

YADAVA COLLEGE

(* An Autonomous Co-Educational Institution*

** Accredited with “A” Grade by NAAC**

Affiliated to Madurai Kamaraj University)

Govindarajan Campus, Thiruppalai, Madurai- 625014



DEPARTMENT OF CHEMISTRY

CERTIFICATE COURSE

SYLLABUS (2015 – 16)

DEPARTMENT OF CHEMISTRY
YADAVA COLLEGE, MADURAI -14.
CBCS (2015-2016)
COURSE CONTENT

Sem	Part	Subject	Code	Title of the paper	Teach. Hours/ Week	Credits	Evaluation		Exam hours
							Internal	External	
I	I	Lang I		Paper I-Tamil	5	3	25	75	3
	II	Lang II		Paper I- English	5	3	25	75	3
	III	Core		Paper I-Basic Principles of Inorganic and Organic Chemistry	8	9	25	75	3
				PracticalII* - Semi micro qualitative Analysis	3	--	--	--	--
		Allied I		Paper I- Physics	3	2	25	75	3
				Practical-I* Physics	2	--	--	--	--
	IV	ENS		Environmental Science	2	2	25	75	3
		SBE		Communicative English-I	2	2	25	75	3
	I	Lang-I		Paper II-Tamil	5	3	25	75	3
	II	Lang-II		Paper II-English	5	3	25	75	3

II	III	Core		Paper II-General Chemistry	8	9	25	75	3
				Practical I* - Semi micro qualitative Analysis	3	2	40	60	3
		Allied I		Paper II -Physics	3	1	25	75	3
				Practical I* Physics	2	1	40	60	3
	IV	VAE		Value Education	2	2	25	75	3
		SBE		Communicative English-II	2	2	25	75	3

Sem	Part	Subject	Code	Title of the Paper	Teach. Hours/ Week	Credits	Evaluation		Exam hours
							Internal	External	
III	I	Lang I		Paper III-Tamil	5	3	25	75	3
	II	Lang II		Paper III –English	5	3	25	75	3
	III	Core		Paper III- Inorganic and Organic Chemistry	4	5	25	75	3
				Volumetric Analysis Practical-II*	2	--	--	--	--
		Allied I		Paper III-Physics	3	2	25	75	3
				Physics Practical –II*	2	-	--	--	--
		Allied II		Paper I-Maths/Botany	3(B)/ 5(M)	2(B)/ 2(M)	25	75	3
				Practical –I* Botany	2	-			
	IV	NME		Dairy Science	2	2	25	75	3
		SBE		Communicative English-III	2	2	25	75	3
IV	I	Lang I		Paper IV- Tamil	5	3	25	75	3
	II	Lang II		Paper IV-English	5	3	25	75	3
	III	Core		Paper IV-Organic and Physical Chemistry	4	5	25	75	3
				Volumetric Analysis practical II*	2	2	40	60	3
		Allied I		Paper I V-Physics	3	2	25	75	3

				Practical II* Physics	2	1	40	60	3
		Allied II		Paper II-Maths/Botany	3(B)/ 5(M)	2(B)/ 3(M)	25	75	3
				Practical –I* Botany	2	1	40	60	3
	IV	NME		Small Scale Industrial Chemicals	2	2	25	75	3
		SBE		Communicative English- IV	2	2	25	75	3

Sem	Part	Subject	Code	Title of the Paper	Teach. Hours/ Week	Credits	Evaluation		Exam hours
							Internal	External	
V	III	Elective I		Paper V-InOrganic Chemistry –I	5	8	25	75	3
		Core		Paper VI - Organic Chemistry -I	5	5	25	75	3
				Paper VII-Physical Chemistry - I	5	5	25	75	3
				Gravimetric Analysis and Organic Preparation Practical III*	3				
				Organic Analysis, & Estimation Practical IV*	2	--	--	--	--
				Physical Chemistry practical-V*	3	--	--	--	--
		Allied II		Paper III-Maths /Botany	3(B)/ 5(M)	2(B)/ 2(M)	25	75	3
				Practical III* Botany	2				
	IV	SBE		Soft skills	2	2	25	75	3
VI	III	Core		Paper VIII- Organic Chemistry - II	5	5	25	75	3
		Elective II		Paper IX- Green and Nano Chemistry	5	7	25	75	3
		Core		Paper X-Physical Chemistry -- II	5	5	25	75	3
				Gravimetric Analysis and Organic	3	3	40	60	6

				Preparation Practical III*					
				Organic Analysis & Estimation Practical – IV*	2	2	40	60	6
				Physical Chemistry practical-V*	3	3	40	60	6
		Allied II		Paper IV- Maths/Botany	3(B)/ 5(M)	2(B)/ 3(M)	25	75	3
				Practical IV* Botany	2	1			
	IV	SBE		General Knowledge	2	2	25	75	3
	V	NCC/NSS /PE/EXT		--	--	1	25	75	3

DEPARTMENT OF CHEMISTRY
YADAVA COLLEGE, MADURAI-14
CBCS (2015-2016)
COURSE CONTENT
B.Sc., Chemistry Major with Mathematics Ancillary

Sem	Part	Subject	Code	Title of the paper	Teach. Hours/ Week	Credits	Evaluation		Exam hours
							Internal	External	
I	I	Lang I		Paper I-Tamil	5	3	25	75	3
	II	Lang II		Paper I- English	5	3	25	75	3
	III	Core		Paper I-Basic Principles of Inorganic and Organic Chemistry	8	9	25	75	3
				PracticalII* - Semi micro qualitative Analysis	3	--	--	--	--
		Allied I		Paper I- Physics	3	2	25	75	3
				Practical*-I Physics	2	--	--	--	--
	IV	ENS		Environmental Science	2	2	25	75	3
		SBE		Communicative English-I	2	2	25	75	3
	I	Lang-I		Paper II-Tamil	5	3	25	75	3
	II	Lang-II		Paper II-English	5	3	25	75	3
				Paper II-General	8	9	25	75	3

II	III	Core		Chemistry					
				Practical I* - Semi micro qualitative Analysis	3	2	40	60	3
		Allied I		Paper II -Physics	3	2	25	75	3
				Practical I* Physics	2	1	40	60	3
	IV	VAE		Value Education	2	2	25	75	3
		SBE		Communicative English-II	2	2	25	75	3

Sem	Part	Subject	Code	Title of the Paper	Teach. Hours/ Week	Credits	Evaluation		Exam hours
							Internal	External	
III	I	Lang I		Paper III-Tamil	5	3	25	75	3
	II	Lang II		Paper III –English	5	3	25	75	3
	III	Core		Paper III- Inorganic and Organic Chemistry	4	5	25	75	3
				Volumetric Analysis Practical-II*	2	--	--	--	--
		Allied I		Paper III-Physics	3	2	25	75	3
				Physics Practical –II*	2	-	--	--	--
		Allied II		Paper I-Maths	5	2	25	75	3
	IV	NME		Dairy Science	2	2	25	75	3
		SBE		Communicative English-III	2	2	25	75	3
	I	Lang I		Paper IV- Tamil	5	3	25	75	3
	II	Lang II		Paper IV-English	5	3	25	75	3
	III			Paper IV-Organic and Physical Chemistry	4	5	25	75	3

IV		Core		Volumetric Analysis practical II*	2	2	40	60	3
		Allied I		Paper I V-Physics	3	2	25	75	3
				Practical II* Physics	2	1	40	60	3
		Allied II		Paper II-Maths	5	3	25	75	3
	IV	NME		Small Scale Industrial Chemicals	2	2	25	75	3
		SBE		Communicative English- IV	2	2	25	75	3

Sem	Part	Subject	Code	Title of the Paper	Teach. Hours/ Week	Credits	Evaluation		Exam hours
							Internal	External	
V	III	Elective I		Paper V-InOrganic Chemistry –I	5	8	25	75	3
		Core		Paper VI - Organic Chemistry -I	5	5	25	75	3
				Paper VII-Physical Chemistry - I	5	5	25	75	3
				Gravimetric Analysis and Organic Preparation Practical III*	3	-	-	-	-
				Organic Analysis, & Estimation Practical IV*	2	--	--	--	--
				-Physical Chemistry practical-V*	3	--	--	--	--
		Allied II		Paper III-Maths	5	2	25	75	3
	IV	SBE		Soft skills	2	2	25	75	3
VI	III	Core		Paper VIII- Organic Chemistry - II	5	5	25	75	3
		Elective II		Paper IX- Green and Nano Chemistry	5	7	25	75	3
		Core		Paper X-Physical Chemistry -- II	5	5	25	75	3
				Gravimetric Analysis	3	3	40	60	6

				and Organic Preparation Practical III*					
				Organic Analysis & Estimation Practical – IV*	2	2	40	60	6
				-Physical Chemistry practical-V*	3	3	40	60	6
		Allied II		Paper IV-Maths	5	3	25	75	3
	IV	SBE		General Knowledge	2	2	25	75	3
	V	NCC/NSS /PE/EXT		--	--	1	25	75	3

*Exams Conducted at the end of even semester

**DEPARTMENT OF CHEMISTRY
YADAVA COLLEGE, MADURAI-14
CBCS (2015-2016)
COURSE CONTENT**

B.Sc., Chemistry Major with Botany Ancillary

Sem	Part	Subject	Code	Title of the paper	Teach. Hours/ Week	Credits	Evaluation		Exam hours
							Internal	External	
I	I	Lang I		Paper I-Tamil	5	3	25	75	3
	II	Lang II		Paper I- English	5	3	25	75	3
	III	Core		Paper I-Basic Principles of Inorganic and Organic Chemistry	8	9	25	75	3
				PracticalII* - Semi micro qualitative Analysis	3	--	--	--	--
		Allied I		Paper I- Physics	3	2	25	75	3
				Practical*-I Physics	2	--	--	--	--
	IV	ENS		Environmental Science	2	2	25	75	3
		SBE		Communicative English-I	2	2	25	75	3
	I	Lang-I		Paper II-Tamil	5	3	25	75	3
		Lang-II		Paper II-English	5	3	25	75	3
				Paper II-General	8	9	25	75	3

II	III	Core		Chemistry					
				Practical I* - Semi micro qualitative Analysis	3	2	40	60	3
		Allied I		Paper II -Physics	3	2	25	75	3
				Practical I* Physics	2	1	40	60	3
	IV	VAE		Value Education	2	2	25	75	3
		SBE		Communicative English-II	2	2	25	75	3

Sem	Part	Subject	Code	Title of the Paper	Teach. Hours/ Week	Credits	Evaluation		Exam hours
							Internal	External	
III	I	Lang I		Paper III-Tamil	5	3	25	75	3
	II	Lang II		Paper III –English	5	3	25	75	3
	III	Core		Paper III- Inorganic and Organic Chemistry	4	5	25	75	3
				Volumetric Analysis Practical-II*	2	--	--	--	--
		Allied I		Paper III-Physics	3	2	25	75	3
				Physics Practical –II*	2	-	--	--	--
		Allied II		Paper I Botany	3	2	25	75	3
				Practical –I* Botany	2	-			
	IV	NME		Dairy Science	2	2	25	75	3
		SBE		Communicative English-III	2	2	25	75	3
	I	Lang I		Paper IV- Tamil	5	3	25	75	3
	II	Lang II		Paper IV-English	5	3	25	75	3

IV	III	Core		Paper IV-Organic and Physical Chemistry	4	5	25	75	3
				Volumetric Analysis practical II*	2	2	40	60	3
		Allied I		Paper I V-Physics	3	2	25	75	3
				Practical II* Physics	2	1	40	60	3
		Allied II		Paper II-Botany	3	2	25	75	3
				Practical –I* Botany	2	1	40	60	3
	IV	NME		Small Scale Industrial Chemicals	2	2	25	75	3
		SBE		Communicative English- IV	2	2	25	75	3

Sem	Part	Subject	Code	Title of the Paper	Teach. Hours/ Week	Credits	Evaluation		Exam hours
							Internal	External	
V	III	Elective I		Paper V-InOrganic Chemistry –I	5	8	25	75	3
		Core		Paper VI - Organic Chemistry -I	5	5	25	75	3
				Paper VII-Physical Chemistry - I	5	5	25	75	3
				Gravimetric Analysis and Organic Preparation Practical III*	3				
				Organic Analysis, & Estimation Practical IV*	2	--	--	--	--
				Physical Chemistry practical-V*	3	--	--	--	--
		Allied II		Paper III-Botany	3	2	25	75	3
				Practical III* Botany	2				
	IV	SBE		Soft skills	2	2	25	75	3
		Core		Paper VIII- Organic Chemistry - II	5	5	25	75	3
		Elective		Paper IX- Green and					

VI	III	II Core		Nano Chemistry	5	7	25	75	3
				Paper X-Physical Chemistry -- II	5	5	25	75	3
				Gravimetric Analysis and Organic Preparation Practical III*	3	3	40	60	6
				Organic Analysis & Estimation Practical – IV*	2	2	40	60	6
				Physical Chemistry practical-V*	3	3	40	60	6
		Allied II		Paper IV-Botany	3	2	25	75	3
				Practical IV* Botany	2	1	40	60	3
	IV	SBE		General Knowledge	2	2	25	75	3
	V	NCC/NSS /PE/EXT		--	--	1	25	75	3

*Exams Conducted at the end of even semester

CONSOLIDATED DISTRIBUTION OF NUMBER OF PAPERS, HOURS OF TEACHING AND CREDITS

Part	Subject	Number of papers		Total no.of papers	Total no.of hours	Credits
		Theory	Practical			
Part I	Tamil	4	--	4	20	12
Part II	English	4	--	4	20	12
Part III	Core	8	5	13	70	60
	Elective	2	-	2	10	15
	Allied –I	4	2	6	20	10
	Allied –II	4(M/B)	2(B)	4(M)6(B)	20	10
Part IV	SBE	6	--	6	12	12
	VAE	1	--	1	02	2
	NME	2	--	2	04	4
	ENS	1	--	1	02	2
Part V	NSS/NCC/PE/EXT	--	--	--		1
Grand Total		36	9	43(M)* 45(B)*	180	140

Self Study Paper Extra credit - 12

*M- Maths

*B- Botany

PAPER I

BASIC PRINCIPLES OF INORGANIC AND ORGANIC CHEMISTRY

SEMESTER: I

SUBJECT CODE:

HOURS/WEEK: 8

TOTAL HOURS/ SEMESTER: 120

Objectives:

This course covers the basic and detailed aspects of periodic properties, chemical bonding, hybridization and shapes of molecules. Students undergoing this course acquire knowledge and understanding the laboratory hygiene and safety and principles and techniques of semi micro methods. The students also acquire an in-depth knowledge about the introduction to organic chemistry and detection, estimation and composition of organic compounds and also reaction mechanism-fundamental aspects and aromatic substitution.

UNIT: I PERIODIC TABLE, PROPERTIES AND CHEMICAL BONDING-I

(24 Hours)

a) Long form of periodic table: Modern periodic law- salient features of modern periodic table- classification of elements into s, p, d and f blocks and their characteristics.

b) Periodic properties: covalent radius- periodic trends in covalent radii; ionic radius- periodic trends in ionic radii; ionization energy- factors determining ionization energies in the periodic table; electronegativity- factors determining electro negativity, applications of electro negativity.

c) Chemical Bonding-I

Ionic bond- covalent bond- differences between ionic and covalent bonds- polarity of covalent bonds- percentage of ionic character in covalent bonds -factors which influence the formation of ionic bond- covalent character in ionic bond, Fajan's rule- coordinate covalent bond.

Some important bond characteristics: bond length, bond angle and bond energy.

UNIT: II - Chemical bonding-II. Concept of hybridization and shapes of molecules (24 Hours)

a) Valence bond theory; postulates of valence bond theory- types of overlapping viz s-s, s-p and p-p overlapping –sigma and pi-bonds- differences between sigma and pi-bonds.

b) Molecular orbital theory: Linear combination of atomic orbital-bonding and antibonding molecular orbitals. MO diagram of simple homo nuclear molecules like H₂, He₂, O₂, F₂ and hetero nuclear molecules like CO and NO. Comparison between VBT and MOT.

c)The concept of hybridization and shapes of molecules

Hybridization: definition - conditions of hybridization- a detailed study of sp (BeCl₂, C₂H₂), sp² (BF₃, C₂H₄), sp³ (CH₄), sp³d (PCl₅), sp³d² (SF₆) and sp³d³ (IF₇) hybridizations.

d) VSEPR THEORY: A detailed study of VSEPR theory and its applications.

UNIT III: LABORATORY HYGIENE AND SAFETY AND PRINCIPLES AND TECHNIQUES OF SEMIMICRO METHODS (24 Hours)

a) Laboratory hygiene and safety

Storage and handling of chemicals – carcinogenic chemicals – Toxic and poisonous chemicals – Waste disposal – Fume disposal – General precautions for avoiding accidents – First aid techniques – Hazards in laboratory - poisoning – methods to avoid poisoning – Treatment for specific poison – laboratory safety measures.

b) Principles and techniques of semimicro methods

Aims of semi micro qualitative analysis – Types of reactions involved in qualitative analysis – Dry reactions – precipitation reactions – Applications of solubility product principle in qualitative analysis – Complexation reaction – Oxidation and reduction reactions – Spot tests – preparation of solution for cation testing on semi micro scale – Removal of interfering ions in the analysis of cations – oxalate, tartrate, borate, fluoride, chromate, phosphate and arsenite.

UNIT: IV INTRODUCTION TO ORGANIC CHEMISTRY AND DETECTION,

ESTIMATION AND COMPOSITION OF ORGANIC COMPOUNDS (24 Hours)

a) Organic Chemistry: Introduction–characteristics of organic compounds- differences between organic and inorganic compounds- sources and importance of organic compounds- classification of organic compounds- homologous series- functional groups.

b) Nomenclature of organic compounds: common name and IUPAC names of alkanes, alkenes, alkynes, alkyl halides, alcohols, ethers, aldehydes, ketones, carboxylic acids, derivatives of carboxylic acids, amines and nitro compounds.

c) Detection of elements: Detection of carbon, hydrogen and nitrogen.

d) Estimation of elements: Estimation of carbon, hydrogen, nitrogen and halogens.

e) Composition of Organic compounds: Empirical, Molecular and Structural formulae- problems to derive empirical and molecular formulae incorporating the estimation of elements and molecular weight calculations.

UNIT:V REACTION MECHANISM – FUNDAMENTAL ASPECTS AND

AROMATIC SUBSTITUTION (24 Hours)

1a) Breaking of C-C bond: Homolytic and heterolytic fission- reaction intermediates- formation and stability of carbonium ions, carbanions and free radicals.

b) Attacking reagents: electrophilic and nucleophilic reagents

c) Types of Reaction: Substitution reaction (S_N1 & S_N2)- electrophilic and nucleophilic addition reactions- elimination reaction ($E1$ & $E2$)- addition and condensation polymerization reactions with suitable examples.

II Aromatic Substitution

a) Electrophilic, nucleophilic and free radical substitution. Explanation with examples

b) Inductive effect, Resonance effect, Electromeric effect and hyperconjugation. Explanation with examples.

c) Mechanism of aromatic mono – substitution (electronic interpretation) halogenation, nitration, sulphonation and Friedel crafts reaction.

d) Isomerism in disubstituted benzene – Korner’s absolute method of orientation – relative method, infrared and dipole moment methods.

e) Directive influence of substituents – rules of disubstitution – vorlanders method. Crum – brown, Hammick and Illingworth’s rules – in gold & Robinson.

f) Electrophilic disubstitution – nucleophilic substitution – unimolecular, bimolecular – benzyne mechanism – free radical and hemolytic substitution in benzene.

TEXT BOOK:

1. B.S. Bahl & Arun Bahl, “Advanced Organic Chemistry”, S. Chand & Co, New Delhi, 2004.

REFERENCE BOOKS:

1. P.L. Soni, H.M. Chawla, “Text Book of Organic Chemistry”, Sultan & Sons, New Delhi, 2004.

2. I.L. Finar, “Organic Chemistry” Volume I, Pearson Education (Singapore) Pvt. Ltd., Indian Branch, 482 F.I.E Patparganj, Delhi 110092 India, 2003.

3. P.L. Soni, “Text Book of Inorganic Chemistry”, Sultan Chand & Co, New Delhi; 2004.

4. Wahid U. Malik, G.D Tuli, R.D Madan “Selected topics in Inorganic Chemistry”, S.Chand & Co, New Delhi- 2002.

5. J. D. Lee, “Concise Inorganic Chemistry”, Fifth Edition, Blackwell Science, USA,

2003.

PAPER II
GENERAL CHEMISTRY

SEMESTER: II

SUBJECT CODE:

HOURS/ WEEK: 8

TOTAL HOURS/ SEMESTER: 120

Objectives:

This course enables the students to acquire a basic knowledge of acids, bases and solvents, oxidation and reduction and solid state. An in-depth study of radio activity is also dealt. The students also acquire a comprehensive idea about isomerism and basic knowledge about the principles of metallurgy..

UNIT I: I. ACIDS, BASES, SOLVENTS AND

OXIDATION AND REDUCTION

(24 Hours)

a) Modern concepts of acids and bases: Arrhenius, Bronsted- Lowry, Lewis and Lux-Flood; Relative strengths of acids and bases – amphoteric solvents- differentiating solvents-levelling effects.

b) Hard and soft acids and bases: Pearson's concept –HSAB principle and its applications.

c) Solvents- definition and classifications [i) protic and aprotic solvents, ii) acidic, basic and amphoteric solvents iii) ionizing and non-ionizing solvents and iv) aqueous and non-aqueous solvents].

II. OXIDATION AND REDUCTION

a) Oxidation and reduction: Definitions- oxidation number-differences between oxidation number and valency- rules for calculating oxidation number- solved examples- oxidizing and reducing agents- redox reactions.

b) Balancing of redox equations by oxidation number method.

UNIT: II SOLID STATE (24 Hours)

a) Types of solid –isotropy and anisotropy –various types of symmetry in crystals –lattice energy-unit cell – seven crystal systems – Bravais lattice-Miller indices- X-ray diffraction of crystal structure- Bragg's equation- determination of crystal structure by X-ray diffraction method and powder method- structures of NaCl and CsCl.

b) Defects in crystals: Stoichiometric defects - Schottky defect –Frenkel defect; non-stoichiometric defects- metal excess defects- metal deficiency defects.

UNIT III: RADIO ACTIVITY (24 Hours)

Radioactivity- definition –nature of radiations from radioactive substances – comparison of the properties of α , β and γ radiations- detection and measurements of radioactivity – Geiger –Muller counter- radioactive decay –group displacement law –radioactive decay series-artificial radio activity-nuclear fission-atom bomb- nuclear fusion- hydrogen bomb-applications of radioactive isotopes.

UNIT: I V ISOMERISM (24 Hours)

a) Geometrical isomerism- Explanation- geometrical isomerism of maleic and fumaric acids –aldoximes and ketoximes- E-Z notations.

b) Optical isomerism: Optical activity-definition-condition for optical activity – optical isomerism of lactic and tartaric acids- enantiomers and diastereomers- racemization- resolution of racemic mixture- Walden inversion- asymmetric synthesis .

Chirality – specifications of absolute configuration by R and S notations.

Optical activity of compounds without asymmetric carbon atoms: allenes, spiranes and biphenyl compounds.

UNIT V:

V PRINCIPLES OF METALLURGY

(24 Hours)

- a) Occurrence of metals:** Ores and minerals - various steps involved in metallurgical processes- Grinding- pulverizing the ore- concentration of the ore: gravity separation, froth floatation and electromagnetic separation – calcination and roasting.
- b) Reduction to free metals:** Smelting, Alumino-thermic reduction: refining- electrolytic refining, zone refining, Van-Arkel-de-Boer process.
- c) Ores-occurrence- extraction of the following metals and their uses** - vanadium, molybdenum, platinum and uranium.
- d) Preparation and uses of** vanadium pentoxide, ammonium molybdate, chloroplatinic acid and uranium hexafluoride.

TEXT BOOKS:

1. B.R.Puri, L.R.Sharma & K.C.Kalia, “Principles of Inorganic Chemistry”, Vishal Publications, Jalandhar, 2004-05
2. B.R.Puri, L.R.Sharma, Madan S. Pathania, “Principles of Physical Chemistry”, Shoban Lal Nagin Chand & Co, Jalandhar, 1998
3. B.S.Bahl & Arun Bahl, “Advanced Organic Chemistry”, S. Chand & Co, Ramnagar, New Delhi, 110055, 2004

REFERENCE BOOKS:

1. Wahid U.Malik, G.D.Tuli, R.D.Madan, “Selected Topics in Inorganic Chemistry”, S.Chand & Co, New Delhi, 2002
2. R.D.Madan, “Modern Inorganic Chemistry”, S. Chand & Co, New Delhi.,2004
3. P.L. Soni, O.P.Dharmarha, U.N.Dash, “Text Book of Physical Chemistry”, Sultan & Sons, New Delhi, 2001

B.Sc., CHEMISTRY MAJOR PRACTICAL-I

SEMI-MICRO QUALITATIVE ANALYSIS

SEMESTER I &II

SUBJECT CODE:
TIME: 3 HRS

(At the end of the FIRST YEAR)

Note: 1. For Practical Record- 10 Marks
2. For Experiment and Results- 50 Marks

Analysis of a mixture containing two cations and two anions of which one is an interfering ion by semi- micro method.

Cations: Lead, copper, iron (II), aluminium, zinc, manganese, nickel, barium, strontium, calcium, magnesium and ammonium.

Anions: Carbonate, Chromate, sulphate, sulphide, nitrate, fluoride, chloride, bromide, oxalate, borate and phosphate.

ANCILLARY CHEMISTRY

PAPER I

GENERAL CHEMISTRY - I

SEMESTER: I

SUBJECT CODE:

HOURS/ WEEK:3

TOTAL HOURS/ SEMESTER: 45

OBJECTIVES:

To enable the students to understand the fundamental concepts in

- *Nature of bonding and reaction mechanism in organic chemistry*
- *Isomerism in organic compounds*
- *Principles and process of metallurgy*
- *Modern field of radioactivity*
- *Problems in oxidation and reduction.*

UNIT I FUNDAMENTAL CONCEPTS OF ORGANIC CHEMISTRY (9Hours)

a) Homolytic and heterolytic cleavage of carbon-carbon bond: carbonium ion and carbanion –free radicals; nucleophilic and electrophilic reagents.

b) Types of Reaction: Substitution reaction (S_N1 & S_N2)- electrophilic and nucleophilic addition reactions-elimination reaction ($E1$ & $E2$)- addition and condensation polymerization reactions with suitable examples.

UNIT:II ISOMERISM IN ORGANIC COMPOUNDS (9 Hours)

a) Isomerism: Definition - types and examples of structural and stereo isomerisms.

b) Optical isomerism: Optical activity-definition-condition for optical activity-isomerism of lactic and tartaric acids-racemization-resolution of racemic mixtures, Walden inversion, asymmetric synthesis.

UNIT: III PRINCIPLES AND PROCESS OF METALLURGY (9 Hours)

a) Ores and minerals: Definition-examples -various steps of metallurgy-crushing, pulverizing,. concentration of the ore- calcination and roasting- reduction into metals Alumino-thermic process

b) Refining of metals: Electrolytic refining, Zone refining and Van-Arkel process .

UNIT: IV RADIOACTIVITY (9 Hours)

a) Comparison of properties of α, β, γ rays-detection &measurements of radioactivity- GM counter –bubble chamber- cloud chamber.

b) Fajan's –Russel-Soddy's group displacement law –illustration- law of radioactivity disintegration constant –average life; half-life period-radioactive series.

UNIT: V OXIDATION –REDUCTION (9 Hours)

Electronic concept of oxidation and reduction –oxidation number-definition of oxidation and reduction in terms of oxidation number-calculation of oxidation numbers of Cr, Mn, Fe, Cu, & halogens-problems –oxidizing and reducing agents- redox reactions- oxidation numbers involved in redox reactions.

TEXT BOOKS:

1. B.S. Bahl & Arun Bahl, "Advanced Organic Chemistry", S. Chand & Co, Ramnagar, New Delhi, 2004
2. P.L. Soni, H.M. Chawla, "Text Book of Organic Chemistry", Sultan & Sons, New Delhi, 2004

3. B.R.Puri, L.R.Sharma, Madan S.Pathania, "Principles of Physical Chemistry", Shoban Lal Nagin Chand & Co, Jalandhar, 1998.

REFERENCE BOOKS:

1. Wahid U.Malik and G.D.Tuli,R.D.Madan, "Selected Topics in Inorganic Chemistry", S. Chand & Co., New Delhi in 2002.

ANCILLARY CHEMISTRY
PAPER II
GENERAL CHEMISTRY - II

SEMESTER: II

SUBJECT CODE:

HOURS/ WEEK: 3

TOTAL HOURS/ SEMESTER:45

OBJECTIVES:

To impart fundamental knowledge related to

- *Atomic Structure*
- *Periodic Table & Periodic Properties*
- *Colloidal State*
- *Polymers*
- *Medicinal Chemistry*

UNIT: I ATOMIC STRUCTURE:

(9 Hours)

Quantum numbers –atomic orbitals-shapes of orbitals- filling up of orbitals- Aufbau principle- Hund's rule-Pauli's exclusion principle- electronic configuration of all elements in the periodic table.

UNIT: II PERIODIC TABLE & PERIODIC PROPERTIES: (9 Hours)

- a) Long form of periodic table-classification of elements into s,p,d and f blocks.
- b) Atomic radii, ionic radii, ionization potential, electron affinity, electro negativity and metallicity and non-metallicity and their periodic variations-interpretation of these variations based upon their electronic configuration.

UNIT:III THE COLLOIDAL STATE: (9 Hours)

- a) Introduction: Phases of colloids-classification of colloidal solutions- preparation (Dispersion methods only), purification, properties- optical property-Tyndal effect, Kinetic property- Brownian movement; Electrical properties-Electrical double layer, Electrophoresis, and Electro osmosis.
- b) Applications of colloids: Colloidal medicine, smoke precipitation, artificial kidney machine, sewage disposal, purification of water, artificial rain.

UNIT:IV POLYMERS: (9 Hours)

Definition-classification of polymers- properties of polymers- addition and condensation polymerization reactions with examples- natural rubber- synthetic rubber - vulcanization of rubber- preparation and applications of polystyrene, urea- formaldehyde resin, Teflon and buna-S-rubber, neoprene and Bakelite.

UNIT:V MEDICINAL CHEMISTRY: (9 Hours)

Chemotherapy: Introduction;

- a) Anesthetics: Definition-classification with examples
- b) Analgesics: Definition- classification with examples

- c) Antibiotics-Definition-uses of penicillin, streptomycin, tetracycline and chloramphenicol
- d) Antimalarial Drugs-Definition- mode of action- examples .

TEXT BOOKS:

1. B.S. Bahl & Arun Bahl, “Advanced Organic Chemistry”, S. Chand & Co, Ramnagar, New Delhi, 110055, 2004
2. P.L. Soni, O.P.Dharmarha, U.N.Dash, “Text Book of Physical Chemistry”, Sultan & Sons, New Delhi, 2001
3. B.R.Puri, L.R.Sharma, Madan S.Pathania, “Principles of Physical Chemistry”, Shoban Lal Nagin Chand & Co, Jalandhar, 1998

REFERENCE BOOKS:

- 1.R.D. Madan, “Modern Inorganic Chemistry”, S. Chand & CO, New Delhi, 2004.
2. P.L. Soni, H.M. Chawla, “Text Book of Organic Chemistry”, Sultan & Sons, New Delhi, 2004.

B.Sc., ANCILLARY CHEMISTRY PRACTICAL –I

QUALITATIVE ANALYSIS

SEMESTER: II

**SUBJECT CODE:
TIME: 3 HRS**

Note: 1. For Practical Record –20 Marks
2. For Experiment and Results -40 Marks

Analysis of a simple salt (By macro method)

Cations: Lead, copper, iron (II), aluminium, zinc, manganese, nickel, calcium, barium, strontium, magnesium and ammonium.

Anions: Carbonate, chloride, fluoride, nitrate, oxalate, borate, phosphate, and sulphate.

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DEPARTMENT OF CHEMISTRY
YADAVA COLLEGE
MADURAI -14

QUESTION PAPER PATTERN
Undergraduate courses
(Both Major and Allied Papers)

Time: 3 hrs

Maximum marks: 75

SECTION- A

(10 X 2 = 20)

Answer any TEN questions only

TEN questions to be answered out of fifteen questions
(THREE questions from each unit)

SECTION- B

(5 X 5 = 25)

Answer any FIVE questions only

FIVE questions to be answered out of eight questions

(Atleast one questions from each unit not exceeding two questions from each unit)

SECTION- C

(3 X 10 = 30)

Answer any THREE questions only

THREE questions to be answered out of five questions

(One question from each Unit)

The serial number of the questions has to be continuous from 1 to 28 from Section A to Section C.

PAPER III

INORGANIC AND ORGANIC CHEMISTRY

SEMESTER: III

SUBJECT CODE:

HOURS/WEEK: 4

TOTAL HOURS/ SEMESTER - 60

Objectives:

To acquire fundamental knowledge related to

Organic compounds such as hydrocarbons, halogen and hydroxy compounds.

Volumetric and Gravimetric analysis

Theory of analytical chemistry

UNIT I: HYDROCARBONS

(12hours)

a) Aliphatic Hydrocarbons

i) Alkanes: Introduction: methods of preparation- by reduction of alkyl halides- by Wurtz reaction- by using Grignard's reagent.

Reactions of Alkanes: halogenation, nitration and aromatisation [no mechanisms]

ii) Alkenes: Introduction; methods of preparation- by dehydrohalogenation of alkyl halides [Saytzeff's rule] - by heating quaternary ammonium hydroxide [Hofmann rule] - by electrolysis of salts of dicarboxylic acids and by pyrolysis (cracking) of alkanes.

Reactions of alkenes: catalytic hydrogenation [Sabatier-Sendersen's reduction], addition of halogen acids, addition to unsymmetrical alkenes [Markovnikov rule] - Anti Markovnikov addition [Kharash Peroxide Effect], ozonolysis [no mechanism]

iii) Alkynes: Introduction- methods of preparation: by dehydrohalogenation of 1, 2-dihalides- by electrolysis of salts of unsaturated dicarboxylic acid .

b) Aromatic hydrocarbons i) Aromaticity- Huckel's rule- method of preparation(any two) and structure of benzene.

ii) Toluene: Preparation from n-heptane

Reactions: - electrophilic substitution reactions [with Cl_2 , H_2SO_4 , HNO_3] - substitution in CH_3 group

ii) Styrene: Preparation from benzene

Reactions: addition reaction with Br_2 - oxidation with KMnO_4

iii) Xylenes: Isolation of xylenes from n- octane, Oxidation of xylene with alkaline KMnO_4

iv) Polynuclear fused Hydrocarbon:

Naphthalene: preparation by Haworth synthesis

Reactions: sulphonation- ozonolysis- Friedel-Craft's alkylation- oxidation reactions; uses of naphthalene.

UNIT II: HALOGEN COMPOUNDS

(12 Hours)

a) Aliphatic Halogen Compounds

i) Mono Halogen Compounds

Introduction; methods of preparation- from alcohol using SOCl_2 from silver carboxylate [Hunsdieker reaction]

Reactions: with Na and alcohol [Wurtz reaction]- with Sn & HCl- reaction with metal(Mg)

ii) Dihalogen Compounds:

Introduction and classification-

1,1-Dihalides: Preparation from ketones and alkynes Reactions: hydrolysis, dehydrohalogenation [with Zn dust & methanol and with ethanolic KOH]

1,2-Dihalides: Preparation from alkenes and glycols Reactions: hydrolysis and dehydrohalogenation

b) Aromatic Halogen Compounds : Introduction and classification

i) Aryl Halides: Preparation from phenol

Reactions: Aromatic electrophilic substitution [halogenation, sulphonation and nitration] nucleophilic aromatic substitutions with aqueous NaOH and NaCN [no mechanisms] - reduction –Wurtz-Fittig reaction- Ullmann reaction

ii) Aromatic Side Chain Compounds

Benzyl Chloride: Preparation: by direct chlorination of toluene- by action of PCl_5 on benzyl alcohol

Reactions: Nucleophilic substitution reactions with aqueous KCN-aromatic electrophilic substitution (nitration, halogenation and sulphonation) - comparative study of nuclear and side chain derivatives.

UNIT III: HYDROXY COMPOUNDS

(12 Hours)

a) Aliphatic Hydroxy Compounds

Alcohols: Introduction and classification

i) MonoHydric Alcohols:

Methods of Preparation: by hydrolysis of esters of carboxylic acids- by reduction of carbonyl compound- from Grignard compound

Properties and reactions: Reason for high melting and boiling points of alcohols.

Distinction between 1° , 2° , 3° alcohols

ii) Dihydric Alcohol: [Ethylene Glycol]

Preparation- from ethylene

Reactions: PCl_5 , PI_3 - oxidation and dehydration reactions. Uses of ethylene glycol

iii) Trihydric Alcohol: [Glycerol]

Preparation from propylene-Reactions:- with mixture of H_2SO_4 , HNO_3 , oxalic acid and phthalic anhydride-Uses of glycerol-Estimation of the number of hydroxyl group in alcohols

b) Aromatic Hydroxy Compounds

Introduction- classification

i) Phenols: Methods of preparation: from sulphonic acid- from Grignard reagent- Properties: Melting and boiling point-Reactions: acidic nature of phenol-Kolbe's reaction- Reimer-Tiemann reaction- Libermann reaction- with formaldehyde- reduction- aromatic electrophilic substitution reaction [nitration, halogenation]- coupling reaction- test for phenols

ii) Dihydric Phenol: [Catechol]

Preparation from o- chloro phenol- reaction with Fehling's solution, Phthalic anhydride
Resorcinol

Preparation from 1, 3- benzene disulphonic acid-Reactions: with Phthalic anhydride

Quinol

Preparation from p-benzoquinone- reactions: oxidation with ferric chloride.

iii) Aromatic Alcohol [Benzyl Alcohol]

Methods of preparation: from benzyl chloride- from benzaldehyde **Properties:** Reduction- oxidation with CrO_3 -Differences between phenol and benzyl alcohol

UNIT: IV VOLUMETRIC AND GRAVIMETRIC ANALYSIS (12 hours)

a) Volumetric analysis:

Introduction-terminology in volumetric analysis. (standard solution, titration, end point, indicator)- standard solution and its type-requirements of primary standard solution-expressing the concentration of solutions.(normality, molarity, molality, mole fraction and percentage composition) – Classification of reactions in volumetric analysis;acid-

base(neutralization) reactions, oxidation-reduction(redox) reactions and precipitation reactions.

Types of acid-base reactions and choice of indicators. .

b) Gravimetric analysis:

Introduction; types of gravimetric methods; steps in gravimetric analysis-precipitation-mechanism of precipitation; desirable properties of gravimetric precipitate.

Contamination of a precipitate; co-precipitation and post-precipitation and their minimization. Precipitation from homogeneous solution-selective and specific precipitants-sequestering agent

UNIT V: Theory of analytical chemistry

(12 hours)

Error analysis: Definition-terms absolute error and relative error-precision and accuracy-classification of errors confidence limit- students Q-test - rejection of experimental data-sources and elimination of errors-significant figures and computation.

Analysis of experimental results: Graphical method-curve-fitting-method of least squares-problems involving straight line graphs.

Instrumental methods of analysis: Beer-Lambert law-principles of colorimetric analysis-visual colorimetric - standard series method- balancing method – estimation of Ni^{2+} and Fe^{3+}

Text Books:

- 1) B.R. Puri, L.R.Sharma, K.C. Kalia, “Principles of Inorganic Chemistry”, Milestone Publishers, Delhi, 2008
- 2) B.S Bahl & Arun Bahl, “Advanced Organic Chemistry”, S. Chand & Co. New Delhi , 2008

Reference Books:

- 1) R.L Madan, S.Chand's," Simplified Course in Inorganic Chemistry," S.Chand & Co.
NewDelhi, 2001
- 2) I.L.Finar, Vol-I," Organic Chemistry," Pearson Education Pvt Ltd. Indian
Branch, 482.F.I.E. Putparganj.
- 3) J.D. Lee,"Concise Inorganic Chemistry" Fifth Edition, Blackwell Science Ltd.-2003.
- 4) R.D. Madan, "Modern Inorganic Chemistry", S.Chand and company Ltd.
NewDelhi, 2008
- 5) S.Usharani,"Analytical Chemistry", MacMillan India Ltd, New Delhi-2000
- 6) R.Gopalan, P.S.Subramanian, K.Rengarajan," Elements of Analytical Chemistry",
Sultan Chand & Sons, New Delhi-2003
- 7) Gurdeep R. Chatwal and Anand,"Instrumental Methods of Chemical Analysis",
Himalaya Publishing House, Mumbai- 2007.

PAPER IV

ORGANIC AND PHYSICAL CHEMISTRY

SEMESTER: IV

SUBJECT CODE:

HOURS/WEEK: 4

TOTAL HOURS/ SEMESTER: 60

Objectives:

To understand the importance of chemistry in the field of

- Aromatic aldehydes and ketones
- Carboxylic Acids
- *Chemical Equilibrium & Distribution Law*
- *Chemical Kinetics*
- *Catalysis and Surface Chemistry*

UNIT-I ALDEHYDES AND KETONES

(12 hours)

Aromatic aldehydes and ketones:

Aromatic aldehydes : Methods of preparation of benzaldehyde- by oxidation of toluene- hydrolysis of benzyl chloride- by Gattermann- kotch reaction- by Gattermann aldehydes reaction- by Rosenmund reduction - by Stephen's reaction- by Grignard reaction-reactions of benzaldehyde- addition of sodium bisulphite- addition of Grignard reagents with ammonia derivatives (NH_2OH , $\text{NH}_2\text{-NH}_2$, $\text{C}_6\text{H}_5\text{NHNH}_2$, $\text{NH}_2\text{-NHCONH}_2$, action of PCl_5 - reduction with Zn /Hg-HCl , mechanism of Cannizzaro reaction, Claisen reaction, Perkin reaction, Knoevenagel reaction, Benzoin condensation, with phenol and tertiary amine, reaction of aromatic nucleus: nitration, sulphonation, halogenation.

Aromatic Ketones : Acetophenone : methods of preparation- by Friedel Craft's reaction from benzene,

Catalytic oxidation of ethyl benzene with air, Reactions : Reduction with Na and ethonal, Zn /Hg-HCl , chlorination, condensation, mannich reaction-uses.

Benzophenone: methods of preparation- by distilling calcium benzoate- by Friedel-Craft's reaction. Reactions : reduction- oxidation- reaction with potassium hydroxide - reaction with sodium, michler's ketone.

UNITIII: CARBOXYLIC ACIDS

(12 hours)

i) Aliphatic carboxylic acids

a) Mono Carboxylic Acid: Introduction- classification- methods of preparation: by oxidation of 1° alcohol and aldehyde- oxidation of methyl ketone (haloform reaction)- by

hydrolysis of ester- by hydrolysis of nitriles- from alkyl substituted acetoacetic and malonic esters

properties: solubility b.pt and m.pt- stability of carboxylate ion, influence of substituents on acidity- reaction with sodium and NaOH- reaction with triethylamine- reactions of salts of carboxylic acids [Na salt, ammonium salt, calcium salt]- reaction with alcohol- electrolysis- reaction with PCl_5 and PCl_3 - reaction with P_2O_5 - reduction with LiAlH_4 - reaction with diazomethane- reaction with Cl_2 , Br_2 , ammonia, NaCN - test for acids- differences between formic acid and acetic acid

b) Dicarboxylic acid: introduction- methods of preparation: by oxidation of glycol with KMnO_4 - by oxidation of hydroxyl acids with $\text{K}_2\text{C}_2\text{O}_7$ - by the hydrolysis of dinitriles or cyano mono carboxylic acid with dil. HCl - by the action of silver or Zn on halogenated mono carboxylic esters- by the electrolysis of salts of acid esters of lower dicarboxylic acid- by treating grignard reagent with solid CO_2 - by the oxidation of unsaturated fatty acids with KMnO_4 - by the oxidation of cyclic alkenes and ketones [with HNO_3 or KMnO_4] from aceto acetic ester- from malonic ester.

properties: reaction of the COOH group reaction with NaOH with $\text{C}_2\text{H}_5\text{OH}/\text{H}^+$ - with NH_4OH - with SOCl_2 - action of heat on dicarboxylic acid [blanc's rule]- oxidation with KMnO_4 - acyloin reaction- halogenation [with Cl_2].

ii) Aromatic acids: (a) benzoic acid (benzene carboxylic acid): Introduction- methods of preparation: oxidation of benzyl alcohol & benzaldehyde- hydrolysis of nitrile- carbonation of Grignard reagent- oxidation of toluene with KMnO_4 - hydrolysis of trichloro methyl group on benzene nucleus.

Properties: Acidity- esterification- reaction with sodium benzoate- reaction with PCl_5 - reaction with ammonia- decarboxylation- reduction with LiAlH_4 - sodium amyl alcohol- reaction with Cl_2 reaction, with nitric acid- uses.

b) Benzene dicarboxylic acid: (Phthalic acid)

Introduction- methods of preparation of phthalic acid: from naphthalene- from o-Xylene.

Properties: Action of heat with KOH – reaction with sodium amalgam and sodium carbonate solution.

iii) Aromatic and aliphatic acid derivatives: Definition with examples only.

UNIT: III CHEMICAL EQUILIBRIUM AND DISTRIBUTION LAW (12 hours)

a) Chemical equilibrium: Reversible and irreversible reactions- chemical equilibrium- law of mass action- equilibrium constant- relationship between K_p and K_c - applications of law of mass action in the synthesis of hydrogen iodide and thermal dissociation of phosphorus pentachloride. Calculation of degree of dissociation from vapour density measurements.

Le-Chatelier-Braun principle; effect of temperature, effect of pressure, effect of concentration and effect of addition of an inert gas on equilibrium reactions. Application of Le-Chatelier-Braun principle to the synthesis of ammonia by Haber's process and the synthesis of sulphuric acid by contact process.

b) Distribution law: Nernst distribution law; definition – conditions for validity of distribution law- different cases of distribution law. Applications of distribution law; principle of solvent extraction- calculation of equilibrium constant- association of a solute and dissociation of a solute.

UNIT: IV CHEMICAL KINETICS

(12 hours)

i) Introduction- terminology: rate of reaction, rate law, rate constant, order and molecularity of a reaction; Differences between order and molecularity.

ii) First order reactions: Derivation of rate constant and half-life period; Examples of first order reactions- catalytic decomposition of hydrogen peroxide, acid hydrolysis of an ester and inversion of sucrose.

iii) Second order reactions: Derivation of rate constant and half-life period- hydrolysis of an ester by alkali.

iv) Zero and fractional order reactions

v) Methods of determination of order of reaction- half-life method and graphical method.

vi) Effect of temperature on reaction rate: Arrhenius equation-significance of energy of activation

vii) Theories of reaction rate: Transition state theory and absolute reaction rate theory.

UNIT: V CATALYSIS AND SURFACE CHEMISTRY (12 hours)

a) Catalysis: i) Definition- homogeneous and heterogeneous catalysis, positive and negative catalysts- characteristics of catalyst.

ii) Autocatalyst-acid-base catalyst-enzyme catalyst- examples.

iii) Theory (mechanism) of catalysts: Intermediate compound formation theory and adsorption theory.

b) Surface Chemistry: i) Definitions- adsorption, adsorbate and adsorbent. Types of adsorption – differences between physical adsorption and chemisorption.

ii) Adsorption of gases on solids: Factors affecting adsorption- adsorption isotherm- Freundlich and Langmuir adsorption isotherms- BET theory.

iii) Applications of adsorption

Text Books:

1) B.R.Puri, L.R.Sharma, S.Pathania, "Principles of Physical Chemistry," Vishal Publishing Co., Jalandhar-2004.

2) Arun Bahl and B.S. Bahl "Advanced Organic Chemistry" S.Chand & Co, New Delhi -2008.

Reference Books:

1) P.L.Soni, O.P.Dharmarha "Text Book of Physical Chemistry" Sultan Chand & Sons. New Delhi-2001.

2) Gurdeep Raj "Advanced Physical Chemistry", Goel Publications, Meerut-1992.

- 3) Samuel Glasstone “A Text Book of Physical Chemistry”, Macmillan, 1976.
- 4) Lailder,” Chemical Kinetics”, Pearson Education, 2004.
- 5) I.L.Finar,”Organic Chemistry”, Vol-I, Pearson Education-2003.
- 6) K.S. Tewari, S.N. Mehrotra, N.K .Vishnoi “A Text Book of Organic Chemistry” Vikas Publishing House Pvt Ltd, New Delhi- 1987 .
- 7) P.L.Soni,H.M. Chawla “Text Book of Organic Chemistry” Sultan Chand & Sons. New Delhi.-19.

MAJOR PRACTICAL -II

VOLUMETRIC ANALYSIS

(At the end of second year)

SEMESTER: IV

SUBJECT CODE:

HOURS: 2

TOTAL MARKS: 100

INTERNAL : 40 MARKS

EXTERNAL : 60 MARKS

Note: 1. For Practical Records-10 Marks

2. For Experiment and Results-50 Marks

A double titration involving the making up the solution to be estimated and the preparation of a primary standard.

Volumetric Analysis : 60 marks

Distribution of marks (for Volumetric)

(20% of the marks is allotted for writing the procedure).

Record (10 marks)

Procedure (15marks)

Estimation (35marks)

Error <2% - 20 marks

Error 2-3% -15 marks

Error 3-4% -10 marks

Error >4% - 5 marks

Volumetric analysis: List of experiments:

- I Acidimetry and alkalimetry**
1. Estimation of NaOH
 2. Estimation of Na_2CO_3
 3. Estimation of oxalic acid

II. Redox Titrations:

a) Permanganometry: 4. Estimation of ferrous ion

5. Estimation of oxalic acid

b) Dichrometry: 6. Estimation of ferrous ion

III. Iodometry and iodimetry

7. Estimation of potassium dichromate

8. Estimation of potassium permanganate

9. Estimation of copper

IV Complexometric Titration:

10. Estimation of Zinc

ANCILLARY CHEMISTRY PAPER III GENERAL CHEMISTRY – III

SEMESTER: III

SUBJECT CODE:

HOURS/WEEK: 3

TOTAL HOURS/ SEMESTER: 45

Objectives:

To impart the fundamental knowledge related to

- *Carbohydrates*

- UNIT I: BIO CHEMISTRY-I (9 hours)**

Definition- classification with examples.

Introduction- classification-preparation, properties and uses of glucose and fructose-
conversion of glucose to fructose and vice versa-differences between them.

Introduction- manufacture of sucrose from cane sugar- properties and uses- structure (no elucidation)- Distinction between sucrose, glucose and fructose

Introduction- Starch and cellulose, α -Amylose and β - Amylose (structure only)- differences between α -Amylose and β - Amylose.

UNIT II: PETROLEUM AND PETROCHEMICALS (9 hours)

Introduction- occurrence- sources of petroleum in India- composition of petroleum- origin of petroleum- carbide theory- Engler's theory- refining of petroleum- increasing the yield of petrol - cracking- knocking and antiknocking- octane number- cetane number- flash point- Synthetic petrol- Fischer-Tropsch process.

Definition –different types of petrochemicals (a brief study only.)

UNIT III: ANALYTICAL CHEMISTRY-I (9hours)

39

Standard solution- solution	types of standard solution-	requirements of primary standard
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Types- titration curves and choice of indicators- Ostwald's theory-theory of acid- base indicators.

Definition with examples- theory of redox indicators.

Definition- adsorption- adsorbate- adsorbent- types of adsorption- physical adsorption- chemical adsorption- differences between these two types.

UNITV: CHEMICAL EQUILIBRIUM AND CHEMICAL KINETICS (9 hours)

Reversible and irreversible reactions- chemical equilibrium- law of mass action- equilibrium constant- applications of law of mass action- relation between K_p and K_c - Le-Chatelier- Braun principle and its applications in i) manufacture of NH_3 by Haber's process ii) manufacture of H_2SO_4 by contact process

Rate of the reaction- rate law- rate constant- order and molecularity of reaction- differences between order and molecularity- derivation of rate constant and half life period for first order reaction.

Reference Books

- 40

2008

2. P.R.Puri, L.R. Sharma, K.C. Kalia, "Principles of Inorganic Chemistry", Milestone Publishers Delhi, 2008
 3. P.L. Soni, O.P.Dharmarha, U.N.Dash, "Text Book of Physical Chemistry", Sultan & Sons, New Delhi, 2001
 4. R.L.Madan, G.D.Tuli "Simplified Course in Inorganic Chemistry" S.Chand & Co, New Delhi 2001
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ANCILLARY CHEMISTRY
PAPER IV
GENERAL CHEMISTRY – IV

SEMESTER: IV

SUBJECT CODE:

HOURS/WEEK: 3

TOTAL HOURS/ SEMESTER: 45

Objectives: *To enable students to understand the fundamental concepts in*

- *Analytical chemistry*
- *Photo chemistry and photochemical reactions*
- *Bio chemistry*
- *Agricultural chemistry*

- *Silicate industry*

UNIT I: ANALYTICAL CHEMISTRY II

(9 hours)

a) Chromatography

Definition- principle of chromatography- types of chromatography- experimental techniques and applications of column chromatography- thin layer chromatography and paper chromatography- R_f value and factors affecting R_f value

b) Colorimetric method of analysis

Introduction- principle- Beer- Lambert's law- merits and demerits- criteria for satisfactory colorimetric estimations- visual colorimetric- balance method- Duboscq colorimeter- estimation of Fe^{3+} ion

UNIT II: PHOTO CHEMISTRY

(9 hours)

Introduction- differences between thermal and photochemical reactions- laws of photochemistry- Grotthus- Draper law and Einstein's law- quantum efficiency. High and low quantum efficiency , Jablonski diagram.

Photochemical reactions

Luminescence-fluorescence-phosphorescence-chemiluminescence,bioluminescence and photosensitisation

UNIT III: BIOCHEMISTRY-II

a) Amino acids and peptides (9 hours)

Introduction- classification- essential and non-essential aminoacids- properties of amino acids.

Peptides- types and formation of peptides

b) Proteins

Introduction- classification i) according to composition ii) according to functions- structure of proteins- properties of proteins-colloidal nature-isoelectric point-

coagulation-precipitation (denaturation)- hydrolysis. Colour tests for proteins- industrial importance of proteins.

UNIT IV: AGRICULTURAL CHEMISTRY

(9 hours)

a) Fertilizers

Definition- nutrients for plants- role of various elements in plant growth- requirements of a good fertilizer- natural and chemical fertilizer- classification of chemical fertilizers- manufacture and uses of urea- super phosphate and potassium nitrate- mixed fertilizer .

b) Insecticides, Fungicides and Pesticides

Definition- classification according to method of applications and actions- preparation and uses of D.D.T, B.H.C, Lead arsenate, Bordeaux mixture.

UNIT V: SILICATE INDUSTRY

(9 hours)

a) Cement

Introduction- composition of cement- raw materials- manufacture of cement by wet process- curing of cement- role of gypsum in setting of cement.

b) Glass

Introduction- composition of glass- raw materials-methods of manufacture- types of glasses.

c) Ceramics

Introduction- raw materials- methods of manufacture and uses.

Reference Books:

1. B.S. Bahl & Arun Bahl, "Advanced Organic Chemistry", S. Chand & Co, New Delhi, 2008
2. P.L. Soni, O.P.Dharmarha, U.N.Dash, "Text Book of Physical Chemistry", Sultan & Sons, New Delhi, 2001
3. R.L.Madan, G.D.Tuli "Simplified Course in Inorganic Chemistry" S.Chand & Co, New Delhi 2001

4. P.R.Puri, L.R. Sharma, K.C. Kalia, "Principles of Inorganic Chemistry", Shobal Lal Nagin Chand & Co, New Delhi, 1993.
5. B.K.Sharma, "Industrial Chemistry", Goel Publishing House, Meerut 1999.
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ANCILLARY PRACTICAL II

VOLUMETRIC ANALYSIS

(At the end of second year)

Semester: IV

Subject Code:

Time: 3 Hrs

Total: 100 marks

Internal: 40 marks

External: 60 marks

A double titration involving making up of the solution to be estimated.

LIST OF EXPERIMENTS

a) Acidimetry and alkalimetry

S.NO	Standard solution	Link solution	Solution for estimation
1	Oxalic acid	Sodium hydroxide	Oxalic acid
2	Sodium carbonate	Hydrochloric acid	Sodium carbonate

b) Permanganometry

S.NO	Standard solution	Link solution	Solution for estimation
1	Ferrous ammonium sulphate	Potassium permanganate	Ferrous ammonium sulphate
2	Oxalic acid	Potassium permanganate	Ferrous ammonium sulphate
3	Oxalic acid	Potassium permanganate	Oxalic acid
4	Ferrous Sulphate	Potassiumpermanganate	Oxalic acid

c) Iodometry and dichrometry

S.NO	Standard solution	Link solution	Solution for estimation
1	Potassium dichromate	Thio	Potassium dichromate
2	Potassium dichromate	Thio	Copper sulphate

Distribution of marks

For Record Note – 10 marks

For Procedure -10 marks

Estimation (40 marks)

Error <2% - 40 marks

Error 2-3% - 30 marks

Error 3-4% - 20 marks

Error 4-5% - 10 marks

Error >5% - 5 marks

NON- MAJOR ELECTIVE (NME)

DAIRY SCIENCE

SEMESTER: III

SUBJECT CODE:

HOURS/WEEK: 2

TOTAL HOURS/ SEMESTER: 30

OBJECTIVES:

To understand the chemistry of milk and milk products and get appointment in dairy units of both private and Government and also enable them to start dairy units.

UNIT-I (6 hours)

Introduction- composition of milk- physical properties- functional properties-effect of heat on milk-check for purity of milk-detection of adulteration in milk.

UNIT-II (6 hours)

Milk Processing: Introduction- different methods of processing of milk -clarification- pasteurization- VHT milk- HTST milk- homogenized milk.

UNIT-III (6 hours)

Milk Powder Processing: Introduction- skimmed milk powder-whole dry milk powder-manufacture of whole dry milk powder-butter milk powder.

UNIT-IV (6 hours)

Milk Products-I

a) Butter: Introduction- preparation process-chemical nature of butter fat-detection of adulteration in butter.

b) Cheese: Introduction- preparation- composition- un-ripened cheese- ripened cheese-processed cheese.

UNIT-V (6 hours)

Milk Products II

a) Ghee: Introduction-manufacturing process-detection of adulteration in ghee.

b) Ice-Cream: Composition-milk fat-milk solid- non fat- sweeteners- stabilizers-emulsifiers.

Field work: Visit to a Dairy unit/farm and submission of report.

Reference Books:

1. K.Bagavathi Sundari, “Applied Chemistry” MJP Publishers, Chennai-2006
2. Lillian Hoauland Meyer, “Food Chemistry” CBS Publishers and Distributors, Delhi, 1987
3. R.Gopalan, P.S.Subramanian, K.Rengarajan, “Elements of Analytical Chemistry”, Sultan Chand & Sons, New Delhi, 2003

NON- MAJOR ELECTIVE (NME)**SMALL SCALE INDUSTRIAL CHEMICALS****SEMESTER: IV****SUBJECT CODE:****HOURS/WEEK: 2****TOTAL HOURS/ SEMESTER: 30****Course Objectives:**

This course helps the students to understand the manufacturing technique of some of the small-scale industrial chemicals and thus enable them to start small scale manufacturing units

Unit I: Detergent powder and Washing powder (6 hours)

a) Detergent powder: Introduction- raw materials – manufacturing methods- advantage and disadvantages of detergents over soaps.

b) Washing powder: Introduction- raw materials- method of manufacturing.

Unit II: Chalk and Crayons (6 hours)

Introduction- materials for manufacturing- manufacturing processes.

Unit III: Candles (6 hours)

Introduction- raw materials- manufacturing method of candles- manufacturing of fragrant candles and candles that can destroy mosquitoes- method of manufacture of superior candles.

Unit IV: Phenoils, Incense stick and Dhuna(Sambirani) (6 hours)

a) Phenoils: Introduction- raw materials used - methods of preparation.

b) Incense stick: Introduction- raw materials- manufacturing process.

c) Dhuna/ Sambrani: Introduction- raw materials- method of manufacturing.

Unit V: Ink (6 hours)

Introduction- different types of inks- methods of preparation of blue black liquid ink, fountain pen ink, red ink and rubber stamp ink- ink remover.

Note: 1. Practical training for the preparation of the above said products will be provided

in the Chemistry Department Laboratory

2. Visit to a small-scale manufacturing unit and submission of report.

Reference Books:

1. Latest Cottage Industries 20th Edition by Mohan Malhotra et al., 1980
2. Preparative materials supplied by J.C. Kumarappa Institute of Rural Technology and Development , T. Kallupatti
3. B.K. Sharma, “Industrial Chemistry” Goel Publishing House, Meerut, 1999

DEPARTMENT OF CHEMISTRY

Yadava College, Madurai -14

Self study paper for brilliant students to earn extra credits

Under graduate course (B.Sc)

S.NO	Sem	Sub code	Subject	Credit	Evaluation			Total Marks
					Duration	Int.	Ext.	

					Hours			
1	III	R3SCY1	Industrial Chemistry	3	3	25	75	100
2	IV	S3SCY2	Forensic Chemistry	3	3	25	75	100

SELF-STUDY PAPER-I

INDUSTRIAL CHEMISTRY

Semester:III

Subject Code:

Credit: 3

Objectives:

To gain knowledge about the chemistry of important manufacturing process

Unit-I: MATCH INDUSTRY, EXPLOSIVES AND SUGAR INDUSTRY(6 hours)

a) Match industry: Introduction- types of matches-raw materials need for safety matches- manufacturing process.

b) Explosives: Introduction- classification- characteristics of explosives- preparation and uses of TNT, picric acid, dynamite, cordite and RDX.

c) Sugar industry: Introduction- manufacture of cane sugar- extraction of juice- purification of juice- defecation- sulphitation and carbonation- concentration- crystallisation- separation of crystals- drying- refining- sugar industry in India.

Unit-II: SILICATE INDUSTRY(6 hours)

a) Cement: Introduction-composition of cement-raw materials need for manufacturing of Portland cement-manufacture of Portland cement by wet process and dry process-role of gypsum in the setting of cement- curing of mortars and concrete.

b) Glass: Introduction- characteristics of glass- composition of glass- raw materials and method of manufacture (tank furnace method) - types of glasses.

c) Ceramics: Introduction- general properties of ceramics- raw materials and manufacturing process.

Unit-III: AGRICULTURAL CHEMISTRY(6 hours)

a) Fertilizer: Introduction--macro and micro plant nutrients-role of various elements in plant growth-requirements of a good fertilizer.

Classification of chemical fertilizers; manufacturing methods and applications of following fertilizers: urea, super phosphate of lime, calcium cyanamide, calcium ammonium nitrate and mixed fertilizers.

b) Insecticides and fungicides

i) Insecticides: Introduction-classification according to the mode of action- preparation and applications of DDT, BHC, gammexane, melathion , parathion and lead arsenate

ii) Fungicides: Introduction- preparation and applications of thio carbamate and bordeaux mixture

Unit-IV: RUBBER AND PLASTIC INDUSTRIES. (6 hours)

a) Rubber: Introduction-composition of natural rubber-occurrence and isolation of natural rubber - draw backs of raw rubber- vulcanization-properties of vulcanized rubber- synthetic rubber- preparation and applications of SBR rubber, neoprene rubber, butyl rubber and Thiokol.

Distinction between natural rubber and synthetic rubber

b) Plastics: Introduction-characteristics of plastics-classification of plastics- differences between thermo setting and thermo plastics- preparation and applications of bakelite, polythene, PVC, polypropylene, poly styrene and urea formaldehyde resin.

Differences between plastics and resins

Unit-V: PAPER AND ELECTROPLATING INDUSTRIES(6 hours)

a) Paper industry: Introduction- raw materials and manufacturing process of paper-types of paper-paper industry in India

b) Electroplating industry: Introduction- electrodeposition or electroplating-applications of electroplating- preparation of materials for electroplating-process of electroplating- theory of electroplating-factors influencing the nature of deposit-requirements of electrolyte; a study of nickel plating, .copper plating, chromium plating and zinc plating

Reference Books:

- 1) Jain and Monika Jain, “Engineering Chemistry” Fifth Edition, Dhanpat Rai & Sons, Delhi, 1990

2) B.K.Sharma, “Industrial Chemistry” Tenth Edition, Krishna Prakashan Media (P) Ltd, Meerut; 1999

3) B.N.Chakrabarty, “Industrial Chemistry” Oxford & IBH Publishing & Co. Pvt Ltd, New Delhi, 1994

4) M.G.Arora & M.Singh “Industrial Chemistry” Anmol Publications. Pvt Ltd, New Delhi, 1999

SELF-STUDY PAPER-II

FORENSIC CHEMISTRY

Semester: IV

Subject Code:

Credit: 3

Objectives:

- *To acquire knowledge about the concept of Chemistry as related to forensic science.*
- *To understand the use of chemicals in criminal investigation.*

UNIT-I: COLLECTION AND PRESERVATION OF EVIDENCES . (6 hours)

A) Introduction- historical development of forensic science; types of physical evidence- importance of physical evidence- collection and preservation of physical evidence- identification of physical evidence.

B) Forensic characteristics of glass and soil

C) Forensic examination of hair, fibre and paints

UNIT-II: EXAMINATION AND IDENTIFICATION OF DRUGS, ALCOHOL AND POISONS. (6 hours)

A) Drug abuse- effects of marijuana and LSD.

B) Alcohol-effect of the amount of alcohol consumed-analysis of alcohol by breathalyzer (a detailed study).

C) Poisons- types and classification of poison - diagnosis of poisons in the living and the dead- clinical symptoms- - identification of phenol, chloral, HCN, alkaloids, and arsenic poisons.

UNIT-III: FINGER PRINT AND FORENSIC SEROLOGY (6 hours)

A) Finger prints- principles- detection and preservation of developed finger prints

B) Forensic Serology-blood types- characterization of blood strains- preservation of blood evidence.

C) Analysis of seminal stains.

UNIT-IV: CRIME DETECTION (6 hours)

A) Document and voice examination-hand writing comparison- collection of hand writing exemplars- typewriting comparisons- voice examination-sound spectrograph.

B) Human bombs- possible explosives (gelatin sticks and RDX) – metal detector devices

UNIT- V: FORGERY AND COUNTERFEITING: (6 hours)

A) Detecting forgery in bank cheques/drafts and educational records like mark sheet, certificate using UV light. Alloy analysis using AAS to detect counterfeit coins.

B) Checking silverline water mark in currency notes.

C) Detecting of gold purity in 22 carat ornaments and detecting gold plated jewels.

Reference Books:

1. Richard Saferstein, "Criminalistics- A Introduction to Forensic Science" Eighth Edition, Prentice Hall, UK; 2000
2. T.H.James, "Forensic Sciences", Stanley Thornes Ltd, New York; 2005

Paper-V

Elective Paper - I

INORGANIC CHEMISTRY-I

Semester: V

Hours/week: 5

Subject Code:

Credits: 5

HOURS/SEMESTER- 75

Objectives:

Students undergoing this course acquire knowledge and understanding of fundamental concepts of coordination compounds, metal carbonyls and nitrosyls, bio inorganic chemistry and inorganic polymers. The students also acquire an in-depth knowledge

about bio-inorganic chemistry transition metal compounds as catalysts and programming in C language.

UNIT-I: COORDINATION COMPOUNDS-I

(15hours)

a) Coordination compounds :

Definition and terminology of coordination compounds:

i) central metal ion ii) ligands iii) coordination sphere iv) coordination number and v) charge of complex ion. Types of ligands- unidentate, bidentate and poly dentate - Postulates of Werner's theory.

b) Nomenclature of coordination compounds: Order of naming ions-naming of coordination sphere-order of naming the ligands-numerical prefixes to indicate the number of ligands-ending of names-oxidation state of the central metal ion-bridging groups-points of attachments and naming of geometrical isomers.

c) Isomerism in Coordination Compounds:

i) Structural isomerism (ionization, hydrate, coordination, coordination position and linkage isomerism- explanation with examples).
ii) Stereoisomerism: Geometrical and optical isomerism in complexes of coordination number 4 and 6.

d) Chelates-chelation - Applications of chelates.

UNIT-II: COORDINATION COMPOUNDS-II

(15hours)

Modern theories of Coordination Compounds :

a) Valence bond theory-assumptions of valence bond theory – VBT as applied to octahedral, tetrahedral and square planar complexes- limitations of valence bond theory.

b) Crystal field theory-crystal field splitting of octahedral, tetrahedral and square planar complexes- crystal field stabilization energy- low spin and high spin complexes- Factors influencing the magnitude of crystal field splitting (nature of the ligands, oxidation state of the metal ion, size of the d-orbital and geometry of the complex)- applications of crystal field theory (magnetic properties and color) of the complexes-Comparison of valence bond theory and crystal field theory

c) Molecular orbital theory: Introduction- MOT as applied to octahedral complexes $[\text{Co}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$

UNIT-III: METAL CARBONYLS AND NITROSYLS AND INORGANIC POLYMER (15hours)

a) Metal Carbonyls: Definition-classification-general methods of preparation and properties of carbonyls-structure and bonding in $\text{Ni}(\text{CO})_4$, $\text{Fe}(\text{CO})_5$, $\text{Cr}(\text{CO})_6$, $\text{Mn}_2(\text{CO})_9$, and $\text{Co}_2(\text{CO})_8$ -EAN rule as applied to carbonyls.

b) Metal Nitrosyls: Definition-general methods of preparation and properties-preparation, properties and structure of sodium nitroprusside and nitroso ferrous sulphate-EAN rule as applied to nitrosyls.

c) Inorganic polymers: Introduction-general properties of inorganic polymers-boron based polymers-polycarbonates, polymeric boron nitride-silicon based polymers-polysilane gums and silicon rubber.

UNIT-IV: BIO-INORGANIC CHEMISTRY AND TRANSITION METAL COMPOUNDS AS CATALYSTS (15 Hours)

b) Bio-Inorganic Chemistry: Role of metal ions (Fe, Co, Zn, Mg, Na, Ca &K) in biological systems-metallo porphyrins- structure and functions of hemoglobin, myoglobin, chlorophyll, vitamin B_{12} and cytochromes-copper proteins.

c) Transition metal compounds as catalysts: Wilkinson's catalyst (hydrogenation of olefins)-Zeigler-Natta catalyst (propylene polymerization)-organo palladium catalyst-Wacker's process (oxidation of olefins)-Vaska's catalyst (synthetic oxygen carriers).

UNIT V) PROGRAMMING IN "C" LANGUAGE (15 Hours)

a) Advantages - keywords – variable and parameters –arrays
data types – structures – funning of C program constants – operators – expressions – input and output – control statements – looping – functions.

b) Applying C programme to calculation of inversion temperature – Crms, Cav and Cmp velocity – degrees of freedom on the basis of phase rule – efficiency of a

heat engine – half – life period of a reaction – critical constants – ionic strength of any electrolytic solutions.

Text Books:

1. B.R.Puri, L.R.Sharma, K.C.Kalia, "Principles of Inorganic Chemistry", Milestone Publishers, Delhi-2008.
2. R.D.Madan, "Modern Inorganic Chemistry", S.Chand and Company Ltd. NewDelhi, 2008.

Reference Books:

1. J.D.Lee, "Concise Inorganic Chemistry," Fifth Edition, Blackwell Science Ltd-2003.
2. G.R.Chatwal, A.K.Bhagi," Bio-Inorganic Chemistry," First Edition, Himalaya Publishing House, 1996.
4. S.F.Kettle, "Coordination Chemistry", ELBS and Nelson, 1986.
5. U.Malik, G.D.Tuli, R.L.Madan "Selected Topics in Inorganic Chemistry," S.Chand & Co, New Delhi-2004
6. Balagurusamy, "programming in ANSI C – Third Edin – Tata McGraw – Hill publishing Co- 2004.

Paper-VI
ORGANIC CHEMISTRY-I

Semester: V

Hours/Week: 5

Subject Code:

Credits: 5

HOURS/SEMESTERS -75

Objectives:

1) To acquire knowledge related to molecular spectroscopy, cyanides, isocyanides, nitro compounds, amines and diazo c compounds.

2) To understand the chemistry and applications of biologically active compounds such as alkaloids and terpenoids.

3) To understand the concept of conformation and conformational analysis.

UNIT: I MOLECULAR SPECTROSCOPY

(15hours)

a) Introduction-characterization of electromagnetic radiation (wave parameters)-regions of the spectrum.

b) Ultraviolet spectroscopy (Electronic Spectroscopy): Introduction-Franck Condon principle (Electronic transition)-types of transition in organic molecules ($n-\pi^*$, $\sigma-\sigma^*$, $n-\sigma^*$, $\pi-\pi^*$)-basic concepts-bathochromic shift, hypsochromic shift, hyperchromic shift, hypochromic shift, auxochrome, chromophore, effect of conjugation, Woodward Fieser rules for calculating λ_{\max} value-(conjugated dienes, α , β unsaturated carbonyl compounds)

c) NMR Spectroscopy: Introduction-rules (predicting the nuclear spin)- chemical shift, factors influencing chemical shift, shielding and deshielding of protons, spin-spin coupling (NMR spectrum of acidified and pure ethanol), coupling constant-rules for calculating the number of lines in NMR spectra (Pascal's triangle)-NMR spectra of ethane, propane, toluene, nitrobenzene, acetone, ethylene, p- xylene.

UNIT – II ORGANIC NITROGEN COMPOUNDS – I

(15Hours)

I. Aliphatic nitrogen compounds

a) Cyanides & Isocyanides:

i) Alkyl cyanide preparation from alkyl halides, amides, carboxylic acid and ammonia, Grignard reagent-properties: reduction, reaction with water, alcohol, alkylhalide, Grignard reagent, ammonia, and acetic anhydride.

ii) Alkyl isocyanide: preparation: from alkyl halides, primary amines-properties: reduction, reaction with water, halogens, and sulphur.

iii) Distinction between ethyl cyanide and ethyl isocyanides.

b) Nitro alkanes and alkyl nitrites:

i) Nitro ethane: preparation from alkyl halide, paraffin, halo acids-properties: reduction, reaction with sodium hydroxide, aldehyde and ketone.

ii) Alkyl nitrite: preparation from sodium nitrite and ethyl alcohol, nitrogen trioxide on ethyl alcohol-properties: reaction with water-reduction, Difference between nitro ethane and ethyl nitrite.

II- Aromatic nitro compounds:

a) Nitrobenzene: preparation from benzene-properties: reduction with Sn/HCl, Zn/ NaOH and ethanol, Zn/ NH₄Cl and H₂O and electrolytic reduction.

b) o-Dinitrobenzene: preparation from o-nitro aniline-reaction with aqueous sodium hydroxide, ammonia and ethanol.

c) m-Dinitrobenzene: preparation from nitrobenzene-properties: reduction with ammonium sulphide, reaction with NaOH and K₃ [Fe(CN)₆].

d) p-Dinitrobenzene: preparation from p-nitro aniline-properties: reduction with ammonium sulphide.

UNIT III ORGANIC NITROGEN COMPOUNDS – II

(15Hours)

I.a) Aliphatic amines: Introduction-classification-methods of preparation of primary amine, from nitroalkanes, alkyl cyanides, acid amides, phthalimide and Grignard reagent-methods of preparation of secondary amines-reduction of alkylisocyanide: from ethylamine, dialkyl cyanides-methods of preparation of tertiary amines from alkyl halide, quaternary ammonium sulphate, separation of mixture of amines (Hoffmann method, Hinsberg method)-properties: basicity of amines, reaction with water, hydrogen chloride, acetyl chloride, nitrous acid, alkylation, aldehyde, ketones, halogenation, Grignard reagent, oxidation, CS₂ and carbylamine test.

ii) Distinction between primary, secondary and tertiary amines.

b) Aromatic amines:

Introduction-classification-methods of preparation of primary amines- reduction of nitro compounds-ammonolysis of aryl halides and ammonolysis of phenols-methods of preparation of primary and secondary amines from aniline, acetanilide-properties: basicity of amines, salt formation, acylation, sulphonylation, alkylation and arylation,

reaction with nitrous acid, oxidation, carbylamine reaction, aldehydes, CS₂, Grignard reagent, bromination, nitration and sulphonation.

c) Aralkylamines:

Benzyl amine: preparation from benzyl chloride, phenyl cyanide, phenylacetamide - properties: reduction, reaction with nitrous acid and oxidation.

(II) Diazo Compounds:

a) Aliphatic diazo compounds:

Diazomethane: Introduction-preparation from N-nitroso-N-methyl urea, nitrous oxide-properties: action of heat, reduction, reaction with mineral acid, carboxylic acids, phenols, alcohols and amines, carbonyl compounds, acid chloride, addition to ethylene and acetylene.

Diazoacetic ester: preparation from ethylglycine hydrochloride-properties: reactions with water, hydrochloric acid, acetic acid, ethanol, iodine, ethylene and acetylene-reduction.

b) Aromatic Diazo compounds.

Benzene diazonium chloride: Introduction-diazotization-preparation from aniline-properties: replacement by hydrogen, chlorine, iodine, fluorine, cyano group, nitro group, hydroxyl group, alkoxy group, reduction and coupling reaction.

UNIT-IV ALKALOIDS AND TERPENOIDS

(15 hours)

a) Alkaloids: Definition- occurrence- classification of alkaloids -extraction of alkaloids-general methods of determining the structure of alkaloids- -structure and synthesis of the following alkaloids: atropine, papaverine, coniine, piperine and nicotine.

b) Terpenoids: Definition- occurrence- classification- - isolation- isoprene rule- general properties- -general methods of determining structure- and structural elucidation of citral, geraniol, terpeniol, menthol and dipentene.

UNIT – V ALICYCLIC COMPOUNDS AND CONFORMATIONAL ANALYSIS

(15Hours)

a) Alicyclic compounds: Introduction-nomenclature-preparation: from dihalogen compounds, calcium salts of carboxylic acids, Dieckmann reaction-properties: reactions with halogens, halogen acids, reduction, oxidation, rearrangement reaction- relative stability of cycloalkanes – Bayer's strain theory and its modification.

b) Conformational analysis: Definition-differences between conformation and configuration-conformations and stability of ethane, 1, 2-dichloroethane, cyclohexane and methyl cyclohexane.

Text Books:

1. B.S.Bahl & Arun Bahl, "Advanced Organic Chemistry", S.Chand & Co. New Delhi-2008
2. P.L.Soni, H.M.Chawla, "Text Book of Organic Chemistry", Sultan Chand & Sons. New Delhi-1990

Reference Books:

1. K.S.Tewari, S.N.Mehrotra, N.K.Vishnoi, "A Text Book of Organic Chemistry" Vikas Publishing House Pvt Ltd, New Delhi-1987
2. I.L.Finar, "Organic Chemistry", Vol-I, Pearson Education-2003.
3. William Kemp, "Organic Spectroscopy" Third Edition, Palgrave, New York-2008.

Paper-VII

PHYSICAL CHEMISTRY-I

Semester: V

Hours/Week: 5

Subject Code:

Credits: 5

HOURS/SEMESTERS -75

Objectives:

This course covers the basic and detailed aspects of thermodynamics, phase rule, Physical properties and chemical constitution Colloidal state and Osmosis and Osmotic pressure

UNIT-I THERMODYNAMICS-I

(15 hours)

a) Importance of thermodynamics-concepts of a system, surroundings, energy-state variables-extensive, intensive properties-different types of processes-isothermal, adiabatic, isobaric, isochoric, reversible, irreversible processes and cyclic.

First law of thermodynamics-definition-mathematical expression-enthalpy and energy as thermodynamics properties-heat capacity at constant P and V- Relation between C_p and C_v -work done-heat absorbed and change in E-during adiabatic and isothermal changes for an ideal and real gas.

b) Zeroth law of thermodynamics and its significance

UNIT-II THERMODYNAMICS-II

(15 hours)

a) **Second law of thermodynamics:**

Need for second law-different ways of stating II law-Carnot cycle-Carnot's theorem-entropy as a thermodynamic property-Clausius inequality-dependence of entropy on variables of the system-entropy changes in ideal gases-entropy and probability

-work function and free energy-G and A as thermodynamic quantities-calculation of free energies-conditions for equilibrium and spontaneity- van't Hoff isotherm- van't Hoff isochore-Gibbs-Helmholtz equation-Clausius-Clapeyron equation and its applications.

b) **Third law of thermodynamics:**

Nernst heat theorem – Statement of Third law of Thermodynamics, determination of absolute entropy of solids, liquids and gases.

UNIT-III PHASE RULE

(15 hours)

- i) Statement and significance of the terms involved. Derivation of phase rule from thermodynamic derivation-application of phase rule to one-component system (water, sulphur system only)
- ii) Two component systems-simple eutectic system (lead-silver system only)-compound formation-congruent melting point (Zn-Mg system only)-incongruent melting point (Na-K system only)-salt hydrates ($\text{FeCl}_3\text{-H}_2\text{O}$ system only).
- iii) Thermodynamics of ideal solutions-Henry's law, Raoult's law-Binary liquid systems-partially miscible(phenol-water system), completely miscible and completely immiscible system-theory of fractional distillation and steam distillation.

UNIT IV PHYSICAL PROPERTIES AND CHEMICAL CONSTITUTION AND OSMOSIS AND OSMOTIC PRESSURE (15 HOURS)

a) Surface tension and chemical constitution ,viscosity and chemical constitution. Molar viscosity, Dipole moment ,dipole moment and molecular structure , Dipole moment- (definition – experimental determination – moments of linkages and groups – various applications)- ionic character Molar refraction and chemical constitution optical activity and chemical constitution. Magnetic properties – Magnetic susceptibility- para, dia and ferro magnetic – specific molar magnetic susceptibility and constitution – determination by Gouy's method.

b) Osmosis and Osmotic Pressure;

Definition- Osmosis -. Semipermeable membranes - Preparation of Cupric ferrocyanide membranes. Berkeley and Hartley's Method.Osmometer.Isotonic solutions. Theories of Osmosis. Molecular sieve Theory, Vapour Pressure Theory, Membrane Bombardment Theory, Reverse Osmosis, Desalination of sea water, Laws of Osmotic Pressure.

UNIT-V THE COLLOIDAL STATE (15 hours)

- i) Definition-various types of colloidal dispersion-classification of colloids-preparation of colloidal solutions-condensation method (double decomposition, hydrolysis, oxidation, and reduction)-dispersion methods (Bredig's method, peptization)
- ii) Purification of colloids (dialysis, electro dialysis, ultra filtration)

- iii) Properties of colloids-optical property(Tyndall effect), kinetic property (Brownian movement)-electrical properties (charge on colloidal particles, electrical double layer, zeta potential), coagulation of colloidal sols (flocculation value) protective action of sols(gold number) -electro kinetic properties (electrophoresis, electro osmosis)
- iv) Applications of colloids (Cottrell precipitator, sewage disposal, artificial rain, artificial kidney machine, blood, purification of water).

Text Books:

1. B.R. Puri and L.R.Sharma, "A Text Book of Physical Chemistry", Vishal Publications, 2004-05.

Reference Books:

1. Gurdeep Raj, "Advanced Physical Chemistry", Goel Publications, Meerut-1992
2. P.L.Soni, O.P.Dharmarha, "Text Book of Physical Chemistry", Sultan Chand & Sons. New Delhi-2001.
3. B.S.Bahl, G.D.Tuli, Arun Bahl," Essentials of Physical Chemistry," S.Chand & Company Ltd, New Delhi-2004

PAPER VIII
ORGANIC CHEMISTRY - II

Semester: VI

Hours/Week: 5

Subject Code:

Credits: 5

HOURS/SEMESTERS -75

Objectives:

- *To acquire an in depth knowledge related to molecular rearrangement, tautomerism and their mechanisms.*
- *To enable the students undertake the knowledge of heterocyclic compounds.*
- *To understand the chemistry and applications of biologically important compounds such as carbohydrates.*
- *To understand the application of chromatography techniques and MASS Spectrometry of organic compounds.*

UNIT–I: MOLECULAR REARRANGEMENTS AND TAUTOMERISM

(15 hours)

a) Molecular Rearrangements: Detailed mechanisms of the following rearrangements: pinacol-pinacolone, Hofmann, Claisen, benzidine, Beckmann and Fries rearrangements.

b) Tautomerism: Definition-classification of tautomerism-prototropy and anionotropy-
. A detailed study of i) keto-enol tautomerism

ii) nitro-acinitro tautomerism

iii) nitroso-isonitroso tautomerism

iv) lactam-lactim tautomerism

Differences between tautomerism and resonance-differences between tautomerism and isomerism.

UNIT-II HETEROCYCLIC COMPOUNDS

(15 hours)

- a) Preparation, synthesis and properties of pyrrole, furan, thiophene and pyridine
- b) Preparation, synthesis and reactions of oxazole, pyrazole, indole, quinoline, Isoquinoline.

UNIT-III CARBOHYDRATES

(15 hours)

Definition and classification-detailed study of monosaccharide-glucose and fructose-mutarotation-epimerisation-structure and configuration of glucose and fructose-comparison between glucose and fructose-methods of ascending and descending in the sugar series-interconversion between glucose and fructose-disaccharides-structure of maltose and lactose - hydrolysis of maltose and , lactose . Sucrose-preparation, properties and structure elucidation.

UNIT-IV CHROMATOGRAPHY

(15 hours)

Chromatography: Definition-principles of chromatography-types of chromatography-experimental technique and applications of column chromatography, thin-layer chromatography, paper chromatography, gas chromatography and high performance liquid chromatography (HPLC)-paper electrophoresis- R_f values and factors affecting R_f values.

UNIT-V MASS SPECTROMETRY

(15 hours)

Mass Spectrometry: i) Basic principles-Aston mass spectrometer-resolution of mass spectrometer.

ii) Mass spectrum-types of ions produced in a mass spectrometer-parent ions-rearrangement ions-isotope, ions-fragmentation, base peak (simple cleavage, Retro-Diels Alder reaction, Mc-Lafferty rearrangement, Nitrogen rule)-applications of mass spectrometry (Fragmentation patterns of organic compounds-alkanes, alkenes, alkyl halides, alcohols, aldehydes, ketones and amines).

Text Books:

1. B.S. Bahl and ArunBahl, "Advanced Organic Chemistry", S.Chand &Co, New Delhi,

2004-2005.

2. P.L. Soni, H.M.Chawla, "Text book of Organic Chemistry", Sultan Chand & Sons, New Delhi- 2003.

Reference Books:

1. I.L. Finar, "Organic Chemistry" Vol-II, Pearson Education Ltd., Delhi-2001
 2. William Kemp, "Organic Spectroscopy" Third Edition, Palgrave, New York-2008
 3. I.L. Finar, "Organic Chemistry," Vol-I, Pearson Education Ltd., Delhi-2003
 4. S.Usharani, "Analytical Chemistry", Macmillan India Ltd, New Delhi-2008.
 5. K.S. Tewari, S.N. Mehrotra, N.K. Vishnoi, "A Text book of Organic Chemistry", Vikas Publishing House Pvt Ltd- 1987.
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GREEN AND NANO CHEMISTRY

Semester: VI

Hours/Week: 5

Subject Code:

Credits: 5

HOURS/SEMESTERS -75

Objectives:

This course enables the students to acquire a basic knowledge of Green Chemistry and Nano chemistry. An in-depth study of synthesis of nanomaterials is also dealt.

UNIT-I GREEN CHEMISTRY-I (15 hours)

Need for Green chemistry-Goals of Green chemistry-Limitations/Obstacles-The progress of Green chemistry-Twelve principles of Green chemistry-Concept of Atom economy (Rearrangement reactions, Addition reactions, Substitution reactions and Elimination reactions)-Concept of selectivity (Chemo selectivity, Regioselectivity, Enantioselectivity and Diastereoselectivity).

UNIT-II GREEN CHEMISTRY-II (15 hours)

Green solvents (Supercritical carbon dioxide, Ionic liquids, water and organic synthesis in solid state) -Mode of supplying energy to a reaction (Use of microwaves and Use of sonication)-Basic concepts in designing a Green synthesis (Choice of starting materials, reagents, catalysts and solvents) Synthesis of Adipic acid, Catechol, BHT, Methyl methacrylate, Urethane, Benzyl bromide, Acetaldehyde, Citral, 4-aminophenylamine and Paracetamol.

UNIT-III GREEN CHEMISTRY-III (15 hours)

Microwave assisted reactions in water (Hofmann elimination, Hydrolysis of benzyl chloride, Hydrolysis of Benz amide, Hydrolysis of methyl benzoate, Oxidation of toluene and Oxidation of alcohols) - Microwave assisted reactions in Organic solvents (Esterification, Fries rearrangement, Orthoester Claisen rearrangement, Diels Alder reaction and Decarboxylation)-Microwave assisted solvent-free reactions (deprotection, saponification, alkylation of reactive methylene compounds, synthesis of nitriles from aldehydes, synthesis of anhydrides from dicarboxylic acids, synthesis of pyridines and

synthesis of Benzimidazoles)-Ultrasound assisted reactions (esterification, saponification, substitution reactions, alkylation, oxidations, reductions and coupling reactions)-Future trends in Green Chemistry.

UNIT-IV NANO CHEMISTRY -I

(15 hours)

Characterisation of Nanomaterials-Stability of Colloidal solutions-Synthesis of metal Nanoparticles top-down and bottom up approach - physical methods (Laser Ablation, Physical Vapour Deposition (Evaporation and Sputtering) and Solvated Metal Atom Dispersion)-Synthesis by chemical methods (Thermolysis, Sonochemical Approach, Reduction by hydrogen, Reduction by methanol, Borohydride reduction and Alkali metal reductions)-Biosynthesis of Nanoparticles.

UNIT-V NANO CHEMISTRY -II

(15 hours)

Synthesis of Nanosized semiconductors (Precipitation methods and Thermal decomposition of complex precursors)-Synthesis of ceramics by physical methods (Gas condensation method and Laser method) and chemical method (Sol-Gel synthesis)-Preparation of Nitrides and Carbides-Properties of Nanostructure materials (Size effects, Optical and electronic properties, magnetic properties)-Application of nanomaterials.

Text books:

1. V.Kumar, "An Introduction to Green Chemistry", First Edition, Vishal Publishing Co, New Delhi-2007.
2. F.J.Ownes, "Introduction to Nanotechnology", Academic Press, Santiago, 2000.

Reference books:

1. Kenneth, J.Klabunde, "Nanoscale Materials in Chemistry", Wiley Interscience, 2001.
2. R.Sanghi, M.M. Srivastava, "Green Chemistry", Narosa Publishing House, New Delhi-2003.
3. V.K.Ahulwalia, M.Kidwai, "New Trends in Green Chemistry", Second Edition, Anamaya Publishers, New Delhi- 2004.

PAPER X

PHYSICAL CHEMISTRY -II

Semester: VI

Hours/Week: 5

Subject Code:

Credits: 5

HOURS/SEMESTERS-75

Objectives:

This course covers the basic and detailed aspects of photochemistry, electrochemistry, molecular spectroscopy and group theory.

UNIT-I PHOTOCHEMISTRY

(15 hours)

- i) Definition of photochemical reaction-differences between thermal and photochemical reactions-laws of photochemistry [Lambert, Beer's law and Stark-Einstein's law]-quantum yield-explanation of low and high quantum yield-experimental determination of quantum yield
- ii Jablonski diagram, Non-radiative transition(IC and ISC) and radiative transition (Fluorescence and Phosphorescence) - differences between fluorescence and phosphorescence, chemiluminescence and bioluminescence , Photosensitization ,
- iii) Kinetics of photochemical reactions- hydrogen-chlorine, hydrogen-bromine reaction.

UNIT-II ELECTROCHEMISTRY-I

(15 hours)

- i) Conductance-definition-specificconductance-equivalent conductance- molar conductance-effect of dilution on equivalent conductance-cell constant-electrolytic dissociation-degree of dissociation
- ii) Ionic mobility-kohlrausch's law and its applications-Ostwald's dilution law-theory of strong electrolytes-Debye-Huckel Onsager theory of strong electrolytes (relaxation effect, electrophoretic effect)
- iii) Common ion effect-buffer solutions-theory of buffer action-applications of buffer solutions-Henderson's equation)-solubility product and its applications(determination of solubilities of sparingly soluble salts, predicting precipitation reactions)-hydrolysis, degree of hydrolysis and hydrolysis constants-relation between the hydrolysis constant

and dissociation constant-conductometric titrations, acid-base titration (NaOH vs HCl, CH₃COOH vs NaOH) and precipitation titrations(NaCl vs AgNO₃).

UNIT-III ELECTROCHEMISTRY-II (15 hours)

Electrochemical cells-Galvanic cells and Electrolytic cell-electrode reaction, electrode potential and standard electrode potentials(electrochemical series) -thermodynamics of cells- EMF and measurement of EMF-representation of electrodes -sign conventions for electrodes- -different types of electrodes (metal-metal ion electrode, gas electrode, calomel electrode, oxidation-reduction electrode)- cells (standard western cadmium cell, lead storage battery)- fuel cells (hydrogen-oxygen fuel cells)-concentration cells (electrode concentration cells, electrolyte concentration cells)-Types of electrolyte concentration cell(concentration cells without transference and concentration cells with transference)-Liquid junction potential and salt bridge-applications of EMF measurements (determination of pH, potentiometric titration)-over voltage.

UNIT-IV MOLECULAR SPECTROSCOPY-I (15 hours)

a) Vibrational-rotational spectroscopy (Infra-red spectroscopy): Introduction-derivation of force constant of diatomic molecule-vibrational energy levels-selection rules-modes of vibration of atoms in poly atomic molecules-CO₂, H₂O (stretching and bending vibration)-applications,detection of functional group (OH, COOH, NH₂, NO₂, CO),study of hydrogen bonding and finger print region.

b) Raman spectroscopy: Introduction-types of scattering-stokes lines-anti stokes lines-quantum theory of Raman effect-selection rules-advantages of Raman spectroscopy over IR spectroscopy-rule of mutual exclusion-applications (structure of CO₂, H₂O, N₂O).

UNIT-V GROUP THEORY (15 hours)

Introduction-symmetry elements and symmetry operations- rules of a group, order of a group - classes and similarity transformation- point group classification (C_{2v},C_{3v},C_{2h},C_{3h},D_{2h},D_{3h},D_{4h},D_{6h},T_d,O_h) – matrix representation of symmetry operation (reflection) – reducible and irreducible representations-Great orthogonality theorem construction of character table (C_{2v} only) .

Text Books:

1. Puri, Sharma, Pathania, "Principles of Physical Chemistry," Vishal Publishing Co, Jalandhar-2004

Reference Books

1. K.K. Rohatgi-Mukherjee, "Fundamentals of Photochemistry", Willey Eastern Ltd., New York-1994.
2. P.K.Bhattacharya, "Group Theory and applications", Himalaya Publishing House-1996.
3. Gurdeep Chatwal, Sham Anand, "Spectroscopy (atomic and molecular)," Himalaya Publishing House, Mumbai-20014.
4. V. Ramakrishna and M.S. Gopinathan "Group Theory in Chemistry", Vishal Publishing Co-2007.
5. Colin, N. Banwell and Elaine M. McCash, "Fundamentals of molecular spectroscopy," Tata McGraw-Hill Publishing Company Limited, New Delhi-1996.

MAJOR PRACTICAL – III
GRAVIMETRIC ANALYSIS AND ORGANIC
PREPARATION/SEPARATION

(At the end of the THIRD YEAR)

Semester : V & VI

Hours/week :3

Subject code :

Credit :3

INTERNAL : 40 Marks

EXTERNAL:60 Marks

CREDIT : 4

Note: 1. For Practical Record – 10 marks

2. For gravimetric analysis – 35 marks

3. For organic preparation – 15 marks

I. Gravimetric Analysis (35 marks)

20% of the marks is allotted for writing the procedure.

1. Estimation of lead as lead chromate
2. Estimation of barium as barium chromate
3. Estimation of calcium as calcium oxalate monohydrate
4. Estimation of nickel as DMG complex

II. Organic preparation / Separation (15 marks)

20% of the marks is allotted for writing the procedure.

Preparations involving the following reactions.

1. Preparation of ACETANILIDE from ANILINE.
2. Preparation of BENZOICACID from BENZAMIDE.
3. Preparation of BENZANILIDE from ANILINE.
4. Preparation of PHENYLBENZOATE from PHENOL.
5. Preparation of 2-NAPHTHYL BENZOATE from 2-NAPHTHOL.
6. Preparation of GLUCOSAZONE from GLUCOSE.
7. Preparation of SALICYLIC ACID from SALICYLATE.

MAJOR PRACTICAL-IV
ORGANIC ANALYSIS AND ESTIMATION
(At the end of the THIRD YEAR)

Semester: V & VI

Hours/week: 2

Subject Code:

Credits: 2

INTERNAL: 40 MARKS

EXTERNAL: 60 MARKS

Note: 1. For Practical Record - 10 marks

2. For Experiment and Results - 50 marks

Organic Analysis 25 marks, Organic estimation 25 marks

Distribution of marks for Estimation

Procedure (5 marks)

Estimation (20 marks)

Error <1% - 20 marks

Error upto 2% - 15 marks

Error upto 3% - 10 marks

Error upto 4% - 5 marks

Error >4% - 3 marks

I. Organic estimation (25 marks)

1. Estimation of phenol
2. Estimation of aniline

II. Organic Analysis (25 marks)

i) Analysis of the following functional group (any one) containing organic substance (aliphatic or aromatic) stating saturation or unsaturation and confirmation by the preparation of a solid derivative:

Acids, phenols, aldehydes, ketones, esters, nitro compounds, amines (primary amines only), amides, anilides and monosaccharide – glucose and fructose.

MAJOR PRACTICAL-V
PHYSICAL CHEMISTRY PRACTICAL
(At the end of the THIRD YEAR)

Semester : V & VI

Hours/week : 3

Subject Code: U3CCYL4

Credits: 3

INTERNAL: 40 MARKS

EXTERNAL: 60 MARKS

- Note:** 1. For Practical Record - 10 marks
2. For Experiment and Results - 50 marks

1. Determination of molecular weights by

Transition temperature method: sodium thiosulphate penta hydrate,
Cryoscopic method: Rast's macro method- naphthalene

2. Phase diagram involving

Simple eutectic system

3. Critical solution temperature:

Estimation of sodium chloride by studying the impurity on CST of phenol-water system

4. Thermo chemistry:

Heat of solution- Ammonium oxalate- water system

5. Viscosity:

Determination of the composition of an unknown mixture.

6. Conductometric Titration:

Titration between an acid (HCl) and a base (NaOH)

7. Potentiometric Titration:

- i) Titration between ferrous ammonium sulphate and potassium permanganate
- ii) Titration between ferrous ammonium sulphate and potassium dichromate.

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SELF-STUDY PAPER (OPTIONAL)

NON-CONVENTIONAL & RENEWABLE SOURCES OF ENERGY

Semester: V

Number of Credits: 3

Subject Code:

Course Objectives:

- *To have an exposure to the different forms of non-conventional and renewable sources of energy available to meet the present day energy demand.*

UNIT- 1: Introduction

Energy sources and their availability- renewable and non-renewable sources of energy- conventional energy sources- non-conventional sources of energy-population growth and energy use- conservation of energy- energy planning- reasons for the requirement of non-conventional energy sources.

UNIT- II: Solar Energy-I

Solar energy- solar radiation at the earth's surface- solar energy collectors- physical principles of the conversion of solar radiation into heat- solar energy collectors-non-concentrating and concentrating collectors-

UNIT- III: Solar Energy-II

A) Solar energy storage- thermal storage- electrical storage- chemical storage- thermochemical energy storage

B) Applications of solar energy- solar water heating- solar cooking - solar thermal electric conversion- solar electric power generation (photo-voltaic cells) -.agriculture and industrial process of heating-

UNIT- IV: Wind Energy & Energy from Ocean:

A) Wind Energy: wind energy conversion- wind energy collector- advantages and disadvantages of wind energy- applications of wind energy.

B) Energy from Oceans: methods of ocean thermal electric power generation-Claude cycle and Anderson cycles energy from tides-basic principle of tidal power- advantages and disadvantages of tidal power generation- prospects of tidal energy in India; Wave energy- advantages and disadvantages of wave energy.

.UNIT- V: Geothermal Energy, Energy from biomass & Bio-Fuels

A) Geothermal Energy: Geothermal sources- hydrothermal- geopressure-magma- advantages and disadvantages of geothermal energy- geothermal energy in India.

B) Energy from biomass: Biomass resources- biomass generation- biogas plant used in India- biomass gasification

C) Bio fuels: Ethanol to substitute petrol- fuel from sorghum- petrocrops an alternative to future fuels

REFERENCE BOOKS:

1. G.D. Rai, “Non-Conventional Energy Sources”, Second Edition, Kanna Publications: 1992.
2. B.K. Sharma, “Environmental Chemistry” Goel Publishing House, Meerut;1996-97

YADAVA COLLEGE, MADURAI-625014
DEPARTMENT OF CHEMISTRY
SELF STUDY PAPER (OPTIONAL)
CHEMISTRY OF BIOMOLECULES

Semester: VI

Number of Credits: 3

Subject Code:

Course Objective:

- To gain knowledge about the concept and scope of bio-molecules like amino acids and proteins, nucleic acids, enzymes and oils and fats.

UNIT-I: Amino acids and Proteins:

a) Amino acids: Definition- classification- synthesis of α -amino acid (Gabriel synthesis, Koop

synthesis)- properties of amino acids (isoelectric point, action of heat, peptide formation).

b) Proteins: Definition- classification (simple and conjugated proteins)- properties of proteins

(colloidal nature, isoelectric point, denaturation, hydrolysis)- colour tests for proteins (biuret test, ninhydrin test)- structure of proteins (primary, secondary, tertiary and quaternary).

UNIT-II: Nucleic acids:

Definition- nucleosides- nucleotides- function of nucleotides- nucleotide as energy carriers- types of nucleic acids- structure of DNA- replication of DNA- functions of DNA-structure and functions of RNA- biological aspects of ageing.

UNIT-III: Vitamins and Hormones:

a) Vitamins: Definition- classification- source- function and deficiency disease of vitamins A, B complex, C, D, E and K.

b) Hormones: Definition- classification- main functions of following hormones- Adrenaline, Cortisone, Testosterone, Estrone, Insulin, pituitary hormones, and thyroxin. Differences between hormones and vitamins.

UNIT – IV: Enzymes:

Definition – classification- coenzyme- mechanism of enzyme action- factors influencing enzyme activity- enzyme inhibition (competitive inhibitor, non-competitive inhibitor and end product inhibition)- role of enzymes in the digestion of food.

UNIT- V: Oils and Fats:

Introduction- classification-composition of oils and fats- extraction and refining of oils- properties (saponification, hydrogenation , rancidity) -analysis of oils and fats (saponification value, acid value, iodine value, Reichert-Meissl value) - uses of oils and fat.

Reference Books:

1. P.L.Soni, H.M.Chawla, “Text Book of Organic Chemistry”, Sultan Chand & Sons, New Delhi; (2003).
2. Arun Bahl, B.S.Bahl, “Advanced Organic Chemistry”, S.Chand & Company Ltd, New Delhi; (2007).
- 3 .K.S.Tewari, S.N.Mehrotra, N.K.Vishnoi, “A Text Book of Organic Chemistry”, Vikas Publishing House Private Ltd, New Delhi; (1987).

DEPARTMENT OF CHEMISTRY
YADAVA COLLEGE, MADURAI-14
Certificate Course on Analytical Chemistry
PAPER- I: INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS

Semester:

Subject Code:

TOTAL HOURS/ SEMESTER: 45

OBJECTIVES:

1. To prepare the student to acquire specialization in Analytical Chemistry
2. To enable the students to get employed as Analytical Chemist in industrial laboratories.
3. To learn the basics of Column Chromatography Analysis.
4. To know about the Spectrophotometric determination of Nickel Using Dimethylglyoxime and identification of Organic compounds using UV- visible Spectrophotometer.
5. To know about the determination of Physico Chemical parameters of Water and Waste water analysis.
6. To get an insight into modern experimental techniques in the field of Analytical Chemistry.

UNIT I ANALYTICAL CHEMISTRY AND ROLE OF ANALYTICAL CHEMISTRY

(9 Hours)

a) ANALYTICAL CHEMISTRY: Introduction-Qualitative Analysis-Quantitative Analysis-Phase Analysis .

b) ROLE OF ANALYTICAL CHEMISTRY: Clinical Tests-Quality Control of Drugs-Role in Industry-Environmental Quality-Food Analysis-High Purity Materials-Miscellaneous Applications.

UNIT II_ CLASSIFICATION OF ANALYTICAL METHODS

(9 Hours)

Classical or Chemical Methods -Gravimetric Method- Gas Analysis- Advantages of Classical Methods-Limitations or Disadvantages of Classical methods – Instrumental or Physicochemical methods of Analysis- Advantages of Instrumental methods- Limitations of instrumental methods- differences between Classical and Instrumental methods.

UNIT III: INSTRUMENTAL ANALYSIS AND COLUMN CHROMATOGRAPHY

(9 Hours)

a) Types of Instrumental Analysis: Electrochemical methods- Basic concepts of (Electrogravimetry-Coulometry-Potentiometry- Conductometry-Polarography) Basic concepts of Optical methods- (Emission spectroscopy-luminescence analysis- X-ray spectroscopy- Raman spectroscopy- Atomic Absorption spectrophotometry- Turbidimetry- Mass spectrometry- Nuclear magnetic resonance- Nephelometry-Refractometry) Radiometric Methods – (Isotopic Dilution)

b) Sensitivity and Detection limits- Selection of an Analytical method- Comparison of some common Quantitative Analytical methods.

C) Chromatography Analysis –

(i) Basic principles of GC and HPLC.

(ii) Extraction of pigments from Spinach – Identification of pigments by Thin Layer Chromatography and Column Chromatography.

(iii) Separation of mixture of o-nitro phenol and p-nitro phenol, separation of β -carotene from Carrot extract by Column Chromatography.

UNIT-IV SPECTROPHOTOMETER AND UV-VISIBLE SPECTROPHOTOMETER

(9 Hours)

a) Basic concept of Beer-lambert's law.

b) Spectrophotometric determination of Nickel using Dimethylglyoxime.

c) Identification of Organic compounds using UV-Visible Spectrophotometer(o-nitro phenol, p-nitro phenol and β -carotene).

Unit V WATER ANALYSIS

(9 Hours)

a) Water and Waste Water Analysis (Determination of Physico-Chemical parameters in Water and Waste Water Analysis).

Text books:

1. Dhanpat Rai & Jain and Jain, "Engineering Chemistry, Publishing, 2008".
2. R. Gopalan, P. S. Subramanian, K. Rengarajan", Elements of Analytical Chemistry," Sultan Chand & Sons 2005.
3. S. Usha Rani, "Analytical Chemistry," Maxmillan India Ltd, New Delhi 2008.
4. K. S. Tewari, S. N. Mehrotra, N. K. Vishnoi," A Text Book of Organic Chemistry", Vikas Publishing 1979.
5. Gurdeep R. Chatwal," Analytical Chemistry," Himalaya Publishing House-2008.

Reference Books:

- 1 Dr. P. Asokan," Analytical Biochemistry," Chinnaa Publications-2006.
- 2 K.B. Baliga,S. M. Shetty,S. A. Zaveri, A. P. Taggarse,"College Analytical Chemistry," Himalaya Publishing House-1997.
- 3 S. M. Khopkar," Basic Concepts of Analytical Chemistry", Wiley Eastern Limited - 1984.
- 4 U. N. Dash," Analytical Chemistry Theory and practice," Sultan Chand & Sons - 2005.
- 5 Gurdeep R. Chatwal, Sham K. Anand, "Instrumental Methods of Chemical Analysis", Himalaya Publishing House - 2006.
- 6 <https://users.stlcc.edu/mhauser/Col%20Chrom.pdf>
- 7 http://www.physics.iitm.ac.in/courses_files/courses/gplab03_odd/spectrophotometer.htm

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DEPARTMENT OF CHEMISTRY

CBCS SYLLABUS (From 2015 – 16 onwards)

For B.Sc., Chemistry Major & Ancillary