -	25	75	100	2
	-	Part V Extension activities	-	-	-	1
	30	Total			800	29
V	6	Part III Core paper –VII	25	75	100	5
	6	Core paper –VIII	25	75	100	4
	6	Practical III	--	--	--	--
	5	Elective I	25	75	100	5
	5	Elective II	25	75	100	5
	2	Part IV project	75	25	100	2
	30	Total			500	21
VI	6	Part III Core paper –IX	25	75	100	5
	7	Core paper –X	25	75	100	5
		Practical III	40	60	100	4
	6	Practical IV	40	60	100	4
	5	Elective III	25	75	100	5
	2	Part IV EVS	25	75	100	2
	2	SBC	25	75	100	2
	2	NME II	25	75	100	2
30	Total			800	29	

TOTAL MARKS : 4000

TOTAL CREDITS : 140

QUESTION PAPER PATTERN

(For BA / B.Sc./B .Com., /B.CA /B.Sc., Com.sci)

FOR CORE, ALLIED & ELECTIVE PAPERS

SUMMATIVE EXAMINATION

Duration - 3 Hrs

Total Marks - 75 Marks

Section A-----10 X 1 =10-----No choice

Section B-----5 X 3 = 15-----5 out of 7 questions

Section C-----4 X 5 = 20-----4 out of 6 questions

Section D-----3 X 10 = 30-----3 out of 5 questions

INTERNAL MARKS:

THEORY - 15

ASSIGNMENT - 5

SEMINAR - 5

TOTAL - 25

INTERNAL QUESTION PAPER PATTERN:

Duration - 1 Hrs

Total Marks - 25 Marks

Section A----- 1 X 3 =3 No choice

Section B-----2 X 1 =2 1 out of 2 questions

Section C-----4 X1 = 4 1 out of 2 questions

Section D----- 6 X 1 =6 1 out of 2 questions

SEMESTER – I

CORE-I INORGANIC AND PHYSICAL CHEMISTRY-I

Objectives

1. To study the adsorption, classification of adsorption and factors affecting adsorption catalysis, theories of catalysis and its application
2. To know the rate of chemical reaction, factors influencing reaction rates, rate law, rate constant, order and molecularity of the reaction, classification of rates based on the order of the reaction, rate equation for first order reactions, half life period, simple and complex reactions and types of complex reactions
3. To know the basics of electrochemistry, definition of various terms, theory of electrolytic conductors, Ostwald's dilution law for weak electrolytes-Faraday's laws of electrolysis, variation of equivalent conductance with concentration, Kohlrausch's Law, common ion effect, buffer solutions, Henderson equation, pH indicators.

UNIT – I : ATOMIC STRUCTURE AND PERIODICITY

Atomic orbital-Quantum numbers –Principal, azimuthal, magnetic and spin quantum numbers and their significance-shapes of atomic orbital-g and u character of atomic orbital-nodal points and nodal planes-Principles governing the occupancy of electrons in various quantum levels-Pauli's exclusion principle-Hund's rule of maximum multiplicity-Aufbau principle,(n+1) rule-writing practice for electronic configuration of vital elements in s,p,d & f block elements-stability of half and fully filled orbital with suitable examples.

Long form of the periodic table-characteristics-classification of elements on the basis of electronic configuration-periodicity of properties-cause of periodicity-explanation of atomic radii, ionic radii, electron affinity, ionisation energy, electronegativity-factors affecting their magnitudes.

UNIT – II : CHEMICAL BONDING

(a) Types of chemical bonds – ionic, covalent, coordinate covalent, hydrogen (inter and intra) and metallic bonds with few suitable examples-comparison between them.

(b) Chemical Bonding – valence bond approach-VB theory- types of overlapping and orbital diagrams- sigma and pi bonds-concept of hybridisation and geometry of molecules- sp^2 , sp^3 , sp^3d and sp^3d^2 with suitable examples.VSEPR theory-shapes of some simple inorganic molecules- $BeCl_2$, $SiCl_4$, PCl_5 , SF_6 , IF_7 , NH_3 , XeF_6 and H_2O .

(c) Molecular Orbital Theory-bonding and antibonding molecular orbital-relative order of energies of molecular orbital-MO theory applied to homonuclear molecules-Hydrogen, Helium, Nitrogen, Oxygen-Hetero nuclear molecules-HF and CO-comparison of VB and MO theories.

UNIT III : SURFACE CHEMISTRY:

(a) **Adsorption**- classification of adsorption of gases on solids- types of adsorption – differences between them – factors affecting adsorption.

(b) **Catalysis**- general characteristics- types of catalytic reactions-types of catalysts- promoters-catalytic poison – theories of catalysis-application of catalysis

UNIT – IV : CHEMICAL KINETICS:

Scope of chemical kinetics- rate of chemical reaction – factors influencing reaction rates- rate law- rate constant – order and molecularity of the reaction – differences between them- classification of rates based on the order of the reaction- rate equation for first order reactions – examples – half life period with derivation – rate equation for pseudo-first order reaction- simple and complex reactions-differences between them – types of complex reactions

UNIT-V : ELECTRO CHEMISTRY - I:

Conductors, insulators and semi conductors-definition with examples-theory of electrolytic conductors- Ostwald's dilution law for weak electrolytes-Faraday's laws of electrolysis-conductance- specific resistance- specific conductance-equivalent conductance- molar conductance-variation of equivalent conductance with concentration- Kohlrauch's Law-statement and application(any one)- common ion effect-buffer solutions-Henderson equation-pH indicators-selection of pH indicators.

CORE PAPER- II
ORGANIC CHEMISTRY- I

Objectives:

- i) To Know the Fundamental Concepts of Organic Chemistry and its Reactions.**
- ii) To study the reactions mechanisms and properties of Aliphatic hydrocarbons like alkanes, alkenes, and alkynes.**

Hrs: 4/Hrs

Credits:4

Max Marks: 75(Ext); 25(Int)

UNIT-I FUNDAMENTAL CONCEPTS-I

- a) Introduction to Organic Chemistry** - Sources and classification of Organic compounds.
- b) Nomenclature of Organic compounds** - Functional groups : Definition – various functional groups – common and IUPAC system of naming- Aliphatic and Aromatic hydrocarbons up to 10 carbon atom systems and other functional derivatives.
- c) Detection and estimation of elements:** Lassaigne's test and Beilstein test- Estimation of nitrogen by Kjeldahl's method -Halogens and Sulphur by Carius method.
- d) Purification techniques:** Fractional distillation, sublimation and crystallization.
- e) Determination of Molecular weight of Organic acids and bases-**Silver salt method for acids, Platinic chloride method for bases. Problems in determining empirical and molecular formulae - differences between them.

UNIT-II FUNDAMENTAL CONCEPTS-I

- a) Introduction to Organic Chemistry** - Sources and classification of Organic compounds.
- b) Nomenclature of Organic compounds** - Functional groups : Definition – various functional groups – common and IUPAC system of naming- Aliphatic and Aromatic hydrocarbons up to 10 carbon atom systems and other functional derivatives.
- c) Detection and estimation of elements:** Lassaigne's test and Beilstein test- Estimation of nitrogen by Kjeldahl's method -Halogens and Sulphur by Carius method.
- d) Purification techniques:** Fractional distillation, sublimation and crystallization.
- e) Determination of Molecular weight of Organic acids and bases-**Silver salt method for acids, Platinic chloride method for bases. Problems in determining empirical and molecular formulae - differences between them.

UNIT- III FUNDAMENTAL CONCEPTS-II

- a) Tetrahedral arrangement of valencies of carbon atoms.
- b) Cleavage of bond: Homolytic and Heterolytic Cleavages of Carbon bond.
- c) Electrophilic and Nucleophilic reagents-Definition and examples.
- d) Electronic effects: Inductive, Electromeric, Resonance effects and hyper conjugation.
- e) Reaction intermediates: Free radicals, Carbonium ion, (carbocation) Carbanions and Carbenes- generation and their stability.

UNIT-IV ALIPHATIC HYDROCARBONS-I

- a) Alkanes: Introduction- Sources- Preparation by wurtz synthesis, decarboxylation and using Grignard reagents- reactions- halogenations-free radical mechanism of halogenations of alkanes- Cracking and Pyrolysis – Octane number- flash point- synthetic petrol, natural gas.
- b) **Alkenes:** Introduction- classification of alkenes, Preparation by dehydrohalogenation of Rx- dehydration of alcohols & by heating quaternary ammonium salts- Hoffmann's rule and Saytzeff rule with examples. Reactions of alkenes- Electrophilic addition of Br₂ and HBr- Markownikoff's rule with examples- Peroxide effect with examples.

UNIT-V ALIPHATIC HYDROCARBONS-II

- a) **Dienes:** Classification-isolated-cumulated and conjugated double bond systems-Diels- Alder reactions-1,2 and 1,4- addition mechanism in butadiene- Geometrical isomerism of dienes.
- b) **Alkynes:** Introduction-preparation of alkynes - acidity of alkynes –Chemical properties- substitution, Hydrogenation, Ozonolysis and combustion reactions of alkynes(Mechanism not necessary)
- d) **Isomerism-** Structural, chain, position, functional isomerism-Tautomerism and Metamerism- Explanation with examples.

Types of Organic Reactions:

- a) Detailed mechanism of aliphatic nucleophilic substitution reactions- SN¹ ,SN² , SNⁱ reactions.
- b) Detailed mechanism of aliphatic elimination reactions: E¹,E²,E_{1CB} reactions-substitution Vs elimination – polymerization reaction - types- explanation with suitable illustrations.
- c) Rearrangement reactions involving alkanes, alkenes and alkynes.

SEMESTER - II

CORE PAPER – III - INORGANIC AND PHYSICAL CHEMISTRY -II

Hrs: 4/Hrs

Credits: 4

Max Marks: 75(Ext); 25(Int)

UNIT – I : STRUCTURE OF SOLIDS

(a) Lattice Energy- ionic crystals, NaCl and CsCl crystal structure – determination of lattice energy using Born-Haber cycle-factors affecting crystal lattice energy-properties of ionic crystals(higher melting point, hardness, electrical conductivity in molten condition and in solution)-Polarisation and Polarising ability- Fajans Rule-Vander Waals forces-ion-ion, ion-dipole interactions.

(b) **Modern Concepts of Acids & Bases :**

Acids and Bases : Modern concepts of acids and bases-Arrhenius,Lowry-Bronsted – Acidity & Basicity,relative order of acidity & basicity-Lux-Flood concept-Lewis concept- Usanovich concept-Levelling effect.

UNIT -II

(a) **Metallurgy** : Occurrence of metals –minerals and ores-mineral wealth in India-steps involved in metallurgical process-concentration-calcination- roasting-reduction to free metal- electrometallurgy- hydrometallurgy- refining of metals-electrolytic refining-Van Arkel process.

(c) Organic & inorganic reagents in semi-micro qualitative analysis – spot tests-advantages- disadvantages- DMG- aluminon & Magneson reagent- thiourea.

UNIT – III : SOLID STATE

(a) Isotropy and anisotropy-symmetry in crystal systems-point groups space lattice unit cell-Bravais lattice-seven crystal systems-laws of crystallography-law of constancy of interfacial angle-law of symmetry-law of rational indices-miller indices-symmetry elements in crystal systems-X-Ray diffraction-Bragg's equation-experimental method of determination of interplanar spacing-calculations involving interplanar spacing in crystal systems.

(b) **Types of crystals** – ionic,molecular,covalent and metallic crystals.

1.Ionic Crystals : Analysis of KCl-Fajan's rule of polarisation of ions.

2.Molecular crystals – Water and Ammonia.

3.Covalent crystals – Diamond and Graphite.

4.Metallic crystals : Metallic bond in metals

5.Conductors,insulators and semiconductors-Frankel and Schotty defects.

UNIT – IV – KINETIC THEORY OF GASES

- (a) **Postulates of kinetic theory of gases-** Derivation of ideal gas laws from the expressions on the basis of kinetic theory of gases-deviation-Vander waals equation- Equation of state-Clausius, Berthelot and Dieterici equations of state-Reduced equation of state law of corresponding states-expansivity and compressibility factor for gases- Boyle and inversion temperatures of gases.
- (b) P-V isotherms of ideal and real gases-Andrew's experiments-critical state of gases- definition and determination of critical constants-relation between critical and Vander waals constants.
- (c) Maxwell-Boltzmann law of distribution of velocities (Derivation not necessary)-graphical representation-effect of temperature on various velocities-comparison of RMS, average and most probable velocities.
- (d) Mean free path-viscosity of gases-collision diameter, frequency and cross section - Loschmidt number-principle of equipartition of energy.

UNIT – V :

(i) NUCLEAR CHEMISTRY - I :

- (a) Constitution of the nuclei – stable and unstable nuclei-their relationship to a n/p ratio-magic number-mass defect and binding energy-whole number rule-packing fraction-mass energy relationship.
- (b) Natural Radioactivity-Detection and measurement of radioactivity-Soddy's group displacement law.
- (c) Artificial Radioactivity : Definition- different types of artificial radioactivity brought about by accelerated particles.
- (d) Artificial transmutation of atoms by projectiles-spallation.

(ii) NUCLEAR CHEMISTRY - II :

- (a) Nuclear fusion and fission-Theories of fission-application of fission-principles of atom bomb-nuclear fusion-emission of energy-stellar energy and hydrogen bomb.
- (b) Application of Radioactivity : Application in medicine-in agriculture-industry-as trace elements in the elucidation of structure and in the investigation of reaction mechanism in analytical chemistry-activation analysis- carbon dating.
- (c) Particle accelerator-Linear accelerator – cyclotron and synchrotron
- (d) Nuclear Reactors : Nuclear reactor – nuclear fuel- FBR-moderators- coolants- Applications.

SEMESTER -III**CORE PAPER-4****INORGANIC,ORGANIC AND ANALYTICAL CHEMISTRY**

Dept.	CHEMISTRY	
Course:	B.Sc.,CHEMISTRY	Effective from 2014-2015
Subject code	II –year	Semester: III
Title		Max.Marks: 75 Pass.Min: 30/100
Hrs/Week	5	Credit:4
Objectives	1. To study about Alcohols, ethers, Thio alcoholand thioethers. 2.To know the preparation and synthetic applications of Poly halogen derivatives. 3. To study the chemistry of S, p, d block elements. 4. To understand the basics of volumetric analysis and the importance of oxidation and reduction reactions.	
Unit	Content	Hrs
Unit I	Alcohols , Ethers, Thiols, Thio ethers and Epoxides a.Alcohol: Preparation by hydroboration, reduction of carbonyl compounds- oxymercuration and demercuration, acids and esters by using Grignard reagents. Reaction with metals. Mechanism and reactivity towards HX, dehydration- Ascending and descending the alcohol series. Rectified spirit- absolute alcohol, methylated , spirit, power alcohol-estimation of number of hydroxyl groups. b. Ethers: Mechanism of Williamson’s synthesis mechanism of cleavage by HX-estimation of methoxy group by Zeisel’s method.	12

	<p>Introduction to crown ethers structure, Application of crown ethers.</p> <p>c) Thio alcohols and Thio ethers: Definition with examples. Preparation and properties of Sulphonol and Mustard Gas- Mechanism of Wittig reaction.</p> <p>d) Epoxides : Definition- Mechanism of acid base-ylides.</p>	
Unit II	<p>Polyhalogen Derivatives:</p> <p>a. Polyhalogen derivatives: Chlorofluoro carbons –westron and Freon-Preparation and applications. Preparation and properties of CHCl_3, CHI_3 and CCl_4.</p> <p>b. Halogen derivatives of unsaturated hydrocarbons: vinyl chloride and Allyl chloride-Preparation & reactivity. Polymerisation reaction of vinyl chloride.</p> <p>c. Organo Metallic Compounds: Grignard reagents-preparation, structure and synthetic applications, limitations, Organozinc and Organolithium compounds- preparation & synthetic applications.</p>	12
Unit III	<p>Chemistry of s-block elements:</p> <p>a. Elements of group IA-General discussion of elements of group IA- Diagonal relationship of Li with Mg- Anomalous behaviour of lithium- extraction of lithium- properties of lithium- analytical reaction of Li.</p> <p>b. Elements of group IB- general discussion –position in the periodic table, Resemblance among Cu, Ag, Au –Gradation in their properties – Resemblance between coinage metals and the VIII group elements.</p> <p>c. Elements of group IIA – Group discussion –diagonal relationship between Be and Al – Anomalous behaviour of Be – comparison of group IA and group IIA elements.</p>	12
Unit IV	<p>Chemistry of p-block elements:</p> <p>a. General discussion of group IV elements – Preparation properties and uses of carbonyl chloride – lead monoxide – red lead – white lead.</p> <p>b. General discussion of group V elements – active nitrogen –</p>	

	<p>preparation and properties of hydrazine, hydrazoic acid and hydroxyl amine – Marsh test for arsenic.</p> <p>c. Peracids and their salts – definition – peracids of carbon – per mono and perdicarbonic acid – permono carbonates and perdicarbonates – peracids of sulphur – permono and perdisulphuric acid.</p> <p>d.</p>	12
Unit V	<p>Analytical chemistry</p> <p>(a) Theory of volumetric Analysis : Principles of volumetric Analysis – concentration units –standard solution-requirements of a primary standard solution-indicator-type of titrations & indicators- neutralization,redox,precipitation & complex formation reactions-choice of indicators in acid base titrations-complexometric titrations,EDTA Titrations-determination of hardness of water</p> <p>(b)Oxidation and Reduction:</p> <p>oxidation and Reduction – Modern electronic concept oxidation number concept – calculation of oxidation number redox reactions balancing ionic reactions involving only $\text{Cr}_2\text{O}_7^{2-}$, Fe^{2+} and MnO_4^{2-} ions in acid medium by oxidation number method.Equivalent weight of oxidizing and reducing agents.</p>	12

Subject code	II Year	Semester :III
Title	SBC – POLYMER CHEMISTRY	Max .Markss:60 Pass. Min :30/75
Hrs/Week	4	Credit :3
Objectives	<ol style="list-style-type: none"> To highlight the commercially important polymers and their various forms. To understand various industrial polymerization processes. To highlight on average molecular weights. To know preparation and properties of commercially important polymers. 	
Unit	Content	Hrs
Unit I	<ol style="list-style-type: none"> Basic Concept : Monomers, Polymers , Polymerization , Degree of Polymerization , Classification of polymers Plastics : Definition – Thermoplastic , Thermosetting plastics , Reinforced Plastic. Elastomer : Definition – Natural & synthetic rubber –smoked rubber Reclaimed rubber – Foam rubbers – Spongy rubber – Laminate rubber Adhesives : Definition – thermosetting – Thermo resins Fibers: Definition – Natural and synthetic , Classification comfort safety - Industrial fibers . 	11
Unit II	Ionic Polymerization : Anionic and Cationic Polymerizations . Step growth polymerisation (Condensation polymerisation) Co-Polimerisation : Random – Alternating Block and Graft copolymers.	10
Unit III	<ol style="list-style-type: none"> Stereo Regular Polymers : Isotatic , syndiotactic & Atactic Geometrical isomers . Ziegler- Natta catalysis - Bi metallic and Mono metallic mechanisms, Thermal property of polymers: Tg and Tm . Determination of Tg by differential scanning calorimeter . Tg of copolymers . 	11
Unit IV	Molecular weight of polymers : Number –Average , Weight – Average Average & Viscosity – Average molecular weights . Molecular weight distribution GPC method –Average molecular weight and Degree of polymerisation . Determination of Average molecular weight , Light Scattering method , Viscosity method .	10
Unit V	Polymer processing techniques: Calendering , film casting , injection moulding. Preparation and uses of the following polymers . Polyethylene (LDPE & HDPE),P.V.C, polystyrene , Nylon-6 , Nylon -6,6, Polyester , Phenol formaldehyde resins and Polycarbonates.	

	Total hours/Semester	52
Text Books	<ol style="list-style-type: none"> 1. Gowariker , V.R ., Viswanathan,N.V. Jeyadev Sreedhar , Polymer Science, New Age International (P)Limited , Publishers 13th reprint (1999) . 2. Fred . W.Billmeyer, Jr.,Text Book of Ploymer Science ,Wiley-Interscience and Sons , Inc 2nd edition -2011. 3. Jain. P.Cand Monika Jain.,Compiled by Trisha jain and jyothika Jain , engineering Chemistry, Rai Publishing compamy (P)Ltd.,15th Edition , 2005. 	

Reference Books	<ol style="list-style-type: none"> 1. Mishra , G.S. Polymer chemistry , New Age International (P) Ltd., 2nd Reprint 1989 . 2. Charles G.Geberlein ,Brown ,Wm. C.,Chemistry And Our World Publishers (Singapore),ISBN069716574-4,1997. 3. M.Gopala Rao And Marshall Sitig , Drydens outlines of Chemical Technology for the 21st Centuary , East – west press , 3rdEdition,1997. 	
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SEMESTER – IV
CORE PAPER - V
ORGANIC CHEMISTRY - II

5

1. To study preparation, properties and reactions of aldehydes, ketones, carboxylic acids and aliphatic nitrogen compounds.
2. To study and analyse aromatic compounds and some of its derivatives like hydrocarbons, halogen, nitro and amino compounds.
3. To know the synthetic applications of some organic compounds.

Content

Aliphatic aldehydes and ketones

- a) Nomenclature- electronic structure of carbonyl group. Preparation of aldehydes and ketones from fatty acids by oxidation of diols and from Grignard reagents. Relative reactivities of aldehyde and ketones. Mechanism of nucleophilic addition of carbonyl compounds with HCN, Hydride transfer reactions with examples. Cannizzaro reaction, Grignard reagent addition reactions. Halogenation, Iodoform reactions.
- b) Name reactions- MPV- Oppenauer reaction-Wolff kishner reduction – Clemmenson reduction and aldol condensation.
- c) Chemistry of Acrolein, Crotonaldehyde, glyceraldehydes, Glyoxal and Acetyl acetone.

Aliphatic carboxylic acids

- a) Structure of carboxylic acid- Acidity of carboxylic acid-effect of substituents on acidity – Comparison of strength of carboxylic acids. Preparation of acids by hydrolysis of esters and nitriles, Carbonation of Grignard reagent. Preparation and properties of Acid chlorides, anhydrides, amides and esters.
- b) **Halogen acids:**
HVZ reaction, hydrolysis of mono, di and trichloro acetic acids.
- c) **Amino acids:** Action of heat on α , β and γ - amino acids.
- d) **Hydroxy acids:** Action of heat on α , β and γ - hydroxy acids.
- e) **Dicarboxylic acids:** Action of heat on dicarboxylic acids: Blanc's rule, Dieckmann condensation, Reformatsky reaction.
- f) Synthetic applications of : Acetoacetic ester and malonic ester.

Aliphatic Nitrogen Compounds:

a) Alkyl cyanide and isocyanides:

General methods of preparation and properties. Thorpe nitrile condensation.

b) Amines:

Classification- Preparation of amines by Hofmann Exhaustive methylation degradation – Gabriel phthalimide synthesis and Leukart reaction.- Separation of 1^o, 2^o and 3^o Amines- Basic character of amines. Preparation and uses of ethylene diamine and hexamethylene diamine.

c) Diazo compounds

Preparation and synthetic applications of Diazomethane and diazo acetic ester.

d) Urea: Structure, estimation and uses.

Aromatic Compounds

- a) Introduction- General characteristics of aromatic compounds. Aromaticity and Huckel's Rule. Structure of benzene.
- b) Mechanism of aromatic electrophilic substitution reactions-Halogenation, Nitration, Sulphonation and Friedel-crafts Reactions.
- c) Directive influence of Substituents on Monosubstituted benzene.
- d) Mechanism of aromatic nucleophilic substitution- Bimolecular and Benzyne mechanism.
- e) Preparation, Properties and uses of Xylene, Toluene and Mesitylene.

Aromatic Halogen, Nitro and Amino compounds

a) Aromatic Halogen compounds:

Preparation, properties and uses of Chloro benzene and Benzyl bromide- BHC and DDT. Reactivity of aryl halides. Differences between nuclear and side chain halogenated derivatives.

b) Aromatic Nitro compounds:

Preparation and properties of nitro benzene and nitro toluenes.

c) Aromatic amino compounds:

Preparation by reduction of nitro compounds and from Chloro benzene. Effect of substituents on the basic character of aromatic amines. Comparison of aliphatic and aromatic amines.

d) Preparation and synthetic applications of Benzene diazonium chloride.

Total hours/ Semester

1. I.L.Finar 'Organic Chemistry' Vol-I&II, (16th edition) England, Addison Wesley Longman Ltd.,(1996).
2. Morrison R.T.Boyd R.N., Organic Chemistry (6th edition) New York, Allyn & Bacon Ltd.,(2006).
3. Bahl B.S., Arun Bahl, Advanced Organic Chemistry (12th edition) New Delhi, Sultan Chand and Co., (1997), (Text Book).
4. Organic Chemistry, P.L.Soni, Sultan Chand & Co. Edition 2006. (Text Book).
5. Pine S.H., Organic Chemistry (4th edition) New Delhi. Megraw – Hill international Book Company. (1996)
6. Seyhan N. Ege, Organic Chemistry, New York, Houghton Mifflin Co., (2004).
7. E.L.Eliel 'Stereochemistry of carbon compounds.
8. B.M.Silverstein G.C.Bassler and T.C.Morrill, 'Spectrometric Identification of Organic Compounds'.
9. R.O.C.Norman 'Organic Synthesis'
- 10.S.H.Pine, J.B.Hendrickson, D.J.Cram and G.S.Hammond 'Organic Chemistry'.
11. Raj K Bansal, Reactions and reagents.

SEMESTER – IV
CORE - VI
PHYSICAL CHEMISTRY - I

UNIT – I : PHASE RULE

(a) Definition of terms – Gibb's phase rule-one component system-water, carbon-di-oxide-polymorphism-two component system-reduced phase rule-simple eutectic system-Pb-Ag system, KI-Water system-system involving compound formation with congruent and incongruent melting point-Zn-Mg system-CuSO₄.5H₂O dehydration phase diagram.

(b) Partially Miscible liquid system-CST-completely immiscible liquid system

(c) Physical properties and chemical constitution

Dipole moment-Definition-electro chemical polarisation of molecules-Classius mosotti equation-Debye equation-Experimental determination-moment of linkage and groups-various applications.

(d) Magnetic moment : Magnetic susceptibility-para, dia and ferro magnetism-specific, molar magnetic susceptibility and constitution- determination by Gouy's method-various applications(any 2).

UNIT – II : THERMODYNAMICS – I :

(a) Introduction : Types of systems-state of a system-thermodynamic or state variables – extensive and intensive properties-state and path functions-exact and inexact differentials-thermodynamic process-reversible and irreversible processes- work, heat and energy. Zeroth law of thermodynamics and its significance.

(b) Thermochemistry : Significance of Hess's law of constant heat of summation-Kirchoff's equation-bond enthalpies and energies.

(c) Law of mass action-Relation between K_c and K_p-Lechatlier principle and its application to Haber's process-common-ion effect in ionic equilibria.

UNIT – III : FIRST LAW OF THERMODYNAMICS :

Statement-mathematical formulation-internal energy- enthalpy or heat content-heat changes at constant volume and at constant pressure-relationship between C_p and C_v –work done ,heat change and enthalpy change for reversible isothermal expansion and compression of an ideal gas –calculation of q, w, e, H for adiabatic expansion of an ideal gas-relation between T, V and P of an ideal gas undergoing adiabatic reversible expansion.Comparison of work done in isothermal and adiabatic reversible expansion of an ideal gas-application of I law to non ideal gas undergoing reversible isothermal and adiabatic expansion-Joule Thomson effect-Joule Thomson co-efficient in the case of ideal gas and real gases-inversion temperature.

UNIT – IV : SOLUTIONS

Definition – terms involved –Dissolution of substances-Temperature and solubility-solubility of gases in liquids-mole fraction, weight percentage, mole percentage ,parts per million-Gaseous solutions- solutions of gases in liquids –Henry's law-ideal solutions-Raoult's law of ideal solutions-Solutions of liquids in liquids in liquids-relation between the mole fractions of the components in the liquid & vapour phases –non-ideal solutions-Activity co-efficients-Definition

of melting point,boiling point,elevation in boiling point,depression in freezing point-ebulioscopic and cryoscopic constant.

UNIT – V : PHOTOCHEMISTRY

Definition of various terms – consequence of light absorption : The Jablonski Diagram –light absorption by solutions- Beer-Lambert law – limitations of Beer-Lambert law – laws of photochemistry—Quantum yield-Experimental determination of quantum yields-photochemical rate law-kinetics of photochemical reactions (only for Hydrogen-Chlorine reaction).Ozone layer in stratosphere –Energy transfer in photochemical reactions-photosensitisation and Quenching-Quenching of Fluorescence –Chemiluminescence- rates of intramolecular photophysical processes and intermolecular energy transfer-The Laser and the Maser- Applications of Laser in Chemistry.

Title	SEMESTER – VI SBC - HEALTH CHEMISTRY	Max.Marks:60 Pass.Min:40/100
Hrs/Week	2	Credit :2
Objectives	<ol style="list-style-type: none"> 1. To appreciate the role of chemistry in the service of humanity. 2. To understand the importance and application of various chemical compounds used in food , medicine , dairy farm foods and in day today life. 	
Unit	Content	Hrs
Unit I	Food chemistry I: Introduction – carbohydrates – classification - sources – uses. Proteins – occurrence characteristics – Food adulteration-Rice, milk, butter, wheat, ghee,- contaminants and detection-Brief note on consumer awareness.	5
Unit II	Food Chemistry II : a. Vitamins – definition – sources – classification daily human requirements – deficiency diseases b. Food poisons: Introduction- chemical Food adulteration- introduction only – Bordeaux mixture, Hg, Pb, DDT, BHC, Malathion in beverages (pesticide) SMG(aginomoto). Soft drinks –soda, fruit juices, alcoholic beverages – examples. Addiction and social problems.	5
Unit III	Chemotherapy : a. Antibiotics – Definition – different types – penicillin- tetracyclines – sulpha drugs –	5

	<p>classification – sulphadiazine – sulphanilamide – applications.</p> <p>b. Antimalarials- types of malaria therapy – Chloroquine – plasmoquine – applications , c.Antipyretics and Analgesis – Definition – paracetamol – uses .</p> <p>d.Anesthetics – types –uses .</p> <p>e.Antiseptics – Disinfectants – Definitions .</p>	
Unit IV	<p>a.Milk -Composition of milk, milk processing, pasteurization .</p> <p>b.Fire protection – Major causes of fire fighting in homes – laps – methods of extinguishing fire – chemical / gas fire extinguishing .</p>	
Unit V	<p>Commonly used chemicals in day today life :</p> <p>Health benefits and ill effects – common salt – baking soda – vinegar – preservatives – soda water- sucrose – flavoring agents - importance and uses soaps and detergents – phenoyl – ink vim house hold – Teflon and aluminium (Altheimers disease) .</p>	5
	Total hourse / Semester	25
Course book	Study material prepared by the department	

Reference Books	<ol style="list-style-type: none">1. P L Soni and H.M Chawla ,Text book of Organic Chemistry , Sulthan Chand & Sons Educational Publishers , 29th edition , 1963 .2. P.L.Soni and Mohan Kstyal , Text book of Organic Chemistry , Sulthan Chand & Sons Educational Publishers , 20th edition 2007 .3. Industrial Chemistry by B.K Sharma , Goel Publishing House 1995 .4. A text books of applied chemistry by Thangammal Jacop , Mecomillan Company Ind Ltd .,1979 .
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