PG and Research Department of Chemistry

Poompuhar College (Autonomous)

Melaiyur-609107

B.Sc., Chemistry

CHOICE BASED CREDIT SYSTEM
SYLLABUS
2019- 2020 ONWARDS

POOMPUHAR COLLEGE (AUTONOMOUS), MELAIYUR -609107

Course structure under CBCS

B.Sc., Chemistry

(for the candidates admitted from the academic year 2019-2020 onwards

SEMESTER	PART	COURSE	TITLE	INSTRUCTION HOURS/WEEK	CREDIT	EXAM HOURS	MARKS INTERNAL	MARKS EXTERNAL	TOTAL
I	I	Language Course - I (LC)-Tamil	Tamil-I	6	3	3	25	75	100
	II	English Language Course - I (ELC)	English – I	6	3	3	25	75	100
	III	Core Course –I (CC)	General Chemistry - I	5	5	3	25	75	100
		Core Course – II (CC)	Semi- Micro Analysis (P)	3	*	*	*	*	*
		First Allied Course - I (AC)	Physics – I	5	3	3	25	75	100
		First Allied Course - II (AC)	Physics (P)	3	*	*	*	*	*
	IV	Value Education	Value Education	2	2	3	25	75	100
			Total	30	16				500
II	I	Language Course - II (LC)-Tamil	Tamil-II	6	3	3	25	75	100
	II	English Language Course - II (ELC)	English – II	6	3	3	25	75	100
	III	Core Course –II (CC)	Semi- Micro Analysis (P)	3	5	3	40	60	100
		Core Course – III (CC)	General Chemistry - II	5	5	3	25	75	100
		First Allied Course - I (AC)	Physics (P)	3	4	3	40	60	100
		First Allied Course - II (AC)	Physics – II	5	3	3	25	75	100
	IV	Environmental Studies	Environmental Studies	2	2	3	25	75	100
			Total	30	25				700
III	I	Language Course - II (LC)-Tamil	Tamil-III	6	3	3	25	75	100
	II	English Language Course - II (ELC)	English – III	6	3	3	25	75	100
	III	Core Course –IV (CC)	General Chemistry - III	5	5	3	25	75	100
		Core Course – V(CC)	Volumetric Analysis (P)	3	*	*	*	*	*
		Second Allied Course - I (AC)	Maths – I/ Zoology	5	3	3	25	75	100
		Second Allied Course – II(AC)	Maths – II/ Zoology (P)	3	*	*	*	*	*
	IV	Non Major Elective -I	Energy Physics	2	2	3	25	75	100
			Total	30	16				500

SEMES	PART	COURSE	TITLE	INSTRUCTION	CREDIT	EXAM HOURS	MARKS I	MARKS EXTER	TOTAL
IV	I	Language Course - IV (LC)- Tamil	Tamil-IV	6	3	3	25	75	100
	II	English Language Course – IV (ELC)	English – IV	6	3	3	25	75	100
	III	Core Course –V (CC)	Volumetric Analysis (P)	2	5	3	40	60	100
		Core Course – VI (CC)	General Chemistry IV	5	5	3	25	75	100
		Second Allied Course - II (AC)	Maths – II / Zoology (P)	2	4	3	25/40	75/60	100
		Second Allied Course - III (AC)	Maths – III / Zoology-II	5	3	3	25	75	100
	IV	Non Major Elective - II	Laser Physics	2	2	3	25	75	100
		Skill Based Elective - I	Adulteration in common food items	2	2	3	25	75	100
			Total	30	27				800
V	III	Core Course – VII (CC)	Inorganic Chemistry - I	5	5	3	25	75	100
		Core Course – VIII (CC)	Organic Chemistry - I	5	5	3	25	75	100
		Core Course – IX (CC)	Physical Chemistry - I	5	5	3	25	75	100
		Core Course – X (CC)	Physical Chemistry (P)	3	*	*	*	*	*
		Core Course – XI (CC)	Gravimetric and Organic analysis (P)	3	*	*	*	*	*
		Major based elective - I	Analytical Chemistry	5	4	3	25	75	100
	IV	Skill Based Elective - II	Analytical aspects of some common drugs	2	2	3	25	75	100
		Skill Based Elective - III	Detection of Adulteration in food (P)	2	2	3	40	60	100
			Total	30	23				600
VI	III	Core Course – X (CC)	Physical Chemistry (P)	3	5	3	40	60	100
		Core Course – XI (CC)	Gravimetric and Organic analysis (P)	4	5	3	40	60	100
		Core Course – XII (CC)	Inorganic Chemistry - II	5	5	3	25	75	100
		Core Course – XIII (CC)	Organic Chemistry - II	5	5	3	25	75	100
		Core Course – XIV(CC)	Physical Chemistry- II	5	5	3	25	75	100
		Major based elective - II	Agricultural Chemistry	5	4	3	25	75	100
	IV	Soft Skills development	Soft Skills development	2	2	3	25	75	100
		Gender Studies	Gender Studies	1	1	3	25	75	100
	V	Extension Activities	Extension Activities	-	1	-	-	-	-
			Total	30	33				800
			Grand Total		140				3900

Programme Outcomes: The B.Sc. Program is successful in imparting the students the following qualities

PO1: Disciplinary Knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.

PO2: Critical Thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.

PO3: Problem Solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's earning to real life situations.

PO4: Analytical&Scientific Reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing viewpoints.Ability to analyse, interpret and draw conclusions from quantitative / qualitative data; and critically evaluate ideas, evidence, and experiences from an open minded and reasoned perspective.

PO5: Self-directed & Lifelong Learning: Ability to work independently, identify and manage a project. Ability to acquire knowledge and skills, including "learning how to learn", through self-placed and self-directed learning aimed at personal development, meeting economic, social and cultural objectives.

PROGRAMME SPECIFIC OUTCOMES for UG

(PSOs): The B.Sc. Chemistry Program is successful in imparting the students the following qualities.

PSO 1: Gain knowledge in terms of principles, concepts, techniques and processes in core chemistry and related disciplines

PSO 2: Acquire analytical skills through practical training using latest techniques, interpretation and presentation of data and skill sets in solving complex problems

PSO 3: Analyse and evaluate scientific, socio-economic problems and provide independent solutions based on modern scientific approach

PSO 4: Utilise the basic principles in the domain of chemistry and exchange ideas to sensitize the impact of the same on industry at large

PSO 5: Apply the theoretical and experimental ideas of chemistry in building a safe environment and acquire entrepreneurship skills through effective communication

SEMESTER – I CORE COURSE – I

GENERAL CHEMISTRY – I

UNIT I

CLASSIFICATION AND NOMENCLATURE OF ORGANIC COMPOUNDS

1.1. Classification based on the nature of carbon skeleton and functional groups - classification of C and H atoms (primary/secondary/tertiary) - IUPAC system of nomenclature of common organic compounds (upto C-10) - alkanes, alkenes, alkynes, cycloalkanes and simple aromatic hydro carbons.

1.2. Naming of organic compounds with one functional group - halogen compounds, alcohols, aldehydes, ketones, carboxylic acids and its derivatives. Cyano compounds, amines, nitro compounds (Both aliphatic and aromatic), phenol. Naming of compounds with two functional groups - naming of compounds with branched carbon chains.

1.3. Naming of heterocyclic compounds containing one and two hetero atoms present in five/six membered rings.

UNIT II

COVALENT BONDING IN ORGANIC MOLECULES, ELECTRONIC EFFECT AND REACTIVE INTERMEDIATES

2.1. Covalent bonding – Concept of hybridization – Structure of organic molecules based on sp^3, sp^2 and sp hybridization.

2.2. Covalent bond properties of organic molecules bond length, bond angle – bond strength of C-H and C – C bonds – bond polarity – dipole moment - Vander Waal's interactions, Inter & Intra molecular forces and their effects on physical properties. Electronic effects: inductive effect, resonance effect - drawing of resonance structures – conditions for resonance - stability of resonance structure. Hyperconjucation – electromeric effect- steric effect- steric overcrowding- steric inhibition of resonance - steric enhancement. Influence of electronic effects – dipole moment - relative strengths of acids and bases - stability of olefins.

2.3 Dissociation of bonds – homolysis and heterolysis - formation and stability of radicals, carbocations and carbanions.

UNIT III

ATOMIC STRUCTURE AND PERIODIC PROPERTIES

3.1. Atomic orbitals, Quantum numbers – principal, azimuthal, magnetic and spin quantum numbers and their significance – principles governing the occupancy of electrons in various quantum levels – pauli's exclusion principle, Hund's rule, Aufbau principle, (n+l) rule, stability of half – filled and fully filled orbitals.

3.2. Classification as s, p, d, & f block elements, periodic properties of elements - atomic volume, atomic and ionic radii, ionization potential, electron affinity and electronegativity along periods and groups – variation of metallic characters – Factors influencing the periodic properties.

UNIT IV

PRINCIPLES OF VOLUMETRIC ANALYSIS

4.1. General principle: Types of titrations. Requirements for titrimetric analysis. Concentration systems: Molarity, molality, normality, ppm -problems. Primary and secondary standards, criteria for primary standards, preparation of standard solutions, standardization of solutions. Limitation of volumetric analysis, endpoint and equivalence point.

4.2. Neutralisation - titration curve, theory of indicators, choice of indicators. Use of phenolphthalein and methyl orange. Complexometric titrations: Stability of complexes, titration involving EDTA. Metal ion indicators and its characteristics. Problems based on titrimetric analysis.

UNIT V

ATOMIC STRUCTURE AND BASIC QUANTUM MECHANICS

5.1 Rutherford's and Bohr's models of atom – Bohr's theory and origin of hydrogen spectrum. Sommerfield's extension of Bohr's theory.

5.2 Electromagnetic radiation – definitions for Wavelength, Wave number and frequency.

5.3 Dualism of light – Particle nature of radiation – black body radiation and Planck's quantum theory, photo electric effect and Compton effect. De Broglie equation - Heisenberg's uncertainty principle. Schrodinger wave equation (Derivation not needed). Wave functions and its physical significance of Ψ and Ψ^2.

REFERENCES

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
2. P.L. Soni, "Text book of Inorganic Chemistry", 20th revised edition, Sultan Chand & Sons, 2000.
3. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rd edition, New Delhi, ShobanLalNagin Chand & Co., (1993).
4. J.D. Lee, ,,Concise Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
5. Morrison, R.T. and Boyd, R.N., Bhattacharjee, S. K. Organic Chemistry (7th edition), Pearson, India, (2011).
6. Bahl, B.S. and Bahl, A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010).
7. Puri B.R., Sharma L.R. and Pathania M.S. Principles of Physical Chemistry, (35th edition), New Delhi- ShobanLalNaginchand and Co. (2013).
8. Glasstone S. and Lewis D., Elements of Physical Chemistry, London, Mac Millan& Co Ltd.
9. A.I. Vogel, A Textbook of Quantitative Inorganic Analysis, ELBS and Longman London, 1975.
10. S.M. Khopkar, Basic Concepts of Analytical Chemistry New Age International Publisher, 2009.

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	2	3	2
CO4	3	3	3	3	3
CO5	3	3	3	3	2

SEMESTER - I & II

CORE COURSE – II **CORE PRACTICAL - I**

SEMIMICRO INORGANIC QUALITATIVE ANALYSIS

Analysis of a mixture containing two cations and two anions of which one will be an interfering ion. Semi-micro methods using the conventional scheme with sodium sulphide may be adopted.

Cations to be studied:

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

Anions to be studied:

Carbonate, Sulphate, Nitrate, Chloride, Flouride, Borate, Oxalate and Phosphate.

Note:

Internal Marks- 40

External marks- 60

Marks Distribution for external

Practical	- 50 Marks
Record	- 10 Marks
Total	- 60 Marks
4 radicals correct with suitable tests	- 50 Marks
3 radicals correct with suitable tests	- 40 Marks
2 radicals correct with suitable tests	- 30 Marks
1 radicals correct with suitable tests	-15Marks
Spotting	- 05 Marks

REFERENCE

1. Venkateswaran V. VeerasamyR.Kulandaivelu A.R., Basic principles of practical Chemistry. 2nd edition, New Delhi,Sultan Chand & sons (1997).

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	2	3
CO3	3	2	3	3	3
CO4	3	3	3	3	3
CO5	3	3	2	3	3

FACULTY **UNIVERSITYNOMINEE** **HOD**

SEMESTER - I Value Education (மதிப்புக் கல்வி)

(Common to All UG Courses)

அலகு – I வாழ்வியல் தத்துவம்

வாழ்க்கை (ப. 2, குறள் - 629) – வாழ்வின் நோக்கம் (ப.61, குறள் - 46) – வாழ்க்கைத் தத்துவம் (ப. 61 - 69 குறள் - 131, 226) - இயற்கை நியதி (ப. 123 – 125, குறள் - 374) – பிற உயிர் பேணல் (ப. 137,138 குறள் - 322,327).

அலகு – II தனிமனிதப் பண்புகள்

பண்பாடு (ப. 132 - 136, குறள் - 72, 431) எண்ணம் ஆராய்தல் (ப. 70 – 77, 666, 282, 467) ஆசை சீரமைத்தல் (ப. 79 – 86, குறள் - 367) சினம் தவிர்த்தல் (ப. 87 - 98, குறள் - 158, 305, 306, 314) கவலை ஒழித்தல் (ப. 99 – 108, குறள் - 629) வாழ்த்தும் பயனும் (ப. 109 - 114, குறள் - 3)

அலகு – III சமுதாய மதிப்புகள் (குணநலப்பேறும், சமுதாய நலனும்)

குடும்பம் (ப. 87, குறள் - 45) – குடும்ப அமைதி (ப. 87 - 90, குறள் - 1025) சமுதாயம் (ப. 93, குறள் - 446) – வாழக்கை முறை (ப. 101 - 103, குறள் - 952) – சகோதரத்துவம் (ப. 103 - 106, குறள் - 807) – பெண்ணின் பெருமை (ப. 99 - 100, குறள் - 56) ஐவகைக் கடமைகள் (தான், குடும்பம், சுற்றம், ஊர், உரகம்) (ப. 93 - 96, குறள் - 43,984) பொருளதாரம் (ப. 121 - 123, குறள் - 754) – சுகாதாரம் - (ப. 123, குறள் - 298) – கல்வி (ப. 113, 123, 127, 128, குறள் - 400) – அரசியல் (ப. 124, குறள் - 691) மக்களின் பொறுப்பு (ப. 125, குறள் - 37) உலக அமைதி (ப. 103 - 106, குறள் - 572).

பார்வை நூல்கள்

1. மனவளக்கலை யோகா, உலகு சமுதாய சேவா சங்கம், வேதாத்திரி பதிப்பகம், 156, காந்திஜி ரோடு, ஈரோடு 635 001 Web site: www. vethathiri.Org. முதற்பதிப்பு 2008 விலை ரூ. 70/-

2. குணநலப்பேறும், சமுதாய நலனும், உலக சமுதாய சேவா சங்கம், வேதாத்திரி பதிப்பகம், 156, காந்திஜி ரோடு,ஈரோடு 635 001Web site: www. vethathiri.Org. இரண்டாம் பதிப்பு ஆகஸ்டு 2008.

FACULTY UNIVERSITYNOMINEE HOD

SEMESTER- II

CORE COURSE- III

GENERAL CHEMISTRY- II

UNIT I

Aliphatic Compounds

1.1 Alkanes: preparations, physical properties, reactions, reactions with radical mechanism for substitution reaction – cracking.

1.2 Alkenes: Preparation from alcohol, haloalkane, dihaloalkanes and alkynes - reactions of alkenes - mechanisms involved in addition of hydrogen, halogen, hydrogen halide, hypohalous acid, water, hydroboration, hydroxylation, ozonolysis and epoxidation - peroxide effect - allylic substitution, oxidation by $KMnO_4$ and polymerization.

1.3 Alkynes: preparation, reactions - addition of hydrogen, halogen, hydrogen halide, water, HCN, CH_3COOH, hydroboration - dimerisation and cyclisation - acidity of terminal alkynes.

UNIT II

Alicyclic Compounds

2.1 Cycloalkanes: Preparation (small, medium & large ring compounds) - reactions - cycloaddition, dehalogenation, pyrolysis of calcium salt of dicarboxylic acid - Wurtz reaction - stability of cycloalkanes - Baeyer's strain theory.

2.2 Cycloalkenes: Preparation and reactions of cycloalkenes - Preparation of conjugate dienes - reactions - 1,2 and 1,4 addition, polymerization and Diels-Alder reaction and its applications.

UNIT III

Metallurgy

3.1 Occurrence of metals – definition of minerals and ores - concentration of ores – froth floatation, magnetic separation, calcination, roasting, smelting, flux, aluminothermic process.

3.2 Extraction processes – Chemical reduction – electrolytic reduction – metal displacement.

3.3 Refining methods – Zone refining – van Arkel de Boer methods – electrolytic refining.

UNIT IV

S - BLOCK ELEMENTS

4.1 Position of hydrogen in the periodic table.

4.2 General characteristics of s – block elements. Compounds of s-block metals – oxides, hydroxides, peroxides, superoxide's-preparation and properties – oxo salts – carbonates – bicarbonates – nitrates and halides.

4.3 Anomalous behavior of Li and Be.

4.4 Extraction of beryllium – physical and chemical properties of Be – Uses – Extraction of Mg – physical and chemical properties – Uses.

UNIT V:

GASEOUS STATE AND LIQUID STATE

5.1 Ideal gas: Kinetic theory of gases - derivation of gas laws – Maxwells distribution of molecular velocities - Types of molecular velocities - collision diameter – collision frequency – mean free path.

5.2 Behaviour of real gas –Vander Waals equation – importance of Vander Waals constants - Boyle temperature – critical constants of a gas and their relationship with Vander Waals equation – derivation of law of corresponding state.

5.3 Liquid state: Physical properties – vapour pressure – Trouton's rule – surface tension – Effect of temperature on surface tension – viscocity – effect of pressure and temperature – refraction – refractive index – specific and molar refraction.

5.4 Liquid crystals – definition – classification – nematic, smectic and cholesteric liquid crystals with examples.

REFERENCES

1. K. S. Tewari and N. K. Vishnoi, A Text Book of Organic Chemistry, 4th edition, Vikas Publishing House Pvt Ltd, 2017.
2. Arun Bahl and B.S. Bahl, A Text Book of Organic Chemistry, 22nd edn,

S Chand & Company, 2016.

3. I. L. Finar, Organic Chemistry Vol-1& 2, 6th edn, Pearson Education Asia, 2004.
4. Bhupinder Mehta and Manju Mehta, Organic Chemistry, 2nd edition, PHI Learning Pvt Ltd, 2015.
5. M.K. Jain and S. C. Sharma, Modern Organic Chemistry, Visal Publishing Co, 2015.
6. N. Tewari, Advanced Organic Reaction Mechanism, 3rd Edition, Books & Allied (P) Ltd, 2011.
7. S.M. Khopkar, Basic Concepts of Analytical Chemistry New Age International Publisher, 2009.
8. W. U. Malik, G. D. Tuli, and R. D. Madan: Selected Topic in Inorganic Chemistry, S. Chand & Company Ltd, New Delhi, 1998.
9. P. L. Soni, Mohan Katyal, Text book of Inorganic Chemistry, 20th Edition, Sultan Chand & Sons, New Delhi, 2007.
10. B.R.Puri, L.R.Sharma and M.S.Pathania, Principles of Physical Chemistry, 47th edition, Vishal Publishing Co, 2016.
11. N. Kundu and S.K. Jain, Physical Chemistry, S. Chand & Company Ltd. 2000
12. K.K.Rohatgi – Mukherjee, Fundamentals of Photochemistry, Reprint, New Age International Publisher, 2006.
13. G.M.Barrow, Physical Chemistry, 6th edn, McGraw-Hill Inc., US, 1996.

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	2	3
CO5	3	3	3	3	3

FACULTY UNIVERSITY NOMINEE HOD

SEMESTER – II

ENVIRONMENTAL STUDIES

UNIT I

Definition Scope & Need for awareness. Natural resources of associated problems.

(a). Forest resources- use of over exploitation deforestation – mining – dams.

(b). Water resources- use of over utilization – surface & ground water – dams

– benefits of problems.

UNIT II

(c). Food resources- modern agriculture – over grassing – fertilizer – porlicide problems.

(d). Energy resources- use of alternate energy sources.

(e). Land resources- Land degradation – Soil erosion – deforestation.

UNIT III

Concept of Ecosystem producer – consumer – decomposer – Energy flow – food chain – food web example of pond ecosystem.

UNIT IV

Biodiversity & its conservation – Values of biodiversity – India as a mega diversity nation – Hot spots.Threats to diversity – Conservation of biodiversity wild life conservation.

UNIT V

Environmental pollution causes effects & control measures of Air, Water, Noise, Thermal pollution & nuclear hazards – Disaster management flood – earthquake – cyclone – land slides.

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

FACULTY **UNIVERSITY NOMINEE** **HOD**

SEMESTER III
CORE COURSE IV
GENERAL CHEMISTRY III

UNIT I

Aromatic Compounds

1.1 Aromaticity - definition - Huckel's rule - consequence of aromaticity - stability, carbon- carbon bond lengths in benzene ring, resonance energy.

1.2 Aromatic electrophilic substitution - general pattern of the mechanism involving σ and π complexes, mechanism of nitration, halogenation, sulphonation and Friedel-Crafts reaction.

1.3 Activating and deactivating substituents - orientation in mono substituted benzenes - reactions of aromatic side chain - halogenation and oxidation.

1.4 Methods of formation and chemical reactions of alkylbenzenes, biphenyl, naphthalene and Anthracene.

1.5 Synthesis of 3-nitrotoluene and 4-bromonitro benzene.

UNIT II

P-BLOCK ELEMENTS – BORON AND CARBON FAMILY

2.1 General characteristics of elements of Group III A – Extraction of Boron - Physical and chemical properties of Boron – compounds of boron – Borax, Boric acid, Diborane, Boron nitride. Extraction of Al – Physical and Chemical properties - uses – compounds of aluminium – Al_2O_3, $AlCl_3$, alums – Alloys of aluminium.

2.2 General characteristics of elements of Group IV A – Allotropic forms of carbon – graphite and diamond - chemistry of oxides of carbon. Preparation of Silicon – Physical and chemical properties of Si – Uses – Oxides of silicon – structures of

silicates. Chemistry of silicones – Manufacture of glass – types of glasses – ceramics. Extraction of lead – physical and chemical properties – Uses – lead pigments.

UNIT III

P - BLOCK ELEMENTS – NITROGEN AND OXYGEN FAMILY

3.1 General characteristics of elements of V A Group – Preparation of nitrogen – Physical and chemical properties of nitrogen – uses – Chemistry of some compounds of nitrogen – hydrazine, hydroxylamine, hydrazoic acid. Preparation of phosphorus – Physical and chemical properties of phosphorus – uses – chemistry of PH_3, PCl_3, PCl_5, $POCl_3$, P_2O_5 and oxyacids of phosphorous – Oxides of nitrogen and Phosphorous – oxoacids of nitrogen and phosphorus.

3.2 Anomalous behavior of oxygen – Structure and allotropy of oxygen, classification of oxides – peroxides, suboxides, basic oxides, amphoteric oxides, acidic oxides, neutral oxides. Allotropy of Sulphur - Oxides of Sulphur – oxoacids of sulphur.

UNIT IV

COLLOIDS AND NANOMATERIALS

4.1 Colloids - Distinguishing characteristics of colloids, suspensions and solutions- Types of colloidal dispersions-Optical properties-Tyndall effect– Kinetic properties – Brownian motion - Electrical properties – Helmholtz and diffuse double layers – electro kinetic or zeta potential – electrophoresis and its applications - Coagulation – methods of coagulation – Hardy Schultz law – Hofmeister series -Protective colloids – protective action – gold number – applications- Emulsions – classification, preparation, Gels – preparation – properties (thixotropy, syneresis and imbibition).

4.2 Nanomaterials – introduction - self-assembly – materials and molecules –self assembled mono layers- nano wires- types of nano particles- pure gold, silver and cobalt-metal oxides- alumina and titania- synthesis by physical vapor deposition method-reduction method.

UNIT V

FIRST LAW OF THERMODYNAMICS AND ITS APPLICATIONS

5.1 System-surrounding-Intensive and extensive variables; state and path functions; isolated, closed and open systems - zeroth law of thermodynamics. First law of thermodynamics-mathematical form- Heat capacity, relation between C_P and C_V. Isothermal process: Calculations of w, q, dE and dH for the reversible expansion of ideal gases under isothermal and adiabatic conditions.

5.2 Joule- Thomson effect-derivation of Joule- Thomson coefficient for ideal gases and real gases, inversion temperatures. Variation of enthalpy change of reaction with temperature (Kirchoff's equation). –Hess's law of constant heat of summation- Bond energy and its calculations.

REFERENCES

1. K. S. Tewari and N. K. Vishnoi, A Text Book of Organic Chemistry, 4th edition, Vikas Publishing House Pvt Ltd, 2017.
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FACULTY **UNIVERSITYNOMINEE** **HOD**

SEMESTER – III & IV

CORE COURSE –V CORE PRACTICAL - II

VOLUMETRIC ANALYSIS

I. Titrimetric Quantitative Analysis

1. Estimation of HCl by NaOH using a standard oxalic acid solution.
2. Estimation of Na_2CO_3 by HCl using a Standard Na_2CO_3 solution.
3. Estimation of oxalic acid by KMnO4 using a standard oxalic acid solution.
4. Estimation of Ferrous ion by $KMnO_4$ using a standard Mohr's salt solution.
5. Estimation of $K_2Cr_2O_7$ by thio using a standard $K_2Cr_2O_7$ solution.
6. Estimation of As_2O_3 using I_2 solution and standard Arseneous oxide solution.
7. Estimation of Chloride (in neutral media).

II. Applied Experiments

1. Estimation of Total Hardness of water

Scheme of Valuation Maximum (60 Marks)

Practical (Marks) - 50

Record - 5 (Marks)

Procedure Writing - 10 (Marks)

Results

- <1%	- 45 Marks
1 – 2%	- 35 Marks
2 – 3%	- 25 Marks
3 – 4 %	- 15 Marks
>4%	- 10 Marks

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FACULTY **UNIVERSITY NOMINEE** **HOD**

SEMESTER IV
CORE COURSE VI
GENERAL CHEMISTRY IV

UNIT I

Haloalkanes and Haloarenes

1.1 Classification of alkyl halides - methods of formation from alcohols, alkanes, alkenes – allylic/ benzylic bromination and chlorination – Hundiecker reaction, Finkelstein reaction and Swart's reaction.

1.2 Nucleophilic substitution reactions - mechanisms of nucleophilic substitution reactions - S_N2, $S_N1$and S_Ni reactions with energy profile diagrams - evidences and factors influencing the mechanisms – stereochemical aspects of nucleophillic substitution mechanisms.

1.3 Methods of formation of aryl halides - nucleophilc substitution reactions of aryl halides.

UNIT II

Alcohols, Phenols and Ethers

2.1 Preparation of alcohols through reduction, hydroboration, hydration, oxymercuration and Grignard reaction. Reactions of alcohol - with metals, esterification with mechanism, oxidation, dehydration, conversion to alkyl halides.

2.2 Preparation of phenols - acidity of phenol Vs alcohols - relative acid strength of substituted phenols - reactions of phenols - esterification, oxidation, Kolbe's, Reimer-Tiemann, Gattermann, electrophilic substitution reactions.

2.3 Ethers – preparations, reactions – epoxide.

2.4 Synthesis of aspirin, 3 and 4-nitro phenol, and t-butyl methyl ether.

UNIT III

Halogen family and Noble gases

3.1 General characteristics of halogen with reference of electro negativity, electron

affinity, oxidation states, and oxidizing power – peculiarities of fluorine, Hydrides, oxides and oxo acids of halogens

3.2 Interhalogen compounds – polyhalide ions – pseudohalogens – preparation, properties and structure of interhalogen compounds

3.3 Inert gases – position in the periodic table – isolation from atmosphere – General characteristics – Structure and shape of xenon compounds – XeF_2,XeF_4, XeF_6, $XeOF_2$, $XeOF_4$– uses of noble gases.

UNIT IV

ACID BASE CHEMISTRY

4.1 Acid Base Chemistry: Theories of acids and bases – Arrhenius, Bronsted-Lowry theory proton donor - acceptor system. Theory of solvent system, Lewis-electron dot system, Usanovich and Lux Flood concept.

4.2 pH of strong and weak acid solutions. Buffer solutions. Henderson equations. Preparation of acidic and basic buffers. Relative strength of acids and bases from K_a and K_b values.

4.3 Classification of solvents -- chemical reactions in water and liquid ammonia as solvents.

UNIT V

CHEMICAL KINETICS

5.1 Definition of order and molecularity – rate of reaction - derivation of rate constant of a first and second order (equimolar concentration of reactants) reactions - derivation of half-life period.

5.2 Effect of temperature on reaction rate – Arrhenius equation – concept of activation energy.

5.3 Collision theory– failures of CT – Lindemann theory of unimolecular reaction. Absolute reaction rate theory – derivation of rate constant of a bimolecular reaction – comparison between ARRT and CT – Significance of free energy of activation and entropy of activation.

REFERENCES

1. R. T. Morrison and R. N. Boyd, Organic Chemistry, 6th edition, prentice hall, 1992.
2. F A Carey and R J Sundberg, Advanced Organic Chemistry, Part A: Structure and Mechanisms, 5th edition, Springer, 2007.
3. Arun Bahl and B.S. Bahl, A Text Book of Organic Chemistry, 22ndedn, S Chand & Company, 2016.
4. I. L. Finar, Organic Chemistry Vol-1, 6th edn, Pearson Education Asia, 2004.
5. P. Y.Bruice, Organic Chemistry, Vol-1 & 2, 7thedn, Pearson Education Asia, 2012.
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11. Sp. Banerjee, Advanced Inorganic Chemistry Vol-2, Arunabha Sen, Books and Allied (P) Ltd., Kolkata, 2017.
12. B.R.Puri, L.R.Sharma and M.S.Pathania, Principles of Physical Chemistry.47thedn, Vishal Publishing Co., 2017.
14. N. Kundu and S.K. Jain, Physical Chemistry, S. Chand & Company Ltd. 2000
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FACULTY UNIVERSITY NOMINEE HOD

SEMESTER - IV

SKILL BASED ELECTIVE - I

ADULTERATION IN COMMON FOOD ITEMS

UNIT I

1.1 Milk - importance of milk as food – composition, specific gravity, pH and its importance - common adulterants - their Harmful effects. Deduction and estimation of adulterants in milk.

1.2 Ghee – grades of ghee –adulteration in ghee and their detection.

1.3 Common adulterants in coffee powder, tea dust, chillipowder, turmeric powder, asafoetida, wheat flour, black pepper and pulses - deduction and their evil effects.

UNIT II

2.1 Oils - edible oils – non edible oils – specific gravity – degree of unsaturation – iodine value – polenske value and its significance.

2.3 Common adulterants and their detection in edible oil - deductions of mineral oil as adulterant. Some common edible oils – coconut oil – olive oil - groundnut oil – gingelly (sesame) oil – mustard oil – rice bran oils – corn oil – health tips.

UNIT III

3.1 Food additives – preservatives, sweeteners, colourants and flavours – their role and evil effects.

3.2 Pesticide residues in food – common pesticide residues - tolerance limit – general methods of determining pesticide residues - natural food poisons – a brief account.

REFERENCES

Gopalan R, Subramanian PS and Rengarajan K (1993) ``Elementsof analytical chemistry" second revised edition, Sultan Chand.

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FACULTY UNIVERSITY NOMINEE HOD

NON MAJOR ELECTIVE-II
CHEMISTRY OF CONSUMER PRODUCTS

UNIT I

SOAPS AND DETERGENTS

1.1. Manufacture of soaps - Toilet and transparent soaps - different ingredients used in toilet soaps - cleaning action of soaps - Detergents and types of detergents.

UNIT II

MILK AND MILK PRODUCTS

2.1. Composition of milk - physical properties of milk - Effect of heat- pasteurization - Effect pasteurization – Homogenization - Ice cream and milk powder.

UNIT III

DYES, PAINTS AND VARNISHES

3.1. Classification based on chemical constitution-Azo dyes-Preparation and uses of methyl orange. Triphenyl methane dyes - Preparation and uses of malachite green. Phthalein dyes - Preparation and uses of phenolphthalein. Anthraquinone dyes – Preparation and uses of alizarin and indigo.

3.2. Classification of Paints - Constituents and their functions- Requirements for good paint - Setting of the paint. Varnishes -Types of varnishes-Constituents and their functions.

REFERENCES

1. A text book of applied chemistry for home science and sciences, ThangammaJacop.
2. Chemical process Industries – Norrish Shreve. R. and Joseph A. Brink Jr. McGraw Hill. Industrial Book Company, London
3. Industrial Chemistry by K. Sharma. Goel Publishing House. Meerut 1995.

4. Fundamental concept of applied chemistry by JayashreeGhosh. 1st edition (2006) S. Chand & Company Ltd., New Delhi.

FACULTY **UNIVERSITY NOMINEE** **HOD**

SEMESTER - IV SKILL BASED ELECTIVE - II
SBE PRACTICAL DETECTION OF ADULTERANTS IN FOOD

1. Determination of specific gravity of milk using lactometer and specific gravity bottle.
2. Determination of pH of milk
3. Determination of protein content in milk
4. Determination of antibiotics in milk
5. Determination of iodine value of oils
6. Common tests for detection of adulterants in oils
7. Test for detection of adulterants in asafetida
8. Detection of adulterants in chilli powder, turmeric powder
9. Detection of Saccharin in sweets
10. Determination of adulterants in wheat powder, tea dust and ghee.

REFERENCES

1. Gopalan R, Subramanian PS and Rengarajan K (1993) ``Elements of analytical chemistry" second revised edition, SultanChand.

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SEMESTER V CORE COURSE VIII
ORGANIC CHEMISTRY I

UNIT I ISOMERISM

Structural isomerism - types with examples – tautomerism – keto-enol, nitro-acinitro, amido- imido. Stereochemistry - Representation of molecules in sawhorse, Fischer and Newman formulae. Symmetry elements - chirality – asymmetric molecules and molecular dissymmetry-pseudo asymmetry. Opticalrotation – specific rotation -optical purity - methods of racemization - Optical isomers - enantiomers - diastereomers – epimers - notation of optical isomers - Cahn-Ingold-Prelog rules, R and S notations for optical isomers with one and two asymmetric carbon atoms - erythro and threo representations - D and L representations - Optical activity in compounds without asymmetric carbon atoms namely biphenyls, allenes and spiranes, Stereo selectivity, stereo specificity -asymmetric synthesis.

1.1 Geometrical isomerism – nomenclature of geometrical isomers – cis/trans, E-Z notation and syn-anti for C=C, C=N compounds - Stability of geometrical isomers and heats of hydrogenation.

1.2 Conformational Analysis - Conformation - Conformational nomenclature: eclipsed, staggered, gauche and anti; dihedral angle, torsion angle, energy barrier of rotation - potential energy diagram. Conformational analysis of ethane and cyclohexane.

UNIT II

CARBONYL COMPOUNDS AND THEIR DERIVATIVES

2.1 Common methods for the synthesis of aldehydes and ketones - synthesis of aldehydes from acid chlorides, Stephen's reduction - Gattermann-Kosch. synthesis of ketones from nitriles, Friedel- Crafts and Hoesch reactions.

2.2 Molecular orbital picture of carbonyl groups. Acidity of α- hydrogen.

Mechanism of nucleophillic additions to carbonyl group. Addition of HCN, alcohols, sodium bisulfite, Grignard reagents -condensation with ammonia and its derivatives - Aldol, Perkin, Benzoin and Knoevenagel condensations, Wittig reaction, Mannich reaction, Reformatsky reaction and Cannizaro reaction. Oxidation by Tollen's reagent, $KMnO_4$. Reduction by H_2/Ni, H_2-Pd-C, $NaBH_4$, $LiAlH_4$, MPV, Clemmenson and Wolff-Kischner reductions.

2.3 General methods of preparation of aromatic carbonyl compounds – physical and chemical properties- uses.

UNIT III

CARBOXYLIC ACIDS AND ITS DERIVATIVES

3.1 Preparation of carboxylic acids, acidity of carboxylic acids, effects of substituents on acid strength, acidity of aliphatic vs aromatic acids. Reactions of carboxylic acids - Hell-Volhard-Zelinsky reaction, Synthesis of acid chlorides, esters and amides, Reduction of carboxylic acids, methods and mechanism of decarboxylation.

3.2 Methods of preparation and chemical reactions of dicarboxylic acids.

3.3 Preparation and reactivity of carboxylic acid derivatives - acid chlorides, amides and anhydrides – Nucleophilic substitutions at acyl carbon. Synthesis of active methylene compounds – diethyl malonate and ethyl acetoacetate.

3.4 General methods of preparation of aromatic carboxylic acids- physical and chemical properties- uses.

3.5 Oils and fats – Fatty acids – manufacture of soap- Mechanism of cleaning action of soap.

UNIT IV

NITROGEN CONTAINING COMPOUNDS

4.1 Preparation of nitroalkanes and nitroarenes - Chemical reactions of nitroalkanes and nitroarenes - reductions in acidic, neutral and alkaline media.

4.2 Methods of preparation of alkyl and aryl amines - Gabriel phthalimide reaction and Hofmann reaction - separation of a mixture of primary, secondary and tertiary amines - Hinsberg's and Hofmann's method - Structural features effecting basicity of amines - basicity of aliphatic and aromatic amines - reactions of amines.

4.3 Aryl diazonium salts - preparation, stability, reactions and synthetic transformations.

4.4 Amino acids - essential and nonessential - methods of preparation - zwitterions

formation - isoelectric point - chemical reactions of amino acid. Polypeptides and proteins- classification - primary, secondary, tertiary and quaternary structure of proteins - determination of primary structure with end group analysis.

UNIT V

HETEROCYCLIC COMPOUNDS AND DYES.

5.1 Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine - Comparison between basicity of pyridine, piperidine and pyrrole.

5.2 Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis.

5.3 Dyes - theory of color and constitution - chromophore, auxochrome, classification according to application and structure - preparation and uses of azo dyes – methyl orange, triphenyl methane dyes - malachite green, indigo dyes - Indigotin, anthraquinone dyes - alizarin, phthalein dyes –fluorescein.

REFERENCES

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2. I. L. Finar, Organic Chemistry Vol-1, 6th edn, Pearson Education Asia, 2004.
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FACULTY UNIVERSITY NOMINEE HOD

SEMESTER V

CORE COURSE VII

INORGANIC CHEMISTRY I

UNIT I

CHEMISTRY OF d-BLOCK ELEMENTS

1.1 Chemistry of transition elements – electronic configuration – group study of titanium, vanadium, chromium, manganese and iron metals.

1.2 Comparative study of zinc group metals- galvanization, evidences for the existence of mercurous ion as Hg_2^{2+}.

1.3 Horizontal comparison of Fe, Co, Ni groups.

1.4 Interstitial compounds – nitrides, carbides, hydrides, borides of Ti, V, Cr, W and their industrial uses. Important uses of transition metals and their alloys. Toxicity of Cd and Hg.

UNIT-II CHEMISTRY OF f-BLOCK ELEMENTS

2.1 General characteristics of f-block elements – comparative account of lanthanides and actinides.

2.2 Lanthanide series – separation by ion exchange and solvent extraction methods – lanthanide contraction and its consequences.

2.3 Actinide series – separation of actinides by ion e exchange and solvent extraction methods – oxidation states and general properties.

2.4 Uranium and Thorium – occurrence, ores, extraction and uses.

UNIT III

Coordination Chemistry I

3.1 Introduction – Ligand - types of ligands - unidentate, bidentate and polydentate ligands, chelating ligands and chelates- IUPAC nomenclature of coordination compounds.

3.2 Isomerism in coordination compounds - Structural isomerism, hydrate isomerism, coordination isomerism, ionisation isomerism, linkage isomerism and coordination position isomerism.

3.3 Stereoisomerism - Geometrical isomerism of four and six coordinate

complexes, optical isomerism of four and six coordinate complexes.

3.4 Theories of coordination compounds - Werner and Sidgwick theories- Valence bond theory, limitations of valence bond theory.

UNIT IV

COORDINATION CHEMISTRY - II

4.1 Crystal field theory – splitting of d orbitals in octahedral, tetrahedral and square planar fields – Crystal field stabilization energy (CFSE) - factors affecting CFSE.

4.2 Labile and inert complexes, stability of coordination compounds – thermodynamic and kinetic stability, relationship between stepwise formation constant and overall formation constant, factors affecting the stability of complexes.

4.3 Unimolecular and biomolecularnucleophilic substitution reactions in octahedral and square planar complexes, trans effect – theories of trans effect and applications.

4.4 Biologically important coordination compounds - Chlorophyll, haemoglobin and vitamin B12.

UNIT V

CARBONYLS AND NITROSYL AND ORGANOMETALLIC COMPOUNDS

5.1. Metal carbonyls - Mono and binuclear carbonyls of Ni, Fe, Cr, Co and Mn – preparation, structure, reactions, bonding and uses.

5.2. Nitrosyl compounds - Classification - nitrosyl chloride and sodium nitroprusside - preparation, properties and structure.

5.3. Organo metallic compounds of alkenes, alkynes and cyclopentadienes – preparation, properties, structure and bonding.

REFERENCES

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
2. W.U. Malik, G.D. Tuli and R.D. Madan, S.Chand and Company Ltd., Selected topics in Inorganic Chemistry', 7th edition, 2001.

3. Gopalan R, Text Book of Inorganic Chemistry, 2nd Edition, Hyderabad, Universities Press, (India), 2012.
4. P.L. Soni, „Text Book of Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
5. B.R. Puri, L.R. Sharma, K.C. Kalia, „Principles of Inorganic Chemistry', 21st edition, Vallabh Publications, 2004-2005.
6. J.E. Huheey, „Inorganic Chemistry', 4th edition, Pearson Education.Inc. 1993.
7. F.A. Cotton, „Advanced Inorganic Chemistry', 6th edition, John Wiley & Sons, Pvt. Ltd., 2003 – 2004.

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FACULTY **UNIVERSITY NOMINEE** **HOD**

SEMESTER V

CORE COURSE IX

PHYSICAL CHEMISTRY I

UNIT I

THERMODYNAMICS – II

1.1. Second law of Thermodynamics – Its need – Different statements – Carnot cycle –Derivation of efficiency of heat engine – Carnot's theorem – Thermodynamic scale of temperature.

1.2. Concept of entropy – definition and physical significance of entropy – entropy change in reversible and irreversible processes – Entropy changes of an ideal gas with change in P,T and V,T. Entropy criterion for spontaneous and equilibrium processes in isolated system

1.3. Helmholtz Free Energy (A) and Gibbs Free Energy(G) –variation of Gibb's free energy change with T and P- Gibbs–Helmholtz Equation — change of phase – clapeyron – clausius equation.

UNIT II

THERMODYNAMICS - III

2.1 Chemical potential – Gibbs – Duhem relations – variation of Chemical potential with T and P.

2.2 Third law of Thermodynamics – Nernst heat theorem – statement of third law– concept of residual entropy – evaluation of absolute entropy from heat capacity. Exception to III law (Ortho and Para hydrogen, CO, N_2O and ice)

2.3 Equilibrium constant and free energy change- thermodynamic derivation of law of mass action- equilibrium constants in terms of pressure and concentration – NH3, PCl5 and CaCO3.

2.4 Thermodynamic interpretation of Lechatelier's principle (Concentration, temperature, pressure and addition of inert gases). Equilibrium constant and free energy change – Vant Hoff's reaction isotherm.

UNIT III

SOLUTIONS

3.1 Dilute solutions- colligative properties, relative lowering of vapour pressure, osmosis, law of osmotic pressure - concept of elevation of boiling point and depression of freezing point (Derivation not required). Determination of molecular masses –abnormal behavior of solutions (non ideal solutions) – association and dissociation in solutions.

3.2 Raoult's law, Henry's law, Ideal and non-ideal solutions, completely miscible liquid systems-benzene and toluene. Dreviation from Raoult's law and Henry'S law. Duhem-Margules equation.Theory of fractional distillation.Azeotropes- HCl – water and ethanol- water system.

3.3 Partially miscible liquids- phenol- water, triethylamine- water and nicotine- water systems. Lower and upper CSTs – effect of impurities on CST.Completely immiscible liquids- principle and applications of steam distillation.Nernst distribution law – derivation.

UNIT IV

PHASE EQUILIBRIA

4.1 Phase rule – Definition of terms – Phase rule – Derivation – Applications – One component systems - H_2O andsulphursystems – super cooling, sublimation – Two component systems – simple eutectic (Pb-Ag, Bi-Cd) - desilverisation of lead – compound formation with congruent melting point (Mg - Zn) – incongruent melting point (Na-K) – solid solutions (Ag-Au system) - Fractional crystallization - Freezing mixtures.

Unit – V: PHOTO CHEMISTRY AND GROUP THEORY

5.1 Photochemistry - Consequences of Light Absorption - The Jablonski Diagram – Radiative and Non radiative transitions – Laws of Photo chemistry – Grothus - Draper Law – Stark - Einsteins Law – Lambert's Law – Beer - Lambert's Law –

Quantum efficiency – Comparison of H_2 - Cl_2, H_2 – Br_2 & H_2 – I_2. Photochemical reaction — Kinetics of Hydrogen-Chlorine Reaction – Photosensitization and Quenching – Fluorescence- phosphorescence- Chemiluminescence and bio-luminescence.

5.2 Group Theory - Symmetry elements and symmetry operations – C_n, σ, S_n, i and E symmetry operations of the following molecules- H_2O, BF_3 and NH_3.

REFERENCES

1. Puri B.R., Sharma L.R and Pathania M.S., Principles of Physical Chemistry, 47th ed., Vishal Publishing Company, 2016
2. Sharma .K.K, Sharma.L.K. A Text bookon physical Chemistry, 6th ed., Sultan Chand, 2016.
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4. Glasstone S. and Lewis. D., Elements of Physical Chemistry. Macmillan
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FACULTY **UNIVERSITY NOMINEE** **HOD**

SEMESTER- V
MAJOR BASED ELECTIVE– I
ANALYTICAL CHEMISTRY

UNIT I

LABORATORY HYGIENE AND SAFETY

1.1 Laboratory safety measures - Storage and handling of corrosive, flammable, explosive, toxic, carcinogenic and poisonous chemicals. Precautions to avoid poisoning.

1.2 Simple first aid proceduresfor accidents - Acid in eye, alkali in eye, acid burns, alkali burns, bromine burns, Poisoning, Inhalation of gases, cut by glasses and heat burns. Waste disposal - fume disposal - precautions for avoiding accidents.

1.3 Evaluation of analytical data -Errors in chemical analysis, classification of errors. Determinate errors, instrumentals errors, personal errors, constant errors and proportional errors.Correction of determinate errors.Random errors - minimizing errors. Precision, accuracy, significant figures, mean, median, mean deviation, standard deviation, curve fitting and method of least squares.

UNIT II

SEPRATION AND PURIFICATION TECHNIQUES

2.1 General principle involved in the precipitation, separation of precipitates, filtration and sample drying, desiccants, vacuum drying. Principle and techniques of distillation, fractional distillation, vacuum distillation, and steam distillation.

2.2 Chromatography - principles involved in adsorption, partition and ion- exchange chromatography. Column Chromatography - principle, types of adsorbents, preparation of the column and application. Thin layer chromatography – principle, choice of adsorbent and solvent, preparation of chromatoplates, R_f values, factors

affecting the R_f values, Significance of R_f values.

2.3 Paper chromatography - principle, development of chromatogram, ascending, descending and radial paper chromatography. Ion - exchange chromatography - principle - types of resins - experimental techniques - separation of Na – K and Cl- and Br- mixture. Electrophoresis and its applications.

UNIT III

GRAVIMETRIC ANALYSIS AND THERMO ANALYTICAL METHODS

3.1 Gravimetric analysis - principle – theories of precipitation – solubility product and precipitation – conditions of precipitations – types of precipitants – specific and selective precipitants – organic and inorganic precipitants – Purity of precipitates – co-precipitation – post precipitation – precipitation from homogeneous solution – use of sequestering agents.

3.2 Thermo analytical methods Principle of Thermo gravimetric analysis (TGA) and Differential thermal analysis (DTA)– Instrumentation for TGA and DTA. Characteristics and factors affecting TGA and DTA curves. TGA and DTA analysis of calcium oxalate monohydrate.

UNIT IV

ELECTRO ANALYTICAL TECHNIQUES

4.1 Electrogravimetry – Redox potential - theory of electrogravimetric analysis - determination of copper (by constant current procedure) .

4.2 Electrolytic separation of metals - Principle - separation of copper and nickel, principles of electrodeposition - overvoltage.

4.3 Coulometry - principle of coulometric analysis – coulometry at controlled potential – instrumentation and technique – separation of nickel and cobalt.

UNIT V

SPECTRO ANALYTICAL TECHNIQUES AND ESTIMATION

5.1 Colorimetry – Beer – lambert's law (Statement only) - Nessler's and photo electric colorimetry - principle - advantages of colormeric estimation. Estimation of Ni^{+2} and

Fe^{+3}.

5.2 Determination of percentage purity of the commercial samples washing soda and bleaching powder. Principle and estimation of phenol, aniline and glucose.

REFERENCES

1. Gopalan R, Subramanian PS and Rengarajan K (1993) ``Elements of analytical chemistry" second revised edition, Sultan Chand.
2. Gurdeep R Chatwal, Sham K. Anand (2005) ``Instrumental methods of chemical analysis", Himalaya publishing house.
3. Vogel A.I. Text Book of Quantitative Inorganic analysis," The English Language Book Society, Fourth edition.
4. Douglas A. Skoog, Donald M. West and F. J. Holler, Fundamentals of Analytical chemistry, 7thedition, Harcourt College Publishers.
5. Mendham J., Denny R. C., Barnes J.D., Thomas M., Vogel's Test book of Quantitative Chemical analysis 6th edition, Pearson education.
6. Sharma, B. K., Instrumental methods of chemical analysis, Goel Publishing House, Merrut (1999).
7. S.M. Khopkar, Basic concepts of analytical chemistry, New age International Pvt. Ltd., New Delhi, 1998.

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FACULTY UNIVERSITY NOMINEE HOD

SEMESTER – V
SKILL BASED ELECTIVE - II
ANALYTICAL ASPECTS OF SOME COMMON DRUGS

UNIT I

1.1 Drugs – Definition – Sources of drugs – (Raw materials). Classification of Drugs – Biological classification (Drugs acting on CNS Chemotherapeutic drugs, Pharmaco – Dynamic agents, Metabolic diseases and Endocrine functions) – chemical classification – Nomenclature of drug – Prescription drugs – Non prescription drugs.

UNIT II

2.1 Disease – Definition – Classification – Causes – treatment and prevention of some common diseases – malaria -filariasis – plague – diphtheria – wooping cough,mumps,tuberculosis – cholera typhoid, dysentery – jaundice – asthma – epilepsy piles – leprosy.

2.2 Biological role of Sodium, potassium, Calcium and lodine (Elementary level)

UNIT III

3.1 Analgesics - Narcotic and non – Narcotic analgesics, Antipyretic, Anti-inflammatory agents, Anti diabetics, Anti Allergic, Anti hypertensive, Anti-septic drugs, Disinfectants, Anesthetics (general and local) - Antibiotics - Definition with Examples.

REFERENCES

1. Jayashree Ghosh, A text book of Pharmaceuticals Chemistry, S. Chand & Co., Ltd, New Delhi.
2. V. K. Ahluwalia and Madhu Chopra, Medicinal Chemistry, Ane books Pvt. Ltd, New Delhi.

3. D. Sriram and P.Yogeeswari, Medicinal Chemistry, Dorling kindersley Pvt. Ltd, New Delhi.

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FACULTY UNIVERSITY NOMINEE HOD

SEMESTER – V & VI

CORE COURSE – X **CORE PRACTICAL - III**

PHSICAL CHEMISTRY PRACTICAL

LIST OF EXPERIMENTS

1. Critical Solution Temperature
2. Effect of impurity on Critical solution Temperature
3. Transition Temperature
4. Rast Method
5. Phase Diagram (Simple eutectic system)
6. Kinetics of Ester Hydrolysis
7. Partition Co-Efficientof iodinebetween water and carbon tetrachloride.
8. Conductometric Acid – Base Titration
9. Potentiometic Redox Titration
10. Determination of cell constant

MARK DISTRIBUTION

Internal - 40
Ext Evaluation - 60
Record - 10
Procedure writing with formula - 10
Practicals - 40

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
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FACULTY UNIVERSITY NOMINEE HOD

SEMESTER - V & VI

CORE COURSE –XI CORE PRACTICAL IV

GRAVIMENTRIC & ORAGANIC ANALYSIS PRACTICAL

GRAVIMETRIC ANALYSIS

1. Estimation of Lead as lead chromate.
2. Estimation of Barium as barium chromate.
3. Estimation of Nickel as Nickel DMG complex.
4. Estimation of Magnesium as Magnesium oxinate
5. Estimation of Calcium as calcium oxalate monohydrate
6. Estimation of Barium as barium sulphate.
7. Estimation of Lead as lead sulphate.

ORGANIC QUALITATIVE ANALYSIS AND ORAGANIC PREPARATION ORGANIC ANALYSIS

Analysis of simple organic compounds (a) characterization of functional groups (b) confirmation by preparation of solid derivatives / characteristic colour reactions.

Note- Mono – functional compounds are given for analysis. In case of bi-functional compounds, students are required to report any one of the functional groups.

ORGANIC PREPARATION

Preparation of Organic compounds involving the following hemical conversions.

1. Oxidation 2. Reduction 3. Hydrolysis 4. Nitration 5. Bromination
6. Diazotization 7. Osazone formation

DETERMINATION OF PHYSICAL CONSTANTS

Determination of boiling / melting points by semimicro method

MARK DISTRIBUTION

Internal evaluation	- 40	External evaluation- 60

Record	- 5+5=10
Gravimetry	- 25
Org. Preparation & org Analysis	- 25
Org. Preparation	- 6
Phy Constant	- 4

Org. analysis	- 15
Aromatic / Aliphatic	- 2
Sat/ Unsat	- 2
Spl. Element	- 3
Functional group	- 5
Derivatives	

REFERENCES

1. Venkateswaran .V.,Veeraswamy. R., Kulandaivelu.A.R., Basic principles of practical chemistry, 2nd edition, New Delhi, Sultan Chand & Sons, (1997)

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FACULTY **UNIVERSITY NOMINEE** **HOD**

SEMESTER VI

CORE COURSE XII

INORGANIC CHEMISTRY II

UNIT I

Nuclear Chemistry I

1.1 Introduction – composition of nucleus and nuclear forces – nuclear stability – mass defect – binding energy – packing fraction – N/P ratio – magic numbers – nuclear models – liquid drop – Shell and collective model.

1.2 Isotopes – detection and separation – deviation of atomic weights from whole numbers – isobars, isotones and isomers – types of nuclear reactions- modes of decay - fission and fusion – atom bomb and hydrogen bomb.

UNIT II

Nuclear Chemistry II

2.1 Natural and induced radioactivity – radioactive decay – half-life period – radioactive displacement law – radioactive series – Radioactive techniques – Geiger Muller and ionization counters. Natural radioactivity – Detection and measurement of radioactivity – radioactive series including neptunium series – group displacement law – Rate of disintegration and half-life period – Average life period.

2.2 Artificial radioactivity – induced radioactivity – uses of radioisotopes – hazards of radiations – nuclear energy – nuclear reactors – nuclear fission and fusion – energy source of the sun and stars – carbon dating – rock dating. Radioactive waste disposal – applications of nuclear science in agriculture, biology and medicine – Atomic power projects in India.

UNIT III

Solid State Chemistry -I

3.1 Classification of solids – amorphous and crystalline solids – Van der waals crystals – covalent crystals – Laws of crystallography – Elements of symmetry – Weiss and Miller indices – Crystal systems and Bravais lattices.

3.2 X-ray diffraction - derivation of Bragg's equation - determination of structures of NaCl by Debye Scherrer (powder method) and rotating crystal methods.

3.3 Metallic state – packing of atoms in metals (BCC, FCC, HCP and simple cube) – theories of metallic bonding – electron gas, Pauling and band theories. Semiconductors – n-type and p-type, transistors – uses.

3.4 Binary metallic compounds - borides, carbides, hydrides and nitrides – classification, preparation, properties and uses.

UNIT IV

Solid State Chemistry -II

4.1 Ionic bonding – lattice energy – Born equation and its derivation, Radius ratio rule – application - structure of solids like zinc blend, wurtzite, fluorite, CdI_2– crystal defects – Schottky and Frenkel defects. Hume-rothary ratio and its significance.

4.2 Some special class of compounds – clathrates – examples and structures – Intertitial and non stoichiometric compounds.

UNIT V

Inorganic Polymers and Industrial Chemistry

5.1 Coordination polymers, metal alkyls, phosphonitrilic polymers. Composition, properties and uses of beryl, asbestos, talc, mica, feldspar and zeolite.

5.2 Gaseous fuels - Natural gas, gobar gas, water gas, semi water gas, carburetted water gas, producer gas and liquified petroleum gas (LPG) – composition, manufacture and applications.

5.3 Safety matches - Introduction, raw materials and manufacturing method.

5.4 Paints and varnishes - Definition, types, Different constituents and their functions.

5.5 Cement - Manufacture – wet and dry processes, composition and setting of cement- importance of gypsum

REFERENCES

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
2. Gilreath, „Fundamental concepts of Inorganic Chemistry', 18th Printing, McGraw Hill International Book Company, 1985.
3. S. Glasstone, „Source book on Atomic Energy', East-West Press, 1967.
4. P.L.Soni, „Text Book of Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.

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FACULTY **UNIVERSITY NOMINEE** **HOD**

SEMESTER VI

CORE COURSE XIII

ORGANIC CHEMISTRY II

UNIT-I

CARBOHYDRATES

1.1 Carbohydrates: Definition - Classification with suitable examples - Classification of sugars as reducing and nonreducing sugars - Stereochemistry of carbohydrates: D- and L- configurations - Erythro and threo diastereomers - Anomers and epimers with suitable examples

1.2 Monosaccharides: Classification of monosaccharides with suitable examples – Glucose - properties of glucose - Epimerisation of glucose - Anomers of glucose and mutarotation - Fructose and its properties - Conversion glucose into fructose and vice-versa - Formation of osazone and glycosides - Fischer open structure and evidences for open structure - Haworth projection cyclic structures (pyranose and furanose) and evidences for cyclic strucures of glucose and fructose - Stepping up - Kiliani- Fischer synthesis and stepping down - Ruff degradation of monosaccharides

1.3 Disaccharides: Sturcture of sucrose and Maltose.

1.4 Polysaccharides: Starch- Cellulose and its important derivatives (elementary treatment).

UNIT-II

NATURAL PRODUCTS AND POLYMERS

2.1 Alkaloids: Definition - classification with suitable examples for each class - properties – general structural elucidation - Sources, isolation, physiological activities - structural elucidation and synthesis of conine and nicotine.

2.2 Terpenoids: definition, isoprene rule, special isoprene rule and classification with suitable examples - Isolation, general structure elucidation- structure elucidation

and Synthesis of citral and geraniol.

2.3 Polymers-definition- classification - preparation of Nylon 6 6, Nylon 6, Dacron, Bakelite, melamine, neoprene, Buna-N, Buna-S and biodegradable polymers.

UNIT III

MOLECULAR REARRANGEMENTS

3.1 Molecular Rearrangements – types of rearrangements (Nucleophilic and electrophilic).

3.2 Mechanism for the following rearrangements – pinacol- pinacolone, benzil-benzilic acid, benzidine, Claisen, Fries, Hofmann, Curtuis, Beckmann, dienone-phenol.

3.3 Photochemical reactions of ketones- Norrish type I and II.

UNIT IV

APPLICATIONS OF UV-VISIBLE AND IR SPECTROSCOPY

4.1 UV and Visible Spectroscopy: Possible electronic transitions in an organic compound. Selection rule. Solvent effect. Chromophore and auxochromes. Various types of shifts in λ max and in ϵ max. Calculation of λ max of an organic compound by Woodward and Feiser rule - dienes. Applications of UV and Visible spectroscopy in organic Chemistry.

4.2 Infrared spectroscopy: number and types of fundamental vibrations – modes of vibrations and their energies, position of IR absorption frequencies for functional groups like aldehydes, ketones, alcohols, acid and amide – factors affecting the frequency absorption- conjugation, inductive effect and hydrogen bonding.

UNIT V

Applications of NMR and Mass Spectroscopy

5.1 Nuclear magnetic Resonance Spectroscopy (NMR): Principle, equivalent and non-equivalent protons- shielded and deshielded protons –anisotropy – chemical shift-reference compound TMS- Splitting of signals – NMR spectrum of simple molecules (n-propyl bromide and iso-propyl bromide)

5.2 Mass Spectrometry: Basic principles - instrumentation - Representation of mass spectrum. Molecular ion -identification of parent ion - isotopic peaks - Determination of molecular formula - meta stable peak. General fragmentation. Mass spectra of ethylbenzene, methoxyethane and acetophenone.

REFERENCES

1. Davis, A. J. Fairbanks, Carbohydrate Chemistry, Oxford Chemistry Primer, Oxford University Press, 2002.
2. L. Finar, Organic Chemistry Vol-1, 6th edn, Pearson Education Asia, 2004.
3. J.Clayden, N. Greeves, S. Warren, Organic Chemistry, 2nd edn, Oxford, 2012.
4. R. Silverstein, M., Bassler, G. C., Morrill, T. C. Spectrometric Identification of Organic Compounds , John Wiley and Sons, INC, Fifth edition, 1991.
5. W. Kemp, Organic Spectroscopy, Palgrave, 1991.
6. D. L. Pavia et al, Introduction to Spectroscopy, 5th Edition, Cengage Learning India Ed. 2015.
7. J.R. Dyer, Application of Absorption Spectroscopy of Organic Compounds, Prentice- Hall of India Pvt.Ltd, 2010.
8. F.W. Billmeyer, Textbook of Polymer Science, 2nd Ed. Wiley Interscience, 1971.
9. P. Ghosh, Polymer Science & Technology, Tata McGraw-Hill Education, 1991.34

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FACULTY UNIVERSITY NOMINEE HOD

SEMESTER VI

CORE COURSE XIV

PHYSICAL CHEMISTRY II

UNIT-I

ELECTRICAL CONDUCTANCE AND TRANSFERENCE

1.1 Metallic and electrolytic conductors – specific, equivalent and molar conductance – measurement of conductance.– variation of conductance with dilution for strong and weak electrolytes (qualitative explanation).

1.2 Transport number and its determination by Hittorff and moving boundary method — Kohlrausch law and its applications – Applications of conductivity measurements –solubility product and conductometric titrations- Ostwald's dilution law and its applications.

1.3 Theory of strong electrolytes – Debye- Huckel-Onsager theory — Wein effect and Debye- Falkenhangen effect.

UNIT-II

GALVANIC CELLS AND APPLICATIONS

2.1. Galvanic cells – reversible and irreversible electrodes and cells – standard cell-emf and its measurement –

2.2. Types of electrodes – electrode reactions – electrode potentials - reference electrodes – standard electrode potentials. Derivation of Nernest equation for electrode potential and cell emf – sign conventions – electrochemical series and its applications – formation of cells – electrode and cell reactions – cell emf.

2.3. calculation of ΔG, ΔH, ΔS and k from emf measurements.

2.4. Applications of emf measurement — determination of pH using quinhydrone and glass electrodes – potentiometric titrations. storage cells – lead acid battery.

UNIT-III:

CATALYSIS AND ADSORPTION

3.1. Catalysis- characteristics- - different types-homogeneous-heterogeneous-acid-base catalysis- auto catalysis-theories of catalysis-intermediate compound formation theory and adsorption theory- kinetics of enzyme catalysis - MichaelisMenton equation. – applications of catalysis

3.2. Adsorption-definition- - physisorption and chemisorptions - factors influencing adsorption of gases on solids – Freundlich adsorption isotherms- Langmuir adsorption isotherm –- Applications of adsorption.

UNIT IV

SPECTROSCOPY - I

4.1. Spectroscopy – definition– the regions of various types of spectra.

4.2. Microwave spectroscopy - Rotational spectra of a rigid diatomic molecule – Condition for a molecule to be active in Microwave region – rotation constant (B) and selection rule for rotational transition – Calculation of Internuclear distance in diatomic molecules.

4.3. Infrared Spectroscopy - Vibrations of diatomic molecules –Harmonic oscillator-Zero point energy, Force constant and Dissociation energy – Condition for a molecule to be active in the IR region – Selection rules for vibrational transition – Fundamental bands and overtones.

UNIT V

SPECTROSCOPY – II

5.1. Raman Spectroscopy - Rayleigh scattering and Raman Scattering - Stokes and Anti-stokes lines in Raman Spectra –Condition for a molecule to be Raman active – Comparison of Raman and IR Spectra – Rule of Mutual Exclusion.

5.2. UV- Visible spectroscopy-conditions- Franck-Condon principle – types of electronic transitions.

5.3. NMR Spectroscopy - Theory of NMR Spectra – Nuclear spin and conditions for a molecule to give rise to NMR spectrum–chemical shift - δ and τ scales – Reasons for using TMS as a Reference- Theory of Spin – Spin coupling – splitting of NMR signals – NMR spectrum of pure and acidified Ethanol.

REFERENCES

1. Puri B.R., Sharma L.R., and Pathania M.S., Principles of Physical Chemistry, Vishal Puyblishing Company.
2. Banwell C.N., Fundamentals of Molecular Spectroscopy, 3rd Ed., New Delhi, 1983.
3. Glasstone. S, Introduction to Electrochemistry Affiliated East – West press, 1966.
4. Albert Cotton. F, Chemical Applications of Group Theory, Third Edition John Wiley & Sons, Singapore, 2003.
5. Rohatgi K.K – Muherjee, Fundamentals of Photochemistry, Wiley Eastern Ltd. (1986).
6. Bahl B.S., ArunBahl and Tuli G.D. (2012). Essentials of Physical Chemistry, New Delhi- Sultan Chand and Sons.
7. Moore W. J. (1972), Physical chemistry, 5th Edition, Orient Longman Ltd.
8. Colin Bannwell N and Elaine Mc Cash M, Fundamentals of molecular spectroscopy, 4th edition, McGraw hill publishing company limited.
9. Russell S. Drago, (1978), Physical methods in Inorganic chemistry, East- west student edition.

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FACULTY **UNIVERSITY NOMINEE** **HOD**

SEMESTER - VI

MAJOR BASED ELECTIVE – II

AGRICULTURAL CHEMISTRY

UNIT I

SOIL SCIENCE

1.1 Definition of soil, soil composition - Soil forming rocks and minerals – classification – weathering of rocks and minerals – processes of weathering and factors affecting them. Soil formation – Factors of soil formation – soil forming processes – soil profile.

1.2 Soil Physical properties –particle size distribution – soil texture and structure - bulk density, particle density, pore space, soil air, soil temperature, soil water– significance of physical properties to plant growth.

1.3 Soil chemical properties – soil mineral matter – soil colloids – inorganic colloids – clay minerals – amorphous – Ion exchange reactions.Organic colloids – soil organic matter, decomposition – Humus formation – significance on soil fertility. Nutrient availability and its evaluation. Soil salinity, acidic and alkaline soils – their formation and reclamation.

UNIT II

FERTILIZER

2.1 Fertilizer - definition – classification of fertilizers – nitrogenous fertilizers [Urea, NH_4NO_3, $(NH_4)_2SO_4$ and CAN] - Effect of nitrogen on plant growth and development - deficiency symptoms-synthetic nitrogenous fertilizers.

2.2 Phosphate fertilizers – Effect of phosphorous on plant growth and development – deficiency symptoms - super phosphate & Bone meal. Potassium fertilizers – functions of Potassium on plant growth and development - deficiency symptoms – KCl, KNO_3 and K_2SO_4.

2.3 Secondary and micro nutrients – their functions on plant growth and development - complex and mixed fertilizers – their advantages.

Types of pollution caused by fertilizers – effects and their control.

UNIT III

PLANT NUTRIENTS AND MANURES

3.1 Biofertilizers- rhizobium, azospirillum, azotobacter, cyanobacteria, phosphobacteria. Complex and mixed fertilizers – their manufacture and composition.

3.2 Green Manures – Green leaf manure – bulky organic and concentrated organic manures – Compost – Farm yard manures handling and storage of compost.

3.3 Enriched farm yard manures – composting of coir pith – sugarcane trash and leaf litters and farm wastes – oil cakes, fish meal, blood, horn and hoof meal.

UNIT IV

PESTICIDES AND INSECTICIDES

4.1 Pesticides – definition –classification of pesticides – mode of action - General methods of formulation - emulsifiableconcentrate, water miscible liquids, wettable powders, dusts, granules.

4.2 Insecticides – Natural organic insecticides (plant products). Nicotine, pyrethrum and rotenone.Inorganic insecticides – Arsenical fluorides and borates.Synthetic organic insecticides –D.D.T, B.H.C, methoxychlo chloredane, endosulfon. Organophosphorous compounds – Carbamic acid derivatives – mode of action. Safety measures in handling them - pollution caused by pesticidesinsecticides and their control.

UNIT V

FUNGICIDES AND HERBICIDES

5.1 Fungicides – definition – classification. Inorganic fungicides– Sulphur compounds, copper compounds,boredeaux mixture and mercuric compounds. Organic fungicides- dithiocarbamates and dithane.

5.2 Herbicides - definition – classification. Inorganic herbicides – arsenical compounds, boron compounds,cyanamides, cyanides, chlorates and sulphamates. Organic herbicides - Nitro-compounds, chlorinated compounds -2 ,4D – compounds – urea herbicides, alachlor. Acaricides and Rodenticides - definition – Fenson, azo benzene, Parathion and Malathion.

5.3 Attractants – Repellants – Fumigants and Defoliants.

REFERENCES

1. Biswas, T.D.andMukeherjee S.K. 1987 *Text book of soil science*.
2. A.J.Daji (1970) *A Text book of soil science* – Asia publishing house, Madras.
3. Donahue, R.L.Miller, R.W.andshickluna, J.C. 1987. *Soils – An introduction to soils and plant Growth* – Prentice Hall of India (P) Ltd., New Delhi.
4. Hesse, P.R.1971. *A text book of soil chemical analysis* John Murray, New York.
5. Jackon, M.L. 1958, *Soil Chemical Analysis*. Prentice Hall of India, New Delhi.
6. Buchel, K.H. 1983. *Chemistry of pesticides* – John wiley& Sons, New York.
7. SreeRamula, U.S.1979, *Chemistry of Insecticides and Fungicides* – Oxford and IBH publishing Co., New Delhi.

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SEMESTER – VI

SOFT SKILL

UNIT I

KNOWTHYSELF/UNDERSTANDING SELF

Introduction to soft skill – Self-discovery – Developing positive attitude – Forming values – goal setting – Career planing.

UNIT II

COMMUNICATION SKILLS/COMMUNICATOIN WITH OTHERS

Art listening – Art of reading – Art of speaking – Developing important relationship – Art of writing – e-mail technique – resume writing.

UNIT III

CORPORATE SKILLS

Developing body language – Time management – Stress management – Group discussion – Mock GD – Mock Interview.

REFERENCES

1. A text book of developing soft skills. Dr.K.Meena&Dr.V.Ayothi.
2. Soft skills. Dr.K.AlexS.Chand& Company Ltd, Ram Nagar, New Delhi – 110 055.
3. Developing the leader within you John C Maxwell.
4. Good to great by Jim Collins.

   The seven habits of highly effective people Stephen Covey

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SEMESTER – VI

GENDER STUDIES

UNIT I

GENDER CONCEPT

Sex and Gender – Social communication of Gender – Gender perspectives of body – Gender discrimination – Gender stereotyping – Gender mainstreaming – Gender and work participation rate – Sex ratio.

UNIT II

FEMINISM Vs GENDER STUDIES

Women study as an agent of change – UGC'S initiatives – Women's studies in XI thplan – Beijing conference – Women development policies of nation and world – International women's Day.

UNIT III

WOMEN'S DEVELOPMENT AND GENDER EQUALITY

National and state commission for women – All women police stations – Family court – Women and Child welfare – Laws regarding Female Foeticide (PCPNOT) – Rules against Eve testing – Role of NGO's – 73 th and 74 th Costitution Amendments.

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FACULTY **UNIVERSITY NOMINEE** **HOD**

SEMESTER – III ALLIED COURSE – I

ALLIED CHEMISTRY - I

(for B.Sc., Mathematics and Physics)

UNIT I

1.1 Coordination chemistry –Definition of central metal ion – Ligand – Coordination number – types of ligands – Werner theory of Coordination compounds, chelates – properties of chelates – importance and uses of EDTA – Biological role of haemoglobin and chlorophyll.

1.2 Industrial Chemistry

Fuel gases – Water gas, producer gas, LPG gas Gobar gas and natural gas.

1.3 Fertilisers – definition - requisites for good fertilizers – classification - nitrogen fertilizers – calcium ammonium nitrate and urea – phosphorus fertilizers - calcium supre phosphate and triple super phosphate – potassium fertilizers - potassium nitrate and potassium chloride their role in growth and development of plant – deficiency symptoms - mixed fertilisers, micronutrients and their role in Plant growth and development - Bio fertilisers.

1.4 Soaps and detergents – an elementary idea about preparation and manufacture cleaning action of soap and detergents.

UNIT II

2.1 Polar effects - Inductive effect – Relative Strength of Aliphatic monocarboxylic acid and aliphatic amines.Resonance – Condition for resonance, Consequences of resonance – resonance energy, Basic property of aniline and acidic property of phenol. Hyperconjugation – Consequences of hyperconjugation – Heat of hydrogenation, Bond length and dipolemoment.Steric effect – steric accelerated reaction and steric inhibited reaction.

2.2 Halogen containing compounds – Importance of chloorohydrocarbon used as solvents and pesticides – choloform, carbon tetrachloride , DDT, BHC.

2.3 Types of solvents – polar and nonpolar - dissolving nature of solvents.

UNIT III

3.1 Aromatioc compounds - Benzene Structure, aromaticity, resonance and stability of benzene.Typical substitution reaction- Nitration, halogenation and alkylation (with mechanism). Polynuclear hydrocarbons – naphthalene –Isolation from coal tar, properties and uses.

3.2 Organic reactions Without Mechanism - Biuret, Decarboxylation, Benzoin, Perkin, Cannizaro, Claisen, Haloform, Carbyl amine, Coupling reactions.

3.3 Chemotherapy explanations (Structures not necessary) with two examples each for Analgesics, Antibacterial, Anti-inflammatory, Antidiabetics, Antiseptic, Disinfectant, Anaesthetics- local and general.

UNIT IV

4.1Thermodynamics–system and surroundings –open system, closed system and isolated system – state and path function – Thermodynamic processes – reversible and irreversible processes. Adiabatic and isothermal processes –

First law of thermodynamics – different statements – Second law of thermodynamics - different statements only – Carnot cycle – Derivation of efficiency of heat engine.

4.2 Phase rule–definition of Phase, component, degree of Freedom – definition of phase rule - one component system - water system.

UNIT V

5.1Chemical equilibrium –Law of mass action – equilibrium constant – homogeneous and heterogeneous equilibria with examples - derivation of KP and KC for the decomposition of HI, $CaCO_3$ and PCl_5.

5.2Chemical Kinetics –rate of reaction – rate equation - order of reaction – molecularity of reaction, Difference between order and molecularity – different methods of determination of order of the reaction. Activation energy – significance of activation energy – effect temperature and reaction rate.

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FACULTY UNIVERSITY NOMINEE HOD

SEMESTER III & IV

ALLIED COURSE. II PRACTICAL
(Volumetric and organic Qualitative Analysis)

I VOLUMETRIC ANALYSIS

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

II ORGANIC ANALYSIS

A study of the reactions of the following organic Compounds.

1. Amine, 2. Amide, 3. Aldehyde, 4. Ketone, 5. Acid,
   6. Corbohydrate and 7. Phenol.

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

Scheme for practical Evaluation.

Organic Qualitative Analysis	- 20
Volumetric Estimation	- 35
Record	- 5
Int Assessment	- 40
	100

Volumetric Analysis
(35 Marks)

Procedure - 5 Marks
Results
< 2% - 30 Marks
2-3% - 20 Marks
3-4% - 10 Marks
> 4% - 5 Marks

Organic Qualitative Analysis

Identificatio of Nitrogen- 4

Marks Saturated on unsaturated- 3 Marks Aliphatic or Aromatic - 3 Marks Preliminary reactions with Procedure- 5 Marks Functional group identified Correctly -5 Marks

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	2	3	3	3	2
CO3	3	2	3	3	3
CO4	3	3	3	3	3
CO5	3	3	2	3	2

SEMESTER – IV **ALLIED COURSE – III**

ALLIED CHEMISTRY – II

(for B.Sc., Mathematics and Physics)

UNIT I

1.1 Nuclear Chemistry- Fundamental particles of nucleus - isotopes, isotones and isomers – Differences between chemical reactions and nuclear reactions, Nuclearfusion and nuclear fission reaction.

1.2 Metallic bond- Electron gas - Pauling and band theories - Semiconductors – intrinsic, extrinsic, n-type and p-typesemi conductors.

UNIT II

2.1 Carbohydrates- Classification – glucose– preparation and properties – Elucidation of structure of glucose.

2.2 Amino acids and proteins- Amino acids – Classification based on structure. Essential and non – essentials amino acids – Preparation and properties – peptides (elementary Treatment) – Proteins – Classification based on physical properties and biological functions. Structures of proteins – primary and secondary structure (elementary treatment).

UNIT III

3.1 Synthetic polymers– polymers – classification of polymers - Teflon alkyl and epoxy resins, polyesters – preparation and uses.

3.2Heterocyclic compounds- Furan, pyrrole and pyridine – preparation and properties – basic properties of pyridine and pyrrole.

3.3 Stereoisomerism- Optical isomerism – Lactic and tartaric acid – racemisation and resolution. Geometrical isomerism – maleic and fumaric acids.

UNIT IV

4.1 Surface Chemistry- Emulsions, gels – preparation, properties and applications.Electrophoresis, Chromatography – Column, paper and thin layer Chromatography.

4.2 Photochemistry -Laws of Photochemistry – definition of Lamberts law, Beer lamberts law, GrothusDrapper law and Einstein law – Photosensitization and applications.

UNIT V

5.1 Electrochemistry -Specific and equivalent conductivities – their determination. An elementary idea of Arrhenius theory.Ostwald's Dilution law with derivation - Kohlrausch law, conductometric titrations.

5.2 pH and buffer–Definition of pH and buffer - Importance of pH and buffers in living systems – pH determination by colorimetric and electrometric methods.

	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	3
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CO5	3	3	3	2	3

FACULTY UNIVERSITY NOMINEE HOD

SEMESTER III **ALLIED COURSE- I**

ALLIED CHEMISTRY – I

(For B.Sc, Zoology & Biotech)

UNIT I

Fundamental concepts

Bonding – nature of bonds – ionic, covalent, coordinate and hydrogen bonds - Cleavage of covalent bonds – homolytic and heterolytic fission – electrophiles, nucleophiles and free radicals . Types of organic reactions – substitution, addition, elimination, rearrangement – definition and examples. Hybridisation – states of hybridization of carbon in methane, ethane, ethylene, acetylene.

UNIT II

Fuel gases, Plant nutrients and Fertilizers

Fuel gases – natural gas, water gas, semi water gas, carburetted water gas, producer gas, LPG and oil gas – composition, manufacture (elementary idea) and uses. Plant nutrients – major nutrients – role of nitrogen, phosphorus and potassium in plant life, micro nutrients. Fertilizers – definition, urea, ammonium sulphate, superphosphate of lime, triple superphosphate and potassium nitrate – preparation and uses.

UNIT III

Industrial Organic Chemistry

Pesticides – DDT, BHC – preparation and uses. Refrigerant – freon 12 – preparation, properties and uses. Polymers – definition, classification – natural and synthetic, homo and copolymers, natural polymers – cotton, silk and wool, preparation and applications of the synthetic polymers – polythene, PVC, teflon and nylon. Synthetic dyes – classification, preparation and uses of methyl orange and indigo, food colours.

UNIT IV

Colloidal State and Chromatography

Colloidal system – definition, types -Emulsions– definition, types – o/w and w/o emulsions – tests for identification, properties and applications. Gels – definition, classification, preparation and properties – syneresis, imbibition and thixotropy. Electrophoresis – applications. Chromatography–column and paper chromatography – experimental procedures only.

UNIT V

Pharmaceutical chemistry

Antiseptic & disinfectants – phenolic compounds – Dettol, phenyle & Lysol – Definition – differences – medicinal uses and side effects. Anaesthetics – general anaesthetics and local anaesthetics – Definition, examples, uses and side effects.

Analgesics – narcotic– morphine & pethidine, non-norcotic – salicylic acid & its derivatives – medicinal uses and side effects. Organic pharmaceutical aids – Preservatives, antioxidants, colouring, flavouring and sweetening agents – Definition, examples and uses.

Text Books:

1. Text Book of Ancillary Chemistry, **V.Veeraiyan** et al,revised edition, 1997.
2. Allied Chemistry, **R. Gopalan** and **S. Sundaram,** , S. Chand & Sons, 2nd edition, 1993.

Reference Books:

1. Text Book of Organic Chemistry**, P.L. Soni** and **H.M. Chawla**, S.Chand & Sons, , 29th edition, 2014 (Unit III).
2. Principles of Inorganic Chemsitry, **B.R. Puri, L.R. Sharma** and **K.C. Kalia** Vishal Publishing Co, Reprint 2016 (Unit I & II).
3. Principles of Physical Chemistry, **B.R.Puri, L.R. Sharma,** Vishal Publishing Company, Jalandhar, 44th edition 2009. (Unit IV)
4. A text book of pharmaceutical chemistry, **Jayashree Ghosh**, S.Chand and Company Ltd., New Delhi, 1st edition, 2004. (Unit V)
5. Pharmaceutical Chemistry, **S. Lakshmi**, S.Chand & Company Ltd., New Delhi, 3rd edition, 2004. (Unit V)

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SEMESTER IV **ALLIED COURSE- III**

ALLIED CHEMISTRY – II

(For B.Sc, Zoology & Biotech)

UNIT I

Acids, Bases and Catalysis

Acids and bases – Arrhenius and Lewis theories of acids and bases, pH scale, buffer solutions – definition – examples of acidic and basic buffer solutions, importance of pH and buffer in living systems. Hardness of water – types and determination of hardness by EDTA titration. Catalysis – types of catalysis, characteristics of catalysts, promoters and catalytic poison, biocatalysts – enzyme catalysis, industrial applications of catalysts.

UNIT II

Carbohydrates, Vitamins and Cosmetics

Carbohydrates – classification, glucose and fructose – sources, manufacturing method, reactions of glucose, derivatives of starch and cellulose – applications. Vitamins – classification, sources and deficiency diseases of vitamins A, D, E, K, C, B_1, B_2, B_5, B_6, and B_{12}.

UNIT III

Amino acids, Proteins and Nucleic acids

α-Amino acids – essential and non essential amino acids, α-amino acid-preparation by Gabriel-phthalimide reaction and Strecker's method, isoelectric point, zwitter ion formation, action of heat, ninhydrin test. Peptides – definition only, proteins – classification, characteristics and biological functions, elementary treatment of primary and secondary structure. Nucleic acids – DNA & RNA – composition and structure (elementary treatment), differences between DNA & RNA.

UNIT IV

ENZYMES

Definition – Nomenclature and classification – factors affecting enzyme activity – concentration of enzymes – concentration of substrate (Michaelis- Menton equation) – effect of temperature – effect of P^H – effect of product concentartion– effect of activators – effect of time – effect of light and radiation – enzymes inhibition (reversible, irreversible and allosteric) – Enzyme specificity – Energy profile diagram for mechanism of enzyme action.

UNIT V

Food Chemistry

Food additives – sweetners, preservatives, emulsifying and stabilizing agents, flavouring agents, antioxidants and colouring agents. Food adulteration – definition and types of adulterations – adulterants in soft drinks, milk and milk products, edible oils and fats. Packaging hazards – prevention and control. Simple tests for common adulterants in coffee powder, tea leaves, cane sugar, honey, turmeric, common salt, dhals, and ice creams.

Text Books

1. Text Book of Organic Chemistry, **P.L. Soni and H.M. Chawla**, S. Chand & Sons, 27th edition, 1997.
2. Principles of Physical Chemistry, **B.R.Puri, L.R. Sharma,** Vishal Publishing Company,

Jalandhar, 44th edition 2009. (Unit IV)

Reference Books :

1. Elements of Physical Chemistry, **B.R. Puri, L.R. Sharma, M.S. Pathania,** VishalPublishing Co. 43rd edition, 2008-09. (Unit I)
2. TextBook of Biochemistry, **O.P. Agarwal and G.R. Agarwal,** , Goel PublishingHouse, 7th edition, 1993. (Unit III & IV)
3. Chemistry for Changing Times, **John W.Hill,** St. edition, subject Publishing House,1986 (Unit II)
4. Ref: Biochemistry by U. Satyanarayana and U. Chakrapani., Third edition 2006 (Revisedreprint : 2007), Arunabha Sen books and allied P. Ltd., Kolkata(Unit IV).
5. Food Additives – Characteristics, Detection and Estimation, **S.N. Mahindru** TataMcGraw Hill Publishing Company Limited. (Unit V).

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