E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI – 625 014.

(*An Autonomous Institution – Affiliated to Madurai Kamaraj University*)

Re-accredited (**3rd Cycle**) with Grade **A+** & **CGPA 3.51** by NAAC

DEPARTMENT OF CHEMISTRY

CBCS SYLLABUS

BACHELOR OF SCIENCE

PROGRAMME CODE - K

COURSE STRUCTURE

(w.e.f. 2021 – 2022 Batch onwards)

Annexure-13

E.M.G.YADAVA WOMEN'S COLLEGE, MADURAI -14

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DEPARTMENT OF CHEMISTRY-UG

(w.e.f. 2021 – 2022 Batch onwards)

COURSE STRUCTURE-SEMESTER WISE

Sem	Part	Sub. Code	Title of the paper	Teaching hrs (Per week)	Exam Duration (hrs)	Marks Allotted			Credits
						CIA	SE	Total	
V	III	**21K51**	**Core**: Organic Chemistry	4	3	25	75	100	4
	III	**21K52**	**Core**: Physical Chemistry-I	4	3	25	75	100	4
	III		**Core: Elective I**	4	3	25	75	100	4
		21K5P	**Core**: Major Practical – III* Gravimetric Estimation and Organic Preparations	4	6	40	60	100	5
			Core: Major Practical – IV* Physical Chemistry	4	-	-	-	-	-
		21AP3	**Allied II** : Physics-Electricity and Electronics	4	3	25	75	100	4
			Allied II : Physics Practical-II*	2	-	-	-	-	-
	IV	**21SEK51**	**SBE**: Chemistry of Bio molecules	2	3	25	75	100	2
		214EV5	Environmental Studies	2	3	25	75	100	2
VI	III	**21K61**	**Core**: Organic Chemistry and Spectroscopy	4	3	25	75	100	4
	III	**21K62**	**Core**: Physical Chemistry-II	4	3	25	75	100	4
	III		**Core : Elective II**	4	3	25	75	100	4
		21K61P	**Core:** Major Practical –IV* Physical Chemistry	4	6	40	60	100	5
		21K62P	**Core**: Major Practical – V* Organic Analysis& Estimation	4	6	40	60	100	5
		21AP4	**Allied II** : Physics - Optics	4	3	25	75	100	4

		21AP4P	**Allied II** : Physics Practical-II*	2	3	40	60	100	1
	IV	**21SEK61**	**SBE**: Green and Nano Chemistry	2	3	25	75	100	2
		214VE6	Value Education	2	3	25	75	100	2
	V	**215NS4/ 215PE4**	Extension Activities NSS/ Phy. Education	-	3	25	75	100	1

Electives
Semester V
Elective- I- (Choose any one)

1. Inorganic and Analytical Chemistry - **21KE5A**
2. Chemistry of materials - **21KE5B**

Semester VI

Elective- II- (Choose any one)

1. Inorganic and Applications of Computer in Chemistry -**21KE6A**
2. Diffraction Methods and Applications -**21KE6B**

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DEPARTMENT OF CHEMISTRY-UG

(w.e.f. 2021 – 2022 Batch onwards)

ALLIED CHEMISTRY (For B.Sc., N&D)
COURSE STRUCTURE - SEMESTER WISE

Sem	Sub Code	Title of the paper	Teaching hrs. (Per week)	Duration of exam (hrs)	Marks allotted			Credits
					C.A	S.E	Total	
V	**21AKN5**	General Chemistry - III	4	3	25	75	100	4
		Allied Practical II* –Volumetric Analysis	2	-	-	-	-	-
VI	**21AKN6**	General Chemistry - IV	4	3	25	75	100	4
	21AKN6P	**Allied Practical II*** – Volumetric Analysis	2	3	40	60	100	1

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DEPARTMENT OF CHEMISTRY-UG

(w.e.f. 2021 – 2022 Batch onwards)

ALLIED CHEMISTRY (For B.Sc Physics)

COURSE STRUCTURE - SEMESTER WISE

Sem	Sub code	Title of the paper	Teaching hrs. (Per week)	Duration of exam (hrs)	Marks allotted			Credits
					CIA	S.E	Total	
V	**21AKP5**	Inorganic, Physical and Medicinal Chemistry	4	3	25	75	100	4
		Allied Practical II* –Volumetric Analysis	2	-	-	-	-	-
VI	**21AKP6**	Analytical and Inorganic Chemistry	4	3	25	75	100	4
	21AKP6P	**Allied Practical II*** –Volumetric Analysis	2	3	40	60	100	1

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DEPARTMENT OF CHEMISTRY

(w.e.f. 2021 – 2022 Batch onwards)

Title of the paper: Organic Chemistry

Semester	**: V**	**Contact Hours:**	**4**
Subject code	**: 21K51**	**Credits**	**: 4**

Objectives:

1. To acquire knowledge related to aromatic substitution
2. To learn the aromatic aldehydes, ketones and carboxylic acids
3. To understand organic nitrogen compounds,
4. To know the concept of heterocyclic compounds
5. To study the carbohydrates.

UNIT: I AROMATIC SUBSTITUTION: Isomerism and orientation of benzene derivatives-determination of orientation- rules of orientation-electronic interpretation of directive effects-mechanism of aromatic electrophilic substitution – halogenation, nitration and sulphonation, Friedel –Craft's reaction (alkylation, acylation) -influence of substituents – activating and deactivating groups-aromatic nucleophilic substitution– unimolecular, bimolecular substitution and benzyne mechanism.

UNIT: II AROMATIC ALDEHYDES, KETONES AND CARBOXYLIC ACIDS:

a) Preparation and properties of benzaldehyde, and acetophenone-Organic naming reactions: Reimer-Tiemann reaction, benzoin condensation, claisen condensation, knoevenagel reaction, cannizzaro reaction, crossed cannizzaro reaction, claisen-Schmidt reaction, perkin reaction -α, β - Unsaturated carbonyl compounds: Preparation and properties of cinnamaldehyde. b) Carboxylic acids: Preparation and properties of benzoic, salicylic, anthranilic and o-phthalic acids.

UNIT: III ORGANIC NITROGEN COMPOUNDS: a) Aromatic amines: Introduction-classification-methods of preparation of primary amines- reduction of nitro compounds and ammonolysis of aryl halides -methods of preparation of secondary and tertiary amines from aniline, acetanilide-properties: basicity of amines, salt formation, acylation, alkylation and arylation, carbylamine reaction, reaction with aldehyde, CS_2, Grignard reagent, bromination, nitration and sulphonation. Distinguish between primary, secondary and tertiary amines. b) Aromatic nitro compounds: nomenclature, preparation-nitration, from diazonium salts, reactions- reduction of nitrobenzene in different medium, electrophilic substitution reactions. c) Cyanides & Isocyanides: Preparation, properties of alkyl cyanides & alkyl isocyanides. Differences between alkyl cyanides & alkyl isocyanides.

UNIT: IV HETEROCYCLIC COMPOUNDS: Nomenclature and classification, general characteristics-aromatic character and reactivity-Preparation and reactions of pyrrole, furan, thiophene, pyridine, quinolone, isoquinoline and indole.

UNIT: V CARBOHYDRATES: Definition and classification- determination of configuration (Fischer's proof) –glucose, fructose-occurrence, preparation, properties, reactions, structural elucidation and uses-mutarotation-epimerisation- methods of ascending and descending in the sugar series-interconversion between glucose and fructose-disaccharides-sucrose-preparation, properties and structural elucidation-comparison between glucose, fructose and sucrose.

Text Books:

1. Bahl B.S. & Arun Bahl, "*Advanced Organic Chemistry*", 22nd Edition, S.Chand & Company, New Delhi, 2020.
2. Jain M.K. & Sharma S.C., "*Modern Organic Chemistry*", Vishal publishing Co, New Delhi, 2017.
3. P. L. Soni, and Chawla H.M., *Text Book of Organic Chemistry*, New Delhi, Sultan Chand & Sons, twenty ninth edition, 2007.

Reference Books:

1. Bansal K., "*Organic Reaction Mechanisms*", 4th Edition, New Age International Pvt. Ltd., New Delhi, 2012.
2. Bhupinder Mehta, Manju Mehta, "*Organic Chemistry*", PHI Learning Private Limited, New Delhi, 2012.
3. Finar I.L., "*Organic Chemistry*", Volume-I, Pearson Education, New Delhi, 2003.
4. Morrison R.T, Boyd R.N and Bhattacharjee S.K, "*Organic Chemistry*," 7th edn, Pearson Education Asia, 2010
5. Tewari K.S, Vishnoi.N.K and Mehrotra S,N, *A Textbook of Organic Chemistry*, 2nd Edition, Vikas Publishing House (Pvt.) Ltd., New Delhi, 2004.

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DEPARTMENT OF CHEMISTRY

(w.e.f. 2021 – 2022 Batch onwards)

Title of the Paper: Core-Physical Chemistry-I

Semester	**: V**	**Contact Hours**	**: 4**
Subject Code	**: 21K52**	**Credits**	**: 4**

Objectives:

1. To acquire knowledge about first law of thermodynamics and its applications.
2. To understand second law of thermodynamics, entropy and free energy.
3. To gain knowledge about phase rule and solutions.
4. To understand colligative properties.
5. To learn the fundamentals of group theory and its applications.

UNIT: I THERMODYNAMICS-I: 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-concept and significance of heat(q), work(w), internal energy(E), enthalpy(H)- heat capacity at constant P and V- Relation between C_p and C_v-work done in reversible isothermal expansion and compression –maximum work-work done in irreversible isothermal expansion and adiabatic expansion. The Joule-Thomson effect, Joule Thomson coefficient for real and ideal gas. b) Zeroth law of thermodynamics-absolute temperature scale.

UNIT: II THERMODYNAMICS-II: a) Second law of thermodynamics: limitations of first law, spontaneity and randomness-Carnot cycle-Carnot's theorem-entropy as a thermodynamic property-Clausius inequality-calculation of entropy change of an ideal gas with change in P,V and T – Entropy changes of an ideal gas in different process –Physical significance of entropy – Work and free energy functions – Variation of free energy change

with temperature & pressure – Maxwell's relationships – The Gibbs- Helmholtz equation– The Clapeyron- Clausis equation and its applications. Van't Hoff isotherm- Van't Hoff isochore.b) Third law of thermodynamics: Nernst heat theorem – Statement of Third law of Thermodynamics, determination of absolute entropy of solid, liquid and gas.

UNIT: III PHASE RULE AND SOLUTIONS: a) 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). b) Two component systems-simple eutectic system (lead-silver system only)-compound formation-congruent melting point (Mg-Zn system only), salt hydrates ($FeCl_3$-H_2O system only).-incongruent melting point (KI-H_2O system only). c) Thermodynamics of ideal solutions-Henry's law, Raoult's law-binary liquid system-partially miscible (phenol-water system)-effect of impurities on critical solution temperature- completely miscible and completely immiscible system-theory of fractional distillation and steam distillation.

UNIT: IV COLLIGATIVE PROPERTIES: Colligative properties –lowering of vapour pressure – osmosis and osmotic pressure –elevation of boiling point –depression in freezing point – experimental determination of lowering of vapour pressure and osmotic pressure – Van't Hoff factor – degree of association – degree of dissociation**.**

UNIT: V GROUP THEORY: Introduction-symmetry elements and symmetry operations- rules of a group, order of a group - classes and similarity transformation- point group classification (C_1,C_2,C_3,C_{nv},D_{nh},T_d,O_h) – matrix representation of symmetry operation- rotation & reflection– reducible and irreducible representation (definition only)- Orthogonality theorem - construction of character table (C_{2v} only).

Text Books:

1. Bhattacharya P.K., "*Group Theory and applications*", Himalaya Publishing House, Mumbai, 1996.
2. Puri B.R, Sharma L.R and Pathania S. "*Principles of Physical Chemistry*", Vishal Publishing Co., New Delhi, 2010.

3. Ramakrishnan V. and Gopinathan M.S., "*Group Theory in Chemistry*", Vishal Publishing Company, 2007

Reference Books:

1. Arun Bahl, Bahl B.S and Tuli G.D "*Essentials of Physical chemistry"* S.Chand &Co Ltd, New Delhi 2009.
2. Soni P.L., Dharmarha O.P., "*Text Book of Physical Chemistry*", Sultan Chand & Sons, New Delhi, 2001.
3. Rajaram.J and Kuriacose J.C, "*Chemical Thermodynamics*", Pearson Education, New Delhi, 2013.
4. Atkins P.W, Paula,"*Elements of Physical Chemistry*", Oxford University Press, 2017

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DEPARTMENT OF CHEMISTRY

(w.e.f. 2021 – 2022 batch onwards)
Core-Elective-I (choice-A)

Title of the paper: Inorganic and Analytical Chemistry

Semester : V	**Contact Hours: 4**
Sub Code : 21KE5A	**Credits : 4**

Objectives:

1. To acquire knowledge about Halogen compounds
2. To understand the fundamental concepts of transition elements
3. To learn about lanthanides and actinides
4. To study the non-aqueous solvents and inorganic polymers
5. To understand the data analysis and thermoanalytical methods

UNIT: I HALOGEN COMPOUNDS: a) Halogen compounds: Electronic configuration, diatomic nature, oxidizing property, electronegativity and electron affinity –Difficulties in the discovery and isolation of fluorine – peculiarities of fluorine – electropositive character of Iodine b) Interhalogen Compounds: Interhalogen compounds: preparation, properties of ClF, ICl, ClF_3, ClF_5, BrF_5 ,IF_5, IF_7 – structure of ICl, ClF_3, IF_5, IF_7- poly halides and pseudo halogens.

UNIT: II TRANSITION ELEMENTS: a) Transition elements –position in the periodic table –general characteristics of d-block elements. b) Occurrence, extraction, properties and uses of titanium, molybdenum and tungsten. c) Chemistry of titanium dioxide, titanium tetrachloride, vanadium pentoxide-ammonium vanadate, ammonium molybdate, molybdenum blue, tungsten oxide and tungsten bronze.

UNIT: III LANTHANIDES AND ACTINIDES: General characteristics of lanthanides and actinides. Lanthanide and actinides, separation by ion-exchange and solvent extraction methods–lanthanide contraction-actinide contraction. Isolation of thorium from monazite

–preparation, properties and uses of ceric ammonium sulphate, thorium dioxide and uranyl acetate. Applications of lanthanides and actinides.

UNIT: IV NON-AQUEOUS SOLVENTS & INORGANIC POLYMERS

a) Non-aqeous solvents: Classification of solvents-general properties of ionizing solvents-chemical reactions-liquid ammonia as solvents-liquid sulphur dioxide as solvents-liquid hydrogen fluoride as solvents. b) Inorganic polymers: Introduction-general properties of inorganic polymers -silicon based polymers-polysilaxane gums and silicon rubber-industrial applications of inorganic polymer.

UNIT: V DATA ANALYSIS AND THERMOANALYTICAL METHODS: a) Data analysis: Introduction-mean –median-precision-accuracy-confidence limits- definition – determinate errors- indeterminate errors-rules for types improving accuracy of data-significant figure-method of least squares. b) Thermoanalytical methods: Introduction-Thermogravimetric analysis (TGA) –principle –thermal analysis of silver nitrate-derivative thermogravimetry(DGA)-factors which influence the thermogram- application of thermogravimetry.

Text Books:

1. Gopalan R. Subramanian P.S. & Rengarajan K. "*Elements of Analytical Chemistry*" S.Chand & Sons , New Delhi, 2003.
2. Madan R.D, "*Modern Inorganic Chemistry*", S.Chand and Company Ltd., New Delhi, 2011.
3. Puri B.R. Sharma L.R. Kalia K.C., "*Principles of Inorganic Chemistry*", Milestone Publishers, Delhi, 2016.

Reference Books:

1. Gurdeep R. Chatwal & Sham K. Anand. "*Instrumental methods of chemical analysis*". Himalaya publishing house, Mumbai, 2002.
2. Lee J.D., "*Concise Inorganic Chemistry*", Fifth Edition, Blackwell Science Ltd., New Delhi, 2003.
3. Malik U. Tuli G.D. & Madan R.L. "*Selected Topics in Inorganic Chemistry*," S.Chand & Company, New Delhi, 2004

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DEPARTMENT OF CHEMISTRY

(w.e.f. 2021 – 2022 Batch onwards)
Core-Elective –I (Choice B)

Title of the paper: Chemistry of Materials

Semester : V **Contact Hours: 4**
Subject Code : 21KE5B **Credits : 4**

Objectives:

1. To understand about structures of solids.
2. To study about preparative method and characterization.
3. To learn the electrical and optical properties.
4. To gain knowledge about magnetic properties.
5. To study the special materials.

UNIT: I STRUCTURES OF SOLIDS : Introduction to solids – Crystalline and amorphous. Unit cell, Bravais lattices and X-ray structure determination (NaCl and KCl only) – powder and single crystal methods. Radius ratio rules – coordination number. Packing arrangement – different structure types in solids – rock salts, zinc blonde, wurtzite, spinel and inverse – spinel and perovskite structures.

UNIT: II PREPARATIVE METHOD AND CHARACTERIZATION: Solid state reactions – ceramic method, sol- gel hydrothermal, high pressure, zone refining, CVD, Czochralski and Bridgman and stockbarger methods. Physical methods – thermogravimetric and differential thermal analysis and scanning electron microscopy (only introduction and applications)

UNIT: III ELECTRICAL AND OPTICAL PROPERTIES: Defects in solid state – point defects – Frenkel and Schottky defects and non-stoichiometric defects. Conductors – variation of conductivity with temperature – semiconductors – p and n types, pn-junction, photoconduction, photo voltaic cell and photogalvanic cell – solar energy conversion,

organic semiconductors. Piezoelectric, pyro-electric and ferroelectrics (introduction and applications) Photolumionescence.

UNIT:IV MAGNETIC PROPERTIES: Magnetic properties – classification – diamagnetic, paramagnetic, antiferro magnetic, ferro and ferri magnetic – magnetic susceptibility – variation with temperature Curie-Wiess law, Curie temperature and Neel temperature. Permanent and temporary magnets.

UNIT: V SPECIAL MATERIALS: Super conductivity – introduction, Meissner effect – mention of Bardeen, Cooper and Schrieffer theory and Cooper pairs – examples of superconducting oxides, Chevrel phases – applications of superconducting materials. Ionic conductors – sodium-b alumina, sodium-sulphur battery. Intercalation-layered compounds – graphitic compounds. Special applications of solid state materials.High energy battery, lithium cells.

Text Books:

1. Meyers H.P., "*Introductory Solid State Physics*", 2nd Edn, Viva books private Limited, New Delhi, 2009.
2. West A.R., "*Solid State Chemistry and its Applications"*, 2nd Edn, John-Wiley and sons Singapore, 2014.

Reference Books:

1. Emelius H.J. & Sharpe A.G., "*Modern aspects of Inorganic Chemistry*", Universal Book stall, 2010.
2. Greenwood N.N., "*Ionic crystals, Lattice defects and Nonstoichiometry*",Butterworths, London, 2003.
3. Jolly W.L., "*Modern Inorganic Chemistry*", Mc Graw Hill Book Company New York, 1996.
4. Shriver D.F & Atkins P.W., "*Inorganic Chemistry*", Oxford University, Longford, 2008.

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DEPARTMENT OF CHEMISTRY

(w.e.f. 2021 – 2022 Batch onwards)

MAJOR PRACTICAL –II

(At the end of V semester)

Title of the paper: Gravimetric Estimation and Organic Preparations

Semester : V **Contact Hours : 4**

Subject Code : 21K5P **Credits : 5**

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

Gravimetric Estimation-25 **Organic Preparations -25 marks**

Distribution of marks for Gravimetric Estimation

Procedure (5marks)

Estimation (20marks)

Error <2% - 20 marks

Error 2-3% -15 marks

Error 3-4% -10 marks

Error >4% -5 marks

I) Gravimetric Estimation:

List of Experiments:

1. Estimation of lead as lead chromate
2. Estimation of barium as barium chromate
3. Estimation of calcium as calcium oxalate monohydrate

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Mark distribution for Organic preparations:

Procedure -10 marks Organic preparation-15 marks

Organic preparations:

1. Benzoic acid from methyl benzoate
2. Salicylic acid from methyl/ethyl salicylate
3. Osazone from glucose
4. Benzoic acid from benzaldehyde.

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(w.e.f. 2021– 2022 Batch onwards)

Skill Based Elective Paper-V

Title of the paper: Chemistry of Bio-molecules

Semester : V **Contact Hours : 2**

Subject code :21SEK51 **Credits : 2**

Objectives:

1. To understand the classification of amino acids and proteins.
2. To provide the knowledge about the structure and function of DNA & RNA.
3. To identify different types of vitamins and harmones.
4. To gain knowledge about enzyme mechanism and applications of enzymes.
5. To gain knowledge about oils.

UNIT: I AMINO ACIDS AND PROTEINS: a) Amino acids: Definition- classification-synthesis of α-amino acid (Gabriel synthesis, Koop synthesis and strecker synthesis)-properties of amino acids (isoelectric point, decarboxylation, acylation, action of heat, peptide formation).b) Proteins: Definition- classification (simple and conjugated proteins)-structure of proteins (primary, secondary, tertiary and quaternary)-properties of proteins (dipolar or zwitter ion, colloidal nature, isoelectric point, denaturation, hydrolysis)- colour tests for proteins (Biuret test, ninhydrin test).

UNIT: II NUCLEIC ACIDS: Definition- classification of nucleic acid-structure of nucleic acid-nucleosides- nucleotides- function of nucleotides- structure of DNA-replication of DNA- functions of DNA-structure and functions of RNA difference between DNA and RNA.

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- cofactor & coenzyme- factors influencing enzyme activity- enzyme action- mechanism of enzyme action- -enzyme inhibitors (competitive inhibitor, non-competitive inhibitor)- applications of enzymes.

UNIT : V OILS: Introduction- classification-composition of oils – occurrence & extraction of oils (extraction- refining)-properties (rancidity, saponification, hydrogenation) -analysis of oils and (acid value, saponification value, iodine value, Reichert-Meissel value) - uses of oils.

Text Books:

1. Arun Bahl, Bahl B.S., "*Advanced Organic Chemistry*", S.Chand & Company Ltd., New Delhi, 2012.
2. Soni P.L., & Chawla H.M., "*Text Book of Organic Chemistry*", Sultan Chand & Sons, New Delhi, 2012.
3. Veerakumar L., "*Biochemistry*", MJP publishers, Chennai, 2019
4. Satyanarayana U. & Chakrapani U., "*Biochemistry*", Elsvier, 2022.

Reference Books:

1. Lubert Stryer, "*Biochemistry",* W. H. Freeman and company, New York, 2010.
2. Tewari K.S., Mehrotra S.N., Vishnoi N.K., "*A Text Book of Organic Chemistry",* Vikas Publishing House Private Ltd., New Delhi, 2017.
3. Veerakumari L., "*Biochemistry"*, MJP publishers, Chennai, 2019.
4. Satyanarayana U. & Chakrapani U., "*Biochemistry*", Elsvier, 2022.

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(w.e.f. 2021– 2022 Batch onwards)

Title of the Paper: Core-Organic Chemistry and Spectroscopy
Semester : VI **Contact hours: 4**
Subject Code : 21K61 **Credits : 4**

Objectives:

1. To enable the students undertake the knowledge of active methylene compounds, dyes and chromatography.
2. To acquire an in-depth knowledge related to alicyclic compounds,
3. To provide knowledge on molecular rearrangement, tautomerism and their mechanisms.
4. To understand the chemistry and applications of biologically important compounds such as alkaloids and terpenoids.
5. To understand the application of spectroscopy in UV, IR and NMR.

UNIT: I REACTIVE METHYLENE COMPOUNDS, DYES AND CHROMATOGRAPHY: a) Reactive methylene compounds: Introduction- Preparation &synthetic applications of acetoacetic ester & malonic ester. b) Dyes: Introduction to dyes – color and constitution – classification based on structure and application – preparation and applications of the following dyes – methyl orange, congo red, malachite green, phenolphthalein and indigo**.** c) Chromatography: Definition-principles of chromatography-types of chromatography-experimental technique and applications of column chromatography, thin-layer chromatography, paper chromatography, paper electrophoresis-R_f values and factors affecting R_f values.

UNIT: II ALICYCLIC COMPOUNDS AND CONFORMATIONAL ANALYSIS: 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, n-butane, 1, 2-dichloroethane, cyclohexane and methyl cyclohexane.

UNIT: III MOLECULAR REARRANGEMENTS AND TAUTOMERISM:

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

UNIT : IV ALKALOIDS AND TERPENOIDS: a) Alkaloids: Definition- occurence-classification of alkaloids -extraction of alkaloids-general methods of determining the structure of alkaloids- structure and synthesis of the following alkaloids: coniine and nicotine. b) Terpenoids: Definition- occurence- classification- - isolation- isoprene rule-general properties-general methods of determining structure- and structural elucidation of citral and menthol.

UNIT : V MOLECULAR SPECTROSCOPY : a) Ultra violet-visible spectroscopy (Electronic Spectroscopy): Introduction-Franck Condon principle (Electronic transition)-types of transition in organic molecules (n-π^*, σ- σ^*, n- σ^*, π- π^*)-basic concepts-batho chromic shift, hypsochromic shift, hyper chromic shift, hypo chromic shift, auxo chrome chromophore, effect of conjucation, Woodward Fieser rules for calculating λ_{max} value-(conjucated dienes, α,β unsaturated carbonyl compounds)**.**

b) IR Spectroscopy: Introduction- principle-selection rules-factors influencing vibration frequencies-finger print region-spectral features of some organic compounds (alkane, alkyl

residue, alkenes, alkynes, cycloalkanes, halogens, alcohols and 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, paraxylene.

Text Books:

1. Arun Bahl and Bahl B.S., "*A Text Book of Organic Chemistry*", 22nd Edition S.Chand & Company, New Delhi, 2016.
2. Finar I.L., "*Organic Chemistry*" Vol. II, 5th Edition, Pearson Education, New Delhi, 2013.
3. Gurdeep R. Chatwal "*Organic chemistry of natural products*" Vol- I & II Himalaya publishing house, New Delhi, 2010.
4. Sharma Y.R., "*Elementary Organic Spectroscopy*", S.Chand & Company Pvt. Ltd., New Delhi, 2013.
5. Soni P.L. Chawla H.M., "*Text Book of Organic Chemistry*", Sultan Chand & Sons, New Delhi, 2012

Reference Books:

1. Finar I.L., "*Organic Chemistry*," Vol-I, Pearson Education Ltd., Delhi, 2013.
2. Tewari T.S., Vishnoi and Mehrotra S.N., *A Textbook of Organic Chemistry*, 2nd Edition, Vikas Publishing House (Pvt.) Ltd., New Delhi, 2017
3. William Kemp, "*Organic Spectroscopy*" Third Edition, Palgrave, New York, 2000.

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CBCS

DEPARTMENT OF CHEMISTRY

(w.e.f. 2021 – 2022 Batch onwards)

Title of the Paper: Core-Physical Chemistry-II

Semester : VI	**Contact Hours: 4**
Subject Code :21K62	**Credits : 4**

Objectives:

1. To learn the basic concepts in electrochemistry.
2. To understand electrodes functions and applications of emf measurements
3. To study the laws of photochemistry.
4. To learn the basic concepts in quantum theory.
5. To acquire the knowledge in rotational, vibrational, IR, Raman spectroscopy.

UNIT: I ELECTROCHEMISTRY: Electrolytic conductance-Faraday's laws of electrolysis – specific conductance – equivalent conductance – molar conductance – variation of molar conductance with dilution – Ionic mobility -Transport number – determination of transport number : Hittrof's method, moving boundary method – Kohlrausch's law – applications – applications of conductance measurements : determination of solubilities of sparingly soluble salts, conductometric titrations, precipitation titrations. - Ostwald's dilution law - Debye - Huckel Onsager theory of strong electrolytes.

UNIT: II ELECTROCHEMICAL CELLS : Galvanic Cells –half cell reactions and reversible electrodes – single electrode potential – thermodynamics of reversible electrodes and cells - The Nernst equation – standard electrode potentials: electrochemical series – concentration cells: electrode and electrolyte concentration cells – types of concentration cells: concentration cells without and with transference – liquid junction potential — applications of emf measurements : acid – base, redox and potentiometric

titrations. Commercial cells - Dry cell, lead storage, alkali (Na-S) and H_2-O_2 fuel cells-lithium ion battery.

UNIT :III PHOTOCHEMISTRY: Definition of photochemical reaction-differences between thermal and photochemical reactions-laws of photochemistry :Lambert, Beer's law, Grotthus –Draper, Stark-Einstein's law-quantum yield-explanation of low and high quantum yield-experimental determination of quantum yield -Jablonski diagram, Non-radiative transition:IC and ISC - radiative transition: Fluorescence and Phosphoresence - differences between fluorescence and phosphorescence - kinetics of photochemical reactions- formation of HCl, HBr - Photosensitization –chemiluminescence and bioluminescence.

UNIT : IV QUANTUM CHEMISTRY : Introduction-experimental foundation of quantum theory - black body radiation and planck's theory(no derivation required) – Photoelectric effect and Einstein's theory-Hydrogen atomic spectrum and Bohr's theory of the atom model - dualistic nature of matter –De-Broglies equation-Postulates of quantum mechanics - derivation of Schrodinger wave equation – wave function and its significance-probability of finding electrons-operators – differential and integral operators only – Application of Schrodinger wave equation – particle in one dimensional box –particle in 3Dbox.

UNIT: V MOLECULAR SPECTROSCOPY: a) Introduction-characterization of electromagnetic radiation (wavelength, wave number)-regions of the spectrum.

b) Rotational spectra of diatomic molecules: Rigid rotator- selection rule –determination of moment of inertia and bond length- relative intensities of spectral lines c)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-CO_2, H_2O(stretching and bending vibrations)-applications, detection of functional group (-OH, -COOH, -NH_2, -CO), study of hydrogen bonding and finger print region d) 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 CO_2, H_2O)

Text Books:

1. Colin N. Banwell & Elaine M. McCash, "*Fundamentals of Molecular Spectroscopy"*, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2017.
2. Puri. B.R, Sharma. L.R. & Pathania. M.S.," *Principles of Physical Chemistry*," 46th Edition, Vishal Publishing Company, New Delhi, 2013.

Reference Books:

1. Arun Bahl, Bahl B.S.,Tuli G.D., " *Essentials of Physical Chemistry*," S.Chand & Company Ltd., New Delhi, 2022.
2. Gurdeep Chatwal, & Sham K. Anand, " *Spectroscopy (atomic and molecular)*," Himalaya Publishing House, Mumbai, 2001.
3. Rohatgi-Mukherjee K.K., "*Fundamentals of Photochemistry*", New Age International Publishers, Daryaganj, 2021.

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DEPARTMENT OF CHEMISTRY

(w.e.f. 2021 – 2022 Batch onwards)
Core-Elective Paper II (Choice A)

Title of the paper: Inorganic and Applications of Computer in Chemistry

Semester	**: VI**	**Contact Hours: 4**	
Subject code	**: 21KE6A**	**Credits**	**: 4**

Objectives:

1. To learn the fundamentals in coordination compounds and chelates.
2. To understand VBT, CFT and molecular orbital theory.
3. To study metal carbonyls, metal nitrosyls and bioinorganic chemistry.
4. To learn the basics of C-language and its applications in chemistry.
5. To acquire the knowledge in representation and manipulation of 2D, 3D molecular structure using cheminformatics.

UNIT: I COORDINATION COMPOUNDS-I: Double salts and coordination compounds – terminology: coordination sphere, coordination number, ligand and its types – nomenclature – EAN rule -Isomerism: structural isomerism and stereo isomerism Chelates: classification – chelate effect and application of the formation of chelated complexes in analytical chemistry.

UNIT: II COORDINATION COMPOUNDS-II: Werner's coordination theory: postulates and experiment evidence - Sidgwick's concept: EAN rule – applications and limitations - Valence Bond Theory: assumptions and illustration to 4- and 6- coordination ions - hybridization and geometry - limitations - Crystal Field Theory: salient features - orbital splitting as applied to octahedral, tetrahedral and square planar complexes - CFSE and its calculation –factors influencing the magnitude of CF splitting:

nature of central cation, spectrochemical series- magnetic moments and color of transition metal complexes- Comparion of VBT and CFT - Molecular orbital theory :σ bonding in octahedral complexes $[Co(NH_3)_6]^{3+}$ & $[CoF_6]^{3+}$- π bonding system introduction only.

UNIT: III METAL CARBONYLS, METAL NITROSYLS AND BIO- INORGANIC CHEMISTRY: a) Metal Carbonyls: Definition-classification-general methods of preparation and properties of carbonyls-structure and bonding in $Ni(CO)_4$, $Fe(CO)_5$, $Cr(CO)_6$, $Mn_2(CO)_9$, and $Co_2(CO)_8$-EAN rule as applied to carbonyls.b) Metal nitrosyls:Nitrosyls-types-nitrosyls compounds.preparation, properties and structure – sodiumnitroprusside-nitroferrous sulphate-EAN as applied to nitrosyls.

c) Bio-Inorganic Chemistry: Role of metal ions (Fe, Co, Zn, Mg, Na, Ca &K) in biological systems- structure of metallo porphyrins- structure and functions of heamoglobin, myoglobin.

UNIT: IV PROGRAMMING IN C LANGUAGE: a) Advantages- types of the language- keywords- variables 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.

UNIT : V CHEM INFORMATICS: a)Representation and manipulation of 2D molecular structure: Introduction- computer representation of chemical structure- Graph Theoretic Representations of Chemical Structures– connection tables and linear notations- structure searching – substructure searching (screening methods) –reaction databases.

b) Representation and manipulation of 3D molecular structure:Introduction-theoretical 3D databases (structure generation programmes – conformational search & analysis – systematic conformational search – random conformational search).

Text Books:

1. Andrew R., Leach Valerie J. & Gillet, "*An Introduction to Chemoinformatics",* Springer International Edition, 2007.
2. James E.Huheey., Ellen A., Keiter,Richard L.Keiter, Okhil K.Medhi *"Inorganic chemistry principles of structure and reactivity"* 4th edition published by pearson Education, New Delhi, 2016.
3. Madan R.D., "*Modern Inorganic Chemistry*", S.Chand & Co., New Delhi, 2011.
4. B.R. Puri, L.R. Sharma and K.C. Kalia, "*Principles of Inorganic Chemistry*", 31st Edition, Milestone Publishers and Distributors, New Delhi, 2013.
5. Raman K.V., "*Computers in Chemistry*", Tata McGraw-Hill Publising Company, New Delhi, 2004.

Reference Books:

1. Balagurusamy, "*Programming in ANSI C"*, Third Edition, Tata McGraw-Hill Publishing Company, 2019.
2. Chatwal G.R. & Bhagi A.K., "*Bio-Inorganic Chemistry*," First Edition, Himalaya Publishing House, Mumbai, 1996.
3. Kettle S.F, "*Coordination Chemistry*", ELBS and Nelson, 1986.
4. Lee J.D., "*Concise Inorganic Chemistry*," Fifth Edition, Blackwell Science Ltd., New Delhi, 2003.
5. Malik U. Tuli G.D. & Madan R.L. "*Selected Topics in Inorganic Chemistry*," S.Chand & Company, New Delhi, 2004.

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DEPARTMENT OF CHEMISTRY

(w.e.f. 2021 – 2022 Batch onwards)
Core- Elective Paper II (Choice -B)

Title of the paper: Diffraction Methods and Applications

Semester : VI	**Contact Hours: 4**
Subject code : 21KE6B	**Credits : 4**

Course Objectives:

1. To learn the Diffraction phenomenon, crystallography.
2. To understand particle structure determination and unit cell, space cell.
3. To study structure analysis and semiconductors.
4. To acquire the knowledge in applications of X-ray diffraction.
5. To learn about neutron diffraction and electron diffraction.

UNIT : I

Diffraction phenomenon – introduction – principles of Diffraction X-rays and crystal-diffraction of particle beams. Single crystal X-rays: X-ray crystallography – single crystals – diffraction from lattices – atoms in lattices – extension of phasing-refinement.

UNIT : II

Particle structure determination – Production of X rays – determining the unit cell and space group – intensity data – data reduction – elucidating the structure – crystallographic results.

UNIT : III

Structure analysis – Growth of X-ray crystallography – inorganic chemistry and mineralogy – metal complexes and covalent molecule – organometallic compounds – metal and semiconductors – organic compounds – biological structures – single crystals work in perspective.

UNIT : IV

Specialized applications of X-ray diffraction – Powder method X-ray diffraction and high polymers degree of crystallinity – orientation – micro and macro structure in polymers – other applications of X-ray diffraction.

UNIT : V

Neutron Diffraction – Diffraction of thermal neutron – elastically scattered neutrons – magnetic scattering of neutrons – inelastic neutron scattering – Electron diffraction – Diffraction from gases and vapours – high energy electron diffraction from solids – low energy diffraction.

Text Book:

1. Wormald J., "*Diffraction Methods*", Oxford series, U.K., 1973.

Reference Books:

1. Ebsworth E.A.V. David W.H. & Rankin Stephen Cradock, "*Structural Methods in Inorganic Chemistry"*, ELBS, Oxford, U.K., 1987.
2. Jolly W.L., "*Modern Inorganic Chemistry*", Mc Graw Hill Book Company New York, 1996

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DEPARTMENT OF CHEMISTRY

(w.e.f. 2021 – 2022 Batch onwards)
SKILL BASED ELECTIVE PAPER-VI

Title of the paper: Green and Nano Chemistry

Semester	**: VI**	**Contact Hours:**	**2**
Subject code	**: 21SEK61**	**Credits**	**: 2**

Objectives:

1. To learn the need for green chemistry and the concept of atom economy.
2. To gain knowledge in various types of green solvents, concepts in designing a green synthesis.
3. To study microwave, ultrasound assisted reactions in green chemistry.
4. To understand the origin of nanotechnology, synthesis of nanomaterials.
5. To study the applications of nanomaterials in nanomedicine.

UNIT I: GREEN CHEMISTRY-I: 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 (Chemoselectivity, Regioselectivity, Enantioselectivity and Diastereoselectivity)

UNIT II: GREEN CHEMISTRY-II: Green solvents-Definition- Various types of 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, Methyl methacrylate, Urethane, Benzyl bromide, Acetaldehyde, Citral, Furfural and Paracetamol.

UNIT III: GREEN CHEMISTRY-III: Microwave assisted reactions in water (Hydrolysis of benzyl chloride, Hydrolysis of benzamide, Hydrolysis of methylbenzoate, Oxidation of toluene , Oxidation of alcohols) - Microwave assisted reactions in Organic solvents (Esterification, Fries rearrangement, Diels Alder reaction)-Microwave assisted solvent-free reactions (Deprotection, Saponification, Synthesis of Benzimidazoles)-Ultrasound assisted reactions (Esterification, Saponification, Oxidations, Coupling reactions)- Future trends in Green Chemistry.

UNIT IV : NANOCHEMISTRY: a) Definition of nanosized material – origin of nano technology - difference in properties between bulk and nanomaterials - Dimension based classification of nano materials - 0D, 1D, 2D, 3D b) Properties and synthesis of nano materials :Magnetic and electrical properties of nanomaterials - synthesis of nano materials - basics of bottom-up and top down approach - PVD, CVD, Sol-gel, wet chemical synthesis only.

UNIT V: APPLICATIONS OF NANO TECHNOLOGY: Quantum dots - fabrication - applications - CNT - synthesis and applications - application of nano materials in nano medicines and pollution control - Principle of Scanning electron microscope.

Text Books:

1. Das Asim K., Mauha Das, "*An Introduction to Nanomaterials and Nanoscience*", CBS Publishers & Distributors Pvt Ltd., New Delhi, 2018.
2. Kumar V., "*An Introduction to Green Chemistry*", First Edition, Vishal Publishing Co., New Delhi, 2007.
3. Shanmugam S., "*Nanotechnology*", MJP publishers, Chennai, 2011.

Reference Books:

1. Ahulwalia V.K. Kidwai M., "*New Trends in Green Chemistry*", Second Edition, Anamaya Publishers, New Delhi, 2012.
2. Kenneth & Klabunde J, "*Nanoscale Materials in Chemistry*", Wiley Interscience, 2001.
3. Ownes F.J.,"*Introduction to Nanotechnology*", Wiley publication, USA, 2003

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DEPARTMENT OF CHEMISTRY

(w.e.f. 2021– 2022 Batch onwards)

MAJOR PRACTICAL-IV

(At the end of the THIRD YEAR)

Title of the Paper: Physical Chemistry

Semester : V&VI **Contact Hours:4**

Subject code : 21K61P **Credits : 5**

Note: 1. For Practical Record - 10 marks

2. For Experiment and Results - 50 marks

1. Determination of molecular weights by

a) Transition temperature method: sodium thiosulphate pentahydrate,

b) Cryoscopic method: Rast's macro method- naphthalene

2. Phase diagram involving

a) Simple eutectic and

b) Compound formation

3. Critical solution temperature:

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

4. Thermochemistry:

Heat of solution- Ammonium oxalate.

5. Viscosity:

Determination of the composition of an unknown mixture.

6. Kinetics:

Determination of relative strength of acids by acid catalysed hydrolysis of ester

7. Conductometric Titration:

a) Acid-base Titration : HCl Vs NaOH

b) Precipitation titration:$BaCl_2$ Vs $MgSO_4$

8. Potentiometric Titration:

a) Titration between ferrous ammonium sulphate and potassium permanganate

b) Titration between ferrous ammonium sulphate and potassium dichromate.

9. Distribution coefficient

Iodine- Carbon tetrachloride, Iodine – Benzene system

10. Colorimetric titration:

a) Colorimetric estimation of Nickel.

b) Colorimetric estimation of Iron.

11. pH titration:

a) Preparation of various Buffer mixtures and comparing their pH values with theoretical values using pH meter.

b) Base pH titration - Strong Acid vs Strong Base.

c) pH titration - Weak Acid vs Strong Base.

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DEPARTMENT OF CHEMISTRY

(w.e.f. 2021 – 2022 Batch onwards)

MAJOR PRACTICAL-III

(At the end of the VI Semester)

Title of the Paper: Organic Analysis and Estimation **Contact hours: 4**
Semester : VI **Credits : 5**
Subject Code :21K62P

Note: 1. For Practical Record - 10 marks

2. For Experiment and Results - 50 marks

Organic Analysis 25 marks, Organic Estimation 25 marks

I. 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 only.

II. Organic estimation (25 marks)

1. Estimation of phenol
2. Estimation of aniline

Distribution of marks for Organic Estimation

Procedure -5 marks
Estimation -20 marks
Error <2% - 20 marks
Error 2-3% - 15 marks
Error3-4% - 10 marks
Error > 4% - 7 marks

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DEPARTMENT OF CHEMISTRY

(w.e.f. 2021 – 2022 Batch onwards)

ANCILLARY CHEMISTRY (For B.Sc., N&D)

Title of the Paper : General Chemistry-III
Semester : V **Contact Hours: 4**
Subject code : 21AKN5 **Credits : 4**

Objectives:

1. To get an insight into the Nature of Chemical bonding
2. To understand the basic concept of Oxidation and Reduction, Acids & Bases
3. To acquire knowledge on Halogen compounds
4. To learn the Chemistry of Polymers
5. To understand the Ionic equilibrium and the Hydrolysis of salts

Unit: I CHEMICAL BONDING a) Valence Bond Theory-Postulates of VB Theory – Types of overlap of Atomic orbitals- s –s Overlapping -s- p Overlapping –p – p Overlapping – Types of Covalent bond -Sigma bond, pi bond and their differences. b) Molecular Orbital Theory -Formation of molecular orbital (combination of s – s Orbital only) -Differences between bonding and antibonding molecular orbitals-Molecular orbital diagram, Bond Order and Magnetic Properties for the following homo nuclear diatomic molecules –Hydrogen, Helium and Nitrogen.

Unit: II OXIDATION AND REDUCTION, ACIDS & BASES

a) Oxidation and Reduction-Electronic concept of Oxidation and Reduction- oxidation number-differences between oxidation number and valency- rules for calculating oxidation number-solved examples- concept of -oxidizing agents and reducing agents-redox reactions and half reactions.

b) Modern concepts of Acids and Bases-Arrhenius concept, Bronsted-Lowry concept, Lewis concept and Usanovich concept- relative strengths of acids and bases –amphoteric Solvents-Levelling effects.

Unit: III HALOGEN COMPOUNDS-Aliphatic halogen compounds -Preparation, Properties and uses of Chloroform and Carbon Tetrachloride -Aromatic halogen compounds -Preparation, Properties and uses of Chlorobenzene -Mechanism of aliphatic nucleophilic substitution -SN^1 – Explanation with Example -SN^2 – Explanation with Example- Differences between SN^1 and SN^2 Mechanisms.

Unit: IV POLYMERS a) Polymers-Definition- Classification of Polymerisation Reactions-Addition-Polymerization-Condensation Polymerization. b) fibres-Definition-Manufacture and uses of important fibres -Polyamide fibre-Polyester fibre. c) Resins – Definition -Manufacture and uses of Amino resin, Unsaturated Polyester resin. d) Plastics -Definition -Classification of Plastic -Thermoplastics -Thermosetting plastics-Manufacture and uses of Polythene and PolyVinyl Chloride.

Unit: V IONIC EQUILIBRIA-Ionic Product of Water -Hydrolysis – definition – Explain degree of Hydrolysis and Hydrolysis constant of the following- Salts of strong acid and strong base -Salts of weak acid and strong base- Salts of strong acid and weak base -Salts of weak acid and weak base.

Text Books:

1. Bahl B.S. & Arun Bahl,"*A Text Book of Organic Chemistry*", S.Chand & Company New Delhi, 2012.
2. Puri B.R, Sharma L.R. and Kalia K.C.,"*Principles of Inorganic Chemistry*", Vishal Publishing Co, Delhi, 2017.
3. Ratinamuthu .K, "*B.Sc Ancillary chemistry"* R. Arunn & Co, Educational Publishers, Madurai.

Reference Books:

1. Jain P. C and Monika Jain, "*Engineering Chemistry*" Fifteenth Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2011.
2. Madan R. D, "*Modern Inorganic Chemistry*", S. Chand and Company Ltd, New Delhi, 2011.
3. Puri, Sharma and Pathania, "*Principles of Physical Chemistry*," Vishal Publishing Co, Jalandhar, 2011.
4. Jain.M.K and Sharma.S.C,"*Modern Organic Chemistry*", Vishal Publishing Co, Delhi, 2018

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DEPARTMENT OF CHEMISTRY

(w.e.f. 2021 – 2022 Batch onwards)

ANCILLARY CHEMISTRY (for B.Sc., Physics)

Title of the Paper: Inorganic, physical and medicinal Chemistry

Semester : V	**Contact Hours: 4**
Subject Code : 21AKP5	**Credits : 4**

Objectives:

1. To gain and understand different types of elements presents in periodic tables.
2. To understand different types of bonds formed by the atoms.
3. To learn about classification, preparation, properties of colloidal.
4. To gain knowledge of catalysis and adsorption
5. To enrich the knowledge in medicinal Chemistry.

UNIT: I PERIODIC TABLE & PERIODIC PROPERTIES: 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 their periodic variations.

UNIT : II CHEMICAL BONDING: Introduction-octet rule and its limitations-types of bonds-Covalent bond - Ionic bond –factors forming the formation of ionic bonds--difference between covalent and ionic bonds - Fajans' rule – coordinate covalent bond - VSEPR theory - Valence bond theory- limitations of VBT - hybridisation – sp ($BeCl_2$), sp^2 (BCl_3) and sp^3(CH_4). Molecular orbital theory: Bonding and antibonding molecular orbitals. MO diagram or molecules like H_2, He_2, O_2, N_2, CO. Comparison between VBT and MOT.

UNIT: III COLLOIDAL STATE: Introduction: Phases of colloids-classification of colloidal solutions- preparation (Dispersion methods only). properties- colligative property- optical property-Tyndal effect, Kinetic property- Brownian movement; Electrical properties-Electrical double layer and, Electrophoresis-Purification of colloidal solution –

dialysis. Applications of colloids: Food, colloidal medicine, rubber plating, sewage disposal, clarification of water, detergent action of soap, artificial rain.

UNIT: IV CATALYSIS AND ADSORPTION: a. 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 - Michaelis Menton equation. – applications of catalysis. b. Adsorption-definition-adsorbent-adsorbate-examples-difference between adsorption and absorption-factors influencing adsorption of gases on solid -physisorption and chemisorption-Langmuir adsorption isotherm –Applications of adsorption.

UNIT: V MEDICINALCHEMISTRY: 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. Puri P.R. Sharma L.R. & Kalia K.C., "*Principles of Inorganic Chemistry*", Milestone Publishers, Delhi, 2019.
2. Bahl B.S. Tuli G.D. & Arun Bahl, " *Essentials of Physical Chemistry,"* S.Chand & Company Ltd., New Delhi, 2010.
3. Ashotosh Kaur, "*Medicinal Chemistry*", 3rd Edition, New Age International (Pvt) Limited, New Delhi, 2006.
4. Madan R. D, "*Modern Inorganic Chemistry*", S. Chand and Company Ltd, New Delhi, 2011.

Reference Books:

1. Malik, Wahid U, Madan R.d. & Tuli G.D., "*Selected Topics in Inorganic Chemistry*" S.Chand &Co., New Delhi, 2010.
2. Bagavathi Sundari. K., "*Applied Chemistry*", MJP Publishers, Chennai, 2006
3. Soni P.L.,Dharmarha O.P. & Dash U.N., "*Text Book of Physical Chemistry*", Sultan & Sons, New Delhi, 2009.
4. Bhalerao Marry & Giragon,"*Pharmaceutical Chemistry*", Himalaya Publishing House, Ramdoot, 2018.
5. Puri, Sharma and Pathania, "*Principles of Physical Chemistry*," Vishal Publishing Co, Jalandhar, 2011.

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DEPARTMENT OF CHEMISTRY

(w.e.f. 2021 – 2022 Batch onwards)
ANCILLARY CHEMISTRY (For B.Sc., N&D)

Title of the Paper: General Chemistry-IV
Semester : VI **Contact Hours : 4**
Subject code : 21AKN6 **Credits : 4**

Objectives:

1. To understand the terminology and theories of Double Salts, Alums and Coordination compounds.
2. To learn the chemistry of some Natural products – Alkaloids and Terpenoids.
3. To learn the preparation and uses of some important Organic Compounds and Industrial Organic Compounds.
4. To acquire knowledge on Chemotherapy.
5. To become familiar with Fertilizers, Insecticides, Pesticides and Fungicides.

Unit: I DOUBLE SALTS, ALUMS AND COORDINATION COMPOUNDS

a) Double Salts And Alums -Definition -Double Salts –Alum-Distinction between Double salts and alums -Preparation and uses of ferrous ammonium sulphate -Preparation and uses of ferric Alum

b) Coordination compounds -Definition -Definition of various terms involved in Coordination Chemistry –Werner's Theory – illustrate with example -Effective Atomic Number rule with examples -Valence Bond Theory –postulates, formation of $[Co(NH_3)_6]^{3+}$ complex.

Unit: II ALKALOIDS AND TERPENOIDS:-a) Alkaloids -Definition -Occurrence-Classification of alkaloids- Extraction of alkaloids- General Properties of alkaloids -Structure of Cocaine, Papaverine and Piperine. b) Terpenoids -Definition -Isoprene rule – Line formula of Terpenoids -Classification – Occurrence- Isolation of Terpenoids (Steam

distillation method) -General properties-Structure of Citral, Geraniol, Menthol, Terpineol and Dipentene (structural elucidation not required).

Unit: III ORGANIC AND INDUSTRIAL ORGANIC COMPOUNDS:-a) Preparation and uses of some Important Organic Compounds–Saccharin, Salicylic acid, Aspirin, Salol and Picric acid. b) Manufacture and uses of some Industrial organic compounds -Alcoholic beverages (Beer and wine)**,** Absolute alcohol**,** n-butyl alcoholand Acetone.

Unit : IV MEDICINAL CHEMISTRY: Introduction-characteristics of a drug-Antibacterials-Definition-preparation and uses of Sulphanilamide -Antimalarials – definition-preparation and uses of chloroquine and Plasmoquine- Antibiotics-definition-classification-based on the specificity of their action, based on gram staining method-Arsenical drugs-definition- preparation and uses of Salvarsan.

Unit: V FERTILIZERS, INSECTICIDES, PESTICIDES AND FUNGICIDES

a) Fertilizers –Definition-role of various elements in plant growth -Manufacture and uses of Nitrogenous fertilizers-Calcium Ammonium Nitrate-Urea-Phosphatic fertilizers - Calcium Super Phosphate - Potash fertilizers-Potassium Nitrate -Potassium Sulphate b) Definition -Classification according to the mode of action - Insecticides, Pesticides and Fungicides -Preparation and uses of DDT and BHC.

Text Books:

1. Bahl B.S. & Arun Bahl, "*Advanced Organic Chemistry*", S.Chand & Company New Delhi, 2004.
2. Puri P.R, Sharma L.R. & Kalia K.C., "*Principles of Inorganic Chemistry*", Vishal Publishing Company, Delhi, 2017.
3. Ratinamuthu .K, "*B.Sc Ancillary chemistry",* R. Arunn & Co, Educational Publishers, Madurai.

Reference Books:

1. Jain.M.K and Sharma.S.C, "*Modern Organic Chemistry*", Vishal Publishing Co, Delhi, 2018.
2. Finar I. L., "*Organic Chemistry*", Volume II, Pearson Education Pvt. Ltd, Indian Branch, Delhi, 2011.
3. Madan R. D, "*Modern Inorganic Chemistry*", S. Chand & Co., New Delhi, 2011.
4. Sharma B. K., "*Industrial Chemistry*", Sixteenth Edition, Krishna Prakashan Media Pvt. Ltd., Meerut, 2011.

E.M.G.YADAVA WOMEN'S COLLEGE, MADURAI -14

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(Re-Accredited with (3rd cycle) A+ & CGPA 3.51 Grade by NAAC)

CBCS

DEPARTMENT OF CHEMISTRY

(w.e.f. 2021 – 2022 Batch onwards)

ANCILLARY CHEMISTRY (for B.Sc., Physics)

Title of the paper: Analytical and Inorganic Chemistry

Semester	**: VI**	**Contact hours:**	**4**
Subject Code	**: 21AKP6**	**Credits**	**: 4**

Objectives:

1. To acquire knowledge and understanding of volumetric method of analysis.
2. To provide a basic knowledge and understanding of essential chemical and physical principles for analytical chemistry.
3. To gain the knowledge of metals, ores- occurrence and extraction process.
4. To develop an understanding concept of stability of nucleus, radioactive law and different types of particles &its applications.
5. To gain about fundamental concepts of acid base titration and oxidation reduction reactions.

UNIT : I ANALYTICAL CHEMISTRY-I: a)Volumetric methods of analysis: Introduction- principle- terminology: molality, molarity, normality, mole fraction - titration- end point- indicator - types of indicators - Standard solution- types of standard solution- requirements of primary standard solution. b) Acid-base titration: Types- titration curves and choice of indicators- Ostwald's theory-theory of acid- base indicators. c) Redox titration: Definition with examples- theory of redox indicators (Action of Phenolphthalein and methyl orange).

UNIT : II ANALYTICAL CHEMISTRY- II: 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- criteria for satisfactory colorimetric estimations- Duboscq colorimeter- estimation of Fe^{3+} ion

UNIT : III PRINCIPLES AND PROCESS OF METALLURGY: 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 RADIO ACTIVITY: 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- carbon dating

UNIT : V ACIDS, BASES AND OXIDATION AND REDUCTION:a) Modern concepts of acids and bases: Arrhenius, Bronsted- Lowry, Lewis and Lux-Flood; Relative strengths of acids and bases – amphoteric solvents- levelling effects. b) Hard and soft acids and bases: Pearson's concept –HSAB principle and its applications. c) 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-balancing of redox equations by oxidation number method.

Text Books:

1. Gopalan R. Subramanian P.S. & Rengarajan K., "*Elements of Analytical Chemistry*", S. Chand & Sons New Delhi, 2010.
2. Madan R.D., "*Modern Inorganic Chemistry*", S.Chand & Co., New Delhi, 2011.
3. Puri P.R. Sharma L.R. & Kalia K.C., "*Principles of Inorganic Chemistry*", Vishal Publications, Jalandhar, 2017.

Reference Books:

1. James Huheey E. Ellen A. & Keiter, "*Inorganic Chemistry*", 4th Edition, Pearson Education, New Delhi, 2013.
2. Khopkar S.M., "*Basic Concepts of Analytical Chemistry*", New Age International Pvt. Ltd., New Delhi, 2012.

3. Lee J. D., "*Concise Inorganic Chemistry*", 5th Edition, Blackwell Science, USA, 2016.

4. Skoog, Douglas.A, West Donald.M, Crough, Stanley.R., "*Fundamentals of Analytical Chemistry*",Cengage Learning, New Delhi, 2014.

5. Wahid U. Malik G.D. Tuli & Madan R.D., "*Selected Topics in Inorganic Chemistry*", S.Chand & Co, New Delhi, 2014.

Annexure-13

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CBCS

DEPARTMENT OF CHEMISTRY

(w.e.f. 2021 – 2022 Batch onwards)

ANCILLARY CHEMISTRY (For B.Sc., N&D & Physics)

Title of the Paper : Volumetric Analysis
Semester : V&VI **Contact Hours : 2**
Subject Code : 21AKN6P /21AKP6P **Credit : 1**

Volumetric analysis (Question model)

You are given a solution containing Sodium carbonate. To estimate volumetrically the weight of Sodium carbonate present in the whole of the given solution. You are provided with approximately decinormal solution of hydrochloric acid and a standard solution of Sodium hydroxide Containing ……. g / L.

S.No.	Standard	Link	Solution to be estimated
1.	NaOH	HCI	Na_2CO3
2.	$FeSO_4$	$KMnO_4$	Mohr's salt
3.	NaOH	Oxalic acid	$KMnO_4$
4.	Na_2CO_3	HCI	NaOH
5.	Mohr's salt	$KMnO_4$	$FeSO_4$
6.	HCI	NaOH	Oxalic acid

Allotment of Marks for Volumetric Analysis

Maximum Marks-100

Internal Maximum Marks – 40		External Maximum Marks - 60	
Procedure	- 10	Record	- 10
Experiment	- 30	Procedure	- 10
Total	- 40	Experiment	- 40
		Total	- 60