H.H. THE RAJAH'S COLLEGE (AUTONOMOUS)

PUDUKKOTTAI-622 001

PG & RESEARCH DEPARTMENT OF CHEMISTRY

B.Sc., CHEMISTRY

COURSE STRUCTURE UNDER CBCS

FOR THE STUDENTS ADMITTED FROM THE ACADEMIC YEAR2021 – 2022 ONWARDS

B.Sc., CHEMISTRY - SYLLABUS

2021-2022

THE VISION AND MISSION OF THE DEPARTMENT

VISION
We provide society with people serving, skilled and problem solving professionals in chemical sciences

MISSION
Provide our society with high quality professionals having a strong education and technical skills in chemistry; with rich cultural, ethical, environmental, and social sensitivities; capacity for critical thinking; and the entrepreneurial skills to solve industrial and environmental problems

PROGRAM SPECIFIC OUTCOMES for **B. Sc. Chemistry** program	
After Successful completion of the Degree, students can	
PSO1	Get solid foundation in chemistry fundamentals which are required to solve chemical, technical and environmental problems.
PSO2	Develop the skills to design, choose and perform experiments with the precautions and protocols.
PSO3	Specify, analyze and investigate the information's, data and systems.
PSO4	Express their thoughts and ideas by effective communication using scientific knowledge
PSO5	Act as an individual and team member relevant to the professional practice.

PROGRAM OUTCOMES for **B. Sc. Chemistry** program	
After Successful completion of the Degree	
PO1	Students get the knowledge in different branches of chemistry and understand all the theories, essential facts, core concepts, principles and postulates relating to the chemistry.
PO2	Students can identify, formulate, survey and analyze complex problems using the basic principles of chemistry.
PO3	Improves student's technical skills in chemistry by continuous training with lab experiments, handling of chemicals, simple preparations and the operation of lab equipment's.
PO4	Improves students understanding about the impact of chemistry in day to day life.
PO5	Promoting students to enter into Post graduate programs or the job market.
PO6	Developing effective communication, co-operation, team work and leadership qualities of the students.
PO7	Acquire the expertise on the role of Chemistry in Industries and to become entrepreneur

B.Sc., CHEMISTRY
COURSE STRUCTURE

Under Credit Based Course System (CBCS)

General allocation of credits

PART	SUBJECT	No. of Courses/Papers	Total Credits	Remarks
I	Tamil/Hindi	4	12	(3+3+3+3)
II	English	4	12	(3+3+3+3)
III	Major - Core	14	60	(10x4+4x5)
III	Major – Elective	3	14	(4+5+5)
III	Allied 1	2	10	(5+5)
III	Allied 2	2	10	(5+5)
IV	Soft Skill	3	12	(4+4+4)
IV	Non Major Elective	2	4	(2+2)
IV	Environmental Studies	1	2	
IV	Value Education	1	2	
IV	Gender Studies	1	1	
V	Extension Activities	1	1	
	Total	37	140	

Environmental Studies – I Semester

Value Education – II Semester

Gender Studies – VI Semester

Soft skill – I (I & II Semester – 2 Hours each sem) – Examination on II Semester

Soft skill – II (III & IV Semester- 2 Hours each sem) – Examination on IV Semester

Soft skill – III (V Semester - 4 Hours) - Examination on V Semester

Non Major Elective – III Semester

Non Major Elective – V Semester

Value Added Course – 2 offered each Department (Examination on II and IV Semester)

For Theory papers → 1 credit/hour
For Practical papers → ½ credit/hour

SEMESTER-WISE DISTRIBUTION OF COURSES AND CREDITS

PART	SUBJECT CODE	COURSE CODE	TITLE	HRS	EVALUATION (MARKS)		TOTAL MRKS	CREDITS
					Int.	Ext.		
I SEMESTER								
I	21ULT1	LC-I	Tamil - I	6	25	75	100	3
II	21ULE1	ELC-I	English - I	6	25	75	100	3
III	21UCH1	CC-I	General Chemistry - I	5	25	75	100	5
III	21UCH2P	CP-II	Volumetric analysis Practical – I*	3				
III	21UBTA1/ 21UMTA1	AC-I	Allied Botony-I*/Allied Maths-I	3	25	75	100	5
III	21UBTA2P	AP-II	Allied Botony Practical –I* /[Allied Maths-I]	3	--	--	--	
III	21USBE1	SBE-I	Soft Skills and Industry awareness -I	2				
IV	21UES	EVS	Environmental Studies	2	25	75	100	2
			Total	30	125	375	500	18
II SEMESTER								
I	21ULT2	LC-II	PART I Tamil - II	6	25	75	100	3
II	21ULE2	ELC-II	PART II English - II	6	25	75	100	3
III	21UCH3	CC-III	General Chemistry - II	5	25	75	100	5
III	21UCH2P	CP-II	Volumetric analysis Practical – I	3	40	60	100	4
III	21UBTA1/ 21UMTA2	AC-I/ AC-II	Allied Botony-I/Allied Maths-II	3	25	75	--	
III	21UBTA2P	AP-II	Allied Botony Practical –I/ [Allied Maths-II]	3	40	60	100	5
III	21USBE1	SBE-I	Soft Skills and Industry awareness -I	2	25	75	100	4
IV	21UVE	VE	Value Education	2	25	75	100	2
Total				30			700	26

PART	CODE	COURSE	TITLE	HRS	MARKS		TOTAL	CREDIT
					Int.	Ext.		
III SEMESTER								
I	21ULT3	LC-III	PART I Tamil - III	6	25	75	100	3
II	21ULE3	ELC-III	PART II English - III	6	25	75	100	3
III	21UCH4	CC-IV	General Chemistry - III	5	25	75	100	4
III	21UCH6P	CP-VI	Inorganic Qualitative Analysis Practical – II*	3				
III	21UPHA3	AC-III	Allied Physics*	3				
III	21UPHA4P	AP-IV	Allied Physics Practical*	3				
III	21USBE2	SBE-II	Soft Skills and Industry awareness -II	2				
IV	21UCHN1	NME-I	For Physics students*	2	25	75	100	3
			Total	30			400	13
IVSEMESTER								
I	21ULT4	LC-IV	PART I Tamil - IV	6	25	75	100	3
II	21ULE	ELC-V	PART II English - IV	6	25	75	100	3
III	21UCH5	CC-V	General Chemistry - IV	6	25	75	100	4
III	21UCH6P	CP-VI	Inorganic Qualitative Analysis Practical– II	3	40	60	100	4
III	21UPHA3	AC-III	Allied Physics	3	25	75	100	5
III	21UPHA4P	AP-IV	Allied PhysicsPractical	3	40	60	100	5
III	21USBE2	SBE-II	Soft Skills and Industry awareness -II	3	25	75	100	4
			Total	30			700	28

PART	CODE	COURSE	TITLE	HRS	MARKS		TOTAL	CREDIT
					Int.	Ext		
V SEMESTER								
III	21UCH7	CC-VII	Inorganic chemistry-I	5	25	75	100	4
III	21UCH8	CC-VIII	Organic chemistry-I	5	25	75	100	4
III	21UCH9	CC-IX	Physical chemistry-I	5	25	75	100	4
III	21UCH13P	CP-XIII	Organic & Gravimetric analysis practical*	6				
III	21UCH14P	CP-XIV	Physical chemistry practical*	3				
III	21UCHE1 A/B/C	EC-I	Analytical chemistry(OR) Chemical analysis of applied industrial products (OR) Agrochemicals	3	25	75	100	5
III	21UCHN2	NME-II	Water treatment and Analysis (OR) Forensic Science (OR) Dairy Chemistry	2	25	75	100	2
IV	21USBE3	SBE-III	Soft Skills and Industry awareness -III	1	25	75	100	4
			Total	30			600	23
VI SEMESTER								
III	21UCH10	CC-X	Inorganic chemistry-II	5	25	75	100	5
III	21UCH11	CC-XI	Organic chemistry-II	5	25	75	100	5
III	21UCH12	CC-XII	Physical chemistry-II	5	25	75	100	4
III	21UCH13P	CP-XIII	Organic & Gravimetric analysis practical	6	40	60	100	4
III	21UCH14P	CP-XIV	Physical chemistry practical	3	40	60	100	4
III	21UCHE2 A/B/C	EC-II	Pharmaceutical and Medicinal chemistry(OR) Fuel chemistry and Batteries (OR) Textile Chemistry	3	25	75	100	5
III	21UCHE3 A/B/C	EC-III	Industrial chemistry(OR) Manufacture of Chemicals (OR) Sugar Chemistry and Sugar Technology	2	25	75	100	4
V	21UGS	GS	Gender Studies	1	25	75	100	1
			Total	30			800	32

Finalized (for the I to VI Semester) in the

BOARD OF STUDIES MEETING HELD ON_____
&
APPROVED BY THE ACADEMIC COUNCIL ON_____

SEMESTER – I

CC - I: GENERAL CHEMISTRY – I

SEMESTER: I **SUBJECT CODE: 21UCH1**

CREDITS: 5 **TOTAL HOURS: 5**

Objectives

1. *To study the atomic structure and periodic properties*
2. *To understand the chemical bonding in chemical compounds.*
3. *To learn the advanced theories of chemical bonding.*
4. *To know the nomenclature of organic molecules*
5. *To know the electronic effects and understand the mechanism of chemical reactions*
6. *To distinguish different states of matter and understand its properties.*

UNIT – I

Atomic Structure

Quantum numbers n, l, m and s – Pauli's exclusion principle – Energy distribution and orbitals - Hund's rule of maximum multiplicity - Aufbau's principle - Electronic Configuration of elements - Stability of Half-filled and completely filled orbitals.

Classification of elements – General characteristics of s, p, d and f- Block elements – Periodicity of properties- Definition and Periodicity of the following properties – Atomic radii and Ionic radii - Factors affecting the Atomic radii and Ionic radii.

Periodic Properties: Atomic and ionic radii, ionization energy, electron affinity and electronegativitydefinition, methods of determination or evaluation, trends in periodic table and applications in predicting and explaining the chemical behaviour.

UNIT – II

Chemical bonding

lonic bond: General characteristics, types of ions, size effects, radius ratio rule and its limitations. Packing of ions in crystals. Born-Landé equation with derivation and importance of Kapustinskii expression for lattice energy. Madelung constant, Born-Haber cycle and its application, Solvation energy.

Covalent bond: Lewis structure, Valence Bond theory (Heitler-London approach). Energetics of hybridization, equivalent and non-equivalent hybrid orbitals. Bent's rule, Resonance and

resonance energy, Molecular orbital theory. Molecular orbital diagrams of diatomic and simple polyatomic molecules N_2, O_2, F2, CO, NO, and their ions; HCl, BeF_2, CO_2, (idea of s-p mixing and orbital interaction to be given). Formal charge, Valence shell electron pair repulsiontheory (VSEPR), shapes of simple molecules and ions containing lone pairs and bond pairs of electrons, multiple bonding (σ and π bond approach) and bond lengths. Covalent character in ionic compounds, polarizing power and polarizability. Fajan's rules and consequences of polarization. Ionic character in covalent compounds: Bond moment and dipole moment. Percentage ionic character from dipole moment and electronegativity difference.

Metallic Bond: Qualitative idea of valence bond and band theories. Semiconductors and insulators, defects in solids.

Weak Chemical Forces: van der Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces, Hydrogen bonding (theories of hydrogen bonding, valence bond treatment) Effects of chemical force, melting and boiling points, solubility energetics of dissolution process.

UNIT – III

Nomenclature of Organic Molecules

Nomenclature of organic compounds: IUPAC naming of simple and substituted aliphatic, aromatic and alicyclic compounds: Hybridization and geometry of molecules – methane, ethane, ethylene and acetylene (sigma and pi-bonds, bond lengths, bond angles, bond energy)

IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atom in alkanes, Isomerism in alkanes, sources methods of formation (with special reference to Wurtz reaction, Kolbe reaction and decarboxylation of carboxylic acids), physical properties and chemical reactions of alkanes, Mechanism of free radical halogenation of alkanes: orientation, reactivity and selectivity.

Cycloalkanes – Nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its limitations. The case of cyclopropane ring, banana bonds.

UNIT – IV

Electronic Effects and Mechanism of Organic Reactions:

Electron displacement effects: Inductive, inductometric, electromeric, mesomeric, resonance (localized and delocalized chemical bond), hyperconjugation and steric effects. Cleavage of bonds

Types of reagents – electrophiles and nucleophiles, Types of organic reactions, Energy considerations. Reactive intermediates – Carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples). Assigning formal charges on intermediates and other ionic species. Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects).

UNIT – V

States of Matter

Gaseous state - Kinetic gas equation - Derivation - Gas laws from the kinetic gas equation - Kinds of velocities - Mean, RMS, Most Probable Velocities - Calculation of molecular velocities - Maxwell's distribution of Molecular Velocities (No derivation) - Effect of Temperature on velocity distribution - Equipartition of energy - Heat capacity on molecular basis - Virial equation of state - Boyle temperature - Coefficient of Compressibility and Thermal expansion.

Liquid state - Density – Diffusion - Viscosity – Evaporation - Surface tension - Effect of temperature on surface tension - Parachor - Definition and Applications only - Coefficient of Viscosity - Effect of Temperature and Pressure - Liquid crystals - Classification and Molecular arrangements.

Solid State - Crystal lattices - Laws of Crystallography - Symmetry elements in crystals - Seven crystal systems - Unit cell - Space lattice - Bravais lattices - Law of Rational Indices - Miller indices

Course Outcomes:

The student understood and acquired the knowledge on the following:

1. *Atomic structure and electronic configuration.*
2. *Chemical bonding among the constituent atoms in molecules.*
3. *VSEPR Theory and structure of simple inorganic molecules.*
4. *Nomenclature of organic compounds, structure, reaction intermediates, fission and fission products and their stability.*
5. *Electron displacements in organic molecules and their in impact in the physical properties of compounds and chemical reaction rates.*
6. *Different states of matter*

Reference Books

1. Principles of Inroganic Chemistry (UGC Syllabus), B.R. Puri, L.R. Sharma, K.C. Kalia, Milestone Publishers, New Delhi, India, 2008.
2. Advanced Inorganic Chemistry by Gurudeep Raj and Chatwal Anand.
3. Modern Inorganic Chemistry by R.D. Madan.
4. Advanced Inorganic Chemistry by Sathyaprakash.
5. J. E. Huheey, E. A. Keiter and R. L. Keiter, Inorganic Chemistry: Principles of Structure and Reactivity, IV Edition, Pearson Education, India, 2006.
3. https://www.iupac.org/fileadmin/user_upload/databases/Red_Book_2005.pdf
4. https://www.crcpress.com › Chemistry › General Chemistry
5. hbcponline.com/ Unit-I
6. P.L. Soni & Mohan Katyal, Text book of Inorganic chemistry 20th revised Edn.
Sultan chand 1992.
7. Organic Chemistry, Bahl and Arun Bahl, S. Chand and Sons, New Delhi, 2005.
8. Organic Chemistry, R. T. Morrison and R. N. Boyd, VI Edition, Printice-Hall of India Limited, New Delhi, 1992.
9. Organic Chemistry, B. Y. Paula, III Edition, Pearson Education, Inc.(Singapore), New Delhi, reprint, 2002.
10. Textbook of Organic Chemistry, P S Kalsi, Mac Millan, 2000.
11. K S Tewari, S N Mehrotra and N K Vishonoi, "A text book of organic chemistry".
12. M K Jain, "Organic Chemistry" Shoban Lal Nagin chand and co.,
12. B R Puri & L R Sharma and Madan S Pathania, "Principles of physical chemistry"
Shoban Lal Nagin Chand and co., Delhi.
13. A Textbook of Physical Chemistry, Volume 2, K L Kapoor, Mc. Millan publishers India Limited.
14. W. Kauzmann, Kinetic Theory of Gases (Thermal Properties of Matter, Vol I), Benjamin, Reading, MA, 1966.

Web References

https://www.iupac.org/fileadmin/user_upload/publications/.../CompleteDraft.pdf
Unit-V

CP - II: VOLUMETRIC PRACTICAL – I

SEMESTER: I & II **SUBJECT CODE: 21UCH2P**

CREDITS: 4 **TOTAL HOURS: 3**

Objectives

To train the students in quantitative analysis of chemicals.
To estimate the metal ions by permanganometric titrations
To estimate the metal ions by iodimetric titrations
To estimate the metal ions by complexometric titrations

1. Permanganometry

1. *Estimation of Ferrous ion*
2. *Estimation of Oxalic acid*
3. *Estimation of Calcium*
4. *Estimation of Sodium Hydroxide*

2. Iodometry and Iodimetry

1. *Estimation of copper*
2. *Estimation of potassium dichromate*
3. *Estimation of As_2O_3*

II SEMESTER

***3.* Argentimetry**

Estimation of Chloride

***4.* Complexometric titrations**

Estimation of Zn or Mg using EDTA.

Course Outcomes:

The student acquired the lab skills on the following:
Estimation of the metal ion by permanganometric titrations
Estimation of the metal ions by iodimetric titrations
Estimation of the metal ions by complexometric titrations

SOFT SKILLS AND INDUSTRY AWARENESS
PAPER I

SEMESTER: I & II **SUBJECT CODE: 21USBE1**

CREDITS: 4 **TOTAL HOURS: 2+2**

Objectives :

i) To inculcate positive attitude among the learners
ii) To introduce goal setting to the learners
iii) To instill effective communicative skills in the learners
iv) To expose the learners to the basics of computers
v) To initiate the learners into computer applications

UNIT - I

POSITIVE A TTITUDE : attitude --- features of attitudes ---formation of attitudes—psychological factors --- change of attitudes –ways of changing attitude in a person – the power of positive attitude ---the benefits of positive attitude --- developing positive attitude --- obstacles in developing positive attitude -- negative attitude --- the causes of negative attitude ---the consequences of negative attitude ---how to change negative attitude

UNIT - II

GOAL SETTING—introduction –importance of goal setting – goal definition --- types of goals --- what exactly goal setting --- why people don't set goals ---how to choose the right goals –SMART GOALS ---Career goals ---benefits of career goal setting ----goal setting tips

UNIT - III

COMMUNICATION SKILLS – communication process –types of communication --- barriers to effective communication --- listening skills --- importance of tone of voice --- voice clarity ---verbal expressiveness –tips to develop communication skills ---government initiatives – job roles

UNIT - IV

KNOWING COMPUTER --characteristics of a computer – limitations of a computer –components of hardware---- basics of operating systems ---definition – functions of operating systems – categories of operating systems --- windows features --- start up, shut down ----- opening and closing an application --- manipulating windows --- saving – printing – deleting files –start menu

UNIT - V

COMPUTER APPLIICATIONS: Word Processing : launching word, word processing basics, the

quick access toolbar, opening a document, saving a document, formatting the text, table manipulation

Using Spread Sheet : elements of electronics spreadsheet, manipulation of cells, formula and function- functions

Learning outcomes:

Learners

i) know to develop positive attitude

ii) Know how to set goals

iii) Learners develop effective communicative skills

iv) Learners know the basics of computers

v) Learners know various computer applications

Refrences:

Prescribed Book : Soft Skills and Industry Awareness - ICT Academy of Tamil Nadu
Books for Reference : Dr.Alex – Soft Skills, S.Chand, New Delhi
Raveendiran et al. Success Through Soft Skills

EVS - ENVIRONMENTAL STUDIES

SEMESTER: I **SUBJECT CODE: 21UES**

CREDITS: 2 **TOTAL HOURS: 2**

Objectives

1. *To know the environment and the need for public awareness.*
2. *To study the resources of forest, water, mineral, food and energy.*
3. *To understand the renewable and non-renewable resources and their management,*
4. *To learn about the ecosystems and food chains.*
5. *To understand the Bio-diversity and its conservation*
6. *To evaluate the environment pollution and social issues.*

UNIT – I

Environments studies:

Definition, classification, scope and importance. Need for public awareness. A preliminary knowledge on the following resources: forest, water, mineral, food and energy. Renewable and non-renewable resources and their management,

UNIT – II

Ecosystems :

Concept of an ecosystem, structure of an ecosystem, producers, consumers and decomposers, energy flow in the ecosystem, food chains, food webs and ecological pyramids, types of ecosystems.

UNIT – III

Bio-diversity and its conservation:

Introduction, definition genus, species and ecosystem diversity - Biogeographical classification of India, values of biodiversity, consumptive use, productive use, social, ethical, aesthetic and option values. Threats to biodiversity: habitats loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, conservation of biodiversity.

UNIT – IV

Environmental pollution:

Definition, causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal and Nuclear pollution. Solid Waste Management: causes, effects and control measures of urban and industrial wastes.

UNIT – V

Social issues and problems:

From unsustainable to sustainable development, urban problems related to energy conservation. Population growth, variation in population among the nations. Environmental Acts, Explosion – family welfare program, environment and human health, human rights, value education, HIV/AIDS, women and child welfare.

Course Outcomess:

1. *The students learnt about the environment, need for public awareness, and resources.*
2. *The students learnt about the concept of an ecosystem, structure of an ecosystem, energy flow in the ecosystem, food chains, food webs and ecological pyramids.*
3. *The students learnt about the bio-diversity, Biogeographical classification of India, values of biodiversity, consumptive use, productive use, social, ethical, aesthetic and option values.*
4. *The students learnt about the threats to biodiversity, habitats loss, poaching of wildlife, man-wildlife conflicts, endangered and endemic species of India, and conservation of biodiversity.*
5. *The students learnt about the Definition, causes, effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal and nuclear pollution.*
6. *The students learnt about the solid waste management, causes, effects and control measures of urban and industrial wastes.*
7. *The students learnt about the social issues and problems of pollution*
8. *The students learnt about the Environmental Acts, explosion in family welfare program, environment and human health, human rights, value education, HIV/AIDS, women and child welfare.*

Reference Text books:

1. Environmental science and Engineering – A.Koushik and P.Koushik.
2. Environmental science working with earth – G.Tyler and Miller.

VALUE ADDED COURSE
PAPER-I
PHYTOCHEMISTRY OF MEDICINAL PLANTS

SUBJECT CODE: 21UCHV1

(EXAMINATION ON II –SEMESTER)

Learning objectivesl

To acquire the knowledge of phytochemistry and biological activities of medicinal plants

UNIT I

Extraction – purification of bio-active compounds from plants – cold & hot extraction – Soxhlet extraction – crude extracts purification by various solvents.

UNIT II

Isolation of bioactive compounds – chromatographic techniques – thin layer chromatography – liquid chromatography – HPLC and UPLC.

UNIT III

Structural analysis of bioactive compounds – IR spectroscopy – Mass spectrometry – NMR spectroscopy.

UNIT IV

Herbal medicine – History of herbal medicine – different types of herbal medicine – Ayurveda, Siddha and Unani – Pharmacological action – clinical research and traditional uses of Indian medicinal plants – Eclipta alba, GymnemaSylvestre, Ocimum sanctum, Curcuma longa.

UNIT V

Phytopharmaceuticals and their health benefits – anthocyanins, carotenoids, lycopene, isoflavones, polyphenols, omega 3 - fatty acids, biological effects of resveratrol.

Course Outcomes

1. *After completion of the course, student can Understand the concepts of phytochemistry*
2. *Student can able to appreciate the medicinal values of plants*
3. *Acquire the knowledge of various techniques involved in the phytochemistry*
4. *Understand the value of bio-active components present in the plants*

References:

1. Godte V.M. 2000. Ayurvedic pharmacology and therapeutic uses of medicinal plants, BharathiyaVidyaBhavan, Mumbai Grewal, R.C. 2000.
2. Medicinal Plants, Campus Books International, New Delhi Harbone, J.B. 1998.
3. Phytochemical Methods A guide to modern techniques of plant analysis, 3rd Majumdar, A. 2000.
4. Home remedies in Ayurveda, Amar Granth Publications, New Delhi. Edition. Springer (India) Private Limited, New Delhi.
5. Silverstein, R.M. and F. X. Webster – Spectroscopic identification of organic compounds, John-Wiley, 1998.
6. Willard, H.H., L. L. Merrit and J.A. Dean, Instrumental Methods of analysis, 1987.

SEMESTER – II

CC - III: GENERAL CHEMISTRY – II

SEMESTER: II **SUBJECT CODE: 21UCH3**

CREDITS: 5 **TOTAL HOURS: 5**

Objectives

1. *To understand the principles of volumetric analysis..*
2. *To study alkaline and alkaline earth metals*
3. *To learn the properties and applications of p block elements.*
4. *To study the* chemistry of alkanes, alkenes and alkynes.
5. *To understand the atomic structure and quantum chemistry.*

UNIT – I

Principle of Volumetric Analysis

Oxidation – reduction reactions - Oxidation number concept – Balancing redox equations by oxidation number and ion – electron methods – Equivalent weight of oxidizing and reducing agents.

Definitions of Molarity, Molality, Normality and Mole Fraction - Their Calculations - Definition and Examples for Primary and Secondary standards - Calculation of Equivalent Weight of Acid, Base, Oxidizing Agent, Reducing Agent and Salts.

Principles of Volumetric Analysis - Theories of Acid- Base, Redox, Complexometric, Iodometric and Iodimetric titrations.

Theories of indicators - Acid-base indicators - Choice of indicators - Redox, Metal ion and Adsorption indicators.

UNIT – II

Introduction to Alkali and Alkaline Earth Metals

Alkali metals - Li, Na, K, Rb and Cs - Occurrence - Comparative study of Elements with respect to Oxides, Halides, Hydroxides Sulphates and Carbonates - Exceptional property of Lithium - Diagonal Relationship of Li with Mg.

Alkaline earth metals - Be, Mg, Ca, Sr and Ba - Occurrence - Comparative study of the elements with respect to Oxides, Hydroxides, Halides, Sulphates and Carbonates - Exceptional property of Beryllium - Diagonal relationship of Be with Al - Comparison of Alkaline Earth Metals with

Alkali Metals - Magnesium acting as bridge element between II A and II B groups - Magnesium resembles Zinc.

Diagonal relationship between lithium and magnesium - Preparation, properties and uses of lithium aluminium hydride and sodiumborohydride - Coinage Metals - Comparative study of coinage metals.

UNIT – III

P-Block Elements

Boron Family: Behaviour of boron - Anomalous behaviour of Boron - Diagonal Relationship between Boron and Silicon - Electron deficiency and Electron acceptor behaviour of Boron trihalides - preparation, properties, uses and structure of Boron nitride, Boron carbide, Borazole and diborane.

Carbon Family : Comparative study of carbon family elements and their compounds (hydrides, halides and oxides) - Chemistry of cyanogens, hydrocyanic acid, cyanic acid, thiocyanic acid, ammonium thiocyanate and carbon disulphide - Structures of graphite, diamond and fullerene.

Nitrogen Family: A comparative study of group VA elements – preparation, properties and uses of Hydrazine, Hydroxylamine and Hydrazoic acid.

Oxygen family: Group study - Comparative study of O, S, Se and Te with respect to Catenation, Oxides, Halides, Hydrides and Oxyacids - Anomalous Behaviour of Oxygen - Oxyacids of Sulphur (Structure only) - Peracids of Sulphur - Preparation, Properties and Structure - Differences between Permonosulphuric Acid and Perdisulphuric Acid.

UNIT – IV

Hydrocarbons: **Chemistry of Alkanes, alkenes and alkynes**

Alkanes - Methods of preparation of alkanes - Wurtz method, Kolbe's method and Reduction of alkyl halides - Physical and Chemical Properties of alkanes - Mechanism of Free Radical Substitution in alkanes – Halogenation and Reactivity.

Alkenes - Properties of alkenes – Electrophilic and Free radical addition - Addition reactions of Alkenes with mechanism - Addition of Hydrogen, Halogens, Hydrogen Halide (Markownikoff's rule) - Hydrogen bromide (Peroxide effect) - Sulphuric Acid, Water, BH_3, Ozonolysis, Hydroxylation with $KMnO_4$ - Allylic substitution by NBS.

Alkynes - Acidity of alkynes - Addition of hydrogen - Hydroboration - Hydrohalogenation - Addition of hypohalous acid, Hydration - Addition of water with HgSO4 catalyst - Oxidation with KMnO4 – Ozonolysis - Formation of Acetylides.

UNIT – V

Atomic Structure and Quantum Chemistry

Planck's Quantum theory of radiation - Photoelectric Effect - Compton Effect - Wave mechanical concept of the atom - de Broglie's relationship – Davisson and Germer experiment - Wave nature of electron - Heisenberg's Uncertainty Principle.

Schrodinger wave equation (Without derivation) - Significance of wave functions ψ and ψ 2 - Shapes of s, p and d- orbitals. Schrödinger equation for hydrogen atom.

Course Outcomes:

The student understood and acquired the knowledge on the following:

1. *Basic principle of volumetric analysis.*
2. *S block elements and its chemistry*
3. *More knowledge about the P block elements.*
4. *Preparation and properties of alkanes, alkenes and alkynes.*
5. *Quantum theories and wave equation.*

Reference Books

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch VIII Edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, V Ed., 2001 John Wiley & Sons, Inc, India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, VI Edition, 1993, Prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, VI Edition, Third Indian Reprint. 2003. Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, II Edition, Saunders College Publishing, California, 1990.
6. Gurdeep Raj, "Advanced Practical Inorganic Chemistry": Krishna Prakashan, Meerut, 21st Edition, 2009.
7. R.B. Puri & L.R. Sharma, "Principles of Inorganic chemistry", Sultan chand, 1989.
8. P.L.Soni & H.M. Chawla "Text book of Organic Chemistry", Sultan chand & sons 1994 Delhi.
9. P.L. Soni & Mohankatyal, Text book of Inorganic Chemistry 20th revised Edn.
10. Modern Inorganic Chemistry by R D Madan
11. Advanced Inorganic Chemistry by Sathyaprakash.
12. J. E. Huheey, E. A. Keiter and R. L. Keiter, Inorganic Chemistry: Principles of Structure and

Reactivity, IV Edition, Pearson Education, India, 2006.
13. Paula Yurkanis Bruice, Organic chemistry, III Edition, Pearson Education, Inc. (Singapore), New Delhi, reprint, 2002.
14. E. S. Gould, Mechanism and Structure in Organic Chemistry, Halt, Rinhart & Winston, New York, 1964.
15. Peter sykes, A Guide book to mechanism in Organic Chemistry, Pearson Education India
16. Organic Chemistry, Bahl and Arun Bahl,, S. Chand and Sons, New Delhi, 2005.
17. K S Tewari, S N Mehrotra and N K Vishonoi, "A text book of organic chemistry".
18.. M K Jain, "Organic Chemistry" Shoban Lal Nagin chand and co.,
19. B R Puri & L R Sharma and Madan S Pathania, "Principles of physical chemistry" Shoban Lal Nagin Chand and co., Delhi.
20. Essential of Physical Chemistry; Arun Bahl, B.S. Bahi and G.D. Tuli, S. Chand and Co.Physical Chemistry through Problems, S.K. Dogra.
21. Physical chemistry; R. L. Madan, G. D. Tuli, S. Chand & Co.
22. Elements of Physical Chemistry - Glasstone and Lewis - Macmillan.
23. Physical Chemistry, P. C. Rakshit, V Edition (1988), Fourth Reprint (1997), Sarat Book House, Calcutta.
24. W. Kauzmann, Kinetic Theory of Gases (Thermal Properties of Matter, Vol I), Benjamin,Reading, MA, 1966.

VE - VALUE EDUCATION

SEMESTER: II **SUBJECT CODE: 21UVE**

CREDITS: 2 **TOTAL HOURS: 2**

UNIT – I

Meaning and nature of value education:

Value: Meaning, origin, nature, classification of value, view of eminent thinkers, meaning of value education, need for value education.

UNIT – II

Objectives and development of human values:

Role of school and colleges in the development of human values. Objectives of value oriented education. Ethical and social values. Gandhiji's non-violence – Gokak committee.

UNIT – III

Strategies and approaches to value education:

Role of education in schools, family, teacher personal value development, conceptional frame work strategy suggested by J R Frankel NCERT approach to value. Education; Role - play technique in value education, value based curriculum, teacher's role.

UNIT – IV

Source of values:

Source of values: Traditional Indian values sources of values – culture, Education, Religion – Hinduism, Christianism, Islam, Buddhism. Indian constitution as source for democratic values, equality, secularism, democracy. Research and resources in value education.

UNIT – V

Methods of teaching and documents on Human value education : Methods of teaching value education, Guidelines for developing values among students. Problems in promoting value Education, Documents of value education. Recommendation of the committee appointed by the central advisory Board of Education 1986-1992.

References

1. J.C Aggarwal, Education of values Environment and Human Rights Shipra Publications, New Delhi 2005.
2. Dube, S C., Modernization and development, The search for an alternative paradigm, Zee books Ltd. London : 1988.
3. Mansell R and When U, Knowledge societies : Information Technology for sustainable Development, OxfordUniversity press, New York.
4. World bank knowledge for Development world development report, Oxford University Press, New York.

SEMESTER – III

CC - IV: GENERAL CHEMISTRY – III

SEMESTER: III **SUBJECT CODE: 21UCH4**

CREDITS: 4 **TOTAL HOURS: 5**

Objectives

1. *To understand the principles of qualitative analysis*
2. *To learn the chemistry of noble gas elements*
3. *To understand the concept of aromaticity*
4. *To study the preparation and properties of alcohols and ethers*
5. *To learn the theories of liquid and gaseous state*

UNIT –I

Semimicro Techniques

Principles of Acid - Base Equilibria - Common ion effect - Solubility Product and its Applications in Qualitative Analysis - Principles of Inorganic Analysis.

Reactions involved in the Separation and Identification of Cations and Anions in Qualitative analysis - Spot test reagents - Aluminon, Cupferon, DMG, Thiourea, Magneson, Alizarin and Nessler's reagent.

Types of solvents - Protic and Aprotic solvents - Amphiprotic / Amphoteric solvents - Aqueous and Non-aqueous solvents - Liquid ammonia, liquid SO_2, Liquid hydrogen fluoride, Sulfuric acid, fluorosulfonic acid, Bromine trifluoride, Dinitrogen tetraoxide.

UNIT – II

Chemistry of Interhalogen compounds and Noble gases

Interhalogen compounds and pseudo halogens – basic nature of iodine.

Noble gases - Electronic Configurations – Position of Noble Gases in the Periodic Table - Chemical inertness of Noble gases – Reason.

Compounds of Xenon - Hybridization and Geometry of XeF2, XeF4, XeF6 XeO_3, $XeOF_2$ and XeOF4.

Clathrates - Definition and Applications - Uses of Noble gases.

UNIT – III

Aromatic Hydrocarbons and Aromaticity

Aromaticity - Modern Theory of Aromaticity - Huckel's (4n +2) Rule and Its Simple Applications to Benzenoid and Non- benzenoid Compounds. Aromaticity of ions. Polycyclic aromatic compounds, annulenes. Anti aromaticity

Electrophilic substitution reactions in Aromatic Compounds - Mechanisms of Nitration, Halogenations, Sulphonation, Friedel-Crafts Acylation and Alkylation.

Directive influence - Orientation - Ortho/Para ratio - Nuclear and Side chain Halogenation.

UNIT –IV

Alcohols Phenols and Ethers

Classification and nomenclature - Oxidation of alcohols – Difference between Primary, Secondary and Tertiary alcohols – Preparation by Grignard method – chemistry of glycol, glycerol and allyl alcohol

Phenols - Acidic character of phenols - Kolbe's reaction, Reimer-Tiemann reaction, Gattermann , Lederer-Manasse, Houben-Hoesh, Friedel-Crafts, Schotten-Baumann and Liebermann's Nitroso Reaction.

Preparation, Properties and Uses of Alpha- and Beta- Naphthols.

Methods of preparation of alphatic and aromatic ethers – reactions of ethers – 1,4 – dioxin – Preparation and uses – Epoxides – Preparation and reactions. Acid-base mechanism of cleavage of epoxides -Thioethers – Preparation and uses - Preparation properties and uses of 1, 4-dioxan, diethylether and anisole.

UNIT – V

Liquid and Gaseous State

Liquid State Intermolecular forces, structure of liquids (qualitative description). Structural differences between solids, liquids and gases. Surface tension and its determination using stalagmometer. Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only). Liquid crystals, the mesomorphic state: Classification of liquid crystals in to Smectic and Nematic, differences between liquid crystal and solid / liquid. Application of liquid crystals as LCD devices

Gaseous State Deviation of real gases from ideal behavior. van der Waals equation of state. Critical phenomenon. PV isotherms of real gases, continuity of state. Andrew's isotherms of CO2. The van der Waal's equation and critical state. Derivation of relationship between critical constants and van der Waal's constants. The law of corresponding states, reduced equation of states. Joule Thomson effect and inversion temperature of a gas. Liquifaction of gases: i) Linde's method based on Joule Thomson effect ii) Claude's method based on adiabatic expansion of a gas.

Course Outcomes

The student understood and acquired the knowledge on the following:

1. *Principle and experiments od semi micro analysis*
2. *The chemistry of noble gas elements*
3. *Theories of Aromaticity*
4. *Chemistry of alcohols, phenols and ethers*
5. *Characteristics of liquis and gaseous state*

Reference Books

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch VIII Edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, V Ed., 2001 John Wiley & Sons, Inc, India.
3. Analytical Chemistry Principles, John H. Kennedy, II Edition, Saunders College Publishing, California, 1990.
4. P.L. Soni & Mohankatyal, Text book of Inorganic Chemistry 20th revised Edn. Sultan chand 1992.
5. R.B. Puri& L.R. Sharma, "Principles of Inorganic chemistry", Sultan chand, 1989.
6. R D Madan, "Modern Inorganic Chemistry" 1987, S Chand and co.,
7. P.L.Soni & H.M. Chawla "Text book of Organic Chemistry", Sultan chand& sons 1994 Delhi.
8. K S Tewari, S N Mehrotra and N K Vishonoi, "A text book of organic chemistry".
9. M K Jain, "Organic Chemistry" Shoban Lal Nagin chand and co.,
10. P L Soni, "Text book of Organic chemistry", Sultan chand& co.,
11. B.S.Bahl and ArunBahl – Advanced organic chemistry.
12. R.T. Morrison and RW. Boyd – Organic chemistry
13. B R Puri& L R Sharma and Madan S Pathania, "Principles of physical chemistry" Shoban Lal Nagin Chand and co., Delhi.
14. Essential of Physical Chemistry; Arun Bahl, B.S. Bahi and G.D. Tuli, S. Chand and Co.
15. Physical Chemistry through Problems, S.K. Dogra.
16. Physical chemistry; R. L. Madan, G. D. Tuli, S. Chand & Co.
17. Text book of Physical Chemistry - S. Glasstone- Macmillan (India) Ltd.
18. Physical Chemistry, P. C. Rakshit, V Edition (1988), Fourth Reprint (1997), Sarat Book House, Calcutta.
19. W. Kauzmann, Kinetic Theory of Gases (Thermal Properties of Matter, Vol I), Benjamin, Reading, MA, 1966.

CP-VI – INORGANIC QUALITATIVE ANALYSIS
PRACTICAL-II

SEMESTER: III & IV **SUBJECT CODE: 21UCH6P**

CREDITS: 4 **TOTAL HOURS: 3**

Objectives

To train the students in qualitative analysis of chemicals
To identify the anions by systematic experiments
To remove the interfering acid radicals and prepare the original solution
To analyze the cation by group analysis and confirmatory tests

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

Cations to be studied

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

Anions to be studied

Carbonate, Sulphite, Sulphate, Nitrate, Chloride, Bromide, Fluoride, Borate, Oxalate, Phosphate and Chromate.

Course Outcomes:

The students acquired the practical knowledge and skills on the following:
Analysis of interfering and non-interfering acid radicals

Preparation of original solution

Step wise analysis of basic radicals

Confirmatory and spot tests

SOFT SKILLS AND INDUSTRY AWARENESS
PAPER II

SEMESTER: III & IV **SUBJECT CODE: 21USBE2**

CREDITS: 4 **TOTAL HOURS: 2+2**

Objectives :

i) To equip the learners for Group Discussion
ii) To prepare the learners to attend interviews
iii) To make the students to learn effective Time Management
iv) To expose the learners to Retail Sector
v) To initiate the learners into Retail Advertising

UNIT- I

Group Discussion --- Types of GD – discussion Vs debate – personality traits – advantages of GD --- Dos and Don'ts

UNIT- II

Selection Interview – Introduction --- interview-meaning --- interview structure --- interview panel – types of interview ---questions looked for in interviews ---preparation before interview ------Body language –dos and don'ts ---standard interview questions ---your answer to questions

UNIT- III

Time Management – importance of time ---importance of time management –the Pareto 80 : 20 Principle and Time Management – the time management matrix --- its utilization ---procrastination : causes and effects --- how to overcome procrastination --- effective time management --- tools for effective time management

UNIT- IV

Retail Sector – introduction –market size -- investment scenario – advantage india --- government initiatives --- types of stores --- types of Merchandising -- Store operations – store appearance – store security – make it difficult for retail theft to happen --- inventory and stock management --- store organization --- importance of store organization

UNIT- V

Retail Advertising --- integrated marketing communication (IMC) – traditional marketing Vs IMC, Benefits of IMC—management of IMC in Retail --- sales promotion-- objectives, limitations, tools, Enterprise source Planning (ERP), supply chain management – the relationship between ERP, CRM, and SCM --- key features of supply chain management – job roles

Learning Outcomes*:*

i) learners are confident enough to join Group Discussion
ii) learners feel well-equipped to attend interviews
iii) learners know the value of time and managing it
iv) learners know the potential of Retail Sector
v) Learners know about Retail Advertising

Refrences:

Prescribed Book : Soft Skills and Industry Awareness - ICT Academy of Tamil Nadu
Books for Reference : Dr.Alex – Soft Skills, S.Chand, New Delhi
Raveendiran et al. Success Through Soft Skills

NME-I – CHOICE I – BIOMOLECULAR CHEMISTRY

SEMESTER: III **SUBJECT CODE: 21UCHN1**

CREDITS: 3 **TOTAL HOURS: 2**

Objectives

1. *To know the biological activities of vitamins*
2. *To study the chemistry of carbohydrate*
3. *To understand the structure and importance of proteins*
4. *To study the functions of lipids*
5. *To understand the enzyme action*

UNIT-I

Vitamins

Definition – Classification – Water Soluble and Fat Soluble – Occurrence - Biological Activities and Deficiency Diseases caused by Vitamin A, B (B6, B12), C, D, E and K - Hormones – Definition and Examples – Biological Functions of Insulin and Adrenaline.

UNIT-II

Carbohydrates

Classification of carbohydrates, stereo isomerism and optical isomerism of sugars, anomeric form and mutarotation. Occurrence, structure and biological importance of mono, di and polysaccharides. Reaction of Carbohydrates due to the presence of hydroxyl, aldehyde and ketone groups. Structure and properties of glucose,fructose and sucrose.

UNIT-III

Proteins and Nucleic acids

Classification and structure of amino acids based on structure. Structure of proteins - primary, secondary, tertiary and quaternary.

Composition of DNA and RNA - Watson crick model of DNA. Types of nucleic acid (DNA and RNA). Nature of genetic material, structure of purine and pyrimidine nucleotides.

UNIT-IV

Lipids

Introduction, definition, classification and functions of Lipids - simple lipids, compound lipids - phospholipids (esp. lecithin cephalin, phospotidyl inositol and phospotidyl serine) and derived lipids - steroid (cholesterol).

UNIT-V

Enzymes

Definition, classifications, isoenzymes, factors affecting enzyme activity - pH, temperature, enzyme concentration. Lock and key mechanism, Induced Fit theory. Michaelis Menten equation, Line weaver Burk plot. Enzyme inhibition - Competitive, Non competitive and uncompetitive inhibition.

Course outcomes:

The student understood and acquired the knowledge on the following:

1. *Biological importance of vitamins*
2. *Structure and properties of carbohydrate*
3. *Nature of genetic material*
4. *Simple and compound lipids*
5. *Enzyme chemistry*

References:

1. Lehninger Principles of Biochemistry-David L. Nelson, Michael M. Cox, Macmillan Worth Publishers.
2. Harper's Biochemistry-Rober K. Murray, Daryl K. Grammer, McGraw Hill, Lange Medical Books. 25th edition.
3. Fundamentals of Biochemistry-J.L. Jain, Sunjay Jain, Nitin Jain, S. Chand & Company.
4. Biochemistry-Dr. Amit Krishna De, S. Chand & Co., Ltd.
5. Biochemistry-Dr. Ambika Shanmugam, Published by Author.
6. Biomolecules-C.Kannan , MJP Publishers,Chennai-5.

NME-I – CHOICE II – ESSENTIALS OF CHEMISTRY

SEMESTER: III **SUBJECT CODE: 21UCHN1**

CREDITS: 3 **TOTAL HOURS: 2**

Objectives

1. *To know about nuclear reactions*
2. *To study the properties, structure and applications of polymers*
3. *To study the basics and applications of industrially important molecules*
4. *To study the causes of pollution*

UNIT I

Nuclear Chemistry

Natural radioactivity, Nature and types of radiations, Properties. Group displacement law. Radio active decay series. Decay rate. Half life period, Average life period, Unit of radioactivity. Radiation dose, artificial radioactivity, nuclear structure. Nuclear fission and Nuclear fusion. Rock dating- Radio carbon dating.

UNIT II

Polymer Chemistry

Classification of polymer, Origin, structure, synthesis, Molecular forces. Commercially important polymers: Application of polyethylene, polystyrene, Nylon-6, Nylon-66, Terylene, Bakelite, Natural and synthetic rubber, vulcanization.

UNIT III

Industrial Chemistry I

Dyes: Dyes – Definition – Chromophores and Auxochromes – Examples - Colour and Dyes - Classification based on Constitution and Application – examples, uses.

Paints - Components of Paint – Requisites of a Good Paint

Pigments – Classification of Pigments on the basis of Colour – Examples

Soaps and detergents: Hard and soft soaps, anionic, cationic and non-ionic detergents, cleansing action of soaps.

UNIT IV

Industrial Chemistry II

Explosives: TNT, TNG, RDX, Gun cotton: name, structure and action. (No structure or chemical reactions needed)

Fuel gases, water gas, producer gas, LPG gas, gobar gas and natural gas

Fertilizers: NPK and mixed fertilizers- pesticides and fungicides.

Drugs: Antipyretic, analgesic, antiseptic, disinfectants, tranquilisers, antibiotics structure, name and uses only.

UNIT V

Environmental Chemistry

Air, Water and Soil Pollution: Air pollution - ozone layer depletion, ozone hole, protection of ozone umbrella –Air pollution caused by fire works, harmful effects of fireworks, acid rain, green house effect, smog –Classic and photochemical smogmanagement of air pollution.

Water pollution: Causes- Heat, industrial waste, sewage water, detergents, agricultural pollutants - treatment of industrial waste water-Activated charcoal, Synthetic resin, reverse osmosis and electro dialysis - Quality of drinking water - Indian standard and W H O standard - Dissolved oxygen - BOD, COD.

Soil pollution - Pesticides, Fertilizers, Industrial waste, plastics - Control of pollution

Course Outcomes

The student understood and acquired the knowledge on the following:

1. *Natural and artificial radio activity*
2. *Industrially important polymers*
3. *Industrially important molecules used for various applications*
4. *Pollution and control*

Reference Books

1. M. C. Day and J. Selbin,“ Theoretical Inorganic Chemistry”.
2. H. S. Arniker,“ Essentials of Nuclear Chemistry:
3. B.K. Sharma “Environmental Pollution”.
4. Solomons- John- Wiley, “Fundamentals of Organic Chemistry”.
5. F.A. Carey, Mc. GrawHill ,“Organic Chemistry” Inc. 226
6. I.L Finar,“Organic Chemistry”, Vol. 1 Longman
7. Tewari, Mehrotra- Vikas&Vishnoi,“A Text book for Organic Chemistry:
8. M.K. JainJain,“ Principles of Organic Chemistry”.
9. A.K. Dey,“Environmental Chemistry”.

VALUE ADDED COURSE

PAPER-II

FOOD SAFETY AND TESTS FOR ADULTERATION IN CONSUMER PRODCUTS

SUBJECT CODE: 21UCHV2

(EXAMINATION ON IV –SEMESTER)

Objectives:

1. *To ensure food safety for common usage*
2. *To understand the adverse effect of food adulteration*
3. *Acquire the knowledge of various types of natural and artificial adulterants.*
4. *To know the techniques and methods to detect adulteration in food materials.*

UNIT-I

Detection of adulterant in milk - water in milk-detergent in milk-starch in milk(khoya, chenna, paneer).Detection of mashed potatoes, sweet potatoes and other starches in ghee and butter. Detection of other oils in coconut oil. Detection of white powder in iodized salt.Differentiation of common salt and iodised salt.

UNIT-II

Detection of sugar solution in honey-detection of chalk powder in sugar-detection extraneous matter – dust, pebble, stone, straw weed seeds, damaged grain, weeviled grain, insectgs rodent hair and excreta in food grains. Detection of clay in coffee powder-chicory powder in coffee powder-exhausted tea in tea leaves- iron fillings tea leaves

UNIT-III

Detection fungus (ergot) containing poisonous substance in food grains-detection of dhatura in food grains-identification of excess bran in wheat flour.detection of fennel seeds in cumin seeds.detection of artificial colour on green peas- wax polishing on apple.

UNIT-IV

Detection of added colour in food grains-detection of iron filings in atta/maida/rawa. Identification of turmeric in colured sella rice. Detection of Rhodamine B in ragi.-detection of lead chromate –artificial colour in turmeric powder.

UNIT-V

Detection of foreign resin –soap stone or other earthy matter in asafetida-detection papaya seeds in black pepper-detection of artificial water soluble synthetic colors in chilly powder-malachite green in green chilli and green vegetables-detection cassia bark in cinnamon-

Learning outcomes:

1. *After completion of the course, student can Understand the types of adulteration*
2. *Student can realise the adverse effect of adulterants in food prodcuts*

3. *To get technical knowhow of detection adulteration in food materials*
4. *Get awareness in safety and hygiene in consumption of food products.*

Refrences:

1. Food safety and standards authority of India– manual –
2. Biotechnological approaches in food adulterants-Madan L.Varma
3. Food adulteration and food frauds-Jonathan Rees

SEMESTER – IV

CC - V: GENERAL CHEMISTRY – IV

SEMESTER: IV **SUBJECT CODE:21UCH5**

CREDITS: 4 **TOTAL HOURS: 6**

Objectives

1. *To study the essential of D and F block elements.*
2. *To study the properties and applications of organometallic compounds*
3. *To study the preparation and properties of carboxylic acids and its derivatives*
4. *To study the chemistry of nitro compounds of amines*
5. *To understand the theories of phase rule and phase equilibria.*

UNIT – I

Transition and Inner transition elements

d-Block elements: Electronic configuration, general characteristics of transition elements, oxidation states, atomic size, ionization potential, colour, complex formation, magnetic properties and acidic & basic properties of oxides- explanation with reference to 3d-series.

Lanthanides – occurrence – general study of lanthanides involving electronic configuration, oxidation states, magnetic properties and complexation behaviour- Lanthanides – separation by ion exchange and solvent extraction methods – lanthanide contraction - Actinides – Occurrence – electronic configuration, oxidation states, magnetic properties and complexation behaviour.- Comparison of lanthanides and actinides and their position in the periodic table - Elements with atomic number 104 and 105; preparation and their position in the periodic table- Chemistry of thorium and uranium – occurrence, ores, extraction and uses.

UNIT – II

Chemistry of organometallic compounds

Introduction, classification based on hapticity and M-C bond connectivity, the 18 electron rule and its application to metal carbonyl complexes e.g. $Cr(CO)_6$, $Ni(CO)_4$,$Fe(CO)_5$, $Fe_2(CO)_9$, $Mn_2(CO)_{10}$, $Fe_3(CO)_{12}$. Metallocenes – ferrocene – structure, synthesis and its reactions.

General preparation, properties (physical and chemical), structure and uses of organomagnesium, organozinc , organophosphorous, organolead and organocopper compounds.

Metal ions present in biological systems, classification of elements according to their action in biological system. Iron and its application in bio-systems, Haemoglobin; Storage and transfer ofiron.

UNIT – III

Carboxylic Acids and their Derivatives

Preparation, physical properties and reactions of monocarboxylic acids: Typical reactions of dicarboxylic acids, hydroxy acids and unsaturated acids: succinic/phthalic, lactic, malic, tartaric, citric, maleic and fumaric acids; Preparation and reactions of acid chlorides, anhydrides, esters and amides; Comparative study of nucleophilic sustitution at acyl group -Mechanism of acidic and alkaline hydrolysis of esters, Claisen condensation, Dieckmann and Reformatsky reactions, Hofmann-bromamide degradation and Curtius rearrangement.

UNIT – IV

Nitro Compounds and Amines

Nitrogen compounds

Amines: Aliphatic & Aromatic: preparation, separation and identification of primary, secondary and tertiary amines; Relative basic characters of Aliphatic and Aromatic amines - Ring substitution in aromatic amines. reaction: diazo coupling reaction, formation and reactions of phenylenediamines, diazomethane and diazoacetic ester.

Preparation, Properties and uses of Sulphanilic acid, sulphanilamide, saccharin, chloromine T-Diamide, urea and thiourea.

Nitro compounds (aliphatic and aromatic): preparation and reaction: reduction under different conditions; Conversion of nitrobenzene to ortho, para and meta dinitrobenzenes. TNT – Aromatic Nitro Compounds.

Alkylnitrile and isonitrile: preparation and reaction, Diazonium salts and their related compounds: reaction involving replacement of diazo group;

UNIT – V

Phase Equilibria

Concept of phases, components and degrees of freedom, derivation of Gibbs Phase Rule for nonreactive and reactive systems; Clausius-Clapeyron equation and its applications to

solidliquid, liquid-vapour and solid-vapour equilibria, phase diagram for one component systems, with applications (H2O and sulphur system). Phase diagrams for systems of solid-liquid equilibria involving eutectic, congruent and incongruent melting points, solid solutions (Pb-Ag system).

Three component systems, water-chloroform-acetic acid system, triangular plots. Binary solutions: Gibbs-Duhem-Margules equation, its derivation and applications to fractional distillation of binary miscible liquids (ideal and non-ideal), azeotropes, partial miscibility of liquids, CST, miscible pairs. Nernst distribution law: its derivation and applications.

Course Outcomes

The student understood and acquired the knowledge on the following:

1. *Chemistry of transition and inner transition elements*
2. *Preparation and properties of organometallic compounds*
3. *Preparation and properties of carboxylic acid and its derivatives*
4. *Chemistry of amines and nitro compounds*
5. *Principles of Phase equilibrium*

References

1. P.L. Soni &Mohankatyal, Text book of Inorganic Chemistry 20th revised Edn. Sultan chand 1992.
2. R.B. Puri& L.R. Sharma, "Principles of Inorganic chemistry", Sultan chand, 1989.
3. P.L.Soni & H.M. Chawla "Text book of Organic Chemistry", Sultan chand& sons 1994 Delhi.
4. K S Tewari, S N Mehrotra and N K Vishonoi, "A text book of organic chemistry".
5. Advanced Inorganic Chemistry by Gurudeep Raj and Chatwal Anand
6. Modern Inorganic Chemistry by R D Madan 1987, S Chand and co.,
7. Advanced Inorganic Chemistry by Sathyaprakash.
8. M K Jain, "Organic Chemistry" Shoban Lal Nagin chand and co.,
9. B R Puri& L R Sharma and Madan S Pathania, "Principles of physical chemistry" Shoban Lal Nagin Chand and co., Delhi.
10. B.S.Bahl and ArunBahl – Advanced organic chemistry.
11. R.T. Morrison and RW. Boyd – Organic chemistry
12. I L Finar, "Organic chemistry" Volume – I E L B S, London.
13. Physical Chemistry, V Edition, G. M. Barrow, Tata McGraw Hill.
14. Physical Chemistry G. K. Vemulapalli, , Prentice-Hall India Pvt. Ltd.
15. Physical Chemistry, K. K. Padmanabha, Lakshmi Printing & Publishing House, Mysore.

SEMESTER – V

CC - VII - INORGANIC CHEMISTRY – I

SEMESTER: V **SUBJECT CODE: 21UCH7**

CREDITS: 4 **TOTAL HOURS: 5**

Objectives

1. *To instruct the theories of acid and base*
2. *To instruct the theories and conceots of coordination compounds*
3. *To instruct the fundamentals of metal carbonyls*
4. *To instruct the core concept of bioinorganic chemistry*

UNIT I

Concepts of acids and bases

Acids and bases; Arrehenius theory, lowry - bronsted theory, the Lewis concepts of acids and bases and lux - flood concepts. The solvent system concept. Relative strength of acids and bases. The usanovich concept.

Hard and soft acids and bases - classification of acids and bases as hard and soft - pearson‘s HSAB cpncept, acid - base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness - application of HSAB principles.

UNIT – II

Coordination Compounds-I

Definition of the terms- classification of ligands – Nomenclature of mononuclear and polynuclear complex - Chelating ligands and chelates - chelates effect - explanation. Co-ordination number - Theories of co-ordination compounds: Werner‘s theory, EAN rule and calculation of effective atomic number of a complex - valence bond theory and magnetic properties of complexes -limitation of VB theory - crystal field theory - postulates of d orbital in octahedral, tetrahedral and square planar complexes - strong and weak ligands - spectrochemicals serials. C.F.S energy and calculation.

UNIT – III

Coordination Compounds-II

Isomerism in complex - structural isomerism - types. Stereoisomerism-geometrical isomerism in 4 & 6 coordinated complex. Optical isomerism in 4 & 6 coordinated complexes – factors

affecting the stability of complexes. Unimolecular and bimolecular nucleophilic substitution reactions in octahedral and square planar complexes – Trans effect. Application of coordination compounds in qualitative and quantitative analysis – separation of copper, cobalt, nickel and cadmium ions. Structure of EDTA and its complexes. Complexometric titration – principles and applications.

UNIT – IV

Metal carbonyls

Classification, preparation and properties of metal carbonyls. Bonding and structure of Fe, Co, Ni and Cr carbonyls. 18 electron rule.

Metal carbides – types - preparation and applications.

Nitrosyl compounds – classification - Nitrosyl chloride and sodiumnitropruside - preparation, properties and structure.

UNIT – V

Bioinorganic Chemistry:

Electron transfer: complementary and non-complementary electron transfer reactions with examples. Metal porphyrin complexes: Structure and mechanism of oxygen transporting by haemoglobin. Structure and role of chlorophyll in photo synthesis - Metallo enzymes: Iron, magnesium and zinc enzymes. Hemocyanin structure and enzymatic activity.

Course Outcomes

The student understood and acquired the knowledge on the following:

1. *IUPAC nomenclature to complexes.*
2. *Checking of hardness of water.*
3. *Drawing a MO diagram of carbonyls.*
4. *Calculating in molecule point group.*

References

1. P.L. Soni, Text Book of inorganic chemistry, S.Chand& Co., New Delhi (1999)
2. B.R.Poori& L.R. Sharma : Principles of inorganic chemistry, Shoban Lal, Nagin Chand & Co., New Delhi (2000)
3. R.D. Madan, G.D.Tuli and S.Malick, Selected Topics in Inorganic Chemistry, S.Chand& Co., New Delhi (1988)
4. J.D.Lee : Concise Inorganic Chemistry, E.L.B.S. IV Edn., (1991)
5. Jeffery et al : ―Vogel Text Book of Inorganic Quantitative Analysis‖, Longman (1984)
6. D.A. Skoog and D.M.West : ‒Fundamentals of Analytical Chemistry‖ W.B. Saunders, New York (1983)
7. P.K. Bhattacharya : Chemical Applications of Group Theory, Himalaya Publishing House, Mumbai (1998)
8. M.S.Gopinath and V.Ramakrishnan : Group Theory and Applications (1988)

CC – VII - ORGANIC CHEMISTRY – I

SEMESTER: V **SUBJECT CODE: 21UCH8**

CREDITS: 4 **TOTAL HOURS: 5**

Objectives

1. *To learn about optical and Geometrical isomerism in organic compounds.*
2. *To acquire the knowledge of Reactions of Carbonyl Compounds.*
3. *To study the various concepts and applications of Acids And Acid Derivatives*
4. *To understand the various 5&6 membered Heterocyclic Compounds.*

UNIT – I

Stereo chemistry-I

Stereoisomerism – definition, classification into optical and geometrical isomerisms. Optical Isomerism : optical activity – optical and specific rotations – conditions for optical activity in solid, liquid and gaseous phases – criteria for optical activity – asymmetric centre – chirality – achiral molecule – meaning of + and – and D and L notations – elements of symmetry. Recemization – methods of recemizations (by substituting and tautomerism). Resolution – asymmetric synthesis (partial and absolute asymmetric synthesis) – Walden inversion – Vant Hoffs rule of superposition- Freudenberg‘s rule of shift.

Notations for optical isomers – Cahn – Ingold – Prelog rules – R/S.notations for optical isomer with one asymmetric carbon – Erythro and Threo representations. Fischer projection, Sawhorse, Newmann projection representation of molecules with two asymmetric carbon atoms.

UNIT – II

Stereo chemistry – II

Optical activity in compounds containing no symmetric carbons – Biphenyls – Allenes and Spirans. Geometrical isomerism – Cis – Trans, Syn - Anti and E-Z notations – geometrical isomerisms in maleicacids and ketoximes — methods of determining of configuration of geometrical isomers. (No details required) Conformational analysis – conformers of cyclohexane (boat, chair and skew boat forms) Axial and equatorial bonds-ring flipping showing axial and equatorial bonds – ring flipping showing axial – equatorial interconversions – conformations of mono substituted cyclohexane.

Methods of distinguishing geometrical isomers (Dipole moment, Dehydration, Heat of Hydrogenation, cyclization, Melting points) – Methods of determining the configuration of geometrical isomers (No details required). Geometrical and optical isomerism in three membered rings.

UNIT – III

Reactions of Carbonyl Compounds

Carbonyl polarization – reactivity of carbonyl group – acidity of hydrogen – mechanism of Aldol – Perkin, Knoevenegal and Benzoin condensation – mechanism of Claisen – Reformatsky – Wittig and Cannizaro reactions.Mechanisms of Reduction (Sodium borohydride, $LiA1H_4$ Wolff – Kishner and MPV reductions) – Mechanisms of Haloform reaction and Michael addition and Oppenauer Oxidation. Photochemistry of carbony1 compounds – Norrish I and II Types of reaction and mechanism.

UNIT – IV

Acids and Acid Derivatives

Ionization of carboxylic acids – acidity constant – comparison of acid strengths of substituted halo acids – Acid strength of substituted Benzoic acids – Hammett equation. Hell-volhard-Zelinski reaction.

Dicarboxylic acids – preparation and properties of oxalic, malonic, succinic, glutaric and adipic acids – malonic and acetoacetic esters – characteristics of active methylene group – synthetic uses of these esters. Tautomerism – definition – keto – enol tautomerism – identification – acid and base catalysed – interconversion mechanism – estimation – amido – imido and nitroacinitro tautomerisms. Acid –base catalysed hydrolysis of ester, hydrolysis of amides and transesterification.

UNIT – V

Heterocyclic Compounds

Aromatic characteristics of heterocyclic compounds – preparation properties and uses furan – pyrole, thiophene structure – synthesis and reactions of pyridine and piperidine – comparative basis characters of pyrrole – pyridine and peperidine with amines. Synthesis and reactions of Quinoline – Isoquinoline and indole with special reference to skraup – Bischler Napieralski and fisher indole synthesis.

Course Outcomes

The student understood and acquired the knowledge on the following:

1. *Identify, classify and draw structures of organic molecules.*
2. *Thorough understanding of stereo chemical properties of organic compounds*
3. *Apply the basic rules of organic nomenclature to interrelate between structures and names of organic compounds.*
4. *To understand the various concepts and applications of Acids And Acid Derivatives*
5. *To acquire the knowledge about various 5&6 membered Heterocyclic Compounds.*

References :

1. Organic Chemistry – Volume I and II – I.L.Finar
2. Advanced Organic Chemistry – Bahl & Bahl
3. Natural products chemistry – Gurdeep Chatwal
4. Pamer and Chawk, Reaction mechanism
5. R.T. Morrison and RW. Boyd – Organic chemistry
6. R Chang –Basic principles of spectroscopy‖
7. Dyer –Organic Application of spectroscopy‖
8. Y R Sharma, Elementary organic spectroscopy, principles and Applications, S Chand, New Delhi, 1992

CC – IX - PHYSICAL CHEMISTRY – I

SEMESTER: V **SUBJECT CODE: 21UCH9**

CREDITS: 4 **TOTAL HOURS: 5**

Objectives

1. *To learn about the colligative properties of dilute solutions*
2. *To know the rate, rate constant order of a reaction*
3. *To study the reaction kinetics and mechanism*
4. *To study the first, second and third law of thermodynamics*

UNIT – I

Colligative properties

Solutions of gases in liquids. Henry‘s law. Fugacity and activity of liquids in liquids. Raoult‘s law.Binary liquid mixtures.Ideal solution. Deviation from ideal behaviour. Thermodynamics of ideal solutions. V.P.Composition, V.P. temperature curves. Azeotropic distillation, review of colligative properties of dilute solutions. One method of determination of mol.wt.calculation. Thermodynamic derivation of elevation of boiling point and depression in freezing point, Van‘t Hoff factor, abnormal molar mass. Distribution, thermodynamic derivation, applications.

UNIT – II

Chemical kinetics-I

Methods for determination of rate of the reactions. Derivation of rate constant and characteristics of first, second, third and Zero order reactions. Derivation of time for half change with examples. Methods of determining the order of a reaction. Arrhenius equation, effect of temperature of the rate of a reaction, concept of energy of activation. Collision theory and derivation of rate constant of a bimolecular reaction, failure of the theory. Theory of absolute reaction rates and thermodynamic derivation of the rate constant for a bimolecular reaction.

UNIT – III

Chemical kinetics-II

Comparison between collision theory and absolute reaction rate theory. Significance of entropy and free energy of activation. Consecutive, parallel and reversible reactions – examples only (no derivation of rate law). Photochemistry: Laws, quantum yield – fluorescence and

phosphorescene. Primary and secondary reactions. Decomposition of hydrogen iodide, hydrogen – chlorine reaction hydrogen – bromine reaction. Photosensitization.

UNIT – IV

Thermodynamics I

System and surrounding – isolated closed and open systems – Intensive and extensive properties – Thermodynamic processes – isothermal, adiabatic, cyclic, reversible and Irreversible processes.State and path functions – Exact and Inexact differentials – concept of heat and work. **First law of Thermodynamics** – statement – definition of Internal Energy (E), enthalpy (H) and heat capacity – Relationship between Cp and Cv. Calculation of q, w, dE and dH for expansion of ideal gas under isothermal and adiabatic reversible and irreversible process – Joule – Thomson co-efficient (μ_{JT}) for ideal and real gases – Inversion temperature variation of heat of reaction with temperature. Kirchoff's equation Bond energy and its calculation from thermochemical data – Integral and differential heats of solution and dilution.

UNIT –V

Thermodynamics II

Second law of thermodynamics : Need for the law. Different statements of law. Concept of entropy: Entropy as a state function – entropy as a function of P.V and T. Entropy changes in phase changes. Entropy as a criterion of spontaneous and equilibrium processes in isolated system. Gibbs and Helmholtz function: Thermodynamics equation of state. Maxwell's relations. Application of second law of thermodynamics & third law – Partial molar quantities – chemical Potential of component in an ideal mixture – Gibbs Duhem equation – Variation of chemical potential with T.P. Reaction isotherm – van't Hoff's equation – van't Hoff's isochore. Clapeyron equation and Clausius Clapeyron equation – Applications. Need for the law. Nernst heat theorem.

Third law of thermodynamics – statement and concept of residual entropy. Evaluation of absolute entropy from heat capacity data. Exception to third law.

Course Outcomes

The student understood and acquired the knowledge on the following:

1. Principle of colligative properties and their applications
2. *Methods of determination of molecular weight*
3. *Theory of chemical kinetics*
4. *Basic principles of thermodynamics*
5. *Applications thermodynamics in various processes*

Reference

1. Principles of Physical Chemistry‖, B R Puri& Sharma
2. Text Book of Chemistry‖, P L Soni
3. Advanced Physical Chemistry‖, Gurdeep Raj
4. Essential of Physical Chemistry‖, B S Bahl, G D Tuli&ArunBahl, S Chand & co., New Delhi.
5. Simplified course in Physical Chemistry‖, R L Madan, G D Tuli, S Chand & Co., New Delhi.
6. B R Puri& L R Sharma, Principles of Physical Chemistry
7. R P Varma & Pradeep Physical Chemistry
8. Dr.S Jain & S P Jankar, Physical Chemistry, Principles & Problems, –Tata McGraw Hill‖, New Delhi, 1990

EC – I – CHOICE I - ANALYTICAL CHEMISTRY

SEMESTER: V **SUBJECT CODE: 21UCHE1A**

CREDITS: 5 **TOTAL HOURS: 3**

Objectives

1. *To know the storage and handling various chemicals and first and procedures.*
2. *To learn data analysis and quantitative analysis.*
3. *To study visible spectrophotometry and colorimetry.*
4. *To learn chromatography technique.*
5. *To study thermo analytical methods.*

UNIT – I

Laboratory hygiene and safety

Storage and handling of corrosive flammable – Explosive – Toxic – Carcinogenic and poisonous chemicals. Simple first aid procedure for accidents – Acid in eye – Alkali in eye – Acid burns – Alkali burns – Bromine burns – poisoning – inhalation of gases –heat burns.

UNIT – II

Data Analysis and quantitative analysis

Errors in chemical Analysis – Classification of Errors – Determinate Errors – Instrument Errors – Methods of errors – Personal Errors – Constant Errors – Random Errors or Indeterminate Errors – precision – Accuracy and Rejection of Results – Significant figures – Mean Deviation and Standard Deviation Curve fitting – Method of least squares. Standard solution – Titration Equivalence point and End point Indicator Basic requirement of a Titrimetric reaction – Types of Titration – Acid – base Titration – Redox Titration – precipitation Titration and complexometric Titration. Indicators. Gravimetric Analysis – Characteristics of precipitating agent – choice of precipitants – Specific and selective precipitant – Condition of precipitation. – Co – Precipitation and post Precipitation, sequestration.

UNIT – III

Visible spectrometry and Colorimetry

Theory of spectrophotometry and colorimetry. Photoelectric colorimeter and spectrophotometer. Criteria for satisfactory colorimetric estimation. Determination of composition of complex, calorimetric estimation of ion.

UNIT – IV

Separation and purification Techniques

General principle involved in the separation of Precipitates – Solvent Extraction. Chromatography – principles involved in Absorption – partition and Ion-Exchange-paper thin Layer – column – Gas – Liquid and Ion Exchange Chromatography – Electrophoresis – Applications. Desiccants – Vacuum Drying – Distillation – Fractional Distillation – steam Distillation Azeotropic Distillation Crystallisation and sublimation Principles and Techniques.

UNIT –V

Thermo Analytical Methods

Principle involved in Thermo Gravimetric Analysis and differential Thermal Analysis – Instrumentation – Characteristics of TGA (CaC_2O_4 – H_2O, $CuSO_45H_2O$) and DTA curves (CaC_2O_4 .H_2O) – Factors affecting TGA and DTA curves.Thermometric Titration (HCl * NaOH). Analytical Electrochemistry – Redox Potential – Measurement and application – Interpretation of chemical behaviour – Electrolytic Separations – Principles of Electro deposition – Electrogravimetry (Estimation of copper and silver).

Course Outcomes

On the successful completion of the course, students will be able to

1. *Tell the basic concepts of analytical chemistry*
2. *Explain the data analysis quantitative analysis*
3. *Discuss colorimetric analysis and its applications.*
4. *Compare the thermogravimetric analysis, differential thermal analysis and its application.*
5. *List the chromatographic techniques. Such as TLC, GLC, HPLC and their application industries.*

References

1. R. Gopalan, P S Subramanian and K Rengarajan, Elements of Analytical chemistry. Sultan and Chand, New Delhi, 1995.
2. B K Sharma, Instrumental methods of chemical analysis, Goel Publishing House, Meerut, 1999.
3. S M Khopkar, Basic concepts of Analytical chemistry, New Age International p Limited, New Delhi, 1998.
4. D A Skoog and D M West, Fundamentals of Analytical chemistry, W B Saunders, New York, 1982.

EC – I – CHOICE – II – CHEMICAL ANALYSIS OFAPPLIED INDUSTRIAL PRODUCTS

SEMESTER: V **SUBJECT CODE: 21UCHE1B**

CREDITS: 5 **TOTAL HOURS: 3**

Objectives

1. *To learn about the composition of soil*
2. *To know the water analysis techniques*
3. *To learn about the food adulteration and analysis*
4. *To study the chemistry of soaps*
5. *To study the analysis of cosmetics*

UNIT II

Analysis of soil:

Composition of soil, Concept of pH and pH measurement.

Complexometric titrations, Chelation, Chelating agents, use of indicators.

Determination of pH of soil samples.

Estimation of calcium and magnesium ions as calcium carbonate by complexometric titration.

UNIT II

Analysis of water:

Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods.

Determination of pH, acidity and alkalinity of a water sample.

Determination of dissolved oxygen (DO) of a water sample.

UNIT III

Analysis of food products:

Nutritional value of foods, idea about food processing and food preservations and adulteration.

Identification of adulterants in some common food items like coffee powder, asafoetida, chilli powder, turmeric powder, coriander powder and pulses, etc.

Analysis of preservatives and colouring matter.

UNIT IV

Analysis of soaps:

Moisture and volatile matter, cobined alkali, total fatty matter, free alkali, total fatty acid, sodium silicate and chlorides.

Analysis of oils: saponification value, iodine value, acid value, ester value, bromine value, acetyl value. Analysis of industrial solvents like benzene, acetone, methanol and acetic acid. Determination of methoxyl and N-methyl groups.

UNIT V

Analysis of cosmetics and Paints:

Major and minor constituents and their function

Analysis of deodorants and antiperspirants, Al, Zn, boric acid, chloride, sulphate.

Determination of constituents of talcum powder: Magnesium oxide, Calcium oxide, Zinc oxide and Calcium carbonate by complexometric titration.

Analysis of paints: Vehicle and pigments, barium sulphate, total lead, lead chromate, iron pigments, zinc chromate.

Course Outcomes

The student understood and acquired the knowledge on the following:

1. *Quantitative analysis of the soil*
2. *Techniques used in water analysis*
3. *Food adulteration and its analysis*
4. *Constituents of soap*
5. *Chemistry of cosmetics and paints*

Reference Books

1. Willard, H. H. Instrumental Methods of Analysis, CBS Publishers.
2. Skoog & Lerry. Instrumental Methods of Analysis, Saunders College Publications, NewYork.
3. Skoog, D.A.; West, D.M. & Holler, F.J. Fundamentals of Analytical Chemistry 6th Ed., Saunders College Publishing, Fort Worth (1992).
4. Harris, D. C. Quantitative Chemical Analysis, W. H. Freeman.
5. Dean, J. A. Analytical Chemistry Notebook, McGraw Hill.
6. Day, R. A. & Underwood, A. L. Quantitative Analysis, Prentice Hall of India.
7. Freifelder, D. Physical Biochemistry 2nd Ed., W.H. Freeman and Co., N.Y. USA (1982).
8. Cooper, T.G. The Tools of Biochemistry, John Wiley and Sons, N.Y. USA. 16 (1977).
9. Vogel, A. I. Vogel‘s Qualitative Inorganic Analysis 7th Ed., Prentice Hall.
10. Vogel, A. I. Vogel‘s Quantitative Chemical Analysis 6th Ed., Prentice Hall.
11. Robinson, J.W. Undergraduate Instrumental Analysis 5th Ed., Marcel Dekker, Inc., New York

EC – I – CHOICE – III – AGROCHEMICALS

SEMESTER: V **SUBJECT CODE: 21UCHE1C**

CREDITS: 5 **TOTAL HOURS: 3**

Objectives

1. *To study about the pest control*
2. *To learn about the synthesis of insecticides*
3. *To know about natural and bio insecticides*
4. *To study about synthetic herbicides*
5. *To study the preparation and applications of Fungicides and Rodenticides*

UNIT - I

Introduction to Pesticides

Definition, Classification and importance of pesticides

Pest control: Different methods – chemical – insecticides, fungicides, herbicides, rodenticides, fumigants, chitin synthesis inhibitors and insect repellents.

Biological – pheremones: Definition and classification, synthesis of Disparlure, Exobrevicomin, Endobrevicomin, frontalin and grandiso pheromones, synthetic sex attractants.

Insect juvenile hormones: JH-A, JH-B, Synthesis of juvabione. Structural formula and importance of methopren.

Environmental pollution from pesticides - Integrated pest management - Pesticide formulations: Dusts, Granules, Wettable powders, Emmulsions and Aerosols.

UNIT - II

Synthetic insecticides

Organochlorine insecticides - synthesis and mode of action of methoxychlor, perthan, Dicofol, Heptachlor, Dieldrin and Endosulfan - Organophosphorous insecticides – synthesis and mode action of Phosphoric acid derivatives, phosdrin, Dichlorophos, parathion, Zolone, Aninphomethyl, TEPP and Sachradan.

Carbamate insecticides- synthesis and mode of action of carbamyl, Furadan, Baygon, Aldicarb and Zectron - Formulation and residue analysis of organochlorine, organophophorous and carbamate insecticides.

UNIT - III

Natural Insecticides and Herbicides

Insecticides of palnt origin – synthesis and importance of pyrethrins (I and II), Rotenone and Nicotine. Main constituents Neem - structural formula of Azadirachtin. Synthesis of polygodial and warbunganol (Antifeedants).

Synthesis of pyrethroids: synthesis of Allethrin, Bioallethrin, Cypermethrin, Fenvalerate, Decemethrin and pyrithrelone.

Concept of Bioinsecticides – Bacillus thiuringiensis - Concept of pro-insecticides-structure and mode of action of pro-pheremones and pre-pro-insecticides.

UNIT - IV

Herbicides

Aryloxyalkyl carboxylic acid derivative: 2,4-D, MCPA,2,4,5-T and 2,4,5-TP - Carbamates propham and chloropham - Urea derivatives – Monouron and diuron.

Aliphatic acids Dalapon,TCA - Aromatic acids -2,3,6-TBA, Dicomba and Amiben.

Nitrogen heterocyclic dericvatives – Simazine, Atrazine, Amitrole, Maleic hydrazide Diquat and paraquat - Phenols PCP and Dinoseb - Benzonitrile compounds.

UNIT - V

Fungicides and Rodenticides

Fungicides –classification ,synthesis application and mode of action of the following classes:

Carbamates – Quinones - chloranil, Dichlone and Benquinox and perchloromethylmercaptan derivative – captan, folpet, difolatan and mesulfan.

Benzimidazoles-carbendazim, Benomyl and Thiabandazole

Rodenticides: Anticoagulents - synthesis and application of warfarin, Coumachlor, Vacor, Coumatetrallyl, Dicoumarol and Bromodiolen.

Acute poisons- application of pindone, Ratindan, Sodium Fluoroacetate, Barium fluoroacetate, Antu,Tetramine, pindone and castrix.

Course Outcomes

The student understood and acquired the knowledge on the following:

1. *Environment pollution by pesticides*
2. *Synthesis and mode of action of insecticides and herbicides*
3. *Chemistry of synthetic herbicides*
4. *Application of Fungicides and Rodenticides*

References

1. Naturally occurring insecticides: M.Jacobson and D.G.Crosby.
2. Insect juvenile harmone chemistry and action : J.J Mann and M.Beroza
3. Polygodial and warburganal.Terpenoidantifeedants part-II rec,Tran,chin 106
4. Insect antifeedants :S.V.ley&P.L Toogood,chemistry in Britain ,Jan 1990 P.31
5. Biofertilizers and Bioinsecticides : A.M.Deshmukh
6. Insecticides and Fungicides :U Sriramulu.
7. Organo chlorine insecticides : persistent organic pollutants :F.Moriary
8. Herbicides,fungicides,formulation chemistry-A.S.Tahori
9. Environmental pollution by pesticides :C.A.Edwards
10. Pespticides managements and insecticide resistance :Watson and brown

SOFT SKILLS AND INDUSTRY AWARENESS
PAPER III

SEMESTER: V **SUBJECT CODE: 21USBE3**

CREDITS: 4 **TOTAL HOURS: 4**

Objectives :

i) To expose the learners to effective vocabulary
ii) To introduce various kinds of leadership to the learners
iii) To make the learners aware of the features of BFSI Sector
iv) To make the learners aware of the potential of Insurance Sector
v) To expose the learners to the fields of BPO and Hotel Industry

UNIT – I

VOCABULARY ENRICHMENT -- definition and importance – word formation : prefixes and suffixes --- compound words ---- compound nouns – compound adjectives ---synonyms and antonyms ---homonyms – homophones --- idioms and phrases ----one word substitutes --- confused words –tips for vocabulary enrichment -- oral presentation : techniques and tasks --- self –introduction--- talking about objects --- description of person --- welcome speech --- vote of thanks ---

UNIT – II

LEADERSHIP --- need for leadership –definition of leadership --- essence of leadership – functions of effective leaders ---differences between leadership and management ---positive and negative leaders ---different leadership styles ---David McClelland's classification of leadership – choice of correct leadership style ---emerging perspectives on leadership in organizations

UNIT – III

BFSI SECTOR – banking sector -- market size – investments --- what is banking? --- types of banks ---- functions of Bank --- types of bank accounts – E-banking (electronic banking)--- government initiatives ---Financial Services --- Market size – Investments --- Government Initiatives

UNIT – IV

INSURANCE SECTOR ----market size ---- investments – advantage India --- Policy measures --- opportunities --- government initiatives – advantages and uniqueness of India's Life Insurance

Sector—Job roles -----ITES SECTOR --- introduction – IT services sector ---BPO Services sector --- market size – investments --- skill requirements in the IT and ITES industry--- major trends impacting skill requirements

UNIT – V

BUSINESS PROCESS OUTSOURCING (BPO) ---- advantages of BPO --- disadvantages of BPO ---- classification of BPO HOSPITALITY SECTOR : introduction --- tourism – Indian market --- market size --- investments --- government initiatives --- types of tourism --- opportunities ---- benefits of career – road ahead – Theme parks – facts on Indian amusement park industry --- structure and development of amusement park sector --- tourism – amusement parks ---recreation industry ---amusement parks ---HOTEL INDUSTRY – categorization of hotels --- latest developments --- cruise lines --- India's cruise potential --- time for domestic cruising – cruise lines in India ---- Job Roles

References:

Prescribed Book : Soft Skills and Industry Awareness - ICT Academy of Tamil Nadu
Books for Reference : Dr.Alex – Soft Skills, S.Chand, New Delhi
Raveendiran et al. Success Through Soft Skills

NME – II – CHOICE I - WATER TREATMENT AND ANALYSIS

SEMESTER: V **SUBJECT CODE: 21UCHN2**

CREDITS: 2 **TOTAL HOURS: 2**

Objectives

1. *To instruct hardness, sterilization.*
2. *To instruct the titration method- clark's process*
3. *To instruct the electrodiaysis and water treatment.*
4. *To instruct the water analysis.*
5. *To instruct on the water pollution, B.O.D and C.O.D*

UNIT-I

Characteristics of water

Introduction - characteristics of water - alkalinity - hardness - unit of hardness - Total solids - Oxidation - transparency - Silica content. -Purification of water for drinking purpose - potability of water - clarification – coagulation, sterilization & disinfection of water - precipitation - ozonisation - Chlorination.

UNIT-II

Methods of water softening

Water softening methods - Clark's process - lime soda process - modified lime soda process - permutit or zeolite process - Ion exchange process - demineralization of water. - Determination of hardness of water - Titration method - complexometric method using EDTA - expressing hardness - equivalents of calcium carbonate - problems to determine temporary & permanent hardness.

UNIT-III

Water treatment

Hard water and industries - industrial water treatment - boiler feed water method of softening - prevention of plumbo solvency - scales in boilers - consequences - internal conditioning methods. Desalination of brackish water - elecrodiaysis - Reverse osmosis.

Modern technologies used in water treatment: Nanotechnology, UV purification, Acoustic nanotube technology and sunspring system.

UNIT-IV

Water analysis

Water analysis - sampling of water for analysis - chemical substances affecting potability - colour, turbidity odour, taste, temperature, pH and electrical conductivity. Analysis of solids present in water - suspended solids - dissolved solids - total acidity - alkalinity - free CO_2 - free chlorine - Ca, Mg, Fe, Mn, Ag & Zn.

Determination of total mass and total activity of water – Spectrophotometric method, Fluorimetric method, Gross alpha method.

UNIT-V

Water pollution

Water pollution: Hydrological cycle –aquatic environment-classification of water pollution – organic pollutants, inorganic pollutants, sediments, radioactive materials, Analysis of chemical substances affecting health - NH3, Nitrate, Nitrite, cyanide, sulphate, sulphide, chloride, fluoride - measurement of toxic chemical substances - analysis of chemical substances indicative of pollution - Dissolved oxygen - Bio Chemical Oxygen Demand (BOD) - Chemical Oxygen Demand (COD).

Course Outcomes

The student understood and acquired the knowledge on the following:

1. *Water hardness*
2. *Clark's process*
3. *Water & COD*

References

1. Industrial Chemistry (including chemical - engineering) - B.K. Sharma - Goel publishing house, Meerut.
2. Pollution control in process industries - S.P. Mahajan - Tata McGraw - Hill Publishing Company Ltd., New Delhi.
3. Water pollution and management - C.K. Varashney - Wiley Eastern Ltd., Chennai - 20.
4. Environmental Chemistry-AK De, Wiley eastern Ltd., New Delhi (1993).
5. A text book of Environmental Chemistry-Krishnan & Kannan, Anmol Publications, New Delhi (1992).
6. Environmental chemistry & pollution control – Dhar, S.Chand &Co., New D

NME – II – CHOICE II – FORENSIC SCIENCE

SEMESTER: V **SUBJECT CODE: 21UCHN2**

CREDITS: 2 **TOTAL HOURS: 2**

Objectives

1. *To know the types and treatment of poison*
2. *To instruct the nature of explosives*
3. *To learn about the detector devices*
4. *To instruct the analysis of biological substances.*
5. *To instruct the metabolite analysis.*

UNIT I

Poisons

Poisons-types and classification - diagnosis of poisons in the living and the dead – clinical symptoms - postmortem appearances. Heavy metal contamination (Hg, Pb, Cd) of sea foods use of neutron activation analysis in detecting arsenic in human hair. Treatment in cases of poisoning - use of antidotes for common poisons.

UNIT II

Crime Detection

Accidental explosion during manufacture of matches and fire works. Human bombs - possible explosives (gelatin sticks and RDX) - metal detector devices and other security measures for VVIP - composition of bullets and detecting powder burn. Analysis of incendiary and timed bombs - spill of toxic and corrosive chemicals from tankers.

UNIT III

Forgery and Counterfeiting

Documents - different types of forged signatures-simulated and traced forgeries - inherent signs of forgery methods - writing deliberately modified - uses of ultraviolet rays - comparison of type written letters - checking silver line water mark in currency notes - alloy analysis using AAS to detect counterfeit coins - detection of gold purity in 22 carat ornaments - detecting gold plated jewels - authenticity of diamond.

UNIT IV

Tracks and Traces

Tracks and traces - small tracks and police dogs-foot prints - casting of foot prints - residue prints, walking pattern or tyre marks - miscellaneous traces and tracks - glass fracture - tool markpaints – fibres. Analysis of biological substances - blood, saliva, urine and hair - Cranial analysis (head and teeth) DNA Finger printing for tissue identification in dismembered bodies - Detecting steroid consumption in athletes and race horses.

UNIT V

Medical Aspects

Aids - causes and prevention - misuse of scheduled drugs - burns and their treatment by plastic surgery. Metabolite analysis using mass spectrum – gas chromatography. Arson natural fires and arson - burning characteristics and chemistry of combustible materials - nature of combustion. Ballistics - classification - internal and terminal ballistics - small arms - laboratory examination of barrel washing and detection of powder residue by chemical tests.

Course Outcomes

The student understood and acquired the knowledge on the following:

1. *Detection and treatment for poisoning*
2. *Chemistry of explosives, toxic and corrosives*
3. *Tracing of forgeries and detection of purity*
4. *Tracks and traces in crime*
5. *Chemistry of combustive materials*

References:

1. T.H.James, Forensic Sciences, Stanley Thornes Ltd.
2. Richard, Criminalistics - An Introduction to Forensic Science (College Version), 8th Edition, Sofestein, Printice Hall.

NME – II – CHOICE III – DAIRY CHEMISTRY

SEMESTER: V **SUBJECT CODE: 21UCHN2**

CREDITS: 2 **TOTAL HOURS: 2**

Objectives

1. *To learn about the milk processing*
2. *To study about the milk proteins and milk vitamins*
3. *To know the chemistry of creaming process*
4. *To know the making of milk powder*
5. *To study the concepts of dairy detergents*

UNIT I

Milk: General composition of milk factors affecting the gross composition of milk, physical and chemical change taking place in milk due to processing parameters - boiling pasteurization - sterilization and homogenization.

UNIT II

Milk lipids-terminology and definitions - Milk proteins: Physical properties of milk proteins-Electrical properties and hydration, solubility. Reaction of milk proteins with formaldehyde and ninhydrin - Milk carbohydrate – Lactose - Estimation of lactose in milk - Milk vitamins-water and soluble vitamins, effect of heat and light on vitamins - Ash and mineral matters in milk.

UNIT III

Creams: Definition – composition - chemistry of creaming process, gravitational and centrifugal methods of separation of cream - Factors influencing cream separation - Cream neutralization. Estimation of fat in cream - Butter: Definition - percentage composition – manufacture - Estimation of fat, acidity, salt and moisture content - Desi butter.

UNIT IV

Milk powder: Definition-need for making powder - drying process spraying, drum drying, jet drying and foam drying-principles involved in each - Manufacture of whole milk powder by spray drying process-keeping quality of milk powder - Ice cream : Definition-percentage composition - types - ingredients needed - manufacture of ice-cream stabilizers-emulsifiers and their role.

UNIT V

Dairy Detergents: Definition-characteristics-classification-washing procedure (modern method) sterilization - chloramin -T and hypochlorite solution.

Course Outcomes

The student understood and acquired the knowledge on the following:

1. *Pasteurization and sterilization process of milk*
2. *Milk lipid technology*
3. *Preparation of cream and butter*
4. *Manufacture of milk powder and ice cream*
5. *Chemistry of dairy detergents*

References

1. Outlines of Diary Technology-Sukumar De
2. Principles of Dairy Chemistry-Robert Jenness & S.Patorn.
3. Indian Diary products-K.S. Rangappa and K.T. Achaya.

CP – XIII – ORGANIC AND GRAVIMETRIC ANALYSIS PRACTICAL

SEMESTER: V & VI **SUBJECT CODE: 21UCH13P**

CREDITS: 4 **TOTAL HOURS: 6**

Objectives

1. *To prepare the organic molecules by following systematic procedure*
2. *To estimate the metal ions by gravimetrically*

ORGANIC ANALYSIS

1. Preparation involving oxidation, reduction, hydrolysis, nitration, sulphonation, halogenatin and diazotization.
2. Characterisation of organic compounds by their functional groups and confirmation by preparation of derivatives.
3. Determination of melting and boiling points of simple organic compounds.

GRAVIMETRIC ANALYSIS

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

Course Outcomes

The student understood and acquired the knowledge on the following:

1. *Single and double stage preparation of organic molecules*
2. *Gravimetric estimation of metal*

CP – XIV – PHYSICAL CHEMISTRY PRACTICAL

SEMESTER: V & VI **SUBJECT CODE: 21UCH14P**

CREDITS: 4 **TOTAL HOURS: 3**

Objectives

1. *To train the students in electrical and non-electrical experiments*

1. Distribution law
2. Kinetics

   Acid catalyzed hydrolysis of an ester (Methyl acetate or Ethyl acetate)
3. Molecular weight :

   Rast‘s method : Naphthalene, m-dinitrobenzene and diphenyl as solvents.
4. Heterogeneous equilibrium
   a. Critical solution temperature of phenol-water system-effect of impurity on CST (2% NaCl or 2% succinic acid solutions)
   b. Simple eutectic system : Naphthalene – Biphenyl, Napthalene Diphenylamine
   c. Determination of transition temperature : Sodium acetate, Sodium thiosulphate, $SrCl_2.6H_2O$ & $MnCl_24H_2O$
5. Electro Chemistry
   a. Conductivity
      1. Cell constant
      2. Equivalent conductivity
      3. Conductometric titrations
   b. Potentiometry : potentiometric titrations

Course Outcomes

The student understood and acquired the knowledge on the following after completing the experiments:

Chemical kinetics, Critical solution temperature, Transition temperature, Simple eutectic system, Partition coefficient and conductometric titrations.

SEMESTER – VI

CC – X – INORGANIC CHEMISTRY - II

SEMESTER: VI **SUBJECT CODE: 21UCH10**

CREDITS: 5 **TOTAL HOURS: 5**

Objectives

1. *To instruct on the (n/p) ratio.*
2. *To instruct the medicinally uses radioactive isotopes.*
3. *To instruct the ores and dressing.*
4. *To instruct the nanoparticles.*
5. *To instruct the comparison of semiconductor.*

UNIT – I

Nuclear Chemistry

Composition of nucleus - structure of nucleus- shell model, liquid drop model and forces in the nucleus. stability of nucleus- (n-p) ratio, mass defect and binding energy. calculation of binding energy from mass defect. packing fraction, Isotopes, isotones and isobars Radioactivity. Natural radioactivity – Q value, cross sections, types of reactions - Soddy‘s group displacement law – the disintegration theory, Rate of radioactive disintegration – half life period and average life period– radioactive disintegration series.

UNIT – II

Radioactivity and Nuclear Transformations

Detection and measurements of radioactivity, G. M. Counter, and Wilson-cloud camper method. Artificial radioactivity: Definition and various types of induced nuclear reactions. Nuclear fission & fusion: Theory of nuclear fission, fissionable and non-fissionable elements, nuclear chain reactions, critical size. Applications – principle of atom bomb and nuclear power generation. Theory of nuclear fusion, proton – proton chain reactions. Solar and Stellar energy – principle of hydrogen bomb- Applications of radioactivity: medicine – agriculture – industry – structural elucidations – carbon dating. Radioactive technique; tracer technique, neutron activation analysis. Particle accelerators: linear accelerator – cyclotron.

UNIT – III

Metallurgy

Basic principles of Metallurgy : Ore dressing: Gravity separation – Froath flotation – Magnetic separation – Roasting– Calcination – Smelting – Flux – Purification – Electrolytic refining – Zone refining – Van-Arkelvapour phase refining – Aluminothermit process - Oxides: classification of oxides on the basis of composition, acidic and basic characters with suit examples. Preparation of hydrogen peroxide and its properties - Hydrides: definition classification of hydrides with suitable examples. Preparation, properties, structure and uses of boranes. Sodium borohydride, lithium aluminium hydride.

UNIT – IV

Material Chemistry

Nanomaterials: definition of nanoparticles. Properties of nanomaterials. Semiconducting nanoparticles and metallic nanoparticles. Optical properties of nanoparticles - Fabrication of nanoparticles, solution based synthesis of nanoparticles, vapour phase synthesis of nanoparticles such as physical vapour deposition and chemical vapour deposition - Bulk materials: synthesis of bulk materials by direct reactions in sold phase, by condensation reaction in solution and by chemical deposition.

UNIT – V

Metallic bonding

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

Course Outcomes

The student understood and acquired the knowledge on the following:

1. *Calculation of (n/p) ratio*
2. *Awareness of atom bomb.*
3. *Gain of knowledge in reducing agent.*
4. *Drawing the structure of SMILY notation.*
5. *Manufacture of solar cell.*

References

1. P.L.Soni, Mohan Katyal, ‒Text book in inorganic chemistry‖, 20th revised edn., Sultan Chand, 1992.
2. EsmarchS.Gilreath, _Fundamental concepts of Inorganic Chemistry‘, International students edn.,Mcgraw – Hill Kogakusha, Ltd., 1958.
3. Gurdeep Chatwal and M.S.Yadu, _Co-ordination Chemistry‘, First edn., Himalaya Publishing House, 1992.
4. B.R.Puri and L.R.Sharma, _Principles of inorganic chemistry‘, shoban Lal Nagin Chand and Co., 1989.
5. Cotton and Wilkinson, _Advanced inorganic chemistry‘, 5thedn.,
6. R.D.Madam, _Modern inorganic chemistry‘.
7. S.Glasstone, _source book on Atomic Energy‘, 3rdedn., Affiliated east west press, 1967.

CC – XI – ORGANIC CHEMISTRY - II

SEMESTER: VI **SUBJECT CODE: 21UCH11**

CREDITS: 5 **TOTAL HOURS: 5**

Objectives

1. *To acquire the knowledge of Phenols Dyes.*
2. *To study the various concepts and applications of Carbohydrates and Natural products.*
3. *To instruct the chemistry of terpenes, steroids, Vitamins and proteins.*
4. *To understand the various Molecular Rearrangement*
5. *To instruct the spectroscopic techniques such as UV, Visible, IR & NMR.*

UNIT – I

Phenols and its derivatives

Phenols : Acidic nature of phenols – explanation on the basis of resonance – ring substitution in phenols – orientation of phenolic groups towards electrophilies – esterification – nitration – sulphonation – halogenation – coupling with diazonium compounds – Kolbe‘s, Reimer – Tieman, Gatterman, Leaderer – Manasse, Houben – Hoesh reaction. Cresols – nitro and amino phenols - pi and trihydric phenols – alpha and beta napthols – preparation and properties.

Dyes: Theory of colour and constitution – classification – according to structure and application – azodyes – methylorange and bismarkbrown. Triphenyl methane dyes – malachite green – Vat dye – indigo – pthalein dyes – phenolphthalein – and flourescein – anthraquinone dye – Alizarin.

UNIT – II

Carbohydrates

Glucose and fructose – reaction and constitution – osazone formation, mutarotation – mechanisms. Cyclic structure – pyrnose and furanose structures – determination of ring forms – chain lengthening and chain shortening of aldoses – interconversation of aldoses and ketoses. Disaccharides – reactions and structure of maltose – lactose and sucrose. Starch and cellulose – a brief study.

Disaccharides: Reactions and structure of maltose, lactose and sucrose. Starch and cellulose structure of starch and cellulose (Haworth) structural Eludidation not necessary.

UNIT – III

Natural products

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

Steroids and Hormones: definition and classification of steroids- Occurrence- structure and physiological activities of cholesterol, estrogens and testosterone

Amino acids and proteins: Definition and classification of amino acids - Essential amino acids - Peptide linkage and protein formation from amino acids-Structure of proteins -Tests for amino acids and proteins.

UNIT – IV

Molecular Rearrangements

Classification – anionotropic and cationotropic – inter and intra molecular rearrangements. Pinacol – pinacolone rearrangement – mechanism – evidence for carbocation formation – migratory aptitude of groups. Beckman – Hoffman – Curtuius – benzidine – and benzylic acid mechanism only. Claisen – sigmatroppic rearrangement – evidences for intramolecular and allylic carbon attachment - Claisen rearrangement - Cope rearrangements - Fries rearrangement – mechanisms.

UNIT – V

Applications of spectroscopy:

Fundamentals: definition and various types of spectroscopy and their inferences.

UV and Visible spectroscopy: Possible electronic transitions in an organic compound. Selection rules. Solvent effect. Chromophores and auxochromes. Various types of shifts in λ max. and in εmax.. Calculation of λ max of an organic compound. Applications of UV &Visible spectroscopy in organic chemistry.

Infra red (IR) spectroscopy: various types of vibrations and number of vibrational degrees of freedom. Selection rule - Solvent effect - Effect of hydrogen bond - Finger print region. The characteristic ranges of absorption of IR radiation of various functional groups.

Nuclear Magnetic Resonance (NMR) Spectroscopy: NMR active nuclei - Equivalent and non - equivalent protons and number of signals. Reference compound (TMS). Relative signal intensities and number of hydrogens. Chemical shift and various factors influencing chemical shift. Spin-spin splitting, splitting constant. NMR spectrum of simple molecules.

Course Outcomes

The student understood and acquired the knowledge on the following:

1. *Apply the principles of radical reactions to write a mechanism for these reaction.*
2. *Write equations for reactions involving alcohols, ethers, and aromatic compounds.*
3. *Apply the principles of organic chemistry to determine the advantages and disadvantages of biochemical molecules in the human body.*
4. *The types of rearrangements.*
5. *Various types of spectroscopic techniques such as UV, Visible, IR & NMR.*

References

1. Organic Chemistry – Volume I and II – I.L.Finar
2. Advanced Organic Chemistry – Bahl & Bahl
3. Natural products chemistry – Gurdeep Chatwal
4. Pamer and Chawk, Reaction mechanism
5. R.T. Morrison and RW. Boyd – Organic chemistry
6. R Chang –Basic principles of spectroscopy‖
7. Dyer –Organic Application of spectroscopy‖
8. Y R Sharma, Elementary organic spectroscopy, principles and Applications, S Chand, New Delhi, 1992

CC – XII – PHYSICAL CHEMISTRY - II

SEMESTER: VI **SUBJECT CODE: 21UCH12**

CREDITS: 4 **TOTAL HOURS: 5**

Objectives

1. *To instruct the theories of electrochemistry*
2. *To know the types of cells and electrodes*
3. *To know the types of electrochemical techniques*
4. *To learn about the liquids and adsorption*
5. *To study the basic concepts of molecular spectroscopy*

UNIT – I

Electrochemistry

Metallic and electrolytic conduction – specific, equivalent and molar conductance with dilution for strong and weak electrolytes (qualitative) – ionic mobility – transport number – determination by Hittorf and moving boundary methods – relation between ionic mobility and ionic conductance – determination of ionic mobilities – Kohlrausch law – Theory of strong electrolytes – Debye Huckel Onsager theory – Verification of Debye Huckel Onsager equation (no derivation). pH of salt solution – buffer solutions – Henderson equation – solubility – solubility product of sparingly soluble salts. Applications of conductivity measurements in the determination of pH, K_a, and solubility product - conductometric titrations.

UNIT – II

Electrochemical cells

Galvanic cells – reversible and irreversible cells – emf and its measurement – standard cells. Types of reversible electrodes – electrode reaction. Measurement of electrode potentials using reference electrodes – standard hydrogen electrode calomel electrode. Derivation of Nernst equation for EMF of cells and electrode potentials - Standard electrode potentials – sign conversion- Electrochemical series and its significance. Concentration cells with and without transference – liquid junction potentials. Expressions and their derivation (for emf of concentration cells and liquid junction potential).

UNIT – III

Electrochemical techniques

Application of emf of measurements. Application of Gibbs Helmholtz equation in the calculation of thermodynamic quantities of galvanic cells. Determination of pH using quinhydrone and glass electrodes. Potentiometric titrations. Applications of concentration cells valency of ions, transport number, K_{sp} and activity coefficients. Polarization and overvoltage – decomposition voltage, corrosion and its prevention, Storage cells – lead acid storage battery – mechanism of charging and discharging – fuel cells.

UNIT – IV

Liquid state & Surface chemistry

Qualitative treatment of the structure of the liquid state. Vacancy theory of liquids and free volume in a liquid. Physical properties of liquids; vapour pressure, surface tension and coefficient of viscosity, and their determination. Effect of addition of various solutes on surface tension and viscosity. Temperature dependence of viscosity of liquids and comparison with that of gases. Qualitative discussion of structure of water. Cohesive forces. Mixture of liquids- Henry‘s law. Classification of liquid crystals with suitable examples. Theory of liquid crystals. Uses of liquid crystals.

Adsorption – Definition of adsorption, adsorbents and adsorbates. Adsorption of gases on solids. Classification of adsorptions with examples. Differences between kinds adsorptions. Adsorption isotherms, derivation of Langmuir‘s and BET adsorption isotherms. Adsorption from solutions. Gibb‘s adsorption isotherm- Catalysts – characteristics of catalysts – classification of catalysts – theories of catalysis – specific and general acid base catalysis. Enzyme catalysis – characteristics of enzyme catalysis – lock and key mechanism – Michaelis – Menten equation.

UNIT – V

Fundamentals of Spectroscopy

Introduction: Electromagnetic radiation, regions of the spectrum, basis features of different spectrometers, statement of the Born – Oppenheimer approximation, degrees of freedom.. Electronic spectrum : Concept of potential energy curve for bonding and antibonding molecular orbitals, qualitative description of selection rules of Frank – condon principle – types of electronic transition, chromospheres, auxochromes, absorption bands and intensity factors affecting maximum and intensity. Rotational spectrum : Diatomic molecules. Energy levels of a

rigid rotor selection rules Vibrational spectrum: Infrared spectrum : energy levels of simple harmonic oscillator, selection rules Raman spectrum : Rayleigh and Raman scattering stokes and antistokes lines, concept of polarizability.

Course Outcomes

The student understood and acquired the knowledge on the following:

1. *Core concept and theories of electrochemistry*
2. *Electrochemical cells and electrode potential*
3. *Surface phenomena*
4. *Basics of spectrometers*

References

1. Principles of Physical Chemistry‖, B R Puri& Sharma
2. Text Book of Chemistry‖, P L Soni
3. Advanced Physical Chemistry‖, Gurdeep Raj
4. Essential of Physical Chemistry‖ B S Bahl, G D Tuli&ArunBahl, S Chand & Co., New Delhi
5. Simplified course in Physical Chemistry‖, R L Madan, G D Tuli, S Chand & Co., New Delhi
6. B R Puri& L R Sharma, Principels of Physical Chemistry
7. R P Varma & Pradeep, Physical Chemistry
8. C N Banswell, Fundamental molecular spectroscopy. Tata Mcgraw Hill Publications, New Delhi 11threpring 1991
9. William kemp, Organic spectroscopy, ELBS, Second Edn. 1987
10. Dr.S.Jain& S P Jankar, Physical Chemistry, Principles & Problems, –Tata McGraw Hill‖, New Delhi, 1990
11. K V Raman –Spectroscopy and mathematics of Quantum chemistry in print‖
12. R Chang –Basic principles of spectroscopy‖
13. Dyer –Organic Application of spectroscopy‖
14. Y R Sharma, Elementary organic spectroscopy, principles and Applications, S Chand, New Delhi, 1992

EC – II – CHOICE – I - PHARMACEUTICAL AND MEDICINAL CHEMISTRY

SEMESTER: VI **SUBJECT CODE: 21UCHE2A**

CREDITS: 5 **TOTAL HOURS: 3**

Objectives

1. *To instruct the uses of morphine and quinine.*
2. *To instruct the drug administration.*
3. *To instruct the mechanism of sulpha drugs.*
4. *To instruct the different principles and chloraonphenical.*

UNIT – I

Pharmaceutical chemistry Terminology

Pharmacy, Pharmacology, Pharmacophore, Pharmacodynamics, Pharmacokinetics (ADME, Receptors - brief treartment) Metabolites and Anti metabolites.

Nomenclature: Chemical name, Generic name and trade names with examples Classification: Classification based on structures and therapeutic activity with one example each, Administration of drugs.

UNIT – II

Drug design and distribution

Introduction – Analogous and prodrugs – concept of _LEAD‘ – Factors governing drug design – Rational approach, Method of variation-- disjunction and conjunction for drug design – _TAILORING‘ of drugs. Factors governing ability of drugs to reach active site – Absorption, distribution, excretion and bio- transformation. Routes of drug administration –-Advantages and disadvantages of oral & parental routes.– LD_{50}, ED_{50} and and therapeutic index – encapsulation and naming of drugs.

UNIT – III

Sulphonamides and antimalarials

Sulphonamides : Definition – mechanism and action of sulpha drugs – synthesis and uses of sulphadiazine, sulphathiazole, sulphapyridine and sulpha furazole.

Antimalarials - Introduction—classification.

Synthesis and uses of quinoline analogues – chloroquinine phosphate, amodiaquine, paraquinineand mepacrine hydrochloride.

UNIT – IV

Antibiotics and Analgesics

Microbial synthesis, assay, structure and uses of different penicilins and chloramphenical,SAR—penicillin intolerance—detection of penicilin allergy.

Analgesics - definition, classification - norcotic and non norcotic. Pharmacological action and uses of pethidine, methadone, heroin and codeine.

Antipyretic analgesics - salicylic acid derivatives – methyl salicylate, aspirin, para amino phenol derivatives – paracetamol, phenacetin and ibuprofen.

UNIT –V

Anesthetics and Anti HIV drugs

Anesthetics - definition – classification--local and general. Volatile—nirous oxide, ether, chloroform, cyclo propane. Non volatile – intravenous – thiopental sodium, metho hexatone. Local anesthetics – cocaine and benzo caine.

Pharmacodynamic Drugs: Antiasthma Drugs (Solbutamol), Antianginals (Glycerol Trinitrate), Diuretics(Frusemide)

HIV-AIDS: Immunity - CD-4cells, CD-8cells, Retro virus, Replication in human body, Investigation available, prevention of AIDS, Drugs available - examples with structures: PIS: Indivanir (crixivan), Nelfinavir(Viracept).

Course Outcomes

The student understood and acquired the knowledge on the following:

1. *Uses of medicinal plants.*
2. *Advantages of LD50, ED50.*
3. *Synthesis of sulpha drugs.*
4. *Structure of penicilins.*
5. *Preparing to vitamin B12.*

References

1. Pharmaceutical chemistry by S.Lakshmi, Sultan chand & sons
2. Medicinal chemistry by Ashutoshkar, New Age International
3. A Text book of pharmaceutical chemistry by Jayashree Ghosh, Sultan Chand & sons
4. Medicinal Chemistry by Dr. B.V.Ramana
5. Synthetic Drugs by O.D.Tyagi & M.Yadav
6. Medicinal Chemistry by Ashutoshkar
7. Medicinal Chemistry by P.Parimoo
8. Pharmacology& Pharmacotherapeutics R.S Satoshkar & S.D.Bhandenkar
9. Medicinal Chemistry by Kadametal P-I & P.II

EC – II – CHOICE – II – FUEL CHEMISTRY AND BATTERIES

SEMESTER: VI **SUBJECT CODE: 21UCHE2B**

CREDITS: 5 **TOTAL HOURS: 3**

Objectives

1. *To learn about renewable and non-renewable energy sources*
2. *To study the petroleum process*
3. *To know the types of fuels*
4. *To study about synthetic lubricants*
5. *To study the function of batteries and fuel cells*

UNIT –I

Review of energy sources (renewable and non-renewable)

Classification of fuels and their calorific value. Coal: Uses of Coal (fuel and non-fuel) in various industries , its composition , carbonization of coal - coal gas , producer gas and water gas – composition and uses – fractionation of coal tar – uses of coal tar based chemicals , requisites of a good metallurgical coke , coal gasification (Hydro gasification and catalytic gasification) coal liquefaction and solvent refining.

UNIT-II

Petroleum and petrol chemical industry:

Composition of crude petroleum, refining and different types of petroleum products and their applications. Fractional distillation (principle and process), cracking (Thermal and catalytic cracking).

UNIT-III

Fuels

Reforming petroleum and non-petroleum fuels (LPG , CNG , LNG , biogas), fuels derived from biomass , fuel from waste , synthetic fuels (gaseous and liquids) , clear fuels , petro chemicals : vinyl acetate , propylene oxide , isoprene , butadiene , toluene and its derivative xylene.

UNIT-IV

Lubricants:

Classification of lubricants, lubricating oils(conducting and non-conducting) , solid and semi solid lubricants , synthetic lubricants. Properties of lubricants (viscosity index , cloud point , pore point) and their determination.

UNIT-V

Batteries:

Primary and secondary batteries, battery components and their role. Characteristics of Battery. Working of following batteries: Pb acid, Li-Battery, Solid state electrolyte battery.

Fuel cells, Solar cell and polymer cell.

Course Outcomes

The student understood and acquired the knowledge on the following:

1. *Types of energy sources*
2. *Petroleum products*
3. *Types of fuels and lubricants*
4. *Characteristics of batteries and fuel cells*

References

1. E.Stochi : Industrial chemistry , Vol-1,Ellis Horwood Ltd.UK
2. P.C.Jain , M.Jain: Engineering chemistry, Dhanpat Rai &sons , Delhi.
3. B.K.Sharma: Industrial Chemistry , Goel Publishing house , Meerut.

EC – II – CHOICE – III – TEXTILE CHEMISTRY

SEMESTER: VI **SUBJECT CODE: 21UCHE2C**

CREDITS: 5 **TOTAL HOURS: 3**

Objectives

1. *To study the preparation and properties of natural fibers*
2. *To study the preparation and properties of synthetic fibers*
3. *To learn the bleaching process of cloth, wool and silk*
4. *To learn the dyeing process*
5. *To study the finishing and water proofing process*

UNIT I

General classification of fibres - chemical structure, production, properties and uses of the following natural fibres - natural cellulose fibres (cotton and jute), natural protein fibre (wool and silk).

UNIT II

Chemical structure, production, properties and uses of the following synthetic fibres.

Man made cellulosic fibres (Rayon, modified cellulose fibres) - Polyamide fibres (different types of nylons) - Poly ester fibres.

UNIT III

Impurities in raw cotton and grey cloth, wool and silk - general principles of the removal – Scouring – bleaching – Desizing – Kierboiling - Chemicking.

UNIT IV

Dyeing - Dyeing of wool and silk –Fastness properties of dyed materials – dyeing of nylon, terylene and other synthetic fibres.

UNIT V

Finishing- Finishes given to fabrics- Mechanical finishes on cotton, wool and silk, method used in process of mercerizing –Anti-crease and Anti-shrink finishes –Water proofing.

Course Outcomes

1. *The student understood and acquired the knowledge on the following:*
2. *Classification of fibres*

3. *Production of synthetic fibres*
4. *Bleaching techniques*
5. *Dyeing and finishing process*

References

1. Chemical Technology of fibrous Materials – F.sadov, M.Horchagin and A.Matetshy, Mir Publishers.
2. The Identification of Textile Fibres – Bruno Nuntak.
3. Introduction to Textile Science -3rd edition, Maryory L.Joseph.
4. Textile Chemistry –Vol.II R.H.Peters, Elserier, Avesterdam.
5. Dyeing and chemical Technology of Textile fibres-5th Edition, E.R.Trotman,Charles Griffin & Co Ltd
6. Chemistry of dyes & Principles of Dyeing -V.A.Shenai, Sevak Publications.
7. Scouring and Bleaching E.R.Trotman, Charles Griffin & Co Ltd.
8. Text Book of Applied Chemistry- K.Kapur.
9. A Students Text Book of Textile Science- A.J.Hall

EC – III – CHOICE – I – INDUSTRIAL CHEMISTRY

SEMESTER: VI **SUBJECT CODE: 21UCHE3A**

CREDITS: 4 **TOTAL HOURS: 2**

Objectives

1. *To instruct the cone sugar manufacture, recovery of sugar from molasses and know about points of vanishes.*
2. *To instruct the manufacture of cement and fertilizers.*
3. *To instruct about the petroleum & fuel gases.*
4. *To instruct the electrochemical industries.*
5. *To learn polymers application.*

UNIT – I

Sugar: Cane sugar manufacture, recovery of sugar from molasses, sugar estimation. Paints &Varnishes : Primary constituents of paints. Dispersion medium (solvent) binder, pigments, oil bases paints, latex paints (alkyd resins) formulation of paints and varnishes.

UNIT – II

Cement: Manufacture – Wet Process and Dry Process. Setting of cement, Cement industries in India.

Fertilizers : Fertilizer industries in India, Manufacture of ammonia, urea, super phosphate, triple super phosphate.

UNIT – III

Petroleum : Origin, refining, Cracking, reforming knocking and octane number, LPG, synthetic gas, synthetic petrol.

Fuel Gases: Large scale production, storage, hazards and uses of coal gas, water gas, producer gas and oil gas.

UNIT – IV

Electrochemical industries: Production of materials like chlorine, caustic soda. Sodium chlorate, potassium permanganate, hydrogen peroxide.hydroxyl amine, Electro synthesis of aniline, p-aminophenol.

Chemical Explosives: Origin of explosive, preparation and chemistry of nitrocellulose, TNT, gunpowder, Water in Industry : Pollution of water by fertilizers, detergents, pesticides, and industrial wastes, BOD and COD.

UNIT – V

Polymers

Introduction: Polymers – Monomers and polymers – degree of polymerization.

Definition – classifications of polymers – Homo Hetero and copolymers – Addition, copolymerization and condensation polymers.

General methods of preparation, properties and uses of following polymers – polyethylene, PVC, polystyrene, Teflon, polyurethanes, phenol – formaldehydes. Properties and uses.

Course Outcomes

The student understood and acquired the knowledge on the following:

1. Sugar, cement, fertilizer, petroleum, electrochemical industries and chemical explosions.

References

1. B.N. Chakrabarty, Industrial Chemistry, Oxford & IBH Publishing Co., New Delhi, 1981.
2. B.K.Sharma, Industrial Chemistry, Geol Publishing House, Meerut.
3. P.P.Singh, T.M.Joseph, R.G.Dhavale, College Industrial Chemistry, Himalaya Publishing House, Bombay, 4thedn., 1983.

EC – III – CHOICE – II – MANUFACTRE OF CHEMICALS

SEMESTER: VI **SUBJECT CODE: 21UCHE3B**

CREDITS: 4 **TOTAL HOURS: 2**

Objectives

To learn the manufacturing process of alcohols, amines, nitro compounds. Aldehydes, esters, ketones etc.,

UNIT I

Manufacture of Alcohol

Methanol-properties and uses - manufacturing methods – catalytic hydration method. Side reactions,

Ethanol-Different process of manufacture - uses-manufacture by catalytic hydration - Ethylene oxide –uses and properties. Manufacture by oxidation, ethanolamines - monoethanol amine - diethanol amine - triethanol

Ethylene glycol – uses - Different methods of preparation - Manufacture through chlorohydrin - Manufacture by oxidation.

UNIT II

Manufacture of chlorinated alkanes

Chlorinated methane – uses - Manufacture of methyl chloride - methyl dichloride - Chloroform, carbon tetra chloride – uses - manufacture by Thacker process - Acetylene uses-manufacture by sachse process - wulf process.

Ethyl chloride – uses - manufacture by hydrochlorination

Trichloroethylene, Perchloro ethylene

Vinyl chloride - uses, manufacture by thermal pyrolysis.

UNIT III

Manufacture of carbon and nitrogen compounds

Carbon black - uses and properties - Channel black - Furnace black (gas and oil) - thermal black - Acetylene black – manufacture.

Hydrogen cyanide - uses and properties. Manufacture by Andrew sons process - By Degusser process, Shawnigan process.

Acrylonitrile and aceto nitrile - uses and Manufacture by ethylene oxide and hydrogen cyanide.

UNIT IV

Manufacture of aldehyde, acid, ester and ketones

Acetaldehyde - Process of manufacture - recent advances-uses.

Acetic acid - Uses and manufacture by oxidation.

Vinyl acetate - uses and manufacture by acetic acid and oxygen.

Acrylic acid - Reppe‘s synthesis.

Acetone and vinyl ether.

UNIT V

Synthetic Fibers and Detergents

Production techniques of synthetic fibres - melt spinning, dry spinning and solution (wet) spinning.

Polyesters, Polyethylene terephthalate (PET) from p Xylene, Poly carbonates, poly amides - Nylon6, Nylon6,6 - Acrylic fibres (Orlon) - manufacture.

Synthetic paper - advantages over conventional paper - method of preparation.

Classification of detergents - uses of detergents – surfactants – additives – manufacture - cleaning action of detergents. Difference between soap and detergents. LAS and ABS detergents.

Course Outcomes

The student understood and acquired the knowledge on the following:

Manufacturing process of industrially important chemicals such as alcohols, amines, nitro compounds. Aldehydes, esters, ketones, polymers, detergents etc.,

References

1. W.L. Faith, Donald B Keyes, Ronald L Clark, Industrial Chemicals.
2. Speight G James, Marcel Dekker Inc 1991,The chemistry and technology of Petroleum
3. Tripathi G.N, Indian Petroleum Directory
4. B.K Sharma , Industrial Chemistry and Chemical Engineering ,Spits PetrochemicalsWiley
5. ASTM Methods, Indian standards
6. Sukumar Maiti ,Introduction to Petrochemicals
7. Dr. BK Baskara Rao- A text book on petrochemicals, Khanna publishers, Delhi

EC – III – CHOICE – III – SUGAR CHEMISTRY AND SUGAR TECHNOLOGY

SEMESTER: VI **SUBJECT CODE: 21UCHE3C**

CREDITS: 4 **TOTAL HOURS: 2**

Objectives

1. *To know the nomenclature of sugar*
2. *To study the conformational analysis of sugars*
3. *To study the synthesis of oligo saccharides*
4. *To study the Instrumental methods of sugar*
5. *To study the basics of sugar management*

UNIT - I

Advanced Sugar Chemistry

Carbohydrate nomenclature. Fischer, Haworth and conformational structures of mono and oligo saccharides. Reducing and non-reducing sugars. Chiral nature of sugars. R-S nomenclature, Fischer D-L nomenclature of sugars. Sugar enantiomers, diastereo isomers, epimers and enomers. Acyclic structure of sugars, determination of relative and absolute configuration of sugars. Cyclic forms of sugars.

UNIT - II

Conformational analysis of sugars

Hassel- Otter effect. Delta-two effect. Anomeric effect. Calculation of conformational free energies. Optical rotation, specific rotation and molecular rotation of sugars. General epimer rule. Relationship between rotation and conformation. Stereo chemical transformations. Mutarotation, enolization, isomerization, anhydride formation and reversion, pH stability of glucose and fructose, protection of sugar hydroxyls.

UNIT - III

Sugar and Sugar byproducts

Oligo saccharide synthesis: Oligo saccharide optical rotating power (Hudson and Klyn rules). ^{13}C NMR spectroscopic data of glucose, fructose and sucrose - Uses of sugar chirons in organic synthesis. Sugar byproducts. Bagasse, molasses and press mud. Bagasse- characteristics and uses.

Production of biogas, fiberboard and furfural. Press mud- extraction of cane wax, press mud and manure. Molasses- fermentation of molasses. Production of alcohol and rectified spirit.

UNIT - IV

Methodology used in Sugar Analysis

Sampling techniques. Determination of moisture in bagasse, molasses and cane sugar. Methods of estimation of total soluble solids in sugar and sugar house products. Optical methods of sugar analysis, sugar scales and normal weight. Estimation of reducing sugars and sugar present in cane juice by Eynon & Lane, Luff & Schoorl and Benedicts methods. Determination of sugars by Invertase method, Jackson- Gellis, Munsen - Walker‘s Cu_2O and De Whalleys‘ volumetric method. Determination of various other constituents present in raw sugars. Estimation and chemical composition of cane and its juice.

Instrumental methods of sugar industry - Static characteristics and Dynamic characteristics. Gas, liquid, vapor thermometers. Bimetallic thermometers and thermocouples. Electronic panometer, cuitometer. Introduction to pneumatic control systems and elements. Working principle and instrumentation methodology of potentiometer, pH meter, polarimeter and cuitometer.

UNIT - V

Sugar Technology and Basic Principles of Management

Sugar Technology: Cane juice interaction, maceration and imbibition. Principles of cane juice clarification, defecation and sulphitation. Juice heaters, filters and reaprovation vaccum pans. Centrifuges. Sugar driers and molasses. Introductory treatment of chemical control - Milling Control and Boiling house control.

Management: Concept and philosophy of management in major and small-scale industries. Location of factory site and Lay out of plant. Joint stock companies. Co-operative Societies. Production management and control. Personnel administration, purchases and sales, organization and control.

Course Outcomes

1. *Nomenclature and chiral nature of sugar*
2. *Stereo chemical transformation of sugar*
3. *Chemistry of sugar by products*
4. *Methods of sugar analysis*
5. *Sugar technology and Management*

References

1. Cane Sugar Hand Book, Maede & Chen, John Wiely & Sons
2. Determination of Food Carbohydrates, D. A. T. Southgate, Applied Science Publishers, London
3. Text Book of Sugar Chemistry and Sugar Technology, Mathur
4. Text Book of Sugar Byproducts, Morris Patrov
5. A Hand Book of Qualitative and Quantitative Organic Analysis, H. J. Clark, Orient Longman
6. Text Book of Biochemistry, Lehninger
7. Analysis of Sugars, Pleus
8. Text Book of Sugar Technology, Hugot
9. Instrumental Methods in Sugar Industry, Eckman
10. Principles of Instrumental Analysis, Skoog and West
11. Technical Methods of Analysis, Griffith, McGraw Hill
12. Advanced Sugar Chemistry, R. S. Shellaxberges
13. Sugar, John Yulkin, Jack Edelman, Liesel Hough
14. International Uniform Methods for Sugar Analysis, H. C. S. De Whelly

GS – GENDER STUDIES

SEMESTER: VI **SUBJECT CODE: 21UGS**

CREDITS: 1 **TOTAL HOURS: 1**

Objectives

1. *To make boys and girls aware of each others strength and weakness.*
2. *To develop sensitivity towards both genders in order to lead an ethically enriched life.*
3. *To promote attitudinal change towards a gender balanced ambience and Women empowerment*

UNIT I

Concept of Gender: sex – gender – biological determinism – patriarchy – ferminism – gender discrimination – gender division of labour – gender stereotyping – gender sensitivity - gender equity – equality – gender mainstreaming – empowerment.

UNIT II

Women‘s studies Vs gender studies: UGC‘S guidelines – VII to XI Plans – gender studies: Beijing conference and CEDAW – exclusiveness and inclusiveness.

UNIT III

Areas of gender discrimination: Family – sex ratio – literacy – health – governance religion – work Vs employment – market – media – polities – law domestic violence – sexual harassment – state policies and planning

UNIT IV

Women development and gender empowerment: Initiative – International Women empowerment year 2001 – mainstreaming global policies.

UNIT V

Women movement and safeguarding mechanism: In India national / state commission for women (NCW) – all Women Police station - Family court – domestic violence act – prevention of sexual harassment at work place supreme court guidelines – maternity benefit act – PNDT Act – hindu succession act 2005 – eve teasing prevention act – self help groups- 73^{rd} and 74^{th} amendment for PRIS

References

1. Bhasin Kamala, Understanding Gender: Gender Basics, New Delhi: Women unlimited,2014
2. Rajadurai.S.V, Geetha.V, Themsed in caste gender and Religion, Tiruchirapalli, BhrathidasanUniversity.

AC – ALLIED CHEMISTRY

SEMESTER: III & IV (for Physics, Botany & Zoology)

I & II (for Maths) **SUBJECT CODE:21UCHA3**

CREDITS: 5 **TOTAL HOURS:3**

Objectives

1. *1.To instruct the atomic orbitals and its hybridization*
2. *2.To instruct the alcohols and ethers*
3. *3.To instruct the chemistry of alkanes,alkenes and alkynes*
4. *4.To instruct the solid state*
5. *5.To instruct the phase rule*

UNIT-I

Chemical Bond

Covalent bond-valance bond theory-types of overlapping of orbitals-sigma and pi bonds,molecular orbital theory -bonding and anti bonding orbitals,bond order.

UNIT-II

Alcohols and Ethers

Classification and nomenclare-distinction between primary and secondary and teriary alcohols-grignard synthesis of alcohols -chemistry of glycol,glycerol and allyl alcohol

UNIT-III

Chemistry of Alkanes,Alkenes and Alkynes

Preparation and uses of alkanes,alkrnes and alkynes.Acidity of alkynes,formation of acetylides

UNIT-IV

Solid State

Typical critical lattice,unit cell,elements of symmetry,Bragg‘s equation,Weiss,indices,miller indicies,simple body center and face center lattices

UNIT-V

Phase Rule

Phase,component,degree of freedom,phase rule definition-one component system-water system

Course Outcomes

1. *The student understood and acquired the knowledge on the following:*
2. *Chemical Bonding*
3. *Chemistry of alcohols and ethers*
4. *Chemistry of alkanes, alkenes and alkynes*
5. *Solid state materials*
6. *Phase rule and its application*

References

1.R.B.Puri& L.R.Sharma, ‐Principal of inorganic chemistry‐,Sultan chand,1989.

2.M K Jain ―Organic chemistry‖Shoban lai Nagin chand and co.

3.R.B.Purie& L.R.Sharma,‖physical chemistry‖

4.P.L.Soni,‖Organic chemistry‖

AP – ALLIED PRACTICAL

SEMESTER: III & IV (for Physics, Botany & Zoology)

I & II (for Maths) **SUBJECT CODE:21CHYD4P**

CREDITS: 5 **TOTAL HOURS:3**

Objectives

1. *To train the students in quantitative analysis of chemicals.*
2. *To train the students in qualitative analysis of chemicals*

Titrimetry

1. Estimation of Sodium hydroxide using standard sodium carbonate
2. Estimation of hydrochloride acid – Standard Oxalic acid
3. Estimation of Oxalic acid – Standard sulphuric acid
4. Estimation of Ferrous sulphate – Standard Mohr‘s Salt solution
5. Estimation of Oxalic acid – Standard ferrous sulphate
6. Estimation of Potassium Permanganate – Standard Sodium hydroxide
7. Estimation of copper – Standard potassium dichromate.

Organic Analysis

Reactions of Phenols, acids (mono and di), aromatic primary amine, aldehydes (aliphatric and aromatic), di-amide, dextrose, systematic analysis of organic compounds containing one functional group and characterization by confirmatory methods, tests for derivative.

Course Outcomes

The students will be trained to estimate chemicals by volumetrically and analyze the organic molecule qualitatively.

H.H. THE RAJAH'S COLLEGE (AUTONOMOUS), PUDUKKOTTAI
PG & RESEARCH DEPARTMENT OF CHEMISTRY
QUESTION PAPER PATTERN
B.Sc., CHEMISTRY
(Effective from the academic year 2021 – 2022 onwards)

UG Internal & External Pattern for Theory

	Maximum	Minimum
Internal Marks:	25	10
External Marks:	75	30
Total Marks:	100	40

Part – A Answer All the Questions 10 x 2 = 20 Marks	Part – B Internal Choice Type 5 x 5 = 25 Marks	Part – C Answer any Three Questions 3 x 10 = 30 Marks
Question 1,2 – I Unit 3,4 – II Unit 5,6 – III Unit 7,8 – IV Unit 9,10 – V Unit	Question 11a (or) 11b – I Unit 12a (or) 12b – II Unit 13a (or) 13b – III Unit 14a (or) 14b – IV Unit 15a (or) 15b – V Unit	Question 16 – I Unit 17 – II Unit 18 – III Unit 19 – IV Unit 20 – V Unit

For NME, EVS, VE & GS
Answer any five out of eight Questions
5 x 15 = 75 Marks

UG Internal & External Pattern for Practical

	Maximum	Minimum
Internal Marks:	40	16
External Marks:	60	24
Total Marks:	100	40

UG INTERNAL PATTERN

UG – THEORY		**UG PRACTICAL**		
Internal test -	50 Marks	Observation Note	-	20
Assignment 1&2-	25 Marks	Program Completion	-	20
Model Exam -	75 Marks	Model Exam	-	60
Total Marks	**- 150 Marks**	**Total Marks**	**-**	**100**

Internal Assessment reduced to 25 marks for Theory & 40 Marks for Practical

மாட்சிமை தங்கிய மன்னர் கல்லூரி (தன்னாட்சி)
புதுக்கோட்டை - 622 001.
வேதியியல் துறை

பாடத் திட்டக் குழுமம் 2021-2023

இத்துடன் இணைக்கபெற்ற இளநிலை, முதுநிலை, ஆய்வியல் நிறைஞர் மற்றும் துணைப் பாடங்களின் பாடத் திட்டங்கள் கீழ்கண்ட குழுவினரால் ஏற்கப் பெற்று அமுல் படுத்த சூன் 2021 முதல் சேர்க்கையாகின்ற மாணவர்களுக்கு பரிந்துரை செய்கிறது.

பாடத் திட்டக் குழுவினர் பெயர்கள்	கையொப்பம்
தலைவர் 1. முனைவர். த. பழனிச்சாமி உதவிப்பேராசிரியர் மற்றும் துறைத்தலைவர் வேதியியல்துறை மா. மன்னர் கல்லூரி , புதுகை	12/8/2021
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4. திரு G. செந்தில்குமார் உதவி பேராசிரியர் , வேதியியல் துறை அரசுக்கலைக்கல்லூரி, சேலம் -7	
துறைப் பேராசிரியர்கள் 5. முனைவர் R. பகுத்தறிவாளன் உதவிப்பேராசிரியர் ,மா. மன்னர் கல்லூரி , புதுகை	12/8/2021
6. திரு P. விஜயகுமார் உதவிப்பேராசிரியர் ,மா. மன்னர் கல்லூரி , புதுகை	
7. முனைவர் .S. வளர்செல்வன் உதவிப்பேராசிரியர் ,மா. மன்னர் கல்லூரி , புதுகை	
8. முனைவர் M. யோசுவா சுவக்கின் உதவிப்பேராசிரியர் ,மா. மன்னர் கல்லூரி , புதுகை	
9. முனைவர் M. சுப்பிரமணியன் உதவிப்பேராசிரியர் ,மா. மன்னர் கல்லூரி , புதுகை	12/8/2021
தொழில் துறை சார்ந்த உறுப்பினர் 10. திரு K.கார்த்திக் , வேதியியல் வல்லுநர் இண்டிகோ பெய்ண்ட்ஸ், பிளாட் No. 4A /3, SIPCOT தொழில் வளாகம், வெள்ளனூர், புதுக்கோட்டை -5	
முன்னாள் மாணவர் 11. திருமதி. C. கண்மணி, உதவியாளர், முதன்மைக் கல்வி அலுவலகம், புதுக்கோட்டை	