



PARISHKAR COLLEGE OF GLOBAL EXCELLENCE (AUTONOMOUS), JAIPUR



SCHEME OF EXAMINATION COURSE STRUCTURE & SYLLABUS AS PER UGC



CHOICE BASED CREDIT SYSTEM (CBCS) FOR BACHELOR OF SCIENCE WITH CHEMISTRY

Department Members

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SEMESTER WISE DISTRIBUTION OF CREDITS AND COURSES

PROPOSED SCHEME FOR CHOICE BASED CREDIT SYSTEM IN B.Sc. (PCM)

Semester	Core Course (CC) (12 Papers) (6 credit each)	Ability Enhancement Compulsory Course (AECC) (2 Papers) (4 credit each)	Skill Enhancement Course (SEC) (4 Papers) (4 credit each)	Discipline Specific Elective (DSE) (6 Papers) (6 credit each)	Total Credit per semester
I	Physics CC I	AECC I (English / Hindi Communication)	SEC I		20
	Mathematics CC I				
II	Physics CC II		SEC II		22
	Mathematics CC II				
	Chemistry CC I				
III	Physics CC III		SEC III		22
	Mathematics CC III				
	Chemistry CC II				
IV	Physics CC IV		SEC IV		22
	Mathematics CC IV				
	Chemistry CC III				
V	Chemistry CC IV			Physics DSE A	24
				Mathematics DSE A	
				Chemistry DSE A	
VI		AECC II (EVS)		Physics DSE B	22
				Mathematics DSE B	
				Chemistry DSE B	
Total Credits	12 x 6 = 72	2 x 4 = 8	4 x 4 = 16	6 x 6 = 36	132

Note: -

- Switch Dissertation with either of the Elective Paper (Only One).
- Freedom of selection of various subjects for industrial exposure.
- Student can opt any SEC offered by any Department.



PROPOSED SCHEME FOR CHOICE BASED CREDIT SYSTEM IN B.Sc. (CBZ)

Semester	Core Course (CC) (12 Papers) (6 credit each)	Ability Enhancement Compulsory Course (AECC) (2 Papers) (4 credit each)	Skill Enhancement Course (SEC) (4 Papers) (4 credit each)	Discipline Specific Elective (DSE) (6 Papers) (6 credit each)	Total Credit per semester
I	Botany CC I	AECC I (English / Hindi Communication)	SEC I		20
	Zoology CC I				
II	Botany CC II		SEC II		22
	Zoology CC II				
	Chemistry CC I				
III	Botany CC III		SEC III		22
	Zoology CC III				
	Chemistry CC II				
IV	Botany CC IV		SEC IV		22
	Zoology CC IV				
	Chemistry CC III				
V	Chemistry CC IV			Botany DSE A	24
				Zoology DSE A	
				Chemistry DSE A	
VI		AECC II (EVS)		Botany DSE B	22
				Zoology DSE B	
				Chemistry DSE B	
Total Credits	12 x 6 = 72	2 x 4 = 8	4 x 4 = 16	6 x 6 = 36	132

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Consolidated Scheme for B.Sc. (PCM)

Semester	Paper	Nomenclature of Paper	Credit per paper	Total Credit per semester
I	AECC I	English / Hindi Communication	4	20
	SEC I	Skill Enhancement Course I	4	
	Physics CC I	Physics Core Course I	4 (T) + 2 (P)	
	Mathematics CC I	Mathematics Core Course I	4 (T) + 2 (P)	
II	SEC II	Skill Enhancement Course II	4	22
	Physics CC II	Physics Core Course II	4 (T) + 2 (P)	
	Mathematics CC II	Mathematics Core Course II	4 (T) + 2 (P)	
	Chemistry CC I	Inorganic Chemistry – I and Organic Chemistry – I (Atomic Structure, Bonding, Chemistry of s- and p-Block Elements, General Organic Chemistry, Aliphatic & Aromatic Hydrocarbons)	4 (T) + 2 (P)	
III	SEC III	Skill Enhancement Course III	4	22
	Physics CC III	Physics Core Course III	4 (T) + 2 (P)	
	Mathematics CC III	Mathematics Core Course III	4 (T) + 2 (P)	
	Chemistry CC II	Physical Chemistry – I and Organic Chemistry – II (Chemical Energetics, Equilibrium & Functional Organic Chemistry – I)	4 (T) + 2 (P)	
IV	SEC IV	Skill Enhancement Course IV	4	22
	Physics CC IV	Physics Core Course IV	4 (T) + 2 (P)	
	Mathematics CC IV	Mathematics Core Course IV	4 (T) + 2 (P)	
	Chemistry CC III	Physical Chemistry – II and Organic Chemistry – III (Solutions, Conductance, Electrochemistry, Nuclear-Radiochemistry, Functional Group Organic Chemistry-II & Spectroscopy)	4 (T) + 2 (P)	
V	Chemistry CC IV	Inorganic Chemistry – II and Physical Chemistry – III (Chemistry of d- and f-Block Elements. Coordination Chemistry, Acid-Base and HSAB, States of Matter & Chemical Kinetics)	4 (T) + 2 (P)	24
	Physics DSE A	Physics Discipline Specific Elective A	4 (T) + 2 (P)	
	Mathematics DSE A	Mathematics Discipline Specific Elective A	4 (T) + 2 (P)	



		Chemistry Discipline Specific Elective A	4 (T) + 2 (P)	
VI	AECC II	EVS	4	22
	Physics DSE B	Physics Discipline Specific Elective B	4 (T) + 2 (P)	
	Mathematics DSE B	Mathematics Discipline Specific Elective B	4 (T) + 2 (P)	
	Chemistry DSE B	Chemistry Discipline Specific Elective B	4 (T) + 2 (P)	
Total Credits			132	132

Chemistry Discipline Specific Elective Paper offered in B.Sc.

Semester	Paper	Papers Name	Semester	Paper	Papers Name
V Semester Chemistry DSE A	CHEMISTRY DSE I	Analytical Methods in Chemistry	VI Semester Chemistry DSE B	CHEMISTRY DSE VII	Food and Beverage Industry
	CHEMISTRY DSE II	Quantum Chemistry, Spectroscopy & Photochemistry		CHEMISTRY DSE VIII	Polymer Chemistry
	CHEMISTRY DSE III	Research Methodology for Chemistry		CHEMISTRY DSE IX	Pharmaceutical and Drug Chemistry
	CHEMISTRY DSE IV	Green Chemistry		CHEMISTRY DSE X	Agrochemical and Fertilizer
	CHEMISTRY DSE V	Environmental Chemistry		CHEMISTRY DSE XI	Metallurgy and its Industrial Importance
	CHEMISTRY DSE VI	Instrumental Methods for Analysis		CHEMISTRY DSE XII	Dissertation

Chemistry Skill Enhancement Course Offered in B.Sc.

S.No.	Papers	Papers Name	S.No.	Papers	Papers Name
1	CHEMISTRY SEC I	Basic Analytical Chemistry	3	CHEMISTRY SEC III	Chemistry of Cosmetics & Perfumes
2	CHEMISTRY SEC II	Pharmaceutical Chemistry	4	CHEMISTRY SEC IV	Pesticide Chemistry

**Consolidated Scheme for B.Sc. (CBZ)**

Semester	Paper	Nomenclature of Paper	Credit per paper	Total Credit per semester
I	AECC I	English / Hindi Communication	4	20
	SEC I	Skill Enhancement Course I	4	
	Botany CC I	Botany Core Course I	4 (T) + 2 (P)	
	Zoology CC I	Zoology Core Course I	4 (T) + 2 (P)	
II	SEC II	Skill Enhancement Course II	4	22
	Botany CC II	Botany Core Course II	4 (T) + 2 (P)	
	Zoology CC II	Zoology Core Course II	4 (T) + 2 (P)	
	Chemistry CC I	Inorganic Chemistry – I and Organic Chemistry – I (Atomic Structure, Bonding, Chemistry of s- and p-Block Elements, General Organic Chemistry, Aliphatic & Aromatic Hydrocarbons)	4 (T) + 2 (P)	
III	SEC III	Skill Enhancement Course III	4	22
	Botany CC III	Botany Core Course III	4 (T) + 2 (P)	
	Zoology CC III	Zoology Core Course III	4 (T) + 2 (P)	
	Chemistry CC II	Physical Chemistry – I and Organic Chemistry – II (Chemical Energetics, Equilibrium & Functional Organic Chemistry – I)	4 (T) + 2 (P)	
IV	SEC IV	Skill Enhancement Course IV	4	22
	Botany CC IV	Botany Core Course IV	4 (T) + 2 (P)	
	Zoology CC IV	Zoology Core Course IV	4 (T) + 2 (P)	
	Chemistry CC III	Physical Chemistry – II and Organic Chemistry – III (Solutions, Conductance, Electrochemistry, Nuclear-Radiochemistry, Functional Group Organic Chemistry-II & Spectroscopy)	4 (T) + 2 (P)	
V	Chemistry CC IV	Inorganic Chemistry – II and Physical Chemistry – III (Chemistry of d- and f-Block Elements. Coordination Chemistry, Acid-Base and HSAB, States of Matter & Chemical Kinetics)	4 (T) + 2 (P)	24
	Botany DSE A	Botany Discipline Specific Elective A	4 (T) + 2 (P)	
	Zoology DSE A	Zoology Discipline Specific Elective A	4 (T) + 2 (P)	



	Chemistry DSE A	Chemistry Discipline Specific Elective A	4 (T) + 2 (P)	
VI	AECC II	EVS	4	22
	Botany DSE B	Botany Discipline Specific Elective B	4 (T) + 2 (P)	
	Zoology DSE B	Zoology Discipline Specific Elective B	4 (T) + 2 (P)	
	Chemistry DSE B	Chemistry Discipline Specific Elective B	4 (T) + 2 (P)	
Total Credits			132	132

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Semester	Paper	Papers Name	Semester	Paper	Papers Name
V Semester Chemistry DSE A	CHEMISTRY DSE I	Analytical Methods in Chemistry	VI Semester Chemistry DSE B	CHEMISTRY DSE VII	Food and Beverage Industry
	CHEMISTRY DSE II	Quantum Chemistry, Spectroscopy & Photochemistry		CHEMISTRY DSE VIII	Polymer Chemistry
	CHEMISTRY DSE III	Research Methodology for Chemistry		CHEMISTRY DSE IX	Pharmaceutical and Drug Chemistry
	CHEMISTRY DSE IV	Green Chemistry		CHEMISTRY DSE X	Agrochemical and Fertilizer
	CHEMISTRY DSE V	Environmental Chemistry		CHEMISTRY DSE XI	Metallurgy and its Industrial Importance
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Chemistry Skill Enhancement Course Offered in B.Sc.

S.No.	Papers	Papers Name	S.No.	Papers	Papers Name
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SEMESTER II

CORE COURSE I: CHEMISTRY CC 1

ATOMIC STRUCTURE, BONDING, CHEMISTRY OF s- AND p-BLOCK ELEMENTS, GENERAL ORGANIC CHEMISTRY, ALIPHATIC & AROMATIC HYDROCARBONS

Course Objectives:

1. *INORGANIC CHEMISTRY*: Provide in-depth knowledge about different types of bonding in main group elements be acquainted with the concept of hybridization and geometry of covalent molecules, shapes of atomic and molecular orbitals. Recall the general trends in the periodic table of s and p block elements.
2. *ORGANIC CHEMISTRY*: Understand the core concepts of organic chemistry i.e. resonance, hyperconjugation, inductive effect etc. and their qualitative and quantitative treatment. Provide an in-depth knowledge about alkanes, alkenes & alkynes and their reactions. Provide an in-depth knowledge about the organic-chemical reactions with a focus on aromaticity & stereochemistry.

Course Learning Outcome:

INORGANIC CHEMISTRY: Comparison b/w classical and quantum mechanics. Solve Schrodinger's wave equation of electron for calculating the energy of atom and discuss the concepts of quantum numbers. Concept of Born-Haber cycle and predict the lattice energy, ionization energy and stability of the ionic compounds. Describe the various types of hybridization and geometry of molecules. Molecular orbital diagrams of homo and hetero nuclear diatomic molecules and determine the bond order with the help of M.O. diagram. Describe the periodicity in properties, structures, applications and chemical reactivity of the s-block elements. Describe properties, structures, applications and chemical reactivity of the s-block and p-block elements.

ORGANIC CHEMISTRY: Identify different electronic effects, their role and impact on molecules. Explain the behavior of different aliphatic hydrocarbons. Identify various organic reaction mechanisms including free radical substitution, electrophilic and nucleophilic addition reactions. To solve problems based on the concept of electronic effect. Apply the fundamental concepts of stereochemistry on simple molecules. Illustrate the mechanism of organic reactions on hydrocarbons depending upon the reactants involved. Identify the different aromatic, non-aromatic, homoaromatic & antiaromatic compounds and interpret their properties. Learn and identify many organic reaction mechanisms including electrophilic aromatic substitution. Predict and describe various types of reactive intermediates, reactivity and factors affecting the reactivity and stability of aromatic substrates

SYLLABUS:

SECTION A: INORGANIC CHEMISTRY - I

Lecture: 30

UNIT – I

Lecture : 18



ATOMIC STRUCTURE: Bohr's theory and its limitations, de-Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Introduction of Quantum mechanics, Schrodinger equation, Significance of ψ and ψ^2 , Quantum numbers (n, l, m and s), Shapes of s, p and d atomic orbitals, nodal planes. Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, Anomalous electronic configurations. Effective nuclear charge

CHEMICAL BONDING: IONIC BONDING: General characteristics of ionic bonding, energy (lattice energy and solvation energy) and their importance in the context of stability and solubility. Born-Landé equation, Born-Haber cycle and its applications, polarizing power and polarizability, Fajan's rules and its applications. **COVALENT BONDING: VB Approach:** Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with examples. **MO THEORY:** Rules for the LCAO method, bonding and antibonding MOs and their characteristics for s-s, s-p and p-p combinations of atomic orbitals, nonbonding combination of orbitals, MO of Homonuclear and Heteronuclear diatomic molecules. Comparison of VB and MO approaches.

UNIT – II :

Lecture : 12

PERIODIC PROPERTIES: Periodicity with respect to Electronic Configuration, Atomic and Ionic Size, Ionization enthalpy, Electron affinity and Electronegativity

s-block ELEMENTS: Comparative study, diagonal relationship, salient features of hydrides, solvation and complexation tendencies including their function in bio system, an introduction to alkyls and aryls.

p-BLOCK ELEMENTS: Synthesis, structure and properties of diborane, ammonia, silane, phosphine and hydrogen sulphide. Synthesis and properties of Borazine.

SECTION B: ORGANIC CHEMISTRY - I

Lecture: 30

UNIT – III :

Lecture : 14

GENERAL ORGANIC CHEMISTRY: Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis. Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions, free radicals, carbenes, benzyne and nitrenes, types of organic reaction, Method of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetics and stereo chemical studies), formal charges.

STEREOCHEMISTRY: Concept of isomerism, types of isomerism, Difference between configuration and conformation. **OPTICAL ISOMERISM:** Representation and interconversion of wedge-dash, Newmann-sawhorse and fischer projection formula, concept of chirality (elements of symmetry, molecular chirality, stereogenic centres), Enantiomerism, Diastereomerism and Meso compounds. Threo and erythro; Relative and absolute configuration, sequence rules, D and L and R/S nomenclature. Resolution of enantiomers, concept of inversion, retention and racemization **GEOMETRICAL ISOMERISM:** Determination of configuration of geometrical isomers, syn-anti, E-Z, cis-trans, Geometrical isomerism in oximes and alicyclic compounds. **CONFORMATIONAL ISOMERISM:** Conformations with respect to acyclic system (ethane, butane) and cyclic system (cyclohexane and mono & disubstituted cyclohexane)

UNIT – IV :

Lecture : 16



(Functional group approach for the following reactions (Nomenclature, classification, preparations physical property & chemical reactions) to be studied with mechanism in context to their structure.)

ALIPHATIC HYDROCARBONS: ALKANES: Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent, Corey house reaction. Reactions: Free radical Substitution: Halogenation. ALKENE: Preparation: Elimination reactions: Dehydration of alcohols and dehydrohalogenation of alkyl halides, Regioselectivity (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). Reactions: cis-addition (alk. KMnO_4) and trans-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis, oxymecuration-demercuration, Hydroboration-oxidation. DIENE: Structure of allenes, and butadiene, method of formation, Reaction: 1,2 and 1,4- addition, Diels-alder reaction and polymerization. ALKYNES: Preparation: Acetylene from CaC_2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydro-halogenation of vicinal-dihalides. Reactions: Acidity of alkynes, Mechanism of electrophilic and nucleophilic addition reaction. Formation of metal acetylides, addition of bromine and alkaline KMnO_4 , ozonolysis and oxidation with hot alkaline KMnO_4 .

AROMATIC HYDROCARBONS: Aromaticity, Benzenoids and Huckel rule. Structure, Stability and C-C bond length of Benzene, resonance structure and MO diagram. Nomenclature: Benzene derivatives, aryl group, aromatic nucleus and side chain. Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid. Reactions: Electrophilic substitution reaction: Mechanism of nitration, halogenation, Sulphonation and Friedel-Craft's reaction. Side chain oxidation of alkyl benzene, Birch reduction. Activating and Deactivating substituents, Directive effect of the groups - orientation and ortho/para ratio, ipso effect.

Reference Books:

- Lee, J.D. *Concise Inorganic Chemistry* ELBS, 1991.
- Cotton, F.A., Wilkinson, G. & Gaus, P.L. *Basic Inorganic Chemistry*, 3rd ed., Wiley.
- Douglas, B.E., McDaniel, D.H. & Alexander, J.J. *Concepts and Models in Inorganic Chemistry*, John Wiley & Sons.
- Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. *Inorganic Chemistry: Principles of Structure and Reactivity*, Pearson Education India, 2006.
- Graham Solomon, T.W., Fryhle, C.B. & Snyder, S.A. *Organic Chemistry*, John Wiley & Sons, 2014.
- McMurry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition, 2013.
- Sykes, P. *A Guidebook to Mechanism in Organic Chemistry*, Orient Longman, New Delhi, 1988.
- Eliel, E.L. *Stereochemistry of Carbon Compounds*, Tata McGraw Hill education, 2000.
- Finar, I.L. *Organic Chemistry* (Vol. I & II), E.L.B.S.
- Morrison, R.T. & Boyd, R.N. *Organic Chemistry*, Pearson, 2010.
- Bahl, A. & Bahl, B.S. *Advanced Organic Chemistry*, S. Chand, 2010.



CORE COURSE I PRACTICAL: CHEMISTRY CC 1
ATOMIC STRUCTURE, BONDING, CHEMISTRY OF s- AND p-
BLOCK ELEMENTS, GENERAL ORGANIC CHEMISTRY,
ALIPHATIC & AROMATIC HYDROCARBONS

CREDIT: 02
LECTURE: 60

Course Objectives:

1. *INORGANIC CHEMISTRY*: Acquire knowledge of conductometric titrations and their calculations. Make the students to get an insight on the use of apparatus used in volumetric analysis and correct titrimetric procedure along with standard and nonstandard solutions. Perform all sorts of volumetric calculations.
2. *ORGANIC CHEMISTRY*: Acquaint students with the identification of different functional groups and draw formulas and structures of these groups. Provide an in-depth knowledge about the organic stereochemistry

Course Learning Outcome:

INORGANIC CHEMISTRY: Develop the analytical skills to carry out different types of volumetric analysis.

ORGANIC CHEMISTRY: Predict the different types of functional groups in organic compounds and determine melting and boiling points. Apply the fundamental concepts of stereochemistry on simple molecules.

SYLLABUS:

Section A: Inorganic Chemistry

Volumetric Analysis

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
2. Estimation of oxalic acid by titrating it with KMnO_4 .
3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO_4 .
4. Estimation of Fe (II) ions by titrating it with $\text{K}_2\text{Cr}_2\text{O}_7$ using internal indicator.
5. Estimation of Cu (II) ions iodometrically using $\text{Na}_2\text{S}_2\text{O}_3$.

Section B: Organic Chemistry

6. Purification of organic compounds by crystallization (from water and alcohol) and distillation.
 7. Criteria of Purity: Determination of melting and boiling points.
 8. Systematic Qualitative Organic Analysis: Elemental analysis (N, S and halogens),
 9. Systematic Qualitative Organic Analysis of Organic Compounds possessing monofunctional groups (carboxylic, phenolic, aldehydic, ketonic, amide, nitro, amines, esters, carbohydrates) and preparation of one derivative in simple organic solids and liquids.
 10. Stereochemical study of organic compounds via models:
 - a) R and Z configuration of optical isomers
 - b) E, Z configuration of geometrical isomers
 - c) Conformational analysis of cyclohexanes and substituted cyclohexanes.
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Reference Books:

- Svehla, G. *Vogel's Qualitative Inorganic Analysis*, Pearson Education, 2012.



- Mendham, J. *Vogel's Quantitative Chemical Analysis*, Pearson, 2009.
- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G. *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
- Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.



SKILL ENHANCEMENT COURSE (SEC 1 – SEC 6)

**SKILL ENHANCEMENT COURSE I: CHEMISTRY SEC I
BASIC ANALYTICAL CHEMISTRY**

**CREDIT: 02
LECTURE: 30**

Course Objectives:

To get knowledge of analytical methods for analysis of soil, water and food products.

Course Learning Outcomes:

Introduction of analytical methods Presentation of experimental data and results. Principle of chromatographic methods.

SYLLABUS:

UNIT – I

Lecture : 15

Introduction: Introduction to Analytical Chemistry and its interdisciplinary nature. Concept of sampling. Importance of accuracy, precision and sources of error in analytical measurements. Presentation of experimental data and results, from the point of view of significant figures.

Analysis of soil: Composition of soil, Concept of pH and pH measurement, Complexometric titrations, Chelation, Chelating agents, use of indicators

- a. Determination of pH of soil samples.
- b. Estimation of Calcium and Magnesium ions as Calcium carbonate by complexometric titration.

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

- a. Determination of pH, acidity and alkalinity of a water sample.
- b. Determination of dissolved oxygen (DO) of a water sample.

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

- a. Identification of adulterants in some common food items like coffee powder, asafoetida, chili powder, turmeric powder, coriander powder and pulses, etc.
- b. Analysis of preservatives and coloring matter.

Chromatography: Definition, general introduction on principles of chromatography, paper chromatography, TLC etc.

- a. Paper chromatographic separation of mixture of metal ion (Fe^{3+} and Al^{3+}).
- b. To compare paint samples by TLC method.

UNIT - II

Lecture: 15



Ion-exchange: Column, ion-exchange chromatography etc.

Determination of ion exchange capacity of anion / cation exchange resin (using batch procedure if use of column is not feasible).

Analysis of cosmetics: Major and minor constituents and their function

- a. Analysis of deodorants and antiperspirants, Al, Zn, boric acid, chloride, sulphate.
- b. Determination of constituents of talcum powder: Magnesium oxide, Calcium oxide, Zinc oxide and Calcium carbonate by complexometric titration.

Suggested Applications (Any one):

- a. To study the use of phenolphthalein in traps cases.
- b. To analyze arson accelerants.
- c. To carry out analysis of gasoline.

Suggested Instrumental demonstrations:

- a. Estimation of macro nutrients: Potassium, Calcium, Magnesium in soil samples by flame photometry.
 - b. Spectrophotometric determination of Iron in Vitamin / Dietary Tablets.
 - c. Spectrophotometric Identification and Determination of Caffeine and Benzoic Acid in Soft Drink.
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REFERENCE BOOKS:

- Willard, H.H., Merritt, L.L., Dean, J. & Settoe, F.A. *Instrumental Methods of Analysis*. 7th Ed. Wadsworth Publishing Co. Ltd., Belmont, California, USA, 1988.
 - Skoog, D.A. Holler F.J. & Nieman, T.A. *Principles of Instrumental Analysis*, Cengage Learning India Ed.
 - Skoog, D.A.; West, D.M. & Holler, F.J. *Fundamentals of Analytical Chemistry 6th Ed.*, Saunders College Publishing, Fort Worth (1992).
 - Harris, D. C. *Quantitative Chemical Analysis*, W. H. Freeman.
 - Dean, J. A. *Analytical Chemistry Notebook*, McGraw Hill.
 - Day, R. A. & Underwood, A. L. *Quantitative Analysis*, Prentice Hall of India.
 - Freifelder, D. *Physical Biochemistry 2nd Ed.*, W.H. Freeman and Co., N.Y. USA (1982).
 - Cooper, T.G. *The Tools of Biochemistry*, John Wiley and Sons, N.Y. USA. 16 (1977).
 - Vogel, A. I. *Vogel's Qualitative Inorganic Analysis 7th Ed.*, Prentice Hall.
 - Vogel, A. I. *Vogel's Quantitative Chemical Analysis 6th Ed.*, Prentice Hall.
 - Robinson, J.W. *Undergraduate Instrumental Analysis 5th Ed.*, Marcel Dekker, Inc., New York (1995).
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**SKILL ENHANCEMENT COURSE II: CHEMISTRY SEC II
PHARMACEUTICAL CHEMISTRY**

**CREDIT: 02
LECTURE: 30**

Course Objectives:

To get knowledge in drug discovery and drug designing. Equip students with the appropriate qualities & skills required in the pharmaceutical, chemical and biomedical industries.

Course Learning Outcomes:

Discipline at the intersection of chemistry, especially synthetic organic chemistry, and pharmacology and various other biological specialties, where they are involved with design, chemical synthesis and development for market of pharmaceutical agents, or bio-active molecules (drugs).

SYLLABUS:

UNIT – I

Lecture : 20

Drugs & Pharmaceuticals

Drug discovery, design and development; Basic Retrosynthetic approach. Synthesis of the representative drugs of the following classes: analgesics agents, antipyretic agents, anti-inflammatory agents (Aspirin, paracetamol, Ibuprofen); antibiotics (Chloramphenicol); antibacterial and antifungal agents (Sulphonamides; Sulphanethoxazol, Sulphacetamide, Trimethoprim); antiviral agents (Acyclovir), Central Nervous System agents (Phenobarbital, Diazepam), Cardiovascular (Glyceryl trinitrate), antilaprosy (Dapsone), HIV-AIDS related drugs (AZT- Zidovudine).

Fermentation

Aerobic and anaerobic fermentation. Production of (i) Ethyl alcohol and citric acid, (ii) Antibiotics; Penicillin, Cephalosporin, Chloromycetin and Streptomycin, (iii) Lysine, Glutamic acid, Vitamin B2, Vitamin B12 and Vitamin C.

UNIT – II

Lecture : 10

Practicals

1. Preparation of Aspirin and its analysis.
2. Preparation of magnesium bisilicate (Antacid).

REFERENCE BOOKS:

- G.L. Patrick: Introduction to *Medicinal Chemistry*, Oxford University Press, UK.
- Hakishan, V.K. Kapoor: *Medicinal and Pharmaceutical Chemistry*, Vallabh Prakashan, Pitampura, New Delhi.



- William O. Foye, Thomas L., Lemke , David A. William: *Principles of Medicinal Chemistry*, B.I. Waverly Pvt. Ltd. New Delhi.
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**SKILL ENHANCEMENT COURSE III: CHEMISTRY SEC III
CHEMISTRY OF COSMETICS & PERFUMES**

**CREDIT: 02
LECTURE: 30**

Course Objectives:

To get Knowledge about the preparation and uses of cosmetic products

Course Learning Outcomes:

Synthesis and extraction of essential oils and their importance in cosmetic industries.

SYLLABUS:

UNIT – I

Lecture : 12

A general study including preparation and uses of the following: Hair dye, hair spray, shampoo, suntan lotions, face powder, lipsticks, talcum powder, nail enamel, creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours. Essential oils and their importance in cosmetic industries with reference to Eugenol, Geraniol, sandalwood oil, eucalyptus, rose oil, 2-phenyl ethyl alcohol, Jasmone, Civetone, Muscone.

UNIT – II

Lecture : 18

Practicals

1. Preparation of talcum powder.
2. Preparation of shampoo.
3. Preparation of enamels.
4. Preparation of hair remover.
5. Preparation of face cream.
6. Preparation of nail polish and nail polish remover.

REFERENCE BOOKS:

- E. Stocchi: *Industrial Chemistry*, Vol -I, Ellis Horwood Ltd. UK.
 - P.C. Jain, M. Jain: *Engineering Chemistry*, Dhanpat Rai & Sons, Delhi.
 - Sharma, B.K. & Gaur, H. *Industrial Chemistry*, Goel Publishing House, Meerut (1996).
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**SKILL ENHANCEMENT COURSE IV: CHEMISTRY SEC IV
PESTICIDE CHEMISTRY**

**CREDIT: 02
LECTURE: 30**

Course Objectives:

To get knowledge of the introduction, synthesis and uses of pesticides.

Course Learning Outcomes:

Understanding of benefits and adverse effects of pesticides

SYLLABUS:

UNIT - I Lecture : 20

General introduction to pesticides (natural and synthetic), benefits and adverse effects, changing concepts of pesticides, structure activity relationship, synthesis and technical manufacture and uses of representative pesticides in the following classes: Organochlorines (DDT, Gammexene,); Organophosphates (Malathion, Parathion); Carbamates (Carbofuran and carbaryl); Quinones (Chloranil), Anilides (Alachlor and Butachlor).

UNIT - II Lecture : 10

Practicals

- 1 To calculate acidity/alkalinity in given sample of pesticide formulations as per BIS specifications.
- 2 Preparation of simple organophosphates, phosphonates and thiophosphates

REFERENCE BOOK:

- Cremllyn, R. *Pesticides. Preparation and Modes of Action*, John Wiley & Sons, New York, 1978.
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