A.G & S.G. SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE

Vuyyuru-521165

NAAC reaccredited at "A" level Autonomous -ISO 9001 – 2015 Certified

DEPARTMENT OF CHEMISTRY (U G)

B O S (1,3,5) Copy

Academic year 2024-2025

DATE :06-09-2024

A.G. & S.G. Siddhartha Degree College of Arts & Science, Autonomous, Vuyyuru .

Minutes of the Meeting of Board of Studies in Chemistry held at 11.00 A.M on 06-09-2024 in the Department of Chemistry.

Dr .G.Giriprasad Presiding

Members Present:

1)…….	**Chairman**	**HOD, Dept. of Chemistry,**
(Dr.G.Giri Prasad)		**A.G. & S.G.S.Degree College,Vuyyuru.**
2)……	**University Nominee**	**Assistant Professor,**
(Prof.D.Ramasekhar Reddy)		**Dept. of Chemistry,Krishna University, MTM.**
3)……	**Academic Council Nominee**	**HOD, Dept. of Chemistry,**
(Dr. S. Kalpana)		**SDMS M College, Vijayawada.**
4)……	**Academic Council Nominee**	**Lecturer in Chemistry,**
(Dr.. A. Indira)		**G.D.C, Dumpagadapa.**
5)……	**Industrialist**	**Manager, Q.A, Biophore india**
(Dr. G Raja)		**Pharmaceuticals pvt ltd Hyd.**
6)…….	**Student Nominee**	**Lecturer in Chemistry,**
(Smt. M. Sowjanya)		**ANR College Gudivada.**
7)…….	**Member**	**Lecturer in Chemistry,**
(Smt. M.V.Santhi)		**A.GS.G.S.Degree College,Vuyyuru**
8)……	**Member**	**Lecturer in Chemistry,**
(Sri. P.Suresh)		**A.G. & S.G.S.Degree College,Vuyyuru.**
9)……	**Member**	**Lecturer in Chemistry,**
(MS. M.Santhi)		**A.G.& S.G.S.Degree College,Vuyyuru.**
10)……	**Member**	**Rtd. Lecturer in Chemistry,**
(Sri K.Ramesh)		**A.G.& S.G.S.Degree College,Vuyyuru.**

Agenda for B.O.S Meeting

1. To recommend the syllabus and model paper for I semester of I Degree B.Sc., Chemistry for the Academic year 2024-2025.
2. To recommend the syllabus and model paper for III semester of II Degree B.Sc., Chemistry for the Academic year 2024-2025.
3. To recommend the syllabus and model papers for V semester of III Degree B.Sc. Chemistry for the Academic year 2024-2025.
4. To recommend the Guidelines to be followed by the question paper setters in Chemistry for I,III,V Semester – end exams.
5. To recommend the teaching and evaluation methods to be followed under Autonomous status.
6. Suggestions regarding certificate course, seminars, workshops, Guest lecture to be organized.
7. Suggestions regarding Value added course
8. Recommend the panel of Examiners for practicals conducted at end of each semester to COE
9. Any other matter.

Chairman

RESOLUTIONS

1. It is resolved to follow the **syllabus of APSCHE (theory and activity) for I semesters of I B.Sc.** First paper for Chemistry major, Maths major, Physics major & Computer major for the academic year 2024-25

Paper title: Essentials and Applications of Mathematical, Physicaland Chemical Sciences

- It is resolved to follow the **syllabus of APSCHE (theory and activity) for I semesters of I B.Sc.** Second paper for Chemistry major, Maths major, Physics major & Computer major for the Academic year 2024-25

  Paper title: Advances in Mathematical, Physical and Chemical Sciences

- It is resolved to follow the **syllabus of APSCHE (theory and activity) for I semesters of I B.Sc.** Botany major, Zoology major & Aqua major for the Academic year 2024—2025

  Paper title: Classical Biology

2. It is resolved to follow the **syllabus of APSCHE (theory and practical) for III semesters of II B.Sc.** for the Academic year 2024--2025.

- Fundamentals in Organic Chemistry (Major&Minor)
- Organic Chemistry (Halogen and & Oxygen Organic Compounds) (Major)

Addition Topics: The Following topics are added in **Unit-2 (**Alcohols and Phenols)

Distinguish of alcohols by Lucas reagent and Vector's Mayer's test acidic nature of phenols.

The Following topics are added in **Unit-3 (**Carbonyl Compounds)

Nucleophilic addition reactions of RMgx, PCl_5 with mechanism and formation of Acetals and Hemi Acetals, Oxidations and reductions Bayer Villiger Oxidation, Oppenaur oxidation, Ozonolysis

- Physical Chemistry -I (Solutions and Electro Chemistry) (Major)
- Inorganic and Physical Chemisatry (Major)

3. It is resolved to follow the **syllabus of APSCHE (theory and practical) for V semesters of III B.Sc.** for the Academic year 2023--2024.

4. It is resolved to follow the **guidelines** to be followed by the question paper setters of Chemistry for I,III & V semesters of Degree B.Sc. for the Academic Year 2024-2025.

It is resolved to continue the following teaching and evolution methods for Academic year 2024-25

Teaching Methods:

- Besides the conventional methods of teaching, we use modern technology i.e. using of LCD projector to display on U boards etc, for better understanding of concepts.

5.Evaluation of a student is done by the following procedure:

- **Internal Assessment Examinations:**

- Out of maximum 100 marks in each paper for I B.Sc, 30 marks shall be allocated for internal assessment. Out of these 30 marks, 20 marks are allocated for two announced tests (i.e.IA-1 & IA-2). Attendance-5marks & Assignment/Activity-5marks
- Out of maximum 100 marks in each paper for II B.Sc,30 marks shall be allocated for two internal assessment. Out of these 30 marks, 20 marks are allocated for announced tests (i.e.IA-1 & IA-2). Attendance-5marks & Assignment-5marks
- Out of maximum 100 marks in each paper for III B.Sc, 30 marks shall be allocated for two internal assessment. Out of these 30 marks, 20 marks are allocated for announced tests (i.e.IA-1 & IA-2). Activity-5marks & Asignment-5marks
- Two announced tests will be conducted and average of these two tests shall be deemed as the marks obtained by the student.

- **Semester – End Examination:**
- I Semester end examinations will be conducting in objective mode.
- The maximum marks for III,V- Semester – End examination of B.Sc shall be 70 marks respectively.the duration of each examination shall be 3 hours. Even though the candidate is absent for two IA exams /obtain Zero marks the external marks are considered (if the candidate gets 40) and the result shall be declared as "PASS".
- Semester – End examinations shall be conducted in theory papers at the end of every semester, while in practical papers, these examinations are conducted at the end of ,III & V semesters for II & III B.Sc for 50 marks.(external-40marks & internal record-10marks)

6..Discussed and recommended for organizing certificate course, seminars, Guest lecturers, workshops to upgrade the knowledge of students, for the approval of the academic council.

7..It is resolved to planning the value added course. In thia academic year for II B.Sc students.

8..Discussed and empowered the Head of the department of Chemistry to suggest the panel of Examiners for practicals conducted at end of each semester to COE

9. NIL.

Chairman

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Title of the Paper: Essentials and Applications of Mathematical, Physicaland Chemical Sciences

Semester: I (60 Hr)

Course Code	**23SCIT11**	**Course Delivery Method**	**Class Room / Blended Mode**
Credits	**4**	CIA Marks	30
No. of Lecture Hours / Week	**5**	Semester End Exam Marks	**70**
Total Number of Lecture Hours	**75**	Total Marks	**100**
Year of Introduction : 2023 - 24	Year of Offering: 2024 - 25	Year of Revision: ----------	Percentage of Revision: 0

Course Objective:

The objective of this course is to provide students with a comprehensive understanding of the essential concepts and applications of mathematical, physical, and chemical sciences. The course aims to develop students' critical thinking, problem-solving, and analytical skills in these areas, enabling them to apply scientific principles to real-world situations.

Learning outcomes:

1. Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors, and statistical measures.
2. To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations
3. To explain the basic principles and concepts underlying a broad range of fundamental areas of chemistry and to connect their knowledge of chemistry to daily life.

4. Understand the interplay and connections between mathematics, physics, and chemistry in various applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.
5. To explore the history and evolution of the Internet and to gain an understanding of network security concepts, including threats, vulnerabilities, and countermeasures.
   - To understand the properties and structure of gaseous and liquid states.
   - To understand the properties of solutions.

Syllabus

Course Details

Unit	Learning Units	Lecture Hours
Essentials and Applications of Mathematical, Physicaland Chemical Sciences		
I	**Essentials of Mathematics** Complex Numbers: Introduction of the new symbol i – General form of a complex number – Modulus- Amplitude form and conversions Trigonometric Ratios: Trigonometric Ratios and their relations – Problems on calculation of angles Vectors: Definition of vector addition – Cartesian form – Scalar and vector product and problems Statistical Measures: Mean, Median, Mode of a data and problems.	**9H**
II	**Essentials of Physics:** Definition and Scope of Physics- Measurements and Units - Motion of objects: Newtonian Mechanics and relativistic mechanics perspective - Laws of Thermodynamics and Significance- Acoustic waves and electromagnetic waves- Electric and Magnetic fields and their interactions- Behaviour of atomic and nuclear particles- Wave-particle duality, the uncertainty principle- Theories and understanding of universe.	**9H**
III	**Essentials of Chemistry** Definition and Scope of Chemistry- Importance of Chemistry in daily life - Branches of chemistryand significance- Periodic Table- Electronic Configuration, chemical changes, classification of matter, Biomolecules- carbohydrates, proteins, fats and vitamins.	**9H**
IV	**Applications of Mathematics, Physics & Chemistry** Applications of Mathematics in Physics & Chemistry: Calculus , Differential Equations & Complex Analysis Application of Physics in Industry and Technology: Electronics and Semiconductor Industry, Robotics and Automation, Automotive and Aerospace Industries, Quality Control and Instrumentation, Environmental Monitoring and Sustainable Technologies. Application of Chemistry in Industry and Technology: Chemical Manufacturing, Pharmaceuticals and Drug Discovery, Materials Science, Food and Beverage Industry.	**9H**

V	**Essentials of Computer Science**: Milestones of computer evolution - Internet, history, Internet Service Providers, Types ofNetworks, IP, Domain Name Services, applications. Ethical and social implications: Network and security concepts- Information Assurance Fundamentals, Cryptography-Symmetric and Asymmetric, Malware, Firewalls, Fraud Techniques- Privacy and Data Protection.	**9H**

Reference Books

1. Functions of one complex variable by John.B.Conway, Springer- Verlag.
2. Elementary Trigonometry by H.S.Hall and S.R.Knight
3. Vector Algebra by A.R.Vasishtha, Krishna Prakashan Media(P)Ltd. 4.Basic Statistics byB.L.Agarwal, New age international Publishers
4. University Physics with Modern Physics by Hugh D. Young and Roger A. Freedman
5. Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker
6. Physics for Scientists and Engineers with Modern Physics" by Raymond A. Serway andJohn W. Jewett Jr.
7. Physics for Technology and Engineering" by John Bird
8. Chemistry in daily life by Kirpal Singh
9. Chemistry of bio molecules by S. P. Bhutan
10. Fundamentals of Computers by V. Raja Raman
11. Cyber Security Essentials by James Graham, Richard Howard, Ryan Olson

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STUDENT ACTIVITIES

UNIT I: ESSENTIALS OF MATHEMATICS:

1: Complex Number Exploration

Provide students with a set of complex numbers in both rectangular and polar forms. They will plot the complex numbers on the complex plane and identify their properties

2:Trigonometric Ratios Problem Solving

Give students a set of problems that require the calculation of trigonometric ratios and their relations. Students will solve the problems using the appropriate trigonometric functions (sine, cosine,tangent, etc.) and trigonometric identities.

3: Vector Operations and Applications

Provide students with a set of vectors in Cartesian form. Students will perform vector addition and subtraction operations to find the resultant vectors.They will also calculate the scalar and vector products of given vectors.

4: Statistical Measures and Data Analysis

Give students a dataset containing numerical values. Students will calculate the mean, median, and mode of the data, as well as other statistical measures if appropriate (e.g., range, standard deviation).They will interpret the results and analyze the central tendencies and distribution of the data.

Unit II: Essentials of Physics

1. **Concept Mapping**

Divide students into groups and assign each group one of the topics. Students will create a concept map illustrating the key concepts, relationships, and applications related to their assigned topic. Encourage students to use visual elements, arrows, and labels to represent connections andinterdependencies between concepts.

2. **Laboratory Experiment**

Select a laboratory experiment related to one of the topics, such as motion of objects or electric and magnetic fields. Provide the necessary materials, instructions, and safety guidelines for conducting theexperiment. Students will work in small groups to carry out the experiment, collect data, and analyze the results. After the experiment, students will

write a lab report summarizing their findings, observations,and conclusions.

Unit III: Essentials of Chemistry

1. **Chemistry in Daily Life Presentation**

Divide students into groups and assign each group a specific aspect of daily life where chemistry plays a significant role, such as food and nutrition, household products, medicine, or environmental issues. Students will research and create a presentation (e.g., PowerPoint, poster, or video) that showcases the importance of chemistry in their assigned aspect.

2. **Periodic Table Exploration**

Provide students with a copy of the periodic table. Students will explore the periodic table and its significance in organizing elements based on their properties. They will identify and analyze trends in atomic structure, such as electronic configuration, atomic size, and ionization energy.

3. **Chemical Changes and Classification of Matter**

Provide students with various substances and chemical reactions, such as mixing acids andbases or observing a combustion reaction.Students will observe and describe the chemical changes that occur, including changes in color, temperature, or the formation of new substances.

4. **Biomolecules Investigation**

Assign each student or group a specific bimolecular category, such as carbohydrates, proteins, fats, or vitamins. Students will research and gather information about their assigned biomolecule category, including its structure, functions, sources, and importance in the human body. They can create informative posters or presentations to present their findings to the class.

Unit IV: Applications of Mathematics, Physics & Chemistry

1: Interdisciplinary Case Studies

Divide students into small groups and provide them with interdisciplinary case studies that involve the interdisciplinary application of mathematics, physics, and chemistry.Each case study should present a real-world problem or scenario that requires the integration ofconcepts from all three disciplines.

2: Design and Innovation Project

Challenge students to design and develop a practical solution or innovation that integrates mathematics, physics, and chemistry principles.Students can choose a specific problem or area of interest, such as renewable energy, environmental conservation, or materials science.

3. **Laboratory Experiments**

Assign students laboratory experiments that demonstrate the practical applications of mathematics, physics, and chemistry. Examples include investigating the relationship between concentration and reaction rate, analyzing the behavior of electrical circuits, or measuring the properties of materials.

4. **Mathematical Modeling**

Present students with real-world problems that require mathematical modeling and analysis.

Unit V: Essentials of Computer Science:

1. Identifying the attributes of network (Topology, service provider, IP address and band width of your college network).
2. Prepare a report covering network architecture.
3. Identify the types of malwares and required firewalls to provide security.
4. Latest Fraud techniques used by hackers.

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MODEL PAPER

FIRST YEAR B.Sc., DEGREE EXAMINATION **SEMESTER-I**

Essentials and Applications of Mathematical, Physicaland Chemical Sciences

Time: 3 hours MODEL PAPER Maximum Marks:

- I Semester end examinations will be conducting in objective mode.

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Title of the Paper: Advances In Mathematical, Physical And Chemical Sciences

Semester: I (60 Hr)

Course Code	**23SCIT12**	**Course Delivery Method**	**Class Room / Blended Mode**
Credits	**4**	CIA Marks	**30**
No. of Lecture Hours / Week	**5**	Semester End Exam Marks	**70**
Total Number of Lecture Hours	**75**	Total Marks	**100**
Year of Introduction : 2023 - 24	Year of Offering: 2024 - 25	Year of Revision: ----------	Percentage of Revision: 0

Course Objective:

The objective of this course is to provide students with an in-depth understanding of the recent advances and cutting-edge research in mathematical, physical, and chemical sciences. Thecourse aims to broaden students' knowledge beyond the foundational concepts and expose them to the latest developments in these disciplines, fostering critical thinking, research skills, and theability to contribute to scientific advancements.

Learning outcomes

1. Explore the applications of mathematics in various fields of physics and chemistry, to understand how mathematical concepts are used to model and solve real-world problems.
2. To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations.

3. Understand the different sources of renewable energy and their generation processes andadvances in nonmaterial's and their properties, with a focus on quantum dots. To study the emerging field of quantum communication and its potential applications. To gain an understanding of the principles of biophysics in studying biological systems. Explore the properties and applications of shape memory materials.
4. Understand the principles and techniques used in computer-aided drug design and drug delivery systems, to understand the fabrication techniques and working principles of nanosensors. Explore the effects of chemical pollutants on ecosystems and human health.
5. Understand the interplay and connections between mathematics, physics, and chemistry in various advanced applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.
6. Understand and convert between different number systems, such as binary, octal, decimal, and hexadecimal. Differentiate between analog and digital signals and understand their characteristics. Gain knowledge of different types of transmission media, such as wired (e.g. copper cables, fiber optics) and wireless (e.g., radio waves, microwave, satellite).

Syllabus

Unit	Learning Units	Lecture Hours
Advances in Mathematical, Physical and Chemical Sciences		
I	**Advances in Basics Mathematics** Straight Lines: Different forms – Reduction of general equation into various forms –Point of intersection of two straight lines Limits and Differentiation: Standard limits – Derivative of a function –Problems on product rule and quotient rule Integration: Integration as a reverse process of differentiation – Basic methods of integration Matrices: Types of matrices – Scalar multiple of a matrix – Multiplication of matrices –Transpose of a matrix and determinants	**9H**
II	**Advances in Physics** Renewable energy: Generation, energy storage, and energy-efficient materials and devices. Recent advances in the field of nanotechnology: Quantum dots, Quantum Communication- recent advances in biophysics- recent advances in medical physics- Shape Memory Materials.	**9H**
III	**Advances in Chemistry** Computer aided drug design and delivery, nano sensors, Chemical Biology, impact of chemical pollutants on ecosystems and human health, Dye removal - Catalysis method.	**9H**
IV	**Advanced Applications of Mathematics, Physics & Chemistry** Mathematical Modelling applications in physics and chemistry Application of Renewable energy: Grid Integration and Smart Grids, Application of nanotechnology: Nanomedicine, Application of biophysics: Biophysical Imaging, Biomechanics, Neurophysics, Application of medical physics: Radiation Therapy, Nuclear medicine Solid waste management, Environmental remediation- Green Technology, Water treatment.	**9H**
V	**Advanced Applications of computer Science :** Number System-Binary, Octal, decimal, and Hexadecimal, Signals-Analog, Digital, Modem, Codec, Multiplexing, Transmission media, error detection and correction- Parity check and CRC, Networking devices- Repeater, hub, bridge, switch, router, gateway.	**9H**

Reference Books

1. Coordinate Geometry by S.L.Lony, Arihant Publications
2. Calculus by Thomas and Finny, Pearson Publications
3. Matrices by A.R.Vasishtha and A.K.Vasishtha, Krishna Prakashan Media(P)Ltd.
4. "Renewable Energy: Power for a Sustainable Future" by Godfrey Boyle
5. "Energy Storage: A Nontechnical Guide" by Richard Baxter
6. "Nanotechnology: Principles and Applications" by Sulabha K. Kulkarni and Raghvendra A. Bohara.
7. "Biophysics: An Introduction" by Rodney Cotterill
8. "Medical Physics: Imaging" by James G. Webster
9. "Shape Memory Alloys: Properties and Applications" by
10. Dimitris C. Lagoudas
11. Nano materials and applications by M.N.Borah
12. Environmental Chemistry by Anil.K.D.E.
13. Digital Logic Design by Morris Mano
14. Data Communication & Networking by Bahrouz Forouzan.

STUDENT ACTIVITIES

UNIT I: ADVANCES IN BASIC MATHEMATICS

1: Straight Lines Exploration

Provide students with a set of equations representing straight lines in different forms, such as slope-intercept form, point-slope form, or general form. Students will explore the properties and characteristics of straight lines, including their slopes, intercepts, and point of intersection.

2. Limits and Differentiation Problem Solving

Students will apply the concept of limits to solve various problems using standard limits.

Encourage students to interpret the results and make connections to real-world applications,such as analyzing rates of change or optimizing functions.

3. Integration Exploration

Students will explore the concept of integration as a reverse process of differentiation and apply basic methods of integration, such as the product rule, substitution method, or integration by parts.

Students can discuss the significance of integration in various fields, such as physics andchemistry

4. Matrices Manipulation

Students will perform operations on matrices, including scalar multiplication, matrix multiplication, and matrix transpose.Students can apply their knowledge of matrices to real-world applications, such as solving systems of equations or representing transformations in geometry.

UNIT II: ADVANCES IN PHYSICS:

1. Case Studies

Provide students with real-world case studies related to renewable energy, nanotechnology, biophysics, medical physics, or shape memory materials. Students will analyze the case studies, identify the challenges or problems presented, and propose innovative solutions based on the recent advances in the respective field. They will consider factors such as energy generation, energy storage, efficiency, sustainability, materials design, biomedical applications, or technological advancements.

2. Experimental Design

Assign students to design and conduct experiments related to one of the topics: renewable energy, nanotechnology, biophysics, medical physics, or shape memory materials. They will identify a specific research question or problem to investigate and design an experiment accordingly. Students will collect and analyze data, interpret the results, and draw conclusions based on their findings. They will discuss the implications of their experimental results in the context of recent advancesin the field.

3. Group Discussion and Debate

Organize a group discussion or debate session where students will discuss the ethical, social, and environmental implications of the recent advances in renewable energy, nanotechnology, biophysics, medical physics, and shape memory materials. Assign students specific roles, such as proponent, opponent, or moderator, and provide them with key points and arguments to support their positions.

UNIT III: ADVANCES IN CHEMISTRY:

1. Experimental Design and Simulation

In small groups, students will design experiments or simulations related to the assigned topic. For example, in the context of computer-aided drug design, students could design a virtual screening experiment to identify potential drug candidates for a specific disease target. For nano sensors, students could design an experiment to demonstrate the sensitivity and selectivity of nano sensors in detecting specific analytes.

Chemical biology-related activities could involve designing experiments to study enzyme-substrate interactions or molecular interactions in biological systems. Students will perform their experiments or simulations, collect data, analyze the results, and draw conclusions based on their findings.

2. Case Studies and Discussion

Provide students with real-world case studies related to the impact of chemical pollutants on ecosystems and human health. Students will analyze the case studies, identify the sources and effects of chemical pollutants, and propose mitigation strategies to minimize their impact. Encourage discussions on the ethical and environmental considerations when dealing with chemical pollutants. For the dye removal using the catalysis method, students can explore case studies where catalytic processes are used to degrade or remove dyes from wastewater. Students will discuss the principles of catalysis, the advantages and limitations of the catalysis method, and its applications in environmental remediation.

3. Group Project

Assign students to work in groups to develop a project related to one of the topics. The project could involve designing a computer-aided drug delivery system, developing a nano sensor for a specific application, or proposing strategies to mitigate the impact of chemical pollutants on ecosystems.

Students will develop a detailed project plan, conduct experiments or simulations, analyze data and present their findings and recommendations. Encourage creativity, critical thinking, and collaboration throughout the project.

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS,

1: Mathematical Modeling Experiment

Provide students with a mathematical modelling experiment related to one of the topics. For example, in the context of renewable energy, students can develop a mathematical model to optimize the placement and configuration of solar panels in a solar farm. Students will work in teams to design and conduct the experiment, collect data, and analyze the results using mathematical models and statistical techniques. They will discuss the accuracy and limitations of their model, propose improvements, and interpret the implications of their findings in the context of renewable energy or the specific application area.

2. Case Studies and Group Discussions

Assign students to analyze case studies related to the applications of mathematical modelling in nanotechnology, biophysics, medical physics, solid waste management, environmental remediation, or water treatment. Students will discuss the mathematical models and computational methods used in the case studies, analyze the outcomes, and evaluate the effectiveness of the modelling approach. Encourage group discussions on the challenges, ethical considerations, and potential advancements in the field. Students will present their findings and engage in critical discussions on the advantages and limitations of mathematical modelling in solving complex problems in these areas.

3. Group Project

Assign students to work in groups to develop a group project that integrates mathematical modelling with one of the application areas: renewable energy, nanotechnology, biophysics, medical physics, solid waste management, environmental remediation, or water treatment. The project could involve developing a mathematical model to optimize the delivery of radiation therapy in medical physics or designing a mathematical model to optimize waste management practices. Students will plan and execute their project, apply mathematical

modelling techniques, analyze the results, and present their findings and recommendations. Encourage creativity, critical thinking, and collaboration throughout the project.

UNIT V: Advanced Applications of computer Science

1. Students must be able to convert numbers from other number system to binary number systems
2. Identify the networking media used for your college network
3. Identify all the networking devices used in your college premises.

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Title of the Paper: ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICALSCIENCE - MODEL PAPER

- I Semester end examinations will be conducting in objective mode.

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Title Of The Paper: Introduction To Classical Biology

Semester: I (60)hr

Course Code	**23CBLT01**	**Course Delivery Method**	**Class Room / Blended Mode**
Credits	**4**	CIA Marks	**30**
No. of Lecture Hours / Week	**5**	Semester End Exam Marks	**70**
Total Number of Lecture Hours	**75**	Total Marks	**100**
Year of Introduction : 2023 - 24	Year of Offering: 2024 - 25	Year of Revision: ----------	Percentage of Revision: 0

Learning objectives

The student will be able to learn the diversity and classification of living organisms and understand their chemical, cytological, evolutionary and genetic principles.

Learning Outcomes

1. Learn the principles of classification and preservation of biodiversity
2. Understand the plant anatomical, physiological and reproductive processes.
3. Knowledge on animal classification, physiology, embryonic development and their economic importance.
4. Outline the cell components, cell processes like cell division, heredity and molecular processes.
5. Comprehend the chemical principles in shaping and driving the macromolecules and life processes.

Syllabus

Unit	Learning Units	Lecture Hours
INTRODUCTION TO CLASSICAL BIOLOGY		
I	**Introduction to Systematics, Taxonomy and Ecology.** 1.1. Systematics – Definition and concept, Taxonomy – Definition and hierarchy. 1.2. Nomenclature – ICBN and ICZN, Binomial and trinomial nomenclature. 1.3. Ecology – Concept of ecosystem, Biodiversity and conservation. 1.4. Pollution and climate change	**9H**
II	**Essential of botany** 2.1. The classification of plant kingdom. 2.2. Plant physiological processes (Photosynthesis, Respiration,Transpiration,phytohormones). 2.3. Structure of flower – Micro and macro sporogenesis, pollination, fertilization and structureof mono and dicot embryos. 2.4 Mushroom cultivation, floriculture and landscaping.	**9H**
III	**Essentials of Zoology** 3.1. The classification of Kingdom Animalia and Chordata. 3.2 Animal Physiology – Basics of Organ Systems & their functions, Hormones and Disorders 3.3 Developmental Biology – Basic process of development (Gametogenesis, Fertilization,Cleavage and Organogenesis) 3.4. Economic Zoology – Sericulture, Apiculture, Aquaculture	**9H**
IV	**Cell biology, Genetics and Evolution** 4.1. Cell theory, Ultrastructure of prokaryotic and eukaryotic cell, cell cycle. 4.2. Chromosomes and heredity – Structure of chromosomes, concept of gene. 4.3. Central Dogma of Molecular Biology. 4.4. Origin of life	**9H**
V	**Essentials of chemistry** 5.1. Definition and scope of chemistry, applications(Food,Medicine,Cosmotics,House hold,Soaps&Detergents) of chemistry in daily life.	**9H**

	5.2. Branches of chemistry(Inorganic,Organic,Physical,Analytical &Environmental) 5.3. Chemical bonds – ionic, covalent, noncovalent – Vander Waals, hydrophobic, hydrogenbonds. 5.4.Green chemistry- Importance&Principles of Green chemistry	

5.4. References

1. Sharma O.P., 1993. Plant taxonomy. 2nd Edition. McGraw Hill publishers.
2. Pandey B.P., 2001. The textbook of botany Angiosperms. 4th edition. S. Chand publishers, New Delhi, India.
3. Jordan E.L., Verma P.S., 2018. Chordate Zoology. S. Chand publishers, New Delhi, India.
4. Rastogi, S.C., 2019. Essentials of animal physiology. 4th Edition. New Age International Publishers.
5. Verma P.S., Agarwal V.K., 2006. Cell biology, genetics, Molecular Biology, Evolution and Ecology. S. Chand publishers, New Delhi, India.
6. Sathyanarayana U., Chakrapani, U., 2013. Biochemistry. 4th Edition. Elsevier publishers.
7. Jain J.L., Sunjay Jain, Nitin Jain, 2000. Fundamentals of Biochemistry. S. Chand publishers, New Delhi, India.
8. Karen Timberlake, William Timberlake, 2019. Basic chemistry. 5th Edition. Pearson publishers.
9. Subrata Sen Gupta, 2014. Organic chemistry. 1st Edition. Oxford publishers.

ACTIVITIES:

1. Make a display chart of life cycle of nonflowering plants.
2. Make a display chart of life cycle of flowering plants.
3. Study of stomata
4. Activity to prove that chlorophyll is essential for photosynthesis
5. Study of pollen grains.
6. Observation of pollen germination.
7. Ikebana.
8. Differentiate between edible and poisonous mushrooms.
9. Visit a nearby mushroom cultivation unit and know the economics of mushroom cultivation.
10. Draw the Ultrastructure of Prokaryotic and Eukaryotic Cell
11. Visit to Zoology Lab and observe different types of preservation of specimens

12. Hands-on experience of various equipment – Microscopes, Centrifuge, pH Meter, Electronic Weighing Balance, Laminar Air Flow
13. Visit to Zoo / Sericulture / Apiculture / Aquaculture unit
14. List out different hormonal, genetic and physiological disorders from the society

A.G & S.G. SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCEVuyyuru-521165

NAAC reaccredited at "A" levelAutonomous -ISO 9001 – 2015 Certified

Title Of The Paper: Introduction To Classical Biology-- MODEL PAPER

- I Semester end examinations will be conducting in objective mode.

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Title Of The Paper: Fundamentals in Organic chemistry (Major)

Semester:3 (45 hrs)

Course Code	**23CHMAL231**	**Course Delivery Method**	**Class Room / Blended Mode**
Credits	**4**	CIA Marks	**30**
No. of Lecture Hours / Week	**4**	Semester End Exam Marks	**70**
Total Number of Lecture Hours	**45**	Total Marks	**100**
Year of Introduction : 2023 - 24	Year of Offering: 2024 - 25	Year of Revision: 2024-2025	Percentage of Revision: 100%

Course Description:

Organic chemistry primarily deals with the structure, properties, composition, reactions, and synthesis of carbon-based compounds. While carbon can form compounds with many elements, organic chemistry traditionally focuses on compounds containing carbon and hydrogen, and may also include elements like oxygen, nitrogen, sulfur, phosphorus, and halogens. Organic chemistry is a vast and dynamic field that underpins many aspects of science and industry, including pharmaceuticals, petrochemicals, polymers, and more. Mastery of its fundamentals provides a solid foundation for further study and application in various scientific and practical contexts.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	Studying structural theory in organic chemistry aim is to provide students with a deep understanding of how the structure of organic molecules influences their properties, reactivity, and behavior.
2	Comprehensive understanding of alkanes and cycloalkanes, focusing on their structures, properties, reactions, and real-world applications.
3	Understanding of alkenes and alkynes, focusing on their structures, physical and chemical properties, reactions, and applications.
4	Comprehensive understanding of benzene and its reactivity, focusing on its structure, properties, reactions, and applications.
5	Thorough understanding of the orientation of aromatic substitution, focusing on how different substituent's influence the reactivity and regioselectivity of the aromatic ring in electrophilic aromatic substitution reactions.

Course Outcomes

At the end of the course, the student will be able to…

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Remember the structure of organic molecules influences their properties, reactivity, and behavior.	K1	PO2	PSO2
CO2	Remember alkenes and alkynes, focusing on their structures, physical and chemical properties, reactions, and applications	K1	PO2	PSO2
CO3	Understand chemical reactions ,alkanes ,alkens, alkynes, bezene and its orientation of aromatic substitution	K2	PO2	PSO1
CO4	Understand different substituent's influence the reactivity and regioselectivity of the aromatic ring .	K2	PO7	PSO1
CO5	Apply fundamental chemical reactions on different compounds in organic chemistry	K3	PO1	PSO3

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX										
CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1		2							1	
CO2		2							2	
CO3		1						2		
CO4							1	2		
CO5	2									3

Use the codes 3,2,1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Syllabus

Course Details

Unit	Learning Units	Lecture Hours
I	**Structural theory in Organic Chemistry** Types of bond fission and organic reagents (Electrophilic, Nucleophilic, and free radical reagents). Reaction intermediates – Carbocations, carbanions & free radicals. Bond polarization: Factors influencing the polarization of covalent bonds, inductive effect - Application of inductive effect (a) Basicity of amines (b) Acidity of carboxylic acids (c) Stability of carbonium ions. Resonance or Mesomeric effect, application to (a) acidity of phenol, and (b) acidity of carboxylic acids. Hyper conjugation and its application to stability of carbonium ions, Free radicals and alkenes.	**9Hrs**
II	**Saturated Hydrocarbons (Alkanes and Cycloalkanes)** General methods of preparation of alkanes- Wurtz and Wurtz Fittig reaction, Corey House synthesis, physical and chemical properties of alkanes, Conformational analysis of alkanes (Conformations, relative stability and energy diagrams of Ethane, Propane and butane). General molecular formulae of cycloalkanes and relative stability, Baeyer strain theory, Cyclohexane conformations with energy diagram, Conformations of mono substituted cyclohexane.	9Hrs
III	**Unsaturated Hydrocarbons (Alkenes and Alkynes)** General methods of preparation, physical and chemical properties, Saytzeff and Hoffmann eliminations (with mechanism), Electrophilic Additions, (H_2, HX) mechanism (Markownikoff/ Antimarkownikoff addition) with suitable examples-syn and anti-addition; addition of	9Hrs

	X_2, HX. Oxymercuration demercuration, ozonolysis, hydroxylation, Diels Alder reaction, 1,2- and1,4-addition reactions in conjugated dienes. Reactions of alkynes; acidity, electrophilic and nucleophilic additions, hydration to form carbonyl compounds, Alkylationof terminal alkynes.	
IV	**Concept of aromaticity, Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non - Benzenoid compounds (cyclopropenylcation, cyclopentadienyl anion and tropylium cation)** Structure of Benzene – Preparation - polymerisation of acetylene and decarboxylation- Properties -mechanism of electrophilic aromatic substitution of Friedel- Craft's alkylation and acylation. halogenation and nitration,	**9Hrs**
V	**Orientation of aromatic substitution** Orientation of aromatic substitution - ortho, para and meta directing groups. Ring activating and deactivating groups with examples (Electronic interpretation of various groups like NO_2 and Phenolic). Orientation of (i) Amino, methoxy and methyl groups (ii) Carboxy, nitro, nitrile, carbonyl and sulphonic acid groups (iii) Halogens.	**9Hrs**

II. List of Reference Books

1. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Guide book to Mechanism in Organic Chemistry by Peter Sykes 6^{th} edition,1985.

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INTERNAL ASSESSMENT MODELPAPER SEMESTER-3

SEMESTER-3	**PAPERCODE: 23CHMAL231**
PAPER TITLE : **FUNDAMENTALS IN ORGANIC CHEMISTRY** ACADEMIC YEAR-2024-25	

Section-A

Short Answer Questions (10 Marks) Answer all questions. Each question carries 5 Marks.

Q1 (a) Describe different Types of bond fissions. K2

OR

(b) Explain generation and any two reactions of Carbocation. K2

Q2 (a) Explain Wurtz Fittig reaction. K2

OR

(b) Describe Corey House synthesis. K2

Section-B

Long Answer Questions (20 Marks) Answer All questions. Each question carries 10 Marks.

Q3 (a) Illustrate inductive effect and its Applications in Basicity of amines and Acidity of carboxylic acids K3

OR

(b) Present hyper conjugation and its application K3

Q4 (a) Describe Baeyer strain theory. K2

OR

(b) Describe Conformations, relative stability and energy diagrams of Propane and Butane K2

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MODELPAPER SEMESTER-3

SEMESTER-3	**PAPERCODE: 23CHMAL231**
PAPER TITLE : **FUNDAMENTALS IN ORGANIC CHEMISTRY**	
ACADEMIC YEAR-2024-2025	

Section-A

Short Answer Questions (20 Marks) Answer all questions. Each question carries 4 Marks.

Q1 (a) Explain generation and any two reactions of Carbanion. K2

OR

(b) Describe different Types of bond fissions. K2

Q2 (a) Outline the Conformations, relative stability and energy diagrams of Ethane K1

OR

(b) List the methods of preparation of alkanes. K1

Q3 (A) Describe Diels alder reaction K2

OR

(b) Explain the acidity of alkynes. K2

Q4 (a) Explain the aromaticity of benzenoid compounds with two examples. K2

OR

(b) Explain the methods for preparation of benzene K2

Q5 (a) Illustrate meta directing groups. K3

OR

(b) Illustrate Ring activating and deactivating groups. K3

Section-B

Long Answer Questions (50 Marks) Answer all questions. Each question carries 10 Marks.

Q6 (a) Describe mesomeric effect and its application in acidity of phenol and acidity of carboxylic acids K2

OR

(b) Explain Hyper conjugation and its application to stability of carbonium ions, Free radicals and alkenes. K2

Q7 (a)Discuss Conformations, relative stability and energy diagrams of Propane and butane K2

OR

(b) Explain the following

i) Baeyer strain theory ii) Conformations of mono substituted cyclohexane. K2

Q8 (a) Interpret Markownikoff and Antimarkownikoff rules addition reactions with suitable examples K3

OR

(b) Apply Saytzeff and Hoffmann eliminations reactions with mechanism for preparation Of alkenes. K3

Q9 (a) Discuss Concept of aromaticity and explain aromaticity of non benzenoid compounds with suitable examples K2

OR

(b) Explain the mechanism of Friedel- Craft's alkylation andacylation. halogenation and nitration reactions on benzene K2

Q10 (a) Interpret the ortho and para directing groups. K3

OR

(b) Explain orentation of Carboxy, nitro, nitrile, carbonyl and sulphonic acid group on benzene ring K2

Note: Red colour letters indicate shuffeling of syllabus from unit V to VI

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PRACTICAL SYLLABUS

Practical Paper – V **Organic Qualitative analysis** **Practical syllabus**	**PAPER CODE : 23CHMAP231** **ACADEMIC YEAR-2024-2025**

Course Description:

This course provides an in-depth exploration of qualitative analysis techniques used in organic chemistry to identify and characterize organic compounds. Students will learn to apply systematic methods for the analysis of organic substances, including the use of traditional and modern analytical techniques.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	Perform and interpret various qualitative tests for organic functional groups.
2	Apply systematic approaches to identify unknown organic compounds.
3	Skills in interpreting experimental data and drawing conclusions about the identity of organic compounds.
4	Analyze and present experimental data effectively.
5	Understand suitable derivatives for organic compounds0

Course Outcomes

At the end of the course, the student will be able to…

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Remember different tests for identification of organic compounds	**K1**	**PO2**	**PSO1**
CO2	Remember MP, BP for identification of organic compounds	**K1**	**PO1**	**PSO1**
CO3	Understand suitable derivatives for identification of organic compounds	**K2**	**PO2**	**PSO2**
CO4	Understand MP, BP for identification of organic compounds	**K2**	**PO2**	**PSO 2**
CO5	Apply systematic approaches to identify unknown organic compounds	**K3**	**PO1**	**PSO3**

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX										
CO NO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1		**2**						**1**		
CO2	**1**							**2**		
CO3		**2**							**2**	
CO4		**2**							**2**	
CO5	**3**									**2**

Use the codes 3,2,1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Syllabus

Analysis of an organic compound through systematic qualitative procedure for functional group identification including the determination of melting point and boiling point with suitable derivatives. Alcohols, Phenols, Aldehydes, Ketones, Carboxylic acids, Aromatic primary amines, amides and simple sugars.

Co-curricular activities and Assessment Methods

1. Continuous Evaluation: Monitoring the progress of student's learning.
2. Class Tests, Worksheets and Quizzes.
3. Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality.
4. SEMESTER -End Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the SEMESTER.

Reference books:

1. Vogel A.I .Practical Organic Chemistry, Longman Group Ltd.
2. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley-Eastern.
3. Ahluwalia V. K. and Agarwal R. Comprehensive Practical Organic Chemistry,University press.

SCHEME OF VALUATION

1.INTERNAL MARKS- Record-10M

2. EXTERNAL MAKS-40

- **Practical -30M**

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Title of The Paper: Organic Chemistry (Halogen and Oxygen organic Compounds)(Major)

Semester:3 (45Hrs/WEEK)

Course Code	**23CHMAL232**	**Course Delivery Method**	**Class Room / Blended Mode**
Credits	**4**	CIA Marks	**30**
No. of Lecture Hours / Week	**4**	Semester End Exam Marks	**70**
Total Number of Lecture Hours	**45**	Total Marks	**100**
Year of Introduction : 2023 - 24	Year of Offering: 2024 - 25	Year of Revision:2024-2025	Percentage of Revision: 100

Course Description:

Halogen and oxygen-containing organic compounds are a diverse group of chemicals that feature halogen atoms (such as fluorine, chlorine, bromine, or iodine) and oxygen atoms in their molecular structures. These compounds are prevalent in various chemical industries and have a wide range of applications. Particularly halogenated organics their toxicity and environmental impact require careful handling and disposal. Oxygen-containing compounds play crucial roles in everyday life, from industrial applications to biological processes, and are fundamental to the study and practice of organic chemistry.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	To study the unique chemical properties of halogen compounds, such as their reactivity,electronegativity, and ability to form stable bonds.
2	To explore the chemical properties of alcohols and phenols, including acidity, hydrogen bonding, solubility, and their reactions with other compounds.
3	To Understanding the chemistry of halogen and oxygen-containing organic compounds is crucial for various applications
4	To remember Oxygen-containing organic compounds include a variety of functional groups, each with distinct properties and reactivity's.
5	To remember structural components of carbohydrates, and their classification.

Course Outcomes

At the end of the course, the student will be able to…

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Remember the concept of SN1and SN2and SNi mechanisms. Halogenated organic compounds	K1	PO2	PSO1
CO2	Remember the reactivity of alcohols and phenols. Oxygen containing Organic compounds	K1	PO2	PSO1
CO3	Understand the skills required to propose various mechanisms. Halogen and Oxygen containing organic compounds	K2	PO1	PSO1
CO4	Apply the concepts for synthesizing various oxygen containing organic compounds.	K3	PO7	PSO3
CO5	Apply Interconvertion of the monosaccharides.	K3	PO7	PSO2

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX										
CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1		2						1		
CO2		2						2		
CO3	2							2		
CO4							2			1
CO5							3		2	

Use the codes 3,2,1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Syllabus

Course Details

Unit	Learning Units	Lecture Hours
I	**Halogen compounds** Alkyl halides: Preparation of alkyl halides from i) alkanes, ii) alkenes and iii) alcohols. Properties - nucleophilic substitution reactions–SN1and SN2 and SNi mechanisms with energy profile diagrams, stereo chemical aspects and effect of solvent. Williamson's synthesis. **Aryl halides:** Preparation i) from phenols ii) Sandmeyer's reaction, nucleophilic aromatic substitution (Benzyne mechanism);relative reactivity of alkyl, allyl, vinyl and benzyl, aryl halides towards nucleophilic substitution reactions.	**9Hrs**
II	**Alcohols and Phenols** **Alcohols:** Preparation of 1^0,2^0,3^0alcohols from Grignard's reagent, Bouveault–Blanc Reduction; Chemical properties – substitution of –OH by using PCl_5, PCl_3, PBr_3, $SOCl_2$ and with HX / $ZnCl_2$, Oxidation of alcohols with PCC, PDC; Oxidation of diols by HIO_4 and $Pb(OAc)_4$, Pinacol Pinacolone arrangement with mechanism, relative reactivity of 1°, 2°, 3°alcohols. **Distinguish of alcohols by Lucas reagent and Vector's Mayer's test** **Phenols: Preparation** from diazonium salt and Cumene, **acidic nature of phenols**. Reactions and mechanism–Reimer– Tiemann**,**Kolbe–Schmitt Reactions, Fries and Claisen rearrangements.	9Hrs
III	**Carbonyl Compounds** Preparation from-Acid chlorides,1,3-dithiane and nitriles; Structure and reactivity of carbonyl group, Nucleophilic addition reactions with HCN, $NaHSO_3$, **RMgx , Pcl5 with mechanism** and **formation of Acetals and Hemi Acetals** alcohols. Addition- elimination reactions with hydroxylamine, hydrazine, phenyl hydrazine, 2,4DNP, semicarbazide. Oxidations and reductions **Bayer Villiger oxidation, Oppenaur oxidation, Ozonolysis**(Clemmensen's, Wolf–Kishner's, with$LiAlH_4$ &	9Hrs

	NaBH4). **Reaction & Mechanism-** Aldol condensation, Cannizzaro reaction, Perkin reaction, Benzoin condensation, Claisen-Schmidt reaction, Haloform reaction	
IV	**Carboxylic Acids:** Preparation from Grignard reagent and hydrolysis of nitriles, Reactions of monocarboxylic acids- Reactions involving -H, -OH and-COOH groups, formation of salts, esters, acidchlorides, amides and anhydrides. Degradation of carboxylic acids by Huns- Diecker's reaction, decarboxylation by Schmidt reaction, Arndt-Eistert synthesis, halogenation by Hell- Volhard- Zelinsky reaction. Mechanisms of acidic and alkaline hydrolysis of esters, Reformatsky reactions, Curtius rearrangement. **Active methylene compounds**: Ketoenol tautomerism, preparation of Aceto Acetic Ester (AAE) by Claisen condensation with mechanism,synthetic applications of AAE in the preparation of mono carboxylic acids, di carboxylic acids, α,β-unsaturated acids and heterocyclic compounds.	**9Hrs**
V	**Carbohydrates** Classification and their biological importance, Monosaccharides: Structural elucidation of glucose and fructose, epimers and anomers, mutarotation, determination of ring size of glucose and fructose, Haworth projections and conformational structures; Inter conversions of aldoses and ketoses; Killiani-Fischer synthesis and Ruff degradation; Disaccharides– Haworth structure of maltose, lactose and sucrose.	**9Hrs**

II. List of Reference Books

1. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd.(Pearson Education).
3. Guide book to Mechanism in Organic Chemistry by Peter Sykes 6th edition, 1985.

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INTERNAL ASSESSMENT MODELPAPER SEMESTER-3

SEMESTER-3	**PAPERCODE:23CHMAL232**
PAPER TITLE : **Organic Chemistry (Halogen and Oxygen organic Compounds) (major)**	
ACADEMIC YEAR-2024-2025	

Section A:

Short Answer Questions (10 Marks) Answer all questions. Each question carries 5 Marks.

Q1 (a) State any two methods for preparation of alkyl halides K1

OR

(b) Tell Williamson's synthesis with an example. K1

Q2 (a) State Pinacol Pinacolone arrangement with mechanism K1

OR

(b) Describe acidic nature of phenols K1

Section B:

Long Answer Questions (20 Marks) Answer all questions. Each question carries 10 Marks.

Q3 (a) Explain mechanisms with energyprofile diagrams, stereo chemistry of SN1 and SN2 reactons K2

OR

(b) Describe the mechanism of Sandmeyer's reaction and nucleophilic aromatic substitution. K2

Q4 (a) Explain Oxidation of alcohols with PCC, PDC K2

OR

(b) Describe the mechanism of Reimer– Tiemann and Kolbe–Schmitt Reactions K2

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(Accredited at "A" Grade by NAAC, Bangalore)
INTERNAL ASSESSMENT MODELPAPER SEMESTER-3

SEMESTER-3	**PAPERCODE:23CHMAL232**
PAPER TITLE: **Organic Chemistry (Halogen and Oxygen organic Compounds) (major)** **ACADEMIC YEAR-2024-2025**	

SEMESTER -END QUESTION PAPER

Section-A

Short Answer Questions (20 Marks) Answer All questions. Each question carries 4 Marks.

Q1	(a) State any two methods for preparation of alkyl halides	K1
	OR	
	(b) Tell relative reactivity of alkyl, allyl, vinyl and benzyl, aryl halides	K1
Q2	(a) State Pinacol Pinacolone arrangement with mechanism	K1
	OR	
	(b) Tell the mechanism of Bouveault–Blanc Reduction	K1
Q3	(a) Interpret the mechanism of Clemmensen reduction.	K2
	OR	
	(b) Interpret the mechanism of Cannizzaro reaction	
Q4	(a) Explain Ketoenol tautomerism with suitable examples.	K3
	OR	
	(b) Interpret the mechanism Curtius rearrangement.	K3
Q5	(a) Discuss Structural elucidation of glucose	K2
	OR	
	(b) Explain the Haworth structure of maltose and sucrose	K2

Section-B

Long Answer Questions (50 Marks) Answer All questions. Each question carries 10 Marks.

Q6 (a) Explain mechanisms and stereo chemistry of SN1 and SN2 reactons K2

OR

(b) Describe the mechanism of Sandmeyer's reaction and nucleophilic aromatic substitution K2

Q7 (a) Explain Oxidation of diols by HIO_4 and $Pb(OAc)_4$ K2

OR

(b) Describe the mechanism of Reimer– Tiemann **and** Kolbe–Schmitt Reactions K2

Q8 (a) interpret the mechanism of 2,4DNP and Bayer Villiger oxidation K3

OR

(b) Interpret the mechanism of Aldol condensation and Perkin reaction K3

Q9 (a) Explain Mechanisms of acidic and alkaline hydrolysis of esters K3

OR

(b) Explain the preparation and synthetic applications of Aceto AceticEster. K3

Q10 (a) Illustrate the mechanism of Killiani-Fischer synthesis and Ruff degradation K3

OR

(b)Explain Classification and their biological importance, Monosaccharides K3

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PRACTICAL SYLLABUS

Practical Paper – VI **ORGANIC PREPARATIONS** **Practical syllabus**	**PAPER CODE : 23CHMAP232** **ACADEMIC YEAR-2024-2025**

Course Description: Organic chemistry preparations refer to methods and techniques used to synthesize organic compounds. These methods can range from basic to advanced, depending on the complexity of the molecule being prepared. Acetylation is a chemical reaction where an acetyl group (CH_3CO) is added to a molecule. This process is often used to modify functional groups, such as converting alcohols to acetates or amines to acetamides. Acetylation is commonly achieved using acetyl chloride (CH_3COCl) or acetic anhydride ($(CH_3CO)_2O$) as the acetylating agents. It's widely used in organic synthesis to protect reactive groups or alter physical properties of compounds.

Course Aims and Objectives:

S.N O	COURSE OBJECTIVES
1	Learn fundamental concepts and techniques used in organic synthesis, by green and conventional methods including reaction mechanisms, stereochemistry, and functional group transformations
2	Remember use principles, equipment and chemicals reactions and follow experimental procedures in the laboratory.
3	Study how acetylation is employed in organic synthesis to modify and synthesize various compounds by green and conventional methods
4	Write detailed laboratory reports and present findings clearly and professionally, demonstrating an understanding of the experimental procedures and outcomes
5	Understand to calculate limiting reagent, theoretical yield, and percent yield.

Course Outcomes

At the end of the course, the student will be able to…

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Remember use glassware, equipment and chemicals and follow experimental procedures in the laboratory.	K1	PO2	PSO1
CO2	Remember to calculate limiting reagent, theoretical yield, and percent yield	K1	PO1	PSO1
CO3	Understand principles involved in organic preparations using green and conventional method	K2	PO1	PSO1
CO4	Understand laboratory techniques including reflux, distillation, recrystallization	K2	PO2	PSO2
CO5	Apply the procedure **in** organic preparations using green and conventional method**.**	K3	PO2	PSO3

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX										
CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1		2						2		
CO2		3						2		
CO3	3							2		
CO4		2							2	
CO5		3								2

Use the codes 3,2,1 for High, Moderate and Low correlation Between CO-PO-PSO respectivelySyllabus - Organic preparations (50M)

i. Acetylation of β-naphthol, **Aniline** and salicylic acid by:

a) Using conventional method.

b) Using green approach

c) Preparation of p-Bromoacetnilide from Acetanilide

d) Preparation of P-nitroacetanilide from acetanilide

ii.

iii. Preparation of Nerolin

Co-curricular activities and Assessment Methods;

1. Continuous Evaluation: Monitoring the progress of student's learning
2. Class Tests, Worksheets and Quizzes
3. Presentations, Projects and Assignments and Group Discussions:Enhances critical thinking skills and personality
4. SEMESTER -End Examination: critical indicator of student's learning andteaching methods adopted by teachers throughout the SEMESTER.

Reference books:

1. Vogel A.I .Practical Organic Chemistry, Longman Group Ltd.
2. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley-Eastern.
3. Ahluwalia V. K. and Agarwal R. Comprehensive Practical Organic Chemistry,University press.

SCHEME OF VALUATION

1.INTERNAL MARKS- Record-10M
2. EXTERNAL MAKS-40

Practical -30M

NOTE: words in red color indicate enhancement of practica

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Autonomous -ISO 9001 – 2015 Certified

Title of The Paper: PHYSICAL CHEMISTRY - I (Major)

Semester:3 (60)hr

Course Code	**23CHMAL233**	**Course Delivery Method**	**Class Room / Blended Mode**
Credits	**4**	CIA Marks	**30**
No. of Lecture Hours / Week	**4**	Semester End Exam Marks	**70**
Total Number of Lecture Hours	**45**	Total Marks	**100**
Year of Introduction : 2023 - 24	Year of Offering: 2024 - 25	Year of Revision:2024-2025	Percentage of Revision: 100

Course Description: Solutions are a key topic in physical chemistry, involving the study of homogeneous mixtures where one substance (the solute) is uniformly distributed in another substance Colligative properties are characteristics of solutions that depend on the number of solute particles in a given quantity of solvent, rather than the type of solute particles. These properties are useful in understanding how solutions behave and are influenced by the presence of solutes. Photochemistry is the branch of chemistry that studies the chemical effects of light. It explores how light interacts with matter, leading to chemical changes. This field is crucial for understanding various natural processes and has practical applications in areas such as materials science, environmental science, and medicine. Electrochemistry is the branch of chemistry that deals with the relationship between electrical energy and chemical changes. It explores how chemical reactions can produce electrical energy and how electrical energy can drive chemical reactions. This field is crucial for many technologies, including batteries, fuel cells, and electroplating.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	Understand the ideal and non ideal behavior of solutions Colligative Properties of solutions
2	Explain the importance of emf and its applications, Potentiometric titrations. Fuelcells
3	Determine the molecular mass of non-volatile solutes, Abnormal colligative properties
4	Apply the principles of electrical conductivity conductometric titrations
5	Discuss the basic concepts of Photochemistry and Laws of photochemistry

Course Outcomes

At the end of the course, the student will be able to…

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Remember the importance of colligative properties in dilute solutions	K1	PO2	PSO2
CO2	Remember the ideal and non ideal behavior of solutions	K1	PO2	PSO2
CO3	Understand Basic concept of Electrochemistry and its applications	K2	PO7	PSO1
CO4	Understand basic principle of Kinetics and increase critical reading about laws of Photo Chemistry	K2	PO2	PSO1
CO5	Apply different types of electrodes in Electrochemistry for determination of EMF of a cell	K3	PO7	PSO3

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX										
CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1		2							2	
CO2		2							1	
CO3							2	1		
CO4		1						2		
CO5							1			1

Use the codes 3,2,1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Course Details

Unit	Learning Units	Lecture Hours
I	**Solutions** Classification - Miscible, Partially miscible and Immiscible - Raoult's Law - Azeotropes- HCl-H_2O system and ethanol-water system. Partially miscible liquids- phenol- water system. Critical solution temperature (CST), Effect of impurity on consulate temperature. Immiscible liquids and steam distillation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.	**9Hrs**
II	**Colligative Properties** Relative lowering of Vapour Pressure, Elevation in boing point depression in freezing point and Osmotic pressure. Determination of molecular mass of non-volatile solute by Ostwald- Walker method, Cottrell's method, Rast method and Barkeley-Hartley method.Abnormal colligative properties. Van't Hoff factor.	9Hrs
III	**Photochemistry** Difference between thermal and photochemical processes, Laws of photochemistry- Grothus- Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield- Photochemical reaction mechanism- hydrogen- chlorine and hydrogen- bromine reaction. Qualitative description of fluorescence, phosphorescence, Jablonski diagram, chemiluminescence - Photosensitized reactions- energy transfer processes (simple example), quenching, Photo stationary state.	9Hrs
IV	**Electrochemistry-I** Conductance, Specific conductance, equivalent conductance and molar conductance - effect of dilution. Cell constant. Strong and weak electrolytes, Kohlrausch's law and its applications, Definition of transport number, determination of transport number by Hittorf's method. Debye-Huckel - Onsagar's equation for strong electrolytes (derivation excluded), Application of conductivity measurements- conductometric titrations.	**9Hrs**
V	**Electrochemistry-II** Electrochemical Cells- Single electrode potential, Types of electrodes with examples: Metal- metal ion, Gas electrode, Inert electrode, Redox electrode, Metal-metal	**9Hrs**

	insoluble salt- salt anion. Determination of EMF of a cell, Nernst equation, Applications of EMF measurements-Potentiometric titrations. Fuelcells – Basic concepts, examples and applications.	

List of Reference books:

1) Principles of physical chemistry by Prutton and Marron

2) Solid State Chemistry and its applications by Anthony R. West

3) Text book of physical chemistry by K L Kapoor

4) Text book of physical chemistry by S Glasstone

5) Advanced physical chemistry by Bahl and Tuli

6) Advanced physical chemistry by Gurudeep Raj

7) Principles of physical chemistry by Puri, Sharma and Pathania.

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INTERNAL ASSESSMENT MODELPAPER SEMESTER-3

SEMESTER-3	**PAPERCODE: 23CHMAL233**
PAPER TITLE : PHYSICAL CHEMISTRY - I (Major) **ACADEMIC YEAR-2024-2025**	

Section-A

Short Answer Questions (10 Marks)Answer all questions. Each question carries 5 Marks.

Q1 (a) Discuss the Azeotropes with an examples K2

OR

(b) Discuss the Nernst distribution law K2

Q2 (a) Define colligative properties. K1

OR

(b) State Van'n Hoff factor for Abnormal colligative properties K1

Section-B

Long Answer Questions (20 Marks)Answer all questions. Each question carries 10 Marks.

Q3 (a) Discuss the Applications of distribution law and Calculation of the partition Coefficient K2

OR

(b) Discuss Classification of Miscible, Partially miscible and Immiscible and state Raoult's Law K2

Q4 (a) Define osmatic pressure and give experimental determination of osmatic pressure by Barkeley-Hartley method. K1

OR

(b) Define Relative lowering of Vapour Pressure give experimental determination of lowering of Vapour Pressure by Ostwald- Walker method K1

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INTERNAL ASSESSMENT MODELPAPER SEMESTER-3

SEMESTER-3	**PAPERCODE: 23CHMAL233**
PAPER TITLE : : PHYSICAL CHEMISTRY - I (major)	
ACADEMIC YEAR-2024-2025	

SEMESTER -END QUESTION PAPER

Section A:
Short Answer Questions (20 Marks)
Answer All questions. Each question carries 4 Marks.

Q1 (a) Discuss the Azeotropes with an examples K2

OR

(b) Discuss the Nernst distribution law K2

Q2(a) Define Relative lowering of Vapour Pressure, Elevation in boing point K1

OR

(b) State Van't Hoff factor for Abnormal colligative properties K1

Q3(a) Explain Quantum yield- Photochemical reaction K2

OR

(b)Explain differences beween fluorescence and phosphorescence K2

Q4 (a) State Kohlrausch's law and its any two applications K2

OR

(b) State Debye-Huckel - Onsagar's equation for strong electrolytes K2

Q5(a) State Nernst equation K2

OR

(b) Give the constrction of fuel bcells and write any two of its application K2

Section B:

Long Answer Questions (50 Marks)

Answer All questions. Each question carries 10 Marks.

Q6 (a) Explain Raoult's Law and discuss HCl-H2O system and ethanol-water system. K2

OR

(b) Critical solution temperature (CST) Effect of impurity on CST K2

Q7 (a) Define osmatic pressure and give experimental determination of osmatic pressure by Barkeley-Hartley method. K1

OR

(b) Give experimental determination of lowering of Vapour Pressure by Ostwald- Walker method K1

Q8 (a) Explain Grothus- Draper's law and Stark-Einstein's law of photochemical equivalence K2

OR

(b)Explain Jablonski diagram, Chemiluminescence K2

Q9 (a) Define of transport number and Describe the determination of transport number by Hittorf's method. K3

OR

(b)Explain different types of conductometric titrations with an example each. K3

Q10 (a) Describe Single electrode potential, Types of electrodes with examples K2

OR

(b) Define EMF? Determination of EMF of a cell, and give any four Applications of EMF measurements K2

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PRACTICAL SYLLABUS

Practical Paper – VII **PHYSICAL CHEMISTRY -I** **Practical syllabus**	**PAPER CODE : 23CHMAP233** **ACADEMIC YEAR-2024-2025**

Course Description:

Conductometric and potentiometric titrations are important techniques in Physical Chemistry, particularly for understanding the properties of solutions and reactions. Critical Solution Temperature of a partially miscible liquid system, such as phenol-water, by heating and cooling the mixture until it becomes homogeneous and then phase separates again. To measure the conductance of a solution during a titration to determine the endpoint, especially useful for titrations involving weak acids and bases. To determine the endpoint of a titration by measuring the potential (voltage) of the solution using an electrode.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	Understand the concept of Critical Solution Temperature (CST) and its significance in the context of phase separation in solutions.
2	Understand The effect of NaCl (sodium chloride) on the Critical Solution Temperature (CST) depends on the system in question, particularly the nature of the solutes and solvents involved
3	Explain the fundamental principles behind conductometric titration, including the relationship between electrical conductivity and ion concentration.
4	Identify the equivalence point from the titration curve by analyzing changes in the slope of the conductivity data.
5	Able to determine unknown strength of acids by using conductometric titrations

Course Outcomes

At the end of the course, the student will be able to…

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Remember the use of glassware, equipment and chemicals and follow experimental procedures in the laboratory.	**K1**	**PO1**	**PSO1**
CO2	Understand Principles and concepts of CST and conductometric titrations practically.	**K2**	**PO2**	**PSO2**
CO3	Apply concepts of Determination of concentration of mixture of acids by using strong base.	**K3**	**PO7**	**PSO1**
CO4	Understand Principles and concepts of Potentiometric titrations	**K2**	**PO2**	**PSO1**
CO5	Apply the concepts and procedures for conductometric & potentiometric titrations	**K3**	**PO7**	**PSO2**

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX										
CO NO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	**2**							**2**		
CO2		**3**							**2**	
CO3							**2**	**1**		
CO4		**2**						**2**		
CO5							**3**		**2**	

Use the codes 3,2,1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Syllabus

CST, Conductometric and Potentiometric Titrimetry **50 M**

1. Determination of CST for Phenol-water system.
2. Effect of electrolyte on CST.
3. Conductometric titration - Determination of concentration of HCl solution usingstandard NaOH solution.
4. Conductometric titration – Determination of concentration of CH_3COOHSolution using standard NaOH solution.
5. Conductometric titration- Determination of concentration of acid mixture using standard NAOH solution.
6. **Conductometric titration- determination of dissociation constant of Acetic acid**
7. Potentiometric titration-Determination of concentration of HCl using standard NaOH solution.

II. Co-curricular activities and Assessment Methods;

1) Continuous Evaluation: Monitoring the progress of student's learning
2) Class Tests, Worksheets and Quizzes
3) Presentations, Projects and Assignments and Group Discussions: Enhancescritical thinking skills and personality
4) SEMESTER -End Examination: critical indicator of student's learning and teachingmethods adopted by teachers throughout the SEMESTER.

III. List of reference books:

1) A Text Book of Quantitative Inorganic Analysis(3^{rd}Edition) –A.I.Vogel
2) Web related references suggested by teacher.

SCHEME OF VALUATION

1.INTERNAL MARKS- Record-10M

2. EXTERNAL MAKS-40

Practical -30M

NOTE: words in red color indicate enhancemnt of practica

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Title of The Paper: INORGANIC AND PHYSICAL CHEMISTRY (Major)

Semester:3 (45)hr

Course Code	23CHMAL234	**Course Delivery Method**	**Class Room / Blended Mode**
Credits	**4**	CIA Marks	**30**
No. of Lecture Hours / Week	**4**	Semester End Exam Marks	**70**
Total Number of Lecture Hours	**45**	Total Marks	**100**
Year of Introduction : 2023 - 24	Year of Offering: 2024 - 25	Year of Revision:2024-2025	Percentageof Revision:100

Course Description: Inorganic and physical chemistry are two fundamental branches of chemistry, each focusing on different aspects of chemical science. Understanding the intersection and distinctions between these fields is crucial for a comprehensive grasp of chemistry inorganic chemistry focuses on the study of inorganic compounds and materials, while physical chemistry deals with the physical principles and theories underlying chemical processes. Together, they provide a comprehensive understanding of both the substances and the phenomena that occur in chemical reactions.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	To learn nomenclature of co-ordinated complexes and various theories, structure and stereo chemistry of coordinationcompounds.
2	To Apply IUPAC nomenclature for complexes of Coordination compounds
3	To Learn labile and inert complexes and in organic reaction mechanism and stability of complexes
4	To understand the relationships between heat, work, and energy. It provides a framework for understanding how energy is transferred and transformed in physical and chemical processes.
5	To learn how to apply thermodynamic concepts such as enthalpy, entropy, and Gibbs free energy to predict the feasibility and direction of chemical reactions and phase changes.

Course Outcomes

At the end of the course, the student will be able to…

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Apply IUPAC nomenclature for Coordination compounds	K3	PO2	PSO3
CO2	Understand the various theories, structure and stereo chemistry of coordination compunds	K2	PO2	PSO2
CO3	Understand the basic concepts of thermodynamics.	K2	PO2	PSO2
CO4	Remember the reaction mechanism in complexes	K1	PO7	PSO2
CO5	Apply the 18 electron rule in inorganic chemistry.	K3	PO7	PSO3

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX										
CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1		2								1
CO2		3							2	
CO3		2							2	
CO4							3		3	
CO5							2			2

Use the codes 3,2,1 for High, Moderate and Low correlation Between CO-PO-PSOrespectively

Course Details

Unit	Learning Units	Lecture Hours
I	**Coordination Chemistry-I** IUPAC nomenclature of Coordination compounds, structural and stereo isomerism in complexes with coordination numbers 4 and 6. Valence Bond Theory(VBT):Postulates- magnetic properties-Inner and outer orbital complexes. Limitations of VBT, CFT-Postulates Splitting in Octahedral, tetrahedral, tetragonal and square planar fields. Crystal field stabilization energy(CFSE), Crystal field effects for weak and strong fields. Factors affecting the magnitude of crystal field splitting energy, Spectro chemical series, Tetragonal distortion of octahedral geometry, Jahn-Teller distortion	**9Hrs**
II	**Coordination Chemistry II** **Inorganic molecular Reaction Mechanism**: Introduction to inorganic reaction mechanisms. Concept of reaction pathways, transition state, intermediate and activated complex. Labile and inert complexes, ligand substitution reactions – SN1 and SN2, Substitution reactions in square planar complexes, Trans-effect, theories of trans effect and its applications **Stability of metal complexes:** Thermodynamic stability and kinetic stability, factors affecting the stability of metal complexes, chelate effect, determination of composition of complex by Job's method and mole ratio method.	9Hrs
III	**Organo metallic compounds** Definition and classification of organo metallic Compounds on the basis of bond type, Metalcarbonyls:18electron rule, electron count of mononuclear, poly nuclear and substituted metal carbonyls of 3d series. General methods of preparation of mono and binuclear carbonyls of 3d series. π-acceptor behaviour of	9Hrs

	CO (MO diagram of CO to be discussed), synergic effect and use of IR data to explain extent of back bonding.	
IV	**Thermodynamics- I** Concept of heat(q), work(w), internal energy(U), State function and Path function- statement of first law; enthalpy(H), relation between heat capacities, calculations of q, w, U and H for reversible, irreversible processes, Joule-Thomson effect-coefficient, Calculation of work for the expansion of perfect gas under isothermal and adiabatic conditions for reversible processes. Temperature dependence of enthalpy of formation-Kirchoff's equation.	**9Hrs**
V	**Thermodynamics II** State function and Path function Different Statements of the law, Carnot cycle and its efficiency, Carnot theorem, Concept of entropy, entropy as a state function, entropy changes in reversible and irreversible processes. Entropy changes in spontaneous and equilibrium processes. Third law of thermodynamics, Nernst heat theorem, Spontaneous and non-spontaneous processes, Helmholtz and Gibbs equation - Criteria for spontaneity.	**9Hrs**

List of Reference Books:

1) Concise coordination chemistry by Gopalan and Ramalingam
2) Coordination Chemistry by Basalo and Johnson
3) Text book of physical chemistry by S Glasstone
4) Concise Inorganic Chemistry by J.D.Lee
5) Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
6) A Text Book of Physical Chemistry by K.L.Kapoor Vol 2, 6^{th} edition, 2019.

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INTERNAL ASSESSMENT MODELPAPER SEMESTER-3

SEMESTER-3	**PAPERCODE: 23CHMAL234**
PAPER TITLE INORGANIC AND PHYSICAL CHEMISTRY (major) **ACADEMIC YEAR-2024-2025**	

Section-A
Short Answer Questions (10 Marks)
Answer all questions. Each question carries 5 Marks.

Q1 (a) Describe structural isomerism in coordination complexes. K2

OR

(b) Discuss the Jahn-Teller distortion in square planar complexes. K2

Q2 (a) Define Labile and inert complexes. K1

OR

(b) Define Trans-effect and explain theories of Trans effect. K1

Section-B
Long Answer Questions (20 Marks)
Answer all questions. Each question carries 10 Marks.

Q3 (a) Explain Valence Bond Theory of Inner and outer orbital complexes. K2

OR

(b) Describe crystal field Splitting in Octahedral and tetrahedral complexes K2

Q4 (a) Explain ligand substitution reactions in square planar complexes. K2

OR

(b) Explain the following.

i) Factors affecting the stability of metal complexes K2

ii) Determination of composition of complex by Job's method K2

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INTERNAL ASSESSMENT MODELPAPER SEMESTER-3

SEMESTER-3	**PAPERCODE: 23CHMAL234**
PAPER TITLE : INORGANIC AND PHYSICAL CHEMISTRY (major) ACADEMIC YEAR-2024-2025	

SEMESTER -END QUESTION PAPER

Section A: Short Answer Questions (20 Marks)

Answer All questions. Each question carries 4 Marks.

Q1	(a) Describe structural isomerism in coordination complexes	K1
	OR	
	(b) Discuss the Jahn-Teller distortion in square planar complexex.	K1
Q2	(a) Define trans effect and write any of its two applications	K1
	OR	
	(b)Define chelates and effect of chelate in stability of comoplexes.	K1
Q3	(a) Describe 18electron rule with an example.	K2
	OR	
	(b) explain π-acceptor behaviour of CO	K2
Q4	(a) Explain Joule-Thomson effect	K2
	OR	
	(b) Describe State function and Path function	K2
Q5	(a) Illustrate the Concept of entropy.	K3
	OR	
	(b)Explain Third law of thermodynamics	K3

Section B:

Long Answer Questions (50 Marks)

Answer All questions. Each question carries 10 Marks.

(a) Explain postulates of Valence Bond Theory and Inner and outer orbital complexes. K2

OR

(b) Describe crystal field Splitting in Octahedral and tetrahedral complexes K2

Q7 (a) Explain ligand substitution reactions in square planar complexes. K2

OR

(b) Explain the following .

i) factors affecting the stability of metal complexes

ii) determination of composition of complex by Job's method K2

Q8 a) Define organo metallic compounds and give its classification K3

OR

(b) Give general methods of preparation of mono and binuclear carbonyl compounds. K3

Q9 (a) Calculate work for the expansion of perfect gas under isothermal and adiabatic conditions K3

OR

(b) Explain following K3

i) Temperature dependence of enthalpy

ii) Kirchoff's equation.

Q10 (a) Explain Carnot theorem and construct Carnot cycle and its efficiency K3

OR

(b) Explain the following

i) Nernst heat theorem for Spontaneous and non- spontaneous processes.

ii) Derivation of Helmholtz and Gibbs equation K3

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PRACTICAL SYLLABUS

Practical Paper – VII **QUALITATIVE INORGANIC ANALYSIS** **Practical syllabus**	**PAPER CODE : 23CHMAP234** **ACADEMIC YEAR-2024-2025**

Course Description: Qualitative inorganic analysis is a branch of chemistry focused on identifying the composition of inorganic compounds or mixtures. It's a fundamental aspect of chemistry, especially in contexts where determining the presence of specific elements or ions is crucial. Qualitative inorganic analysis is essential in various fields, including environmental testing, forensic analysis, and industrial quality control. It requires a solid understanding of chemical reactivity and the ability to interpret experimental results accurately

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	Gain a solid grasp of the theoretical concepts behind qualitative inorganic analysis
2	Learn the principles of separation and identification of ions in a mixture
3	Learn to perform classical tests such as precipitation, flame tests, and complexation reactions.
4	Learn to identify the cations and anions present in a mixture through a series of confirmatory tests.
5	Learn to use these references to support the analysis and interpretation of results.

Course Outcomes

At the end of the course, the student will be able to…

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Remember use glassware, equipment and chemicals and follow experimental procedure.	K1	PO1	PSO1
CO2	Understand the basic concepts of qualitative analysis of inorganic mixture **.**	K2	PO2	PSO1
CO3	Understand the analysis of mixture salt containing two anions and two cations.	K2	PO2	PSO2
CO4	Apply the concepts of common ion effect, solubility product and concepts related toqualitative analysis.	K3	PO7	PSO2
CO5	Apply the procedure for salt mixture and report anions a cations present in it.	K3	PO7	PSO2

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX										
CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	1							1		
CO2		2						2		
CO3		3							2	
CO4							3		3	
CO5							2		2	

Use the codes 3,2,1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Analysis of Mixture **50M**

Analysis of mixture salt containing two anions and two cations (From two different groups)from the following:

Anions: Carbonate, Sulphate, Chloride, Bromide, Acetate, Nitrate, Borate, Phosphate. **Cations:** Lead, Copper, Iron, Aluminium, Zinc, Nickel, Manganese, Calcium, Strontium, Barium, magnesium and Ammonium.

Minimum of Six mixtures should be analyzed.

Co-curricular activities and Assessment Methods

1) Continuous Evaluation: Monitoring the progress of student's learning
2) Class Tests, Worksheets and Quizzes Presentations, Projects and Assignments and Group Discussions: Enhancescritical thinking skills and personality
3) SEMESTER - End Examination: critical indicator of student's learning and teachingmethods adopted by teachers throughout the SEMESTER .

List of Text books:

1. A textbook of qualitative inorganic analysis by A.I. Vogel.

SCHEME OF VALUATION

1.INTERNAL MARKS- Record-10M

2. EXTERNAL MAKS-40

Practical -30M

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Title Of The Paper: Fundamentals in Organic chemistry (Minor)

Semester:3 (45 hr)

Course Code	**23CHMIL231**	**Course Delivery Method**	**Class Room / Blended Mode**
Credits	**4**	CIA Marks	**30**
No. of Lecture Hours / Week	**4**	Semester End Exam Marks	**70**
Total Number of Lecture Hours	**45**	Total Marks	**100**
Year of Introduction : 2023 - 24	Year of Offering: 2024 - 25	Year of Revision:2024-2025	Percentageof Revision:100

Course Description:

Organic chemistry primarily deals with the structure, properties, composition, reactions, and synthesis of carbon-based compounds. While carbon can form compounds with many elements, organic chemistry traditionally focuses on compounds containing carbon and hydrogen, and may also include elements like oxygen, nitrogen, sulfur, phosphorus, and halogens. Organic chemistry is a vast and dynamic field that underpins many aspects of science and industry, including pharmaceuticals, petrochemicals, polymers, and more. Mastery of its fundamentals provides a solid foundation for further study and application in various scientific and practical contexts.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	Studying structural theory in organic chemistry aim is to provide students with a deep understanding of how the structure of organic molecules influences their properties, reactivity, and behavior.
2	Comprehensive understanding of alkanes and cycloalkanes, focusing on their structures, properties, reactions, and real-world applications.
3	Understanding of alkenes and alkynes, focusing on their structures, physical and chemical properties, reactions, and applications.
4	Comprehensive understanding of benzene and its reactivity, focusing on its structure, properties, reactions, and applications.
5	Thorough understanding of the orientation of aromatic substitution, focusing on how different substituent's influence the reactivity and regioselectivity of the aromatic ring in electrophilic aromatic substitution reactions.

Course Outcomes

At the end of the course, the student will be able to…

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Remember the structure of organic molecules influences their properties, reactivity, and behavior.	K1	PO2	PSO2
CO2	Remember alkenes and alkynes, focusing on their structures, physical and chemical properties, reactions, and applications	K1	PO2	PSO2
CO3	Understand chemical reactions ,alkanes ,alkens, alkynes, bezene and its orientation of aromatic substitution	K2	PO2	PSO1
CO4	Understand different substituent's influence the reactivity and regioselectivity of the aromatic ring .	K2	PO7	PSO1
CO5	Apply fundamental chemical reactions on different compounds in organic chemistry	K3	PO1	PSO3

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX										
CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1		2							1	
CO2		2							2	
CO3		1						2		
CO4							1	2		
CO5	2									3

Use the codes 3,2,1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Syllabus

Course Details

Unit	Learning Units	Lecture Hours
I	**Structural theory in Organic Chemistry** Types of bond fission and organic reagents (Electrophilic, Nucleophilic, and free radical reagents). Reaction intermediates – Carbocations, carbanions & free radicals. Bond polarization: Factors influencing the polarization of covalent bonds, inductive effect - Application of inductive effect (a) Basicity of amines (b) Acidity of carboxylic acids (c) Stability of carbonium ions. Resonance or Mesomeric effect, application to (a) acidity of phenol, and (b) acidity of carboxylic acids. Hyper conjugation and its application to stability of carbonium ions, Free radicals and alkenes.	**9Hrs**
II	**Saturated Hydrocarbons (Alkanes and Cycloalkanes)** General methods of preparation of alkanes- Wurtz and Wurtz Fittig reaction, Corey House synthesis, physical and chemical properties of alkanes, Conformational analysis of alkanes (Conformations, relative stability and energy diagrams of Ethane, Propane and butane). General molecular formulae of cycloalkanes and relative stability, Baeyer strain theory, Cyclohexane conformations with energy diagram, Conformations of mono substituted cyclohexane.	9Hrs
III	**Unsaturated Hydrocarbons (Alkenes and Alkynes)** General methods of preparation, physical and chemical properties, Saytzeff and Hoffmann eliminations (with mechanism), Electrophilic Additions, (H_2, HX) mechanism (Markownikoff/ Antimarkownikoff addition) with suitable examples-syn and anti-addition; addition of	9Hrs

	X_2, HX. Oxymercuration demercuration, ozonolysis, hydroxylation, Diels Alder reaction, 1,2- and1,4-addition reactions in conjugated dienes. Reactions of alkynes; acidity, electrophilic and nucleophilic additions, hydration to form carbonyl compounds, Alkylationof terminal alkynes.	
IV	**Concept of aromaticity, Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non - Benzenoid compounds (cyclopropenylcation, cyclopentadienyl anion and tropylium cation)** Structure of Benzene – Preparation - polymerisation of acetylene and decarboxylation- Properties -mechanism of electrophilic aromatic substitution of Friedel- Craft's alkylation and acylation. halogenation and nitration,	**9Hrs**
V	**Orientation of aromatic substitution** Orientation of aromatic substitution - ortho, para and meta directing groups. Ring activating and deactivating groups with examples (Electronic interpretation of various groups like NO_2 and Phenolic). Orientation of (i) Amino, methoxy and methyl groups (ii) Carboxy, nitro, nitrile, carbonyl and sulphonic acid groups (iii) Halogens.	**9Hrs**

II. List of Reference Books

1. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Guide book to Mechanism in Organic Chemistry by Peter Sykes 6^{th} edition,1985.

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INTERNAL ASSESSMENT MODELPAPER SEMESTER-3

SEMESTER-3	**PAPERCODE: 23CHMIL231**
PAPER TITLE : **FUNDAMENTALS IN ORGANIC CHEMISTRY** ACADEMIC YEAR-2024-2025	

Section-A
Short Answer Questions (10 Marks)
Answer all questions. Each question carries 4 Marks.

Q1 (a) Describe different Types of bond fissions. K2

OR

(b) Explain generation and any two reactions of Carbocation. K2

Q2 (a) Explain Wurtz Fittig reaction. K2

OR

(b) Describe Corey House synthesis. K2

Section B:
Long Answer Questions (20 Marks)
Answer All questions. Each question carries 10 Marks.

Q3 (a) Illustrate inductive effect and its Applications in Basicity of amines and Acidity of carboxylic acids K3

OR

(b) Present hyper conjugation and its application K3

Q4 (a) Describe Baeyer strain theory. K2

OR

(b) Describe Conformations, relative stability and energy diagrams of Propane and Butane K2

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MODELPAPER SEMESTER-3

SEMESTER-3	**PAPERCODE: 23CHMIL231**
PAPER TITLE : **FUNDAMENTALS IN ORGANIC CHEMISTRY** ACADEMIC YEAR-2024-2025	

Section A:

Short Answer Questions (20 Marks)

Answer all questions. Each question carries 4 Marks.

Q1	(a) Explain generation and any two reactions of Carbanion.	K2
	OR	
	(b) Describe different Types of bond fissions.	K2
Q2	(a) Outline the Conformations, relative stability and energy diagrams of Ethane	K1
	OR	
	(b) List the methods of preparation of alkanes.	K1
Q3	(A) Describe Diels alder reaction	K2
	OR	
	(b) Explain the acidity of alkynes.	K2
Q4	(a) Explain the aromaticity of benzenoid compounds with two examples.	K2
	OR	
	(b) Explain the methods for preparation of benzene	K2
Q5	(a) Illustrate meta directing groups.	K3
	OR	
	(b) Illustrate Ring activating and deactivating groups.	K3

Section-B

Long Answer Questions (50 Marks)

Answer all questions. Each question carries 10 Marks.

Q6 (a) Describe mesomeric effect and its application in acidity of phenol and acidity of carboxylic acids K2

OR

(b) Explain Hyper conjugation and its application to stability of carbonium ions, Free radicals and alkenes. K2

Q7 (a) Discuss Conformations, relative stability and energy diagrams of Propane and butane K2

OR

(b) Explain the following

i) Baeyer strain theory ii) Conformations of mono substituted cyclohexane. K2

Q8 (a) Interpret Markownikoff and Antimarkownikoff rules addition reactions with suitable examples K3

OR

(b) Apply Saytzeff and Hoffmann eliminations reactions with mechanism for preparation Of alkenes. K3

Q9 (a) Discuss Concept of aromaticity and explain aromaticity of non benzenoid compounds with suitable examples K2

OR

(b) Explain the mechanism of Friedel- Craft's alkylation andacylation. halogenation and nitration reactions on benzene K2

Q10 (a) Interpret the ortho and para directing groups. K3

OR

(b) Explain orentation of Carboxy, nitro, nitrile, carbonyl and sulphonic acid group on benzene ring K2

Note: Red colour letters indicate shuffeling of syllabus from unit V to VI

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PRACTICAL SYLLABUS

Practical Paper – V **Organic Qualitative analysis** **Practical syllabus**	**PAPER CODE : 23CHMIL231** **ACADEMIC YEAR-2024-2025**

Course Description:

This course provides an in-depth exploration of qualitative analysis techniques used in organic chemistry to identify and characterize organic compounds. Students will learn to apply systematic methods for the analysis of organic substances, including the use of traditional and modern analytical techniques.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	Perform and interpret various qualitative tests for organic functional groups.
2	Apply systematic approaches to identify unknown organic compounds.
3	Skills in interpreting experimental data and drawing conclusions about the identity of organic compounds.
4	Analyze and present experimental data effectively.
5	Understand suitable derivatives for organic compounds0

Course Outcomes

At the end of the course, the student will be able to…

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Remember different tests for identification of organic compounds	K1	PO2	PSO1
CO2	Remember MP, BP for identification of organic compounds	K1	PO1	PSO1
CO3	Understand suitable derivatives for identification of organic compounds	K2	PO2	PSO2
CO4	Understand MP, BP for identification of organic compounds	K2	PO2	PSO 2
CO5	Apply systematic approaches to identify unknown organic compounds	K3	PO1	PSO3

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX										
CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1		2						1		
CO2	1							2		
CO3		2							2	
CO4		2							2	
CO5	3									2

Use the codes 3,2,1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Syllabus

Analysis of an organic compound through systematic qualitative procedure for functional group identification including the determination of melting point and boiling point with suitable derivatives. Alcohols, Phenols, Aldehydes, Ketones, Carboxylic acids, Aromatic primary amines, amides and simple sugars.

Co-curricular activities and Assessment Methods

5. Continuous Evaluation: Monitoring the progress of student's learning.
6. Class Tests, Worksheets and Quizzes.
7. Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality.
8. SEMESTER -End Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the SEMESTER.

Reference books:

4. Vogel A.I .Practical Organic Chemistry, Longman Group Ltd.
5. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley-Eastern.
6. Ahluwalia V. K. and Agarwal R. Comprehensive Practical Organic Chemistry,University press.

SCHEME OF VALUATION

1.INTERNAL MARKS- Record-10M

2. EXTERNAL MAKS-40

- **Practical -30M**

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Title of the Paper: Analytical Methods in Chemistry-I **Semester: V**

Academic year-2024-2025

Course Code	CHESET01	**Course Delivery Method**	**Class Room / Blended Mode**
Credits	**3**	CIA Marks	30
No. of Lecture Hours / Week	**3**	Semester End Exam Marks	**70**
Total Number of Lecture Hours	**45**	Total Marks	**100**
Year of Introduction : 2022-23	Year of Offering: 2024-25	Year of Revision: 0	Percentage of Revision: **0**

Course Outcomes:

Students after successful completion of the course will be able to:

CO1. Remember the basic concepts of .quantitative analysis data treatment, separation techniques and analysis of water (PO7)

CO2. Acquire knowledge on the concepts quantitative analysis data treatment, separation techniques and analysis of water (PO1, PO7)

CO3. Apply the conceptual knowledge gained in the areas of quantitative analysis data treatment, separation techniques and analysis of water in the chosen job role (PO1)

CO4. Analyse that how far the quantitative methods, data treatment methods separation techniques and Analysis of water (PO1)

Syllabus

Course Details

Unit	Learning Units	Lecture Hours
I	**Quantitative analysis-1** 1. A brief introduction to analytical methods in chemistry 2. Principles of volumetric analysis, concentration terms- Molarity, Normality, v/v, w/v, ppm and ppb, preparing solutions- Standard solution, primary standards and secondary standards. 3. Description and use of common laboratory apparatus- volumetric flask, burette, pipette,beakers, measuring cylinders.	**8Hrs**
II	**Quantitative analysis-2** 1. Principles of volumetric analysis: Theories of acid-base (including study of acid-base titration curves), redox, complexometric, iodometric and precipitation titrations-choice of indicators for the saturations. 2. Principles of gravimetric analysis: precipitation, coagulation, peptization, co-precipitation, post precipitation, digestion, filtration, and washing of precipitate, drying and ignition.	**12 Hrs**
III	**Treatment of analytical data** Types of errors- Relative and absolute, significant figures and its importance, accuracy – methods of expressing accuracy, errors- Determinate and indeterminate and minimization of errors, precision-methods of expressing precision, standard deviation and confidence interval.	**8 Hrs**
IV	**Separation techniques** 1. Solvent Extraction: Introduction, principle, techniques, factors affecting solvent extraction, Batch extraction, continuous extraction and counter current extraction. Synergism. Application-Determination of Iron (III). 2. Ion Exchange method: Introduction, action of ion	**5 Hrs**

	exchange resins, applications	
V	**Spectrophotometry** Principle, Instrumentation: Single beam and double beam spectrometer, Beer- Lambert's law- Derivation and deviations from Beer-Lambert's law, applications of Beer- Lambert's law- Quantitative determination of Fe^{+2}, $Mn^{+2}$and Pb^{+2}. Determination of PK value of indicator, determination of Glucose in blood.	**12Hrs**

III References

1. Analytical Chemistry by Gary D.Christian, Purnendu K.Dasgupta and KevinA.Schug,Seventh edition, Wiley.

2. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.

3. Text book of Environmental Chemistry and Pollution Control by S.S.Dara andD.D.Mishra, Revised edition, S Chand & Co Ltd.

Text Books:

1. Instrumental methods of chemical analysis by B K Sharma

2. Separation methods MN Sastry

Reference materials on the web/web links:

1.https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Quantifying_Nature/Volumetric_Chemical_Analysis_(Shiundu)/14.1%3A_Sampling_and_Statistical_Analysis_of_Data

2. https://vlab.amrita.edu/?sub=2&brch=190&sim=338&cnt=1

IV Co-Curricular Activities:

a) Mandatory (Lab/field training of students by teacher (lab: 10 + field: 05) :

1.For Teacher: Training of students by the teacher in laboratory and field for not less than 15 hours on the field techniques/skills of calibration of pH meter, Strong acid vs strong base titration using pH meter, determination of chloride ion, estimation of water quality parameters and estimation of Iron(II).

Google classroom created during instruction of course by the teacher concerned for sharing relevant material and conducting exams.

2. For Student: Student shall visit a related industry/chemistry laboratory in universities/research organizations/private sector facility and observe. Write their observations and submit a hand written fieldwork/project work report not exceeding10 pages in the given format to the teacher.

3. Max marks for Fieldwork/project work Report: 05.

4. Suggested Format for Fieldwork/project work**:** Title page, student details, index page, details of place visited, observations, findings, and acknowledgements.

5. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Training of students' by related industrial experts.
2. Assignments, Seminars and Quiz (on related topics).
3. Visits to facilities, firms, research organizations etc.
4. Invited lectures and presentations on related topics by field/industrial experts.

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Model Paper

SEMESTER – V	**PAPER CODE : CHESET01**
PAPER TITLE : Analytical Methods in Chemistry-I **ACADEMIC YEAR-2024-2025**	

Time: 3Hours Maximum marks: 75 Minimum marks: 30

SECTION-A Short answer questions (25 Marks: 5x5)
Answer any Five questions. Each carries 5 marks.
At least 1 question should be given from each unit

1. Explain the preparation of v/v based with suitable examples-L2
2. Discuss the significance of quantitative analysis in Chemistry-L2
3. Explain the need of drying the precipitate in garavimetric analysis-L2
4. Discuss the principal involved in Idometric titrations-L2
5. Define accuracy and explain the methods of expressing accuracy-L2
6. Discuss the principal and theory involved in solvent extraction-L1
7. Illustrate the importance of significant figures in qualitative analysis-L3
8. Explain the quantitative determination of Pb^{+2} by spectrophotometric methods-L3

SECTION-B (Total: 5x10=50 Marks)

9(a) Discuss the detail about the primary and secondary standards with suitable examples-L2

Or

9(b) Describe the role of the following apparatus in analytical chemistry I) Volumetric flask II) Burette III) Pipette –L2

10(a) Elaborate the theory involved in complexometric and acid base titrations-L2

Or

10(b) Write a note on the following terms in gravimetric analysis I) Precipitation II) Digestion III) Filteration-L2

11(a) Define error, discuss in detail about various types of errors encountered in quantitative analysis-L2

Or

11(b) Elaborate the methods used for minimization of errors-L2

12(a) Discuss the various factors which effect solvent extraction-L2

Or

12(b) Explain in detail about role of Ion exchange resins in separation of compounds-L2

13(a) Explain the role of spectrophotometry in the determination of PK value of an indicator-L2

Or

13(b) Give a detailed account on various factors responsible for deviation from Beer's- Lambert's law-L2

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PRACTICAL SYLLABUS

Practical Paper – V **Analytical methods in chemistry-I** **Practical syllabus**	**PAPER CODE : CHESEP01** **ACADEMIC YEAR-2024-2025**

Analytical methods in Chemistry-1-PRACTICAL SYLLABUS
(Skill Enhancement Course (Elective), Credits: 02)
Practical Hrs ;45 (3hr/W)

I Learning Outcomes: On successful completion of this practical course, student shall be able to:

CO1. Estimate Iron (II) using standard Potassium dichromate solution (PO1)

CO2. Learn the procedure for the estimation of total hardness of water (PO7)

CO3. Demonstrate the determination of chloride using Mohr's method (PO1, PO7)

CO4. Acquire skills in the operation and calibration of pH meter (PO1)

II Practical (Laboratory) Syllabus :(**30hrs**)

1. Estimation of Iron(II) using standard Potassium dichromate solution (using DPA indicator)

2. Estimation of total hardness of water using EDTA

3. Determination of chloride ion by Mohr's method

4. Study the effect on pH of addition of HCl/NaOH to solutions of acetic acid, sodium acetate and theirmixtures

5. Preparation of buffer solutions of different pH (i) Sodium acetate-acetic acid, (ii) Ammonium chloride-ammonium hydroxide.

6. pH metric titration of (i) strong acid vs. strong base, (ii) weak acid vs. strong base.

7. Determination of dissociation constant of a weak acid.

II Lab References:
1. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.

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PRACTICAL SYLLABUS

Practical Paper – V **Analytical methods in chemistry-I** **Practical syllabus**	**PAPER CODE : CHESEP01** **ACADEMIC YEAR-2024-2025**

Analytical methods in Chemistry-1-PRACTICAL SYLLABUS

(Skill Enhancement Course (Elective), Credits: 02)

Practical Hrs ;45 (3hr/W)

SCHEME OF VALUATION

1.INTERNAL MARKS- Record-10M

2. EXTERNAL MAKS-40

- **Practical -30M**
- **Viva questions = 10 M**

TOTAL = 50 M

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Title of the Paper: Analytical Methods in Chemistry-2 **Semester: V**

Course Code	**CHESET02**	**Course Delivery Method**	**Class Room / Blended Mode**
Credits	**3**	CIA Marks	30
No. of Lecture Hours / Week	**3**	Semester End Exam Marks	**70**
Total Number of Lecture Hours	**45**	Total Marks	**100**
Year of Introduction : 2022 - 23	Year of Offering: 2024- 25	Year of Revision: --------	Percentage of Revision: 0

Learning Outcomes: Students after successful completion of the course will be able to:

CO1. Remember the basic concepts of Chromatography like paper, TLC, Column, GC & HPLC (PO7)

CO2. Understand the significance of paper, TLC, Column, GC & HPLC in separation and identification of compounds (PO1, PO7) .

CO3. Apply the conceptual knowledge gained in the techniques of chromatography in separating and identifying the chemical compounds as and when required (PO1).

CO4. Analyse that how far one chromatographic technique is much use full in separation and identification of compounds over the other chromatographic technique (PO1, PO7).

Syllabus

Course Details

Unit	Learning Units	Lecture Hours
I	**Chromatography-Introduction and classification** Principle, Classification of chromatographic methods, Nature of adsorbents, eluents, R_f values, factors affecting R_f values.	**7 hr**
II	**TLC and paper chromatography** 1. Thin layer chromatography: Principle, Experimental procedure, preparation of plates, adsorbents and solvents, development of chromatogram, detection of spots, applicationsand advantages. 2. Paper Chromatography: Principle, Experimental procedure, choice of paper andsolvents, various modes of development- ascending, descending, radial and two dimensional, applications.	**12** hr
III	**Column chromatography** 1. Column chromatography: Principle, classification, Experimental procedure, stationary and mobile phases, development of the Chromatogram, applications, factors affecting the column efficiency. 2. Applications:- Separation of .Methylene Blue and Flurocene by column chromatography.	**10 Hr**
IV	**Gas chromatography:** Basic principles. Different types of GC techniques. Selection of columns and carrier gases. Instrumentation. Detectors-Thermal conductivity detector, Flame ionization detector, R_f values. Applications in the separation of amino acids & estrogens	**8 hr**
V	**High Performance liquid chromatography (HPLC)** Basic principles. Normal and reversed Phases. Selection of column and mobile phase. Instrumentation. Detectors-RID, UV detector R_f values. Applications in the	**8 Hr**

	separation, separation of anions, barbiturates, tropane alkaloids.	

III References

1.Fundamental so Analytical Chemistry by F.James Holler, Stanley R Crouch, DonaldM.Westand Douglas A.Skoog, Ninth edition, Cengage.

2. Analytical Chemistry by Gary D.Christian, Purnendu K.Dasgupta and KevinA.Schug, Seventh edition, Wiley.

3. Quantitative analysis by R.A.Day Jr. and A.L.Underwood, Sixth edition, Pearson.

4. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition/ Pearson.

Text Books:

1. Instrumental methods of chemical analysis by B K Sharma

2. Instrumental methods of chemical analysis by Gurudeep & Chatwal Anand

Reference materials on the web/web links:

1.https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Instrumental_Analysis/Chromatography/Gas_Chromatography

2. https://lab-training.com/hplc-high-performance-liquid-chromatography/

VI Co-Curricular Activities:

a) Mandatory :(Lab/field training of students by teacher (lab: 10+ fields: 05):

1. For Teacher: Training of students by the teacher in laboratory and field for not lessthan15 hours on the field techniques/skills of determination of hardness of water, using the calorimeter and or Spectrophotometer, preparation of TLC plate, identification of spots in TLC and Paper chromatographic techniques, loading of column, selection of solvent system, separation of amino acids and dyes mixture using chromatographic techniques.

Google classroom created during instruction of course by the teacher concerned for sharing relevant material and conducting exams.

2. For Student: Student shall visit a related industry/chemistry laboratory in universities/research organizations/private sector facility and observe the chromatographic techniques used for the separation of compounds. Write their observations and submit a hand written fieldwork/project work report not exceeding10 pages in the given format to the teacher.

3. Max marks for Fieldwork/project work Report: 05.

4. Suggested Format for Fieldwork/project work**:** Title page, student details, index page, details of place visited, observations, findings, and acknowledgements.

5. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Training of students by related industrial experts.
2. Assignments, Seminars and Quiz (on related topics).
3. Visits to facilities, firms, research organizations etc.
4. Invited lectures and presentations on related topics by field/industrial experts.

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Model Paper

SEMESTER – V PAPER- V	**PAPER CODE : CHESET02**
PAPER TITLE : Analytical Methods in Chemistry-2 Paper 7B **ACADEMIC YEAR-2024-2025**	

Time: 3Hours Maximum marks: 75 Minimum marks: 25

SECTION-A
Answer any Five questions. Each carries 5 marks.
At least 1 question should be given from each unit

1) What is the basic principle involved in chromatography, explain nature of adsorbents-L1

2) How to prepare TLC plates-L3

3) Explain Ascending and descending techniques in paper chromatography-L2

4) Explain the classification of column chromatography-L2

5) Write briefly about experimental procedure for column chromatography-L2

6) Explain the schematic diagram of G.C-L2

7) Explain schematic diagram of HPLC-L2

8) Write experimental procedure of TLC.-L2

SECTION-B
(Total: 5x10=50 Marks)

9 (a) How do the chromatographic methods are classified? Explain any one-L2

Or

(b) Define Rf value, Explain factors effecting the Rf values-L2

10 (a) Discuss the applications of TLC.-L3

Or

(b) Explain the applications of paper chromatography-L3

11(a) Explain the factors effecting the column efficiency in CC-L2

Or

(b) Discuss the separation of methylene blue and fluorescein by C C.-L2

12 (a) Explain different types detectors used in G.C-L2.

Or

(b) Explain the separation of Amino acids by G.C-L2

13 (a) Explain the different detectors used in HPLC-L2

Or

(b) Explain the separation of Anions and Barbiturates by HPLC-L2

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PRACTICAL SYLLABUS

Practical Paper – V **Analytical methods in chemistry-2** **Practical syllabus**	**PAPER CODE : CHESEP02** **ACADEMIC YEAR-2024-2025**

I Learning Outcomes: On successful completion of this practical course, student shall be able to:

CO1. Perform the separation of a given dye mixture using TLC (PO1)

CO2. Learn the preparation of TLC plates (PO1, PO7)

CO3. Demonstrate the separation of mixture of amino acids using paper chromatography (PO1)

CO4. Acquire skills in using column chromatography for the separation of dye mixture (PO7)

II Practical (Laboratory) Syllabus: (**30hrs**)

1. Separation of a given dye mixture (methyl orange and methylene blue) using TLC (usingalumina as adsorbent).
2. Separation of different amino acids using paper chromatography.
3. Separation of given mixture of amino acids (glycine and phenyl alanine) using ascendingpaper chromatography.
4. Estimation of Fe^{+2} by using thiocynate by calorimeter.
5. Separation of sugars using TLC
6. Verification of Beer lambert's law. (Using potassium permanganate solution) usingcolorimeter /spectrophotometer

III Lab References:

1. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.
2. Vogel A. I. Practical Organic Chemistry, Longman Group Ltd.
3. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley- Eastern.
4. Ahluwalia V. K. and Aggarwal R. Comprehensive Practical Organic Chemistry, University press.
5. Mann F.Gand Saunders B.C, Practical Organic Chemistry, Pearson Education.

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PRACTICAL SYLLABUS

Practical Paper – V **Analytical methods in chemistry-2** **Practical syllabus**	**PAPER CODE : CHESEP02** **ACADEMIC YEAR-2024-2025**

SCHEME OF VALUATION

1. **INTERNAL MARKS- Record-10M**
2. **EXTERNAL MAKS-40**

- **Practical-30M**
- **Viva questions = 10 M**

TOTAL = 50 M