B.Sc. CHEMISTRY (HONOURS)
(Single Major)

SEMESTER – I

I B.Sc. CHEMISTRY (HONOURS)

(Course – 1 & 2)

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. Chemistry (H) I Semester			
Course Code Major-1 (General)	TITLE OF THE COURSE **Course – 1: Essentials of Mathematics, Physics, chemistry & Computer Science**				
Teaching	Hours Allocated: 60 (**Theory and Activities**) (5 Hrs./wk.	L	A	P	C
Pre-requisites	Basic knowledge about Mathematics, physics, Chemistry and Computer science	4	1	-	4

Course Objectives:

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

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors, and statistical measures.	Critical Thinking
CO2	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	Application
CO3	To Explain the basic principles and concepts underlying a broadrange of fundamental areas of chemistry and to Connect their knowledge of chemistry to daily life.	Application
CO4	ore the history and evolution of the Internet and to gain an nding of network security concepts, including threats, vulnerabilities, ntermeasures.	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT I: ESSENTIALS OF MATHEMATICS: **9hrs.**

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

UNIT II: ESSENTIALS OF PHYSICS: 9hrs.

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

UNIT III: ESSENTIALS OF CHEMISTRY:: 9 hrs.

Definition and Scope of Chemistry- Importance of Chemistry in daily life -Branches of chemistry and significance- Periodic Table- Electronic Configuration, chemical changes, classification of matter, Biomolecules- carbohydrates, proteins, fats and vitamins.

UNIT IV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY: 9 hrs

Applications of Mathematics: 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.

UNIT V: ESSENTIALS OF COMPUTER SCIENCE: 9 hrs.

Milestones of computer evolution - Internet, history, Internet Service Providers, Types of Networks, 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

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 by B.L.Agarwal, New age international Publishers
5. University Physics with Modern Physics by Hugh D. Young and Roger A. Freedman
6. Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker
7. Chemsitry in daily life by Kirpal Singh
8. Chemistry of bio molecules by S. P. Bhutan
9. Fundamentals of Computers by V. Raja Raman

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

Student Activities (15 hrs)

Unit – I: Mathematics **3 hrs.**

1: Complex Number Exploration Provide students with a set of complex numbers in both rectangular and polar forms.

2: Trigonometric Ratios Problem Solving Give students a set of problems that require the calculation of trigonometric ratios and their relations.

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.

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).

Unit – II: Physics **3 hrs.**

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 the experiment. Students will work in small groups to carry out the experiment, collect data, and analyze the results.

Unit – III: Chemistry **3 hrs.**

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.

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.

3: Chemical Changes and Classification of Matter Provide students with various substances and chemical reactions, such as mixing acids and bases or observing a combustion reaction.

4: Biomolecules Investigation Assign each student or group a specific biomolecule 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.

Unit – IV: Applications of Mathematics, Physics and Chemistry 3 hrs.

1: 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.

2: Mathematical Modeling Present students with real-world problems that require mathematical modeling and analysis

UNIT V: ESSENTIALS OF COMPUTER SCIENCE: 3 hrs.

1. Identifying the attributes of network (Topology, service provider, IP address and bandwidth
2. Your college network) and 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.

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. CHEMISTRY (H)
SEMESTER - I
QUESTION PAPER BLUE PRINT
Course -1: ESSENTIALS OF MATHEMATICS, PHYSICS, CHEMISTRY & COMPUTER SCIENCE

TIME: $2^1/_2$ hrs. **Max. MARKS: 50**

PART-A

Answer **ALL** the Questions **5x7 = 35 M**

1. **UNIT-I 2 Questions (Answer Q. No. 1 or 2)**
2. **UNIT- II 2 Questions (Answer Q. No. 3 or 4)**
3. **UNIT- III 2 Questions (Answer Q. No. 5 or 6)**
4. **UNIT- IV 2 Questions (Answer Q. No. 7 or 8)**
5. **UNIT- V 2 Questions (Answer Q. No. 9 or 10)**

PART – B

Answer any **FIVE** Questions **5x3 = 15 M**

6. **2 Question from UNIT- I (Q. No. 11 & 12)**
7. **2 Questions from UNIT- II (Q. No. 13 & 14)**
8. **2 Question from UNIT- III (Q. No. 15 & 16)**
9. **1 Questions from UNIT- IV (Q. No. 17)**
10. **1 Questions from UNIT- V (Q. No. 18)**

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. CHEMISTRY(H) MAJORS
SEMESTER - I

Major-1: ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

SEMESTER END EXAMINATION MODEL QUESTION PAPER (2023-24)

Time: $2^{1}/_{2}$ hrs. **Max. Marks: 50**

PART- A **5 x 7 = 35 Marks**

Answer ALL the questions. Each carries SEVEN marks.

1. UNIT-I

(or)

2. UNIT-I
3. UNIT-II

(or)

4. UNIT-II
5. Write the chronology of periodic table and significance of electronic configuration in designing periodic table

(or)

6. Explain about Biomolecules with examples
7. Explain the step by step process of Drug discovery.

(or)

8. UNIT-IV
9. UNIT-V

(or)

10. UNIT-V

PART- B **5 x 3 = 15 Marks**

Answer any FIVE of the following questions. Each one carries THREE marks.

11. Unit I
12. Unit I
13. Unit II
14. Give a brief account on classification of matter.
15. Write the importance of chemistry in daily life.
16. Unit IV
17. Unit IV
18. Unit V

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. Chemistry (H) I Semester			
Course Code Major-2 (General)	TITLE OF THE COURSE **Course – 2: Advances of Mathematics, Physics, chemistry & Computer Science**				
Teaching	Hours Allocated: 60 (**Theory and Activity**) (5 hrs. / wk.)	L	A	P	C
Pre-requisites	Basic knowledge about Mathematics, Physics, chemistry and Computer science	4	1	-	4

Course Objectives:

1. To provide students with an in-depth understanding of the recent advances and cutting- edge research in mathematical, physical, and chemical sciences.
2. To broaden students' knowledge beyond the foundational concepts and expose them to the latest developments in these disciplines, fostering critical thinking, research skills, and the ability to contribute to scientific advancements.

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	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.	Application
CO2	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.	Application
CO3	Understand the different sources of renewable energy and their generation processes and advances in nanomaterial's and their properties.	Application
CO4	Understand and convert between different number systems, such as binary, cimal, and hexadecimal. Differentiate between analog and digital signals erstand their characteristics.	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT I: ADVANCESIN BASICS MATHEMATICS 9 hrs.

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

UNIT II: ADVANCES IN PHYSICS: 9 hrs.

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.

UNIT III: ADVANCES IN CHEMISTRY: 9 hrs.

Computer aided drug design and delivery, Nano sensors, Chemical Biology, impact of chemical pollutants on ecosystems and human health, Dye removal- Catalysis method

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY 9hrs.

Mathematical Modeling applications in physics and chemistry Application of Renewable energy: Grid Integration and Smart Grids, Application of nanotechnology: Nano medicine, Application of biophysics: Biophysical Imaging, Biomechanics, Neurophysics, Application of medical physics: Radiation Therapy, Nuclear medicine Solid waste management, Environmental remediation- Green Technology, Water treatment.

UNIT V: Advanced Applications of computer Science 9 hrs.

Number System-Binary, Octal, decimal, and Hexadecimal, Signals-Analog, Digital, Modem, Codec, Multiplexing, Transmission media, error detection and correction- Parity check andCRC, Networking devices- Repeater, hub, bridge, switch, router, gateway.

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 PrakashanMedia(P)Ltd.
4. "Renewable Energy: Power for a Sustainable Future" by Godfrey Boyle
5. "Energy Storage: A Nontechnical Guide" by Richard Baxter
7. "Biophysics: An Introduction" by Rodney Cotterill
8. "Medical Physics: Imaging" by James G. Webster
9. "Shape Memory Alloys: Properties and Applications" by Dimitris C. Lagoudas
10. Nano materials and applications by M.N.Borah
11. Environmental Chemistry by Anil.K.D.E.
12. Digital Logic Design by Morris Mano
13. Data Communication & Networking by BahrouzForouzan.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

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CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

Student Activities (15 hrs.)

UNIT I: ADVANCESIN BASIC MATHEMATICS 3 hrs.

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.

2: Limits and Differentiation Problem Solving Students will apply the concept of limits to solve various problems using standard limits.

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.

4: Matrices Manipulation Students will perform operations on matrices, including scalar multiplication, matrix multiplication, and matrix transpose.

UNIT II: ADVANCES IN PHYSICS: 3 hrs.

1: Experimental Design Assign students to design and conduct experiments related to one of the topics: renewable energy, nanotechnology, biophysics, medical physics,

2: 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.

UNIT III: ADVANCES IN CHEMISTRY: 3 hrs.

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.

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.

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.

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY 3 hrs.

1: Mathematical Modeling Experiment Provide students with a mathematical modeling experiment related to one of the topics. For example, in the context of renewable energy, studentscan develop a mathematical model to optimize the placement and configuration of solar panels ina solar farm..

2: Case Studies and Group Discussions Assign students to analyze case studies related to the applications of mathematical modeling in nanotechnology, biophysics, and medical physics,solid waste management, environmental remediation, or water treatment.

3. Group Project

Assign students to work in groups to develop a group project that integrates mathematicalmodeling with one of the application areas: renewable energy, nanotechnology, biophysics,medical physics, solid waste management, environmental remediation, or water treatment.

UNIT V: Advanced Applications of computer Science 3 hrs.

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

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. CHEMISTRY (H)
SEMESTER - I
QUESTION PAPER BLUE PRINT
Course -2: ADVANCES OF MATHEMATICS, PHYSICS, CHEMISTRY & COMPUTER SCIENCE

TIME: $2^1/_2$ hrs. **Max. MARKS: 50**

PART-A

Answer **ALL** the Questions 5**x7 = 35 M**

1. **UNIT-I 2 Questions (Answer Q. No. 1 or 2)**
2. **UNIT- II 2 Questions (Answer Q. No.3 or 4)**
3. **UNIT- III 2 Questions (Answer Q. No. 5 or 6)**
4. **UNIT- IV 2 Questions (Answer Q. No. 7 or 8)**
5. **UNIT- V 2 Questions (Answer Q. No. 9 or 10)**

PART – B

Answer any **FIVE** Questions **5x3 = 15 M**

11. **2 Questions from UNIT- I (Q. No 11 & 12)**
12. **2 Questions from UNIT- II (Q. No 13 & 14)**
13. **2 Questions from UNIT- III (Q. No 15 & 16)**
14. **1 Question from UNIT- IV (Q. No 17)**
15. **1 Question from UNIT- V (Q. No 18)**

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. CHEMISTRY MAJOR
SEMESTER - I

Major-2: ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

SEMESTER END EXAMINATION MODEL QUESTION PAPER (2023-24)

Time: $2^1/_2$ hrs. **Max. Marks: 50**

PART- A **5 x 7 = 35 Marks**

Answer ALL the questions. Each carries SEVEN marks.

1. UNIT-I

(or)

2. UNIT-I
3. UNIT-II

(or)

4. UNIT-II

5. Discuss the impact of chemical pollutants on ecosystem and human health.

(or)

6. Exemplify the types of nano sensors and applications.
7. Describe the sewage water treatment.

(or)

8. UNIT-IV
9. UNIT-V

(or)

10. UNIT-V

PART- B **5 x 3 = 15 Marks**

Answer any FIVE of the following questions. Each one carries THREE marks.

11. Unit I
12. Unit I
13. Unit II
14. Unit II
15. Describe the importance of dye removal.
16. Write a note on Solid waste management.
17. Unit IV
18. Unit V

SEMESTER – II

I B.Sc. CHEMISTRY (HONOURS)

(Course – 3 & 4)

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. CHEMISTRY (H) SEMESTER - II			
Course Code Major-3	TITLE OF THE COURSE Course -3: **GENERAL & INORGANIC CHEMISTRY**				
Teaching	Hours Allocated: 45 (**Theory**) (3 hrs. / Wk.)	L	T	P	C
Pre-requisites:	Basic knowledge about inorganic chemistry and elements	3	-	-	3

Course Objectives:

1. Gain knowledge about on atomic structure and Periodic table
2. Gain knowledge about different types of chemical bonds and their applications
3. Get knowledge on different theories of acids and bases and their applications

Course Outcomes:

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	1. Understand the structure of atom and the arrangement of elements in the periodic table.	Understanding
CO2	2. Understand the nature and properties of ionic compounds.	Understanding
CO3	3. Explain the existence of special types of compounds through weak chemical forces.	Application
CO4	4. Define acids and bases and predict the nature of salts.	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

Unit - I: Atomic Structure and Periodic table 9 h

Electronic configuration: Bohr theory, duel nature of electrons, Heisenberg uncertainty principle, the Schrodinger equation, significance of wave functions, Pauli's exclusion principle, Hund's rule, sequence of energy levels (Aufbau principle).

Periodicity: Periodic law and arrangement of elements in the periodic table (Groups and Periods) General properties of atoms: size of atoms and ions-atomic radii, ionic radii, covalent radii; trend in ionic radii, ionization potential, electron affinity; electro negativity - Pauling, Mulliken-Jaffe, Allred-Rochow definitions; oxidation states and variable valency; isoelectronic relationship; inert-pair effect;

UNIT - II: Ionic bond 9 h

Properties of ionic compounds, factors favoring the formation of ionic compounds, ionization potential, electron affinity, and electronegativity. Lattice energy: definition, factors affecting lattice energy, Born-Haber cycle-enthalpy of formation of ionic compound and stability. Stability of ionic compounds in terms of ΔH_f and Uo. Solubility and thermal stability of ionic compounds. Covalent character in ionic compounds-polarization and Fajan's rules and its applications.

UNIT - III: The Covalent Bond 9 h

Valance Bond theory-arrangement of electrons in molecules, hybridization of atomic orbitals and geometry of molecules-$BeCl_2$, BF_3, CH_4, PCl_5, SF_6, effect of bonding and nonbonding electrons on the structure of molecules, effect of electronegativity,

Isoelectronic principle, illustration of structures by VESPR model: NH_3, H2O, SF_4, ICl^{-4} ,ICl^{-2} , XeF_4, XeF_6

Molecular orbital theory -LCAO method, construction of M.O. diagrams for homonuclear and hetero-nuclear diatomic molecules (N2, O2, CO and NO)

UNIT - IV: Metallic and Weak Bonds 9 h

The Metallic bond: metallic properties, free electron theory, Valence Bond Theory, band theory of metals. Explanation of conductors, semiconductors and insulators.

Weak bonds: hydrogen bonding-intra- and intermolecular hydrogen bonding, influence on the physical properties of molecules, comparison of hydrogen bond strength and properties of hydrogen bonded N, O and F compounds; associated molecules-ethanol and acetic acid; Vander Waals forces, ion dipole-dipole interactions.

UNIT - V: Acids and Bases 9 h

Theories of acids and bases: Arrhenius theory, Bronsted-Lowry theory, Lewis theory, the solvent system,

Non aqueous solvents: classification-protonic and aprotic solvents, liquid ammonia as solvent-solutions of alkali and alkaline earth metals in ammonia.

Types of chemical reactions: acid-base, oxidation-reduction, calculation of oxidation number. Definition of pH, pKa, pKb. Types of salts, Salt hydrolysis. Pearson's concept, HSAB principle & its importance, bonding in Hard-Hard and Soft-Soft combinations

List of Reference Books:

1. J. D. Lee, Concise Inorganic Chemistry, 5th ed., Blackwell Science, London, 1996.
2. B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Shoban Lal Nagin Chand and Co., 1996.
3. D. F. Shriver and P. W. Atkins, Inorganic Chemistry, 3 rd ed., W. H. Freeman and Co, London,

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-': No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	1	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	1	2	1	3	2	3	1	2	3	2	3	2
Avg.	2.5	2.25	2.75	2.0	2.5	1.75	2.0	2.0	2.25	2.25	2.25	2.75	2.75

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. CHEMISTRY (H)
SEMESTER – II
QUESTION PAPER BLUE PRINT
Course -3: GENERAL AND INORGANIC CHEMISTRY

TIME: $2^{1}/_{2}$ hrs. **MARKS: 50 M**

PART -A

Answer ALL the Questions **5 x 7 = 35 M**

1. 2 Questions from UNIT- I
2. 2 Questions from UNIT- II
3. 2 Questions from UNIT-III
4. 2 Questions from UNIT IV
5. 2 Questions from UNIT-V

PART – B

Answer any FIVE Questions **5 x 3 = 15 M**

6. 2 Question from UNIT- I
7. 1 Questions from UNIT- II
8. 2 Question from UNIT- III
9. 1 Questions from UNIT- IV
10. 2 Questions from UNIT- V

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
I B.Sc. CHEMISTRY (H)
SEMESTER-II
MODEL PAPER (From 2023-234)
Course - 3: GENERAL AND INORGANIC CHEMISTRY

Time: $2^1/_2$ hrs. **Maximum Marks: 50**

PART- A

Answer ALL the questions. Each carries SEVEN marks **5 x 7 = 35 M**

1. Explain in detail about Bohr's atomic model

(OR)

2. Describe the trends in atomic and ionic radii across periods and groups. How do ionization potential and electron affinity change as you move across and down the periodic table?
3. Discuss the factors that favor the formation of ionic compounds. How do ionization potential, electron affinity, and electronegativity play a role in driving the creation of these compounds?

(OR)

4. What is the Born-Haber cycle, and how does it help us calculate the enthalpy of formation of an ionic compound?
5. Explain the geometries of $BeCl_2$, CH_4 and PCl_5 based on Valence bond theory

(OR)

6. Construct Molecular Orbital diagrams for N_2 and NO molecules
7. Explain in detail about the Band theory of metals

(OR)

8. Write about Vander Waals forces, ion dipole- dipole interactions and hydrogen bonding

9. Discuss Lewis acid – base theory with examples

(OR)

10. Explain HSAB principle with examples

PART- B

Answer any FIVE of the following questions. Each carry THREE marks 5 x 3 = 15 M

11. What is the inert-pair effect, and how does it manifest in heavier elements?
12. Discuss different scales of electronegativity briefly
13. Name two properties that are influenced by the polarization of ionic compounds.
14. Illustrate molecular structures of NH_3 and SF_4 by using the VSEPR model
15. Explain isoelectronic principle
16. Explain free electron theory of metals
17. Explain BRONSTED-LOWRY theory of acids and bases
18. Define pH, pKa & pKb

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code Major-3 practical	TITLE OF THE COURSE **Course -3: ANALYSIS OF SIMPLE SALT**	I B.Sc. CHEMISTRY(H) (II Semester)			
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites	Qualitative analysis of inorganic simple anions and cations	-	-	2	1

Course Objectives:

1. Identification of inorganic simple anions
2. Identification of inorganic simple cations
3. Usage of different lab equipment and reagents for simple salt analysis.
4. Chemical reactions involving in the identification of acidic and basic radicals.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Understand the basic concepts of qualitative analysis of inorganic salts
CO2	Usage of glassware, equipment and chemicals involved in salt analysis
CO3	Apply the concepts of common ion effect, solubility product and concepts related to qualitative analysis
CO4	Acquire knowledge of micro scale salt analysis procedure.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	-

50 M

Syllabus:

Analysis of Inorganic SIMPLE SALT

Analysis of simple salt containing ONE anion and ONE cation from the following:

Anions: Carbonate, Sulphate, Chloride, Bromide, Acetate, Nitrate, Borate and Phosphate

Cations: Lead, Copper, Iron, Aluminium, Zinc, Nickel, Manganese, Calcium, Strontium, Barium, Magnesium and Ammonium

1. A Text Book of Quantitative Inorganic Analysis - Vogel, A. I.
2. A Textbook of Elementary Qualitative Analysis. Third edition (Engelder, Carl J.)
3. Systematic Qualitative Analysis. K L Kapoor.

Web Links:

1. https://youtu.be/adA8doZhqWs

CO-PO Mapping:

1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], 4: (No Correlation)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO1	3	3	3	2	3	2	2	2	3	2	2	3	3
CO2	3	3	3	2	3	2	2	3	2	3	3	3	3
CO3	3	2	3	2	3	1	2	2	2	2	2	3	2
CO4	3	3	2	1	3	2	2	1	2	3	3	3	3
Avg.	3	2.75	2.75	2	3	2	2	2	2.25	2.5	2.5	3	2.75

	Government College (Autonomous) Rajamahendravaram	Program & Semester			
Course Code Major-4	**TITLE OF THE COURSE** **Course -4: INORGANIC CHEMISTRY**	I B.Sc. Chemistry (H) (II Semester)			
Teaching	Hours Allocated: 45 (**Theory**)	L	T	P	C
Pre-requisites	Basics in inorganic chemistry and elements	3		-	3

Course Objectives:

1. To learn the preparation and structure and Diborane and Borazole.
2. To provide knowledge about different types of Interhalogen compounds.
3. To provide basic knowledge on d-block elements and f-block elements.
4. To learn the synthetic applications of Grignard reagents.

CourseOutcomes:

On Completion of the course, the students will be able to	
CO1	Acquire knowledge on preparation and structure and Diborane and Borazole.
CO2	Identify the importance of Interhalogen compounds and pseudo halogens.
CO3	Comprehend the applications of d-block elements and f-block elements.
CO4	Identify the importance of Organo metallic compounds in Organic synthesis.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development			**Employability**			**Entrepreneurship**	

Syllabus:

UNIT –I Chemistry of p-block elements – I **9 h**

Group 13: Preparation & structure of Diborane, Borazine and (BN)x
Group14: Preparation, classification and uses of silicones and Silanes.
Group 15: Preparation & structure of Phosphonitrilic Chloride $P_3N_3Cl_6$

Unit II Chemistry of p-block elements – II **9 h**

Group 16: Classification of Oxides, structures of oxides and Oxoacids of Sulphur
Group 17: Preparation and Structures of Interhalogen compounds. Pseudo halogens,.

UNIT-III Chemistry of d-block elements: **9 h**

Characteristics of d-block elements with special reference to electronic configuration, variable valence, color, magnetic properties, catalytic properties and ability to form complexes. Stability of various oxidation states of 3d series-Latimer diagrams.

UNIT-IV Chemistry of f-block elements: **9 h**

Chemistry of lanthanides - electronic configuration, oxidation states, lanthanide contraction, consequences of lanthanide contraction, color, magnetic properties. Separation of lanthanides by ion exchange method. Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

UNIT-V: ORGANOMETALLIC CHEMISTRY

Definition - classification of Organometallic compounds - nomenclature, preparation, properties and applications of alkyls of Li and Mg.

List of Reference Books:

1. Inorganic Chemistry by J.E.Huheey
2. Basic Inorganic Chemistry by Cotton and Wilkinson
3. A textbook of qualitative inorganic analysis by A.I. Vogel 4. Concise Inorganic Chemistry by J.D.Lee

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No Correlation)

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	PO1 0	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	1	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	1	2	1	3	2	3	1	2	3	2	3	2
Avg.	2.5	2.25	2.75	2.0	2.5	1.75	2.0	2.0	2.25	2.25	2.25	2.75	2.75

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. CHEMISTRY (H)
SEMESTER – II
QUESTION PAPER BLUE PRINT
Course -4: INORGANIC CHEMISTRY

TIME: $2^{1}/_{2}$ hrs. **MARKS: 50 M**

PART -A

Answer ALL the Questions **5 x 7 = 35 M**

11. 2 Questions from UNIT- I
12. 2 Questions from UNIT- II
13. 2 Questions from UNIT-III
14. 2 Questions from UNIT IV
15. 2 Questions from UNIT-V

PART – B

Answer any FIVE Questions **5 x 3 = 15 M**

1. 2 Question from UNIT- I
2. 2 Questions from UNIT- II
3. 2 Question from UNIT- III
4. 1 Questions from UNIT- IV
5. 1 Questions from UNIT- V

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
I B.Sc. CHEMISTRY (HONOURS)
SEMESTER-II
MODEL PAPER (From 2023-234)
Course - 3: GENERAL AND INORGANIC CHEMISTRY

Time: $2^1/_2$ hrs. **Maximum Marks: 50**

PART- A

Answer ALL the questions. Each carries SEVEN marks **5 x 7 = 35 M**

1. What are silicones? Write the classification, preparation and applications of Silicones.

(OR)

2. Explain the preparation and structure of Borazole.

3. Explain the classification of oxides based on oxygen content.

(OR)

4. Explain the preparation and structures of AX_5 and AX_7 type Inter halogen compounds.

5. Explain the following characteristic properties of d-block elements.
   i. Ability to exhibit variable oxidation states
   ii. ii. Ability to form complex compounds.

(OR)

6. Write short notes on the following properties of d- block elements
   i. Catalytic properties
   ii. ii. Magnetic properties.
7. What is Lanthanide contraction ? Explain.the consequences of Lanthanide contraction

(OR)

8. Explain the separation of Lanthanides by ion exchange method.
9. Write the preparation and synthetic applications of Grignard reagents.

(OR)

10. Explain the preparation and synthetic applications of R-Li.

PART- B

Answer any FIVE of the following questions. Each carries THREE marks 5 x 3 = 15 M

11. Explain the structure of $P_3N_3Cl_6$.

12. Explain the preparation and the structure of Diborane

13 .Write a short note on pseudo halogens.

14. Describe the classification of oxides based on chemical behavior.

15. Explain the abnormal electronic configurations of Cr and Cu.

16. Write a short note on Latimer diagrams.

17. Write the differences between Lanthanides and Actinides.

18. Explain briefly about the classification of Organo metallic compounds.

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code Major-4 practical	TITLE OF THE COURSE **Course -4: Preparation of Inorganic compounds**	I B.Sc. CHEMISTRY(H) (II Semester)			
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites	Properties of various inorganic elements	-	-	2	1

Course Objectives:

1. To get knowledge on properties of inorganic elements
2. Understand the structures of inorganic compounds
3. Usage of different lab equipment and reagents for preparation of inorganic compounds
4. Chemical reactions involving in the preparation of inorganic compounds

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Understand the basic concepts of inorganic preparations
CO2	Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
CO3	Apply the properties of various elements for the preparation of inorganic compounds.
CO4	Acquire knowledge on the structures of inorganic compounds

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	-

Syllabus:

Preparation of Inorganic compounds **50 M**

Preparation of following Inorganic compounds:

1. Crystallization of compounds and determination of melting point.
2. Preparation of Cuprous chloride.
3. Preparation of Potash Alum.
4. Preparation of Chrome Alum.
5. Preparation of Ferrous oxalate
6. Preparation of Ferrous ammonium sulphate.

Reference books:

1. Vogel's Quanlitative Inorganic Analysis, Seventh edition, Pearson.

CO-PO Mapping:

1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], 4: (No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	2	2	2	3	2	2	3	3
CO2	3	3	3	2	3	2	2	3	2	3	3	3	3
CO3	3	2	3	2	3	1	2	2	2	2	2	3	2
CO4	3	3	2	1	3	2	2	1	2	3	3	3	3
Avg.	3	2.75	2.75	2	3	2	2	2	2.25	2.5	2.5	3	2.75

B.Sc. ORGANIC CHEMISTRY
(Single Major)

SEMESTER – I

I B.Sc. ORGANIC CHEMISTRY

(Course – 1 & 2)

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. Organic Chemistry (I Semester)			
Course Code Major-1 (General)	TITLE OF THE COURSE **Course – 1: Essentials of Mathematics, Physics, chemistry & Computer Science**				
Teaching	Hours Allocated: 60 (**Theory and Activities**) (5 Hrs./wk.	L	A	P	C
Pre-requisites	Basic knowledge about Mathematics, physics, Chemistry and Computer science	4	1	-	4

Course Objectives:

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

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors, and statistical measures.	Critical Thinking
CO2	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	Application
CO3	To Explain the basic principles and concepts underlying a broadrange of fundamental areas of chemistry and to Connect their knowledge of chemistry to daily life.	Application
CO4	ore the history and evolution of the Internet and to gain an nding of network security concepts, including threats, vulnerabilities, ntermeasures.	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT I: ESSENTIALS OF MATHEMATICS: **9hrs.**

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

UNIT II: ESSENTIALS OF PHYSICS: 9hrs.

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

UNIT III: ESSENTIALS OF CHEMISTRY:: 9 hrs.

Definition and Scope of Chemistry- Importance of Chemistry in daily life -Branches of chemistry and significance- Periodic Table- Electronic Configuration, chemical changes, classification of matter, Biomolecules- carbohydrates, proteins, fats and vitamins.

UNIT IV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY: 9 hrs

Applications of Mathematics: 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.

UNIT V: ESSENTIALS OF COMPUTER SCIENCE: 9 hrs.

Milestones of computer evolution - Internet, history, Internet Service Providers, Types of Networks, 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

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 by B.L.Agarwal, New age international Publishers
5. University Physics with Modern Physics by Hugh D. Young and Roger A. Freedman
6. Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker
7. Chemsitry in daily life by Kirpal Singh
8. Fundamentals of Computers by V. Raja Raman

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

Student Activities (15 hrs)

Unit – I: Mathematics **3 hrs.**

1: Complex Number Exploration Provide students with a set of complex numbers in both rectangular and polar forms.

2: Trigonometric Ratios Problem Solving Give students a set of problems that require the calculation of trigonometric ratios and their relations.

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.

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).

Unit – II: Physics **3 hrs.**

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 the experiment. Students will work in small groups to carry out the experiment, collect data, and analyze the results.

Unit – III: Chemistry **3 hrs.**

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.

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.

3: Chemical Changes and Classification of Matter Provide students with various substances and chemical reactions, such as mixing acids and bases or observing a combustion reaction.

4: Biomolecules Investigation Assign each student or group a specific biomolecule 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.

Unit – IV: Applications of Mathematics, Physics and Chemistry 3 hrs.

1: 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.

2: Mathematical Modeling Present students with real-world problems that require mathematical modeling and analysis

UNIT V: ESSENTIALS OF COMPUTER SCIENCE: 3 hrs.

1. Identifying the attributes of network (Topology, service provider, IP address and bandwidth
2. Your college network) and 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.

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. ORGANIC CHEMISTRY
SEMESTER - I
QUESTION PAPER BLUE PRINT
Course -1: ESSENTIALS OF MATHEMATICS, PHYSICS, CHEMISTRY & COMPUTER SCIENCE

TIME: $2^{1}/_{2}$ hrs. **Max. MARKS: 50**

PART-A

Answer **ALL** the Questions 5**x7 = 35 M**

1. **UNIT-I 2 Questions (Answer Q. No. 1 or 2)**
2. **UNIT- II 2 Questions (Answer Q. No. 3 or 4)**
3. **UNIT- III 2 Questions (Answer Q. No. 5 or 6)**
4. **UNIT- IV 2 Questions (Answer Q. No. 7 or 8)**
5. **UNIT- V 2 Questions (Answer Q. No. 9 or 10)**

PART – B

Answer any **FIVE** Questions **5x3 = 15 M**

6. **2 Question from UNIT- I (Q. No. 11 & 12)**
7. **2 Questions from UNIT- II (Q. No. 13 & 14)**
8. **2 Question from UNIT- III (Q. No. 15 & 16)**
9. **1 Questions from UNIT- IV (Q. No. 17)**
10. **1 Questions from UNIT- V (Q. No. 18)**

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. ORGANIC CHEMISTRY MAJOR
SEMESTER - I

Major-1: ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

SEMESTER END EXAMINATION MODEL QUESTION PAPER (2023-24)

Time: $2^1/_2$ hrs. **Max. Marks: 50**

PART- A **5 x 7 = 35 Marks**

Answer ALL the questions. Each carries SEVEN marks.

1. UNIT-I

(or)

2. UNIT-I
3. UNIT-II

(or)

4. UNIT-II

5. Write the chronology of periodic table and significance of electronic configuration in designing periodic table

(or)

6. Explain about Biomolecules with examples
7. Explain the step by step process of Drug discovery.

(or)

8. UNIT-IV
9. UNIT-V

(or)

10. UNIT-V

PART- B **5 x 3 = 15 Marks**

Answer any FIVE of the following questions. Each one carries THREE marks.

11. Unit I
12. Unit I
13. Unit II
14. Give a brief account on classification of matter.
15. Write the importance of chemistry in daily life.
16. Unit IV
17. Unit IV
18. Unit V

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. Organic Chemistry (I Semester)			
Course Code Major-2 (General)	TITLE OF THE COURSE **Course – 2: Advances of Mathematics, Physics, chemistry & Computer Science**				
Teaching	Hours Allocated: 60 (**Theory and Activity**) (5 hrs. / wk.)	L	A	P	C
Pre-requisites	Basic knowledge about Mathematics, Physics, chemistry and Computer science	4	1	-	4

Course Objectives:

1. To provide students with an in-depth understanding of the recent advances and cutting- edge research in mathematical, physical, and chemical sciences.
2. To broaden students' knowledge beyond the foundational concepts and expose them to the latest developments in these disciplines, fostering critical thinking, research skills, and the ability to contribute to scientific advancements.

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	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.	Application
CO2	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.	Application
CO3	Understand the different sources of renewable energy and their generation processes and advances in nanomaterial's and their properties.	Application
CO4	Understandand convert between different number systems, such as octal, decimal, and hexadecimal. Differentiate between analog and digital and understand their characteristics.	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT I: ADVANCESIN BASICS MATHEMATICS 9 hrs.

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

UNIT II: ADVANCES IN PHYSICS: 9 hrs.

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.

UNIT III: ADVANCES IN CHEMISTRY: 9 hrs.

Computer aided drug design and delivery, Nano sensors, Chemical Biology, impact of chemical pollutants on ecosystems and human health, Dye removal- Catalysis method

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY 9hrs.

Mathematical Modeling applications in physics and chemistry Application of Renewable energy: Grid Integration and Smart Grids, Application of nanotechnology: Nano medicine, Application of biophysics: Biophysical Imaging, Biomechanics, Neurophysics, Application of medical physics: Radiation Therapy, Nuclear medicine Solid waste management, Environmental remediation- Green Technology, Water treatment.

UNIT V: Advanced Applications of computer Science 9 hrs.

Number System-Binary, Octal, decimal, and Hexadecimal, Signals-Analog, Digital, Modem, Codec, Multiplexing, Transmission media, error detection and correction- Parity check andCRC, Networking devices- Repeater, hub, bridge, switch, router, gateway.

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 PrakashanMedia(P)Ltd.
4. "Renewable Energy: Power for a Sustainable Future" by Godfrey Boyle
5. "Energy Storage: A Nontechnical Guide" by Richard Baxter
6. "Biophysics: An Introduction" by Rodney Cotterill
7. "Medical Physics: Imaging" by James G. Webster
8. "Shape Memory Alloys: Properties and Applications" by Dimitris C. Lagoudas
9. Nano materials and applications by M.N.Borah
10. Environmental Chemistry by Anil.K.D.E.
11. Digital Logic Design by Morris Mano
12. Data Communication & Networking by BahrouzForouzan.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

Student Activities (15 hrs.)

UNIT I: ADVANCESIN BASIC MATHEMATICS 3 hrs.

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.

2: Limits and Differentiation Problem Solving Students will apply the concept of limits to solve various problems using standard limits.

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.

4: Matrices Manipulation Students will perform operations on matrices, including scalar multiplication, matrix multiplication, and matrix transpose.

UNIT II: ADVANCES IN PHYSICS: 3 hrs.

1: Experimental Design Assign students to design and conduct experiments related to one of the topics: renewable energy, nanotechnology, biophysics, medical physics.

2: 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.

UNIT III: ADVANCES IN CHEMISTRY: 3 hrs.

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.

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.

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.

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY 3 hrs.

1: Mathematical Modeling Experiment Provide students with a mathematical modeling experiment related to one of the topics. For example, in the context of renewable energy, studentscan develop a mathematical model to optimize the placement and configuration of solar panels ina solar farm.

2: Case Studies and Group Discussions Assign students to analyze case studies related to the applications of mathematical modeling in nanotechnology, biophysics, and medical physics,solid waste management, environmental remediation, or water treatment.

3. Group Project

Assign students to work in groups to develop a group project that integrates mathematicalmodeling with one of the application areas: renewable energy, nanotechnology, biophysics,medical physics, solid waste management, environmental remediation, or water treatment.

UNIT V: Advanced Applications of computer Science 3 hrs.

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

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. ORGANIC CHEMISTRY
SEMESTER - I
QUESTION PAPER BLUE PRINT
Course -2: ADVANCES OF MATHEMATICS, PHYSICS, CHEMISTRY & COMPUTER SCIENCE

TIME: $2^{1}/_{2}$ hrs. **Max. MARKS: 50**

PART-A

Answer **ALL** the Questions 5**x7 = 35 M**

1. **UNIT-I 2 Questions (Answer Q. No. 1 or 2)**
2. **UNIT- II 2 Questions (Answer Q. No.3 or 4)**
3. **UNIT- III 2 Questions (Answer Q. No. 5 or 6)**
4. **UNIT- IV 2 Questions (Answer Q. No. 7 or 8)**
5. **UNIT- V 2 Questions (Answer Q. No. 9 or 10)**

PART – B

Answer any **FIVE** Questions **5x3 = 15 M**

11. **2 Questions from UNIT- I (Q. No 11 & 12)**
12. **2 Questions from UNIT- II (Q. No 13 & 14)**
13. **2 Questions from UNIT- III (Q. No 15 & 16)**
14. **1 Question from UNIT- IV (Q. No 17)**
15. **1 Question from UNIT- V (Q. No 18)**

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. ORGANIC CHEMISTRY MAJOR
SEMESTER - I

Major-2: ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

SEMESTER END EXAMINATION MODEL QUESTION PAPER (2023-24)

Time: $2^1/_2$ hrs. **Max. Marks: 50**

PART- A **5 x 7 = 35 Marks**

Answer ALL the questions. Each carries SEVEN marks.

1. UNIT-I

(or)

2. UNIT-I
3. UNIT-II

(or)

4. UNIT-II

5. Discuss the impact of chemical pollutants on ecosystem and human health.

(or)

6. Exemplify the types of nano sensors and applications.
7. Describe the sewage water treatment.

(or)

8. UNIT-IV
9. UNIT-V

(or)

10. UNIT-V

PART- B **5 x 3 = 15 Marks**

Answer any FIVE of the following questions. Each one carries THREE marks.

11. Unit I
12. Unit I
13. Unit II
14. Unit II
15. Describe the importance of dye removal.
16. Write a note on Solid waste management.
17. Unit IV
18. Unit V

SEMESTER – II

I B.Sc. ORGANIC CHEMISTRY

(Course – 3& 4)

	Government College (Autonomous) Rajamahendravaram	Program & Semester			
Course Code Major-3	**TITLE OF THE COURSE** **Course -3: INORGANIC CHEMISTRY**	I B.Sc. Organic Chemistry (II Semester)			
Teaching	Hours Allocated: 45 (**Theory**)	L	T	P	C
Pre-requisites	Basics in inorganic chemistry and elements	3		-	3

Course Objectives:

1. To learn the preparation and structure and Diborane and Borazole.
2. To provide knowledge about different types of Interhalogen compounds.
3. To provide basic knowledge on d-block elements and f-block elements.
4. To learn the synthetic applications of Grignard reagents.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Acquire knowledge on preparation and structure and Diborane and Borazole.
CO2	Identify the importance of Interhalogen compounds and pseudo halogens.
CO3	Comprehend the applications of d-block elements and f-block elements.
CO4	Identify the importance of Organo metallic compounds in Organic synthesis.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		**Employability**		**Entrepreneurship**	

Syllabus:

UNIT –I Chemistry of p-block elements – I **9 h**

Group 13: Preparation & structure of Diborane, Borazine and (BN)x
Group14: Preparation, classification and uses of silicones and Silanes.
Group 15: Preparation & structure of Phosphonitrilic Chloride $P_3N_3Cl_6$

Unit II Chemistry of p-block elements – II **9 h**

Group 16: Classification of Oxides, structures of oxides and Oxoacids of Sulphur
Group 17: Preparation and Structures of Interhalogen compounds. Pseudo halogens,.

UNIT-III Chemistry of d-block elements: **9 h**

Characteristics of d-block elements with special reference to electronic configuration, variable valence, color, magnetic properties, catalytic properties and ability to form complexes. Stability of various oxidation states of 3d series-Latimer diagrams.

UNIT-IV Chemistry of f-block elements: **9 h**

Chemistry of lanthanides - electronic configuration, oxidation states, lanthanide contraction, consequences of lanthanide contraction, color, magnetic properties. Separation of lanthanides by ion exchange method. Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

UNIT-V: ORGANOMETALLIC CHEMISTRY

Definition - classification of Organometallic compounds - nomenclature, preparation, properties and applications of alkyls of Li and Mg.

List of Reference Books:

1. Inorganic Chemistry by J.E.Huheey
2. Basic Inorganic Chemistry by Cotton and Wilkinson
3. A textbook of qualitative inorganic analysis by A.I. Vogel 4. Concise Inorganic Chemistry by J.D.Lee

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No Correlation)

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	PO1 0	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	1	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	1	2	1	3	2	3	1	2	3	2	3	2
Avg.	2.5	2.25	2.75	2.0	2.5	1.75	2.0	2.0	2.25	2.25	2.25	2.75	2.75

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. ANALYTICALCHEMISTRY
SEMESTER – II
QUESTION PAPER BLUE PRINT
Course -3: INORGANIC CHEMISTRY

TIME: $2^{1}/_{2}$ hrs. **MARKS: 50 M**

PART -A

Answer ALL the Questions **5 x 7 = 35 M**

1. 2 Questions from UNIT- I
2. 2 Questions from UNIT- II
3. 2 Questions from UNIT-III
4. 2 Questions from UNIT IV
5. 2 Questions from UNIT-V

PART – B

Answer any FIVE Questions **5 x 3 = 15 M**

1. 2 Question from UNIT- I
2. 2 Questions from UNIT- II
3. 2 Question from UNIT- III
4. 1 Questions from UNIT- IV
5. 1 Questions from UNIT- V

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
I B.Sc. ANALYTICAL CHEMISTRY
SEMESTER-II
MODEL PAPER (From 2023-234)
Course - 3: GENERAL AND INORGANIC CHEMISTRY

Time: $2^1/_2$ hrs. **Maximum Marks: 50**

PART- A

Answer ALL the questions. Each carries SEVEN marks **5 x 7 = 35 M**

1. What are silicones? Write the classification, preparation and applications of Silicones.

(OR)

2. Explain the preparation and structure of Borazole.

3. Explain the classification of oxides based on oxygen content.

(OR)

4. Explain the preparation and structures of AX_5 and AX_7 type Inter halogen compounds.

5. Explain the following characteristic properties of d-block elements.
   i. Ability to exhibit variable oxidation states
   ii. Ability to form complex compounds.

(OR)

6. Write short notes on the following.
   i. Catalytic properties
   ii. Magnetic properties.

7. What is Lanthanide contraction? Explainthe consequences of Lanthanide contraction .

(OR)

8. Explain the separation of Lanthanides by ion exchange method.

9. Write the preparation and synthetic applications of Grignard reagents.

(OR)

10. Explain the preparation and synthetic applications of R-Li.

PART- B

Answer any FIVE of the following questions. Each carries THREE marks 5 x 3 = 15 M

11. Explain the structure of $P_3N_3Cl_6$.

12. Explain the preparation and the structure of Diborane

13 .Write a short note on pseudo halogens.

14. Describe the classification of oxides based on chemical behavior.

15. Explain the abnormal electronic configurations of Cr and Cu.

16. Write a short note on Latimer diagrams.

17. Write the differences between Lanthanides and Actinides.

18. Explain the classification of Organo metallic compounds.

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code Major-3 practical	TITLE OF THE COURSE **Course -3: ANALYSIS OF SIMPLE SALT**	I B.Sc. ORGANC CHEMISTRY (II Semester)			
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites	Qualitative analysis of inorganic simple anions and cations	-	-	2	1

Course Objectives:

1. Identification of inorganic simple anions
2. Identification of inorganic simple cations
3. Usage of different lab equipment and reagents for simple salt analysis.
4. Chemical reactions involving in the identification of acidic and basic radicals.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Understand the basic concepts of qualitative analysis of inorganic salts
CO2	Usage of glassware, equipment and chemicals involved in salt analysis
CO3	Apply the concepts of common ion effect, solubility product and concepts related to qualitative analysis
CO4	Acquire knowledge of micro scale salt analysis procedure.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	-

Syllabus:

Analysis of Inorganic SIMPLE SALT

50 M

Analysis of simple salt containing ONE anion and ONE cation from the following:

Anions: Carbonate, Sulphate, Chloride, Bromide, Acetate, Nitrate, Borate and Phosphate

Cations: Lead, Copper, Iron, Aluminium, Zinc, Nickel, Manganese, Calcium, Strontium, Barium, Magnesium and Ammonium

1. A Text Book of Quantitative Inorganic Analysis - Vogel, A. I.
2. A Textbook of Elementary Qualitative Analysis. Third edition (Engelder, Carl J.)
3. Systematic Qualitative Analysis. K L Kapoor.

Web Links:

1. https://youtu.be/adA8doZhqWs

CO-PO Mapping:

1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], 4: (No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	2	2	2	3	2	2	3	3
CO2	3	3	3	2	3	2	2	3	2	3	3	3	3
CO3	3	2	3	2	3	1	2	2	2	2	2	3	2
CO4	3	3	2	1	3	2	2	1	2	3	3	3	3
Avg.	3	2.75	2.75	2	3	2	2	2	2.25	2.5	2.5	3	2.75

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. ORGANIC CHEMISTRY (SEMESTER – II)			
Course Code Major-4	TITLE OF THE COURSE Course -4: **FUNDAMENTALS OF ORGANIC CHEMISTRY**				
Teaching	Hours Allocated: 45 (**Theory**) (3 hrs. / Wk.)	L	T	P	C
Pre-requisites:	Basic knowledge organic chemistry	3	-	-	3

Course Objectives:

1. To provide basic knowledge about structural theory in organic chemistry
2. To provide knowledge on alkenes, alkynes and its applications
3. Gain knowledge on benzene and its derivatives in synthetic organic chemistry

Course Outcomes:

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	Understand concepts of inductive effect, mesomeric effect and hyper conjugation	Skill
CO2	Understand about the synthesis and synthetic applications of alkenes	Application
CO3	Understand about the synthesis and synthetic applications of cycloalkanes	Understand
CO4	Get knowledge on benzene and its derivatives and their synthetic application	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT-I: **9 Hrs.**

STRUCTURAL THEORY IN ORGANIC CHEMISTRY

Types of bond fission and organic reagents (Electrophilic, Nucleophilic, and free radical reagents including neutral molecules like H2O,NH3& AlCl3).

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, carbanions..

Types of Organic reactions : Addition - electrophilic, nucleophilic and free radical. Substitution - electrophilic, nucleophilic and free radical. Elimination- Examples.

UNIT-II: **9 Hrs.**

ACYCLIC HYDROCARBONS

Alkenes - Preparation of alkenes. Properties: Addition of hydrogen - heat of hydrogenation and stability of alkenes. Addition of halogen and its mechanism. Addition of HX, Markonikov's rule, addition of H2O, HOX, H2SO4 with mechanism and addition of HBr in the presence of peroxide (anti - Markonikov's addition).

Dienes - Types of dienes, reactions of conjugated dienes - 1,2 and 1,4 addition of HBr to 1,3 - butadiene and Diel's - Alder reaction

UNIT-III: **9 Hrs.**

Alkynes - Preparation by dehydrohalogenation of dihalides, dehalogenation of tetrahalides, Properties; Acidity of acetylenic hydrogen (formation of Metal acetylides).

Preparation of higher acetylenes, Metal ammonia reductions, Physical properties. Chemical reactivity - electrophilic addition of X2, HX, H2O (Tautomerism), Oxidation with KMnO4, OsO4, reduction and Polymerisation reaction of acetylene.

UNIT-IV: **9 Hrs.**

ALICYCLIC HYDROCARBONS (CYCLOALKANES)

Nomenclature, Preparation by Freunds method, Wislicenus method. Properties - reactivity of cyclopropane and cyclobutane by comparing with alkanes,

Stability of cycloalkanes - Baeyer's strain theory, Sachse and Mohr predictions and Pitzer's strain theory. Conformational structures of cyclobutane, cyclopentane, cyclohexane..

UNIT – V:

BENZENE AND ITS REACTIVITY

Concept of aromaticity - aromaticity (definition), Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non - Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation)

Reactions - General mechanism of electrophilic substitution, mechanism of nitration, Friedel Craft's alkylation and acylation.

Orientation of aromatic substitution - Definition of ortho, para and meta directing groups. Ring activating and deactivating groups with examples (Electronic interpretation of various groups like NO2 and Phenolic). Orientation of (i) Amino, methoxy and methyl groups (ii) Carboxy, nitro, nitrile, (iii) Halogens

CO-PO Mapping:

(1: Slight[Low]; 2: Moderate[Medium]; 3: Substantial[High], '-': No Correlation)

	PO 1	PO 2	PO3	PO4	PO 5	PO6	PO 7	PO8	PO 9	PO1 0	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	1	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	1	2	1	3	2	3	1	2	3	2	3	2
Av g.	2.5	2.25	2.75	2.0	2.5	1.75	2.0	2.0	2.25	2.25	2.25	2.75	2.75

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

I B.Sc. O R G A N I C CHEMISTRY

SEMESTER – II QUESTION PAPER BLUE PRINT

Course -4: FUNDAMENTALS OF ORGANIC CHEMISTRY

TIME: $2^{1}/_{2}$ hrs. **MARKS: 50 M**

PART -A

Answer ALL the Questions **5 x 7 = 35 M**

1. 2 Questions from UNIT- I
2. 2 Questions from UNIT- II
3. 2 Questions from UNIT-III
4. 2 Questions from UNIT IV
5. 2 Questions from UNIT-V

PART – B

Answer any FIVE Questions **5 x 3 = 15 M**

6. 2 Question from UNIT- I
7. 2 Questions from UNIT- II
8. 1 Question from UNIT- III
9. 1 Questions from UNIT- IV
10. 2 Questions from UNIT- V

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
I B.Sc. ORGANIC CHEMISTRY
SEMESTER-II
MODEL PAPER (From 2023-234)
Course - 4: FUNDAMENTALS OF ORGANIC CHEMISTRY

Time: $2^1/_2$ hrs. **Maximum Marks: 50**

PART- A

Answer ALL the questions. Each carries SEVEN marks **5 x 7 = 35 M**

1. What is inductive effect? Explain its applications

(OR)

2. Explain types of organic reactions with examples
3. Explain the preparation methods and chemical properties of alkenes

(OR)

4. Explain 1,2 – and 1,4 – addition reactions in conjugated dienes

5. Write the preparations and chemical properties of alkynes

(OR)

6. Explain the chemical properties of higher alkynes

7. Explain the preparation and chemical properties of cycloalkanes

. **(OR)**

8. How Baeyer strain theory is used for explaining the stability of cycloalkanes?

9. Explain the concept of aromaticity based on Huckels rule

(OR)

10. Explain aromatic substitution reactions of Benzene

PART- B

Answer any FIVE of the following questions. Each carries THREE marks 5 x 3 = 15 M

11. Write briefly about organic reagents
12. Explain the acidity of phenols by using mesomeric effect
13. Discuss Markonikov's rule
14. What is Diels - Alder reaction? Give example
15. Write briefly about the acidity of alkynes
16. What are cyclo alkanes? Give example
17. What are ring activation groups? give example
18. Differentiate between benzenoid and non – benzenoid aromatic compounds

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code Major-4 practical	TITLE OF THE COURSE **Course -4: ORGANIC FUNCTIONAL GROUP ANALYSIS**	I B.Sc. ORGANIC CHEMISTRY (II Semester)			
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites	Organic qualitative analysis and functional groups	-	-	2	1

Course Objectives:

1. To provide basic knowledge about organic functional groups
2. To provide knowledge about the analysis of organic functional groups
3. To provide practical handling of laboratory apparatus involving the organic functional group analysis

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Identify different organic functional groups
CO2	Get practical skill to the analysis of different organic functional groups
CO3	Identify different unknown components present in the given organic compounds
CO4	Acquire knowledge on the nature of the organic compounds

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	-

Practical Syllabus: **50 M**

Organic functional group analysis:

Reactions of the following functional groups present in organic compounds (at least 4)

1. Alcohols ,
2. Phenols,
3. Aldehydes, ketones,
4. Carboxylic Acids
5. Amines

CO-PO Mapping:

1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], 4: (No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	2	2	2	3	2	2	3	3
CO2	3	3	3	2	3	2	2	3	2	3	3	3	3
CO3	3	2	3	2	3	1	2	2	2	2	2	3	2
CO4	3	3	2	1	3	2	2	1	2	3	3	3	3
Avg.	3	2.75	2.75	2	3	2	2	2	2.25	2.5	2.5	3	2.75

B.Sc. ANALYTICAL CHEMISTRY
(Single Major)

SEMESTER – I

I B.Sc. ANALYTICAL CHEMISTRY

(Course – 1 & 2)

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. Analytical Chemistry (I Semester)			
Course Code Major-1 (General)	TITLE OF THE COURSE **Course – 1: Essentials of Mathematics, Physics, chemistry & Computer Science**				
Teaching	Hours Allocated: 60 (**Theory and Activities**) (5 Hrs./wk.	L	A	P	C
Pre-requisites	Basic knowledge about Mathematics, physics, Chemistry and Computer science	4	1	-	4

Course Objectives:

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

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors, and statistical measures.	Critical Thinking
CO2	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	Application
CO3	To Explain the basic principles and concepts underlying a broadrange of fundamental areas of chemistry and to Connect their knowledge of chemistry to daily life.	Application
CO4	ore the history and evolution of the Internet and to gain an nding of network security concepts, including threats, vulnerabilities, ntermeasures.	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT I: ESSENTIALS OF MATHEMATICS: **9hrs.**

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

UNIT II: ESSENTIALS OF PHYSICS: 9hrs.

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

UNIT III: ESSENTIALS OF CHEMISTRY:: 9 hrs.

Definition and Scope of Chemistry- Importance of Chemistry in daily life -Branches of chemistry and significance- Periodic Table- Electronic Configuration, chemical changes, classification of matter, Biomolecules- carbohydrates, proteins, fats and vitamins.

UNIT IV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY: 9 hrs

Applications of Mathematics: 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.

UNIT V: ESSENTIALS OF COMPUTER SCIENCE: 9 hrs.

Milestones of computer evolution - Internet, history, Internet Service Providers, Types of Networks, 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

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 by B.L.Agarwal, New age international Publishers
5. University Physics with Modern Physics by Hugh D. Young and Roger A. Freedman
6. Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker
7. Chemsitry in daily life by Kirpal Singh
8. Fundamentals of Computers by V. Raja Raman

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

Student Activities (15 hrs)

Unit – I: Mathematics **3 hrs.**

1: Complex Number Exploration Provide students with a set of complex numbers in both rectangular and polar forms.

2: Trigonometric Ratios Problem Solving Give students a set of problems that require the calculation of trigonometric ratios and their relations.

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.

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).

Unit – II: Physics **3 hrs.**

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 the experiment. Students will work in small groups to carry out the experiment, collect data, and analyze the results.

Unit – III: Chemistry **3 hrs.**

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.

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.

3: Chemical Changes and Classification of Matter Provide students with various substances and chemical reactions, such as mixing acids and bases or observing a combustion reaction.

4: Biomolecules Investigation Assign each student or group a specific biomolecule 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.

Unit – IV: Applications of Mathematics, Physics and Chemistry **3 hrs.**

1: 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.

2: Mathematical Modeling Present students with real-world problems that require mathematical modeling and analysis

UNIT V: ESSENTIALS OF COMPUTER SCIENCE: 3 hrs.

1. Identifying the attributes of network (Topology, service provider, IP address and bandwidth
2. Your college network) and 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.

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. ANALYTICALCHEMISTRY
SEMESTER - I
QUESTION PAPER BLUE PRINT
Course -1: ESSENTIALS OF MATHEMATICS, PHYSICS, CHEMISTRY & COMPUTER SCIENCE

TIME: $2^1/_2$ hrs. **Max. MARKS: 50**

PART-A

Answer **ALL** the Questions 5**x7 = 35 M**

1. **UNIT-I 2 Questions (Answer Q. No. 1 or 2)**
2. **UNIT- II 2 Questions (Answer Q. No. 3 or 4)**
3. **UNIT- III 2 Questions (Answer Q. No. 5 or 6)**
4. **UNIT- IV 2 Questions (Answer Q. No. 7 or 8)**
5. **UNIT- V 2 Questions (Answer Q. No. 9 or 10)**

PART – B

Answer any **FIVE** Questions **5x3 = 15 M**

6. **2 Question from UNIT- I (Q. No. 11 & 12)**
7. **2 Questions from UNIT- II (Q. No. 13 & 14)**
8. **2 Question from UNIT- III (Q. No. 15 & 16)**
9. **1 Questions from UNIT- IV (Q. No. 17)**
10. **1 Questions from UNIT- V (Q. No. 18)**

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. INDUSTRIAL CHEMISTRY MAJOR
SEMESTER - I

Major-1: ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

SEMESTER END EXAMINATION MODEL QUESTION PAPER (2023-24)

Time: $2^1/_2$ hrs. **Max. Marks: 50**

PART- A **5 x 7 = 35 Marks**

Answer ALL the questions. Each carries SEVEN marks.

1. UNIT-I

(or)

2. UNIT-I
3. UNIT-II

(or)

4. UNIT-II

5. Write the chronology of periodic table and significance of electronic configuration in designing periodic table

(or)

6. Explain about Biomolecules with examples
7. Explain the step by step process of Drug discovery.

(or)

8. UNIT-IV
9. UNIT-V

(or)

10. UNIT-V

PART- B **5 x 3 = 15 Marks**

Answer any FIVE of the following questions. Each one carries THREE marks.

11. Unit I
12. Unit I
13. Unit II
14. Give a brief account on classification of matter.
15. Write the importance of chemistry in daily life.
16. Unit IV
17. Unit IV
18. Unit V

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. Analytical Chemistry (I Semester)			
Course Code Major-2 (General)	TITLE OF THE COURSE **Course – 2: Advances of Mathematics, Physics, chemistry & Computer Science**				
Teaching	Hours Allocated: 60 (**Theory and Activity**) (5 hrs. / wk.)	L	A	P	C
Pre-requisites	Basic knowledge about Mathematics, Physics, chemistry and Computer science	4	1	-	4

Course Objectives:

1. To provide students with an in-depth understanding of the recent advances and cutting- edge research in mathematical, physical, and chemical sciences.
2. To broaden students' knowledge beyond the foundational concepts and expose them to the latest developments in these disciplines, fostering critical thinking, research skills, and the ability to contribute to scientific advancements.

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	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.	Application
CO2	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.	Application
CO3	Understand the different sources of renewable energy and their generation processes and advances in nanomaterial's and their properties.	Application
CO4	Understandand convert between different number systems, such as octal, decimal, and hexadecimal. Differentiate between analog and digital and understand their characteristics.	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT I: ADVANCESIN BASICS MATHEMATICS 9 hrs.

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

UNIT II: ADVANCES IN PHYSICS: 9 hrs.

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.

UNIT III: ADVANCES IN CHEMISTRY: 9 hrs.

Computer aided drug design and delivery, Nano sensors, Chemical Biology, impact of chemical pollutants on ecosystems and human health, Dye removal- Catalysis method

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY 9hrs.

Mathematical Modeling applications in physics and chemistry Application of Renewable energy: Grid Integration and Smart Grids, Application of nanotechnology: Nano medicine, Application of biophysics: Biophysical Imaging, Biomechanics, Neurophysics, Application of medical physics: Radiation Therapy, Nuclear medicine Solid waste management, Environmental remediation- Green Technology, Water treatment.

UNIT V: Advanced Applications of computer Science 9 hrs.

Number System-Binary, Octal, decimal, and Hexadecimal, Signals-Analog, Digital, Modem, Codec, Multiplexing, Transmission media, error detection and correction- Parity check andCRC, Networking devices- Repeater, hub, bridge, switch, router, gateway.

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 PrakashanMedia(P)Ltd.
4. "Renewable Energy: Power for a Sustainable Future" by Godfrey Boyle
5. "Energy Storage: A Nontechnical Guide" by Richard Baxter
6. "Biophysics: An Introduction" by Rodney Cotterill
7. "Medical Physics: Imaging" by James G. Webster
8. "Shape Memory Alloys: Properties and Applications" by Dimitris C. Lagoudas
9. Nano materials and applications by M.N.Borah
10. Environmental Chemistry by Anil.K.D.E.
11. Digital Logic Design by Morris Mano
12. Data Communication & Networking by BahrouzForouzan.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

Student Activities (15 hrs.)

UNIT I: ADVANCESIN BASIC MATHEMATICS 3 hrs.

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.

2: Limits and Differentiation Problem Solving Students will apply the concept of limits to solve various problems using standard limits.

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.

4: Matrices Manipulation Students will perform operations on matrices, including scalar multiplication, matrix multiplication, and matrix transpose.

UNIT II: ADVANCES IN PHYSICS: 3 hrs.

1: Experimental Design Assign students to design and conduct experiments related to one of the topics: renewable energy, nanotechnology, biophysics, medical physics.

2: 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.

UNIT III: ADVANCES IN CHEMISTRY: 3 hrs.

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.

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.

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.

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY 3 hrs.

1: Mathematical Modeling Experiment Provide students with a mathematical modeling experiment related to one of the topics. For example, in the context of renewable energy, studentscan develop a mathematical model to optimize the placement and configuration of solar panels ina solar farm.

2: Case Studies and Group Discussions Assign students to analyze case studies related to the applications of mathematical modeling in nanotechnology, biophysics, and medical physics,solid waste management, environmental remediation, or water treatment.

3. Group Project

Assign students to work in groups to develop a group project that integrates mathematicalmodeling with one of the application areas: renewable energy, nanotechnology, biophysics,medical physics, solid waste management, environmental remediation, or water treatment.

UNIT V: Advanced Applications of computer Science 3 hrs.

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

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. ANALYTICAL CHEMISTRY
SEMESTER - I
QUESTION PAPER BLUE PRINT
Course -2: ADVANCES OF MATHEMATICS, PHYSICS, CHEMISTRY & COMPUTER SCIENCE

TIME: $2^1/_2$ hrs. **Max. MARKS: 50**

PART-A

Answer **ALL** the Questions 5**x7 = 35 M**

1. **UNIT-I 2 Questions (Answer Q. No. 1 or 2)**
2. **UNIT- II 2 Questions (Answer Q. No.3 or 4)**
3. **UNIT- III 2 Questions (Answer Q. No. 5 or 6)**
4. **UNIT- IV 2 Questions (Answer Q. No. 7 or 8)**
5. **UNIT- V 2 Questions (Answer Q. No. 9 or 10)**

PART – B

Answer any **FIVE** Questions **5x3 = 15 M**

11. **2 Questions from UNIT- I (Q. No 11 & 12)**
12. **2 Questions from UNIT- II (Q. No 13 & 14)**
13. **2 Questions from UNIT- III (Q. No 15 & 16)**
14. **1 Question from UNIT- IV (Q. No 17)**
15. **1 Question from UNIT- V (Q. No 18)**

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. ANALYTICAL CHEMISTRY MAJOR
SEMESTER - I

Major-2: ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

SEMESTER END EXAMINATION MODEL QUESTION PAPER (2023-24)

Time: $2^1/_2$ hrs. **Max. Marks: 50**

PART- A **5 x 7 = 35 Marks**

Answer ALL the questions. Each carries SEVEN marks.

1. UNIT-I

(or)

2. UNIT-I
3. UNIT-II

(or)

4. UNIT-II

5. Discuss the impact of chemical pollutants on ecosystem and human health.

(or)

6. Exemplify the types of nano sensors and applications.
7. Describe the sewage water treatment.

(or)

8. UNIT-IV
9. UNIT-V

(or)

10. UNIT-V

PART- B **5 x 3 = 15 Marks**

Answer any FIVE of the following questions. Each one carries THREE marks.

11. Unit I
12. Unit I
13. Unit II
14. Unit II
15. Describe the importance of dye removal.
16. Write a note on Solid waste management.
17. Unit IV
18. Unit V

SEMESTER – II

I B.Sc. ANALYTICAL CHEMISTRY

(Course – 3& 4)

	Government College (Autonomous) Rajamahendravaram	Program & Semester			
Course Code Major-3	**TITLE OF THE COURSE** **Course -3: INORGANIC CHEMISTRY**	I B.Sc. Analytical Chemistry (II Semester)			
Teaching	Hours Allocated: 45 (**Theory**)	L	T	P	C
Pre-requisites	Basics in inorganic chemistry and elements	3		-	3

Course Objectives:

1. To learn the preparation and structure and Diborane and Borazole.
2. To provide knowledge about different types of Interhalogen compounds.
3. To provide basic knowledge on d-block elements and f-block elements.
4. To learn the synthetic applications of Grignard reagents.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Acquire knowledge on preparation and structure and Diborane and Borazole.
CO2	Identify the importance of Interhalogen compounds and pseudo halogens.
CO3	Comprehend the applications of d-block elements and f-block elements.
CO4	Identify the importance of Organo metallic compounds in Organic synthesis.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		**Employability**		**Entrepreneurship**	

Syllabus:

UNIT –I Chemistry of p-block elements – I **9 h**

Group 13: Preparation & structure of Diborane, Borazine and (BN)x
Group14: Preparation, classification and uses of silicones and Silanes.
Group 15: Preparation & structure of Phosphonitrilic Chloride $P_3N_3Cl_6$

Unit II Chemistry of p-block elements – II **9 h**

Group 16: Classification of Oxides, structures of oxides and Oxoacids of Sulphur
Group 17: Preparation and Structures of Interhalogen compounds. Pseudo halogens,.

UNIT-III Chemistry of d-block elements: **9 h**

Characteristics of d-block elements with special reference to electronic configuration, variable valence, color, magnetic properties, catalytic properties and ability to form complexes. Stability of various oxidation states of 3d series-Latimer diagrams.

UNIT-IV Chemistry of f-block elements: **9 h**

Chemistry of lanthanides - electronic configuration, oxidation states, lanthanide contraction, consequences of lanthanide contraction, color, magnetic properties. Separation of lanthanides by ion exchange method. Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

UNIT-V: ORGANOMETALLIC CHEMISTRY

Definition - classification of Organometallic compounds - nomenclature, preparation, properties and applications of alkyls of Li and Mg.

List of Reference Books:

1. Inorganic Chemistry by J.E.Huheey
2. Basic Inorganic Chemistry by Cotton and Wilkinson
3. A textbook of qualitative inorganic analysis by A.I. Vogel 4. Concise Inorganic Chemistry by J.D.Lee

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No Correlation)

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CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	1	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	1	2	1	3	2	3	1	2	3	2	3	2
Avg.	2.5	2.25	2.75	2.0	2.5	1.75	2.0	2.0	2.25	2.25	2.25	2.75	2.75

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. ANALYTICALCHEMISTRY
SEMESTER – II
QUESTION PAPER BLUE PRINT
Course -3: INORGANIC CHEMISTRY

TIME: $2^{1}/_{2}$ hrs. **MARKS: 50 M**

PART -A

Answer ALL the Questions **5 x 7 = 35 M**

1. 2 Questions from UNIT- I
2. 2 Questions from UNIT- II
3. 2 Questions from UNIT-III
4. 2 Questions from UNIT IV
5. 2 Questions from UNIT-V

PART – B

Answer any FIVE Questions **5 x 3 = 15 M**

1. 2 Question from UNIT- I
2. 2 Questions from UNIT- II
3. 2 Question from UNIT- III
4. 1 Questions from UNIT- IV
5. 1 Questions from UNIT- V

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
I B.Sc. ANALYTICAL CHEMISTRY
SEMESTER-II
MODEL PAPER (From 2023-234)
Course - 3: GENERAL AND INORGANIC CHEMISTRY

Time: $2^1/_2$ hrs. **Maximum Marks: 50**

PART- A

Answer ALL the questions. Each carries SEVEN marks **5 x 7 = 35 M**

1. What are silicones? Write the classification, preparation and applications of Silicones.

(OR)

2. Explain the preparation and structure of Borazole.

3. Explain the classification of oxides based on oxygen content.

(OR)

4. Explain the preparation and structures of AX_5 and AX_7 type Inter halogen compounds.

5. Explain the following characteristic properties of d-block elements.
   i. Ability to exhibit variable oxidation states
   ii. Ability to form complex compounds.

(OR)

6. Write short notes on the following.
   i. Catalytic properties
   ii. Magnetic properties.

7. What is Lanthanide contraction? Explainthe consequences of Lanthanide contraction .

(OR)

8. Explain the separation of Lanthanides by ion exchange method.

9. Write the preparation and synthetic applications of Grignard reagents.

(OR)

10. Explain the preparation and synthetic applications of R-Li.

PART- B

Answer any FIVE of the following questions. Each carries THREE marks 5 x 3 = 15 M

11. Explain the structure of $P_3N_3Cl_6$.

12. Explain the preparation and the structure of Diborane

13 .Write a short note on pseudo halogens.

14. Describe the classification of oxides based on chemical behavior.

15. Explain the abnormal electronic configurations of Cr and Cu.

16. Write a short note on Latimer diagrams.

17. Write the differences between Lanthanides and Actinides.

18. Explain the classification of Organo metallic compounds.

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code Major-3 Practical	TITLE OF THE COURSE **Course -3: ANALYSIS OF SIMPLE SALT**	I B.Sc. ANALYTICAL CHEMISTRY (II Semester)			
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites	Qualitative analysis of inorganic simple anions and cations	-	-	2	1

Course Objectives:

1. Identification of inorganic simple anions
2. Identification of inorganic simple cations
3. Usage of different lab equipment and reagents for simple salt analysis.
4. Chemical reactions involving in the identification of acidic and basic radicals.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Understand the basic concepts of qualitative analysis of inorganic salts
CO2	Usage of glassware, equipment and chemicals involved in salt analysis
CO3	Apply the concepts of common ion effect, solubility product and concepts related to qualitative analysis
CO4	Acquire knowledge of micro scale salt analysis procedure.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	-

Syllabus:

Analysis of Inorganic SIMPLE SALT

50 M

Analysis of simple salt containing ONE anion and ONE cation from the following:

Anions: Carbonate, Sulphate, Chloride, Bromide, Acetate, Nitrate, Borate and Phosphate

Cations: Lead, Copper, Iron, Aluminium, Zinc, Nickel, Manganese, Calcium, Strontium, Barium, Magnesium and Ammonium

1. A Text Book of Quantitative Inorganic Analysis - Vogel, A. I.
2. A Textbook of Elementary Qualitative Analysis. Third edition (Engelder, Carl J.)
3. Systematic Qualitative Analysis. K L Kapoor.

Web Links:

1. https://youtu.be/adA8doZhqWs

CO-PO Mapping:

1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], 4: (No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	2	2	2	3	2	2	3	3
CO2	3	3	3	2	3	2	2	3	2	3	3	3	3
CO3	3	2	3	2	3	1	2	2	2	2	2	3	2
CO4	3	3	2	1	3	2	2	1	2	3	3	3	3
Avg.	3	2.75	2.75	2	3	2	2	2	2.25	2.5	2.5	3	2.75

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. ANALYTICAL CHEMISTRY (SEMESTER – II)			
Course Code Major-4	TITLE OF THE COURSE Course -4: **BASIC PRINCIPLES IN ANALYTICAL CHEMISTRY**				
Teaching	Hours Allocated: 45 (**Theory**) (3 hrs. / Wk.)	L	T	P	C
Pre-requisites:	Basic knowledge about material and energy balances	3	-	-	3

Course Objectives:

1. To provide basic knowledge about Chemical concentrations and standard solutions
2. To provide basic awareness on Chemical analysis
3. To understand and proper handling of common laboratory glass apparatus
4. To provide knowledge and applications of errors in chemical analysis

Course Outcomes:

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	Understand chemical concentrations and get skill to prepare different standard solutions	Skill
CO2	Understand about chemical analysis and identify suitable chemical methods to analyze different samples.	Application
CO3	Handle different types of common laboratory glass apparatus used in chemical analysis	Understand
CO4	Get awareness on errors in chemical analysis and get capability to calculate them	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT-I: **9 Hrs.**

A. SI Units:

1. Definitions of the Seven Base Units: Mass, Length, Time, Temperature, Amount Of substance, Electrical current and luminous intensity
2. Derived units and Conversion between units.

B. CHEMICAL CONCENTRATIONS:

1. Mole, molar mass; Calculations in grams and moles;
2. Solutions and their concentrations:
   i. Molar concentrations;
   ii. Analytical Molarity;
   iii. Equilibrium molarity of a particular species;
   iv. Percent concentration;
   v. Parts per million/ billion (ppm, ppb);
   vi. Volume ratios for dilution procedures;
   vii. p-functions;

C. Preparation of standard Solutions and Experimental procedure:

Standard solutions, Primary standard solutions and Secondary Standard solutions

UNIT-II: **9 Hrs.**

INTRODUCTION TO ANALYTICAL CHEMISTRY AND ANALYTICAL METHODS – I:

1. Introduction to Chemical analysis
2. General steps involved in chemical analysis
3. Quantitative Chemical analysis
4. Types of Quantitative Chemical Analysis: Classical methods of analysis and Instrumental methods of analysis with examples
5. Methods of detecting analytes based on,
   a. Physical properties,
   b. Electromagnetic radiations
   c. Electric charge

UNIT-III: **9 Hrs.**

INTRODUCTION TO ANALYTICAL CHEMISTRY AND ANALYTICAL METHODS – II:

1. Description, use and calibration of common laboratory apparatus: Volumetric flask, Burettes and Pipettes
2. Description and use of common laboratory apparatus Conical Flask, Weighing bottles, Funnels, Desiccators, Drying ovens
3. pH meter - components, use, maintenance, applications
4. Single pan analytical balance - operation and construction, Errors in weighing and care of an analytical balance.

UNIT-IV: **9 Hrs.**

ERRORS IN CHEMICAL ANALYSIS:

1. Errors and Types of Errors
2. Accuracy and Precision
3. Propagation of uncertainty: Gaussian distribution
4. Mean and Standard deviation;
5. Statistical tests of data: F-test, t-test, Q-test for bad data
6. Calibration curve;
7. Significant figures and their computation rules
8. Laboratory note book
9. Safety with chemicals and Wastes.

UNIT – V:

VOLUMETRICANALYSIS: **9Hours**

1. Titrimetric analysis: Volumetric titrimetry introduction
2. Different terms involved in titrimetric analysis: Titrant, Titrand, The equivalence point, the end point and Indicator.
3. Classification and principles of volumetric methods with examples:
    i. Acid-Base titrations,
    ii. Redox Titrations
    iii. Complexometric Titrations
    iv. PrecipitationTitrations.
4. Indicator; Definition, theories of indicators, different types of indicators
5. Buffer Solutions

Text Books:

1. Douglas A. Skoog and Donald M.West: Fundamentals of Analytical Chemistry.
2. Quantitative chemical analysis by Vogel's 6^{th} and 7^{th} editions

List of Reference Books:

1. Seamus P.J. Higson: Analytical Chemistry.
2. Douglas A. Skoog and Donald M.West: Fundamentals of Analytical Chemistry.
3. Adion A. Gordus: Schaum's Outline of Analytical Chemistry, Tata McGraw-Hill.
4. GaryD.Christian: Analytical Chemistry.
5. Freifelder and Kealy: Analytical Chemistry.
6. Daniel C Harris: Exploring Chemical Analysis.
7. Daniel C Harris: Quantitative Chemical Analysis.
8. Quantitative chemical analysis by Vogel's 6^{th} and 7^{th} editions

CO-PO Mapping:

(1: Slight[Low]; 2: Moderate[Medium]; 3: Substantial[High], '-': No Correlation)

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CO2	2	3	3	3	3	2	1	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	1	2	1	3	2	3	1	2	3	2	3	2
Avg.	2.5	2.25	2.75	2.0	2.5	1.75	2.0	2.0	2.25	2.25	2.25	2.75	2.75

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. ANALYTICAL CHEMISTRY
SEMESTER – II
QUESTION PAPER BLUE PRINT
Course -4: BASIC PRINCIPLES IN ANALYTICAL CHEMISTRY

TIME: $2^{1}/_{2}$ hrs. **MARKS: 50 M**

PART -A

Answer ALL the Questions **5 x 7 = 35 M**

1. 2 Questions from UNIT- I
2. 2 Questions from UNIT- II
3. 2 Questions from UNIT-III
4. 2 Questions from UNIT IV
5. 2 Questions from UNIT-V

PART – B

Answer any FIVE Questions **5 x 3 = 15 M**

6. 1 Question from UNIT- I
7. 2 Questions from UNIT- II
8. 2 Question from UNIT- III
9. 2 Questions from UNIT- IV
10. 1 Questions from UNIT- V

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
I B.Sc. ANALYTICAL CHEMISTRY
SEMESTER-II
MODEL PAPER (From 2023-234)
Course - 4: BASIC PRINCIPLES IN ANALYTICAL CHEMISTRY

Time: $2^1/_2$ hrs. **Maximum Marks: 50**

PART- A

Answer ALL the questions. Each carries SEVEN marks **5 x 7 = 35 M**

1. What are Primary standard solutions? Explain the experimental procedure for the preparation of a primary standard solution.

(OR)

2. What are secondary standard solutions? Explain the experimental procedure for the preparation of a secondary standard solution.
3. Explain the methods of detecting analytes based on Electic charge and electromagnetic radiation

(OR)

4. Explain about the Instrumental methods of analysis with examples

5. Explain in detail about pH meter

(OR)

6. Write in detail about the single pan analytical balance

7. What are Errors? Write about the classification of errors

. **(OR)**

8. What are significant figures? Write the computation rules of significant figures

9. Explain different theories of Indicators

(OR)

10. Explain the acid – base titrations with examples

PART- B

Answer any FIVE of the following questions. Each carries THREE marks 5 x 3 = 15 M

11. Define mole and molar concentration
12. Write briefly about chemical analysis
13. Discuss Qualitative analysis in briefly
14. How do you calibrate volumetric flask?
15. Write the uses of commonly used laboratory glass apparatus
16. Define mean and standard deviation
17. Explain briefly about accuracy
18. What are Buffer solutions?

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code Major-4 Practical	TITLE OF THE COURSE **Course -4: VOLUMETRIC ANALYSIS**	I B.Sc. ANALYTICAL CHEMISTRY (II Semester)			
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites	Preparation of standard solutions and handling of laboratory apparatus	-	-	2	1

Course Objectives:

1. To provide basic knowledge about the handling of laboratory apparatus
2. To provide knowledge about the preparation of standard solutions
3. To provide hands on training for the determination of different components

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Handle and calibrate the common laboratory glass apparatus
CO2	Get practical skill to the preparation of different standard solutions used for quantitative analysis
CO3	Determine different unknown components present in the given solutions
CO4	Acquire knowledge on buffer solutions

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	-

Practical Syllabus: **50 M**

1. Use and calibration of common volumetric apparatus : Burette, Pipette and Volumetric flask
2. Preparation of standard solutions: Primary and secondary standard solutions
3. Determination of Sodium carbonate by using standard HCl solution
4. Determination of zinc by using EDTA solution
5. Preparation of Buffer solutions

CO-PO Mapping:

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CO2	3	3	3	2	3	2	2	3	2	3	3	3	3
CO3	3	2	3	2	3	1	2	2	2	2	2	3	2
CO4	3	3	2	1	3	2	2	1	2	3	3	3	3
Avg.	3	2.75	2.75	2	3	2	2	2	2.25	2.5	2.5	3	2.75

B.Sc. INDUSTRIAL CHEMISTRY
(Single Major)

SEMESTER – I

I B.Sc. INDUSTRIAL CHEMISTRY

(Course – 1 & 2)

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. Industrial Chemistry I Semester			
Course Code Major-1 (General)	TITLE OF THE COURSE **Course – 1: Essentials of Mathematics, Physics, chemistry & Computer Science**				
Teaching	Hours Allocated: 60 (**Theory and Activities**) (5 Hrs./wk.	L	A	P	C
Pre-requisites	Basic knowledge about Mathematics, physics, Chemistry and Computer science	4	1	-	4

Course Objectives:

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

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors, and statistical measures.	Critical Thinking
CO2	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	Application
CO3	To Explain the basic principles and concepts underlying a broadrange of fundamental areas of chemistry and to Connect their knowledge of chemistry to daily life.	Application
CO4	ore the history and evolution of the Internet and to gain an nding of network security concepts, including threats, vulnerabilities, ntermeasures.	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT I: ESSENTIALS OF MATHEMATICS: **9hrs.**

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

UNIT II: ESSENTIALS OF PHYSICS: 9hrs.

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

UNIT III: ESSENTIALS OF CHEMISTRY:: 9 hrs.

Definition and Scope of Chemistry- Importance of Chemistry in daily life -Branches of chemistry and significance- Periodic Table- Electronic Configuration, chemical changes, classification of matter, Biomolecules- carbohydrates, proteins, fats and vitamins.

UNIT IV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY: 9 hrs

Applications of Mathematics : 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.

UNIT V: ESSENTIALS OF COMPUTER SCIENCE: 9 hrs.

Milestones of computer evolution - Internet, history, Internet Service Providers, Types of Networks, 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

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 by B.L.Agarwal, New age international Publishers
5. University Physics with Modern Physics by Hugh D. Young and Roger A. Freedman
6. Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker
7. Chemsitry in daily life by Kirpal Singh
8. Fundamentals of Computers by V. Raja Raman
9. Cyber Security Essentials by James Graham, Richard Howard, Ryan Olson

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

Student Activities (15 hrs.)

Unit – I: Mathematics **3 hrs.**

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.

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).

Unit – II: Physics **3 hrs.**

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 the experiment. Students will work in small groups to carry out the experiment, collect data, and analyze the results.

Unit – III: Chemistry **3 hrs.**

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 and bases 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 biomolecule 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 theclass.

Unit – IV: Applications of Mathematics, Physics and Chemistry 3 hr.

1: 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, ormeasuring the properties of materials.

2: Mathematical Modeling Present students with real-world problems that require mathematical modeling and analysis

UNIT V: ESSENTIALS OF COMPUTER SCIENCE: 3 hrs.

1. Identifying the attributes of network (Topology, service provider, IP address and bandwidth
2. Your college network) and 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.

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. INDUSTRIAL CHEMISTRY
SEMESTER - I
QUESTION PAPER BLUE PRINT
Course -1: ESSENTIALS OF MATHEMATICS, PHYSICS, CHEMISTRY & COMPUTER SCIENCE

TIME: $2^{1}/_{2}$ hrs. **Max. MARKS: 50**

PART-A

Answer **ALL** the Questions 5**x7 = 35 M**

1. **UNIT-I 2 Questions (Answer Q. No. 1 or 2)**
2. **UNIT- II 2 Questions (Answer Q. No. 3 or 4)**
3. **UNIT- III 2 Questions (Answer Q. No. 5 or 6)**
4. **UNIT- IV 2 Questions (Answer Q. No. 7 or 8)**
5. **UNIT- V 2 Questions (Answer Q. No. 9 or 10)**

PART – B

Answer any **FIVE** Questions **5x3 = 15 M**

6. **2 Question from UNIT- I**
7. **2 Questions from UNIT- II**
8. **2 Question from UNIT- III**
9. **1 Questions from UNIT- IV**
10. **1 Questions from UNIT- V**

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. MATHEMATICS, PHYSICS AND CHEMISTRY MAJORS
SEMESTER - I

Major-1: ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

SEMESTER END EXAMINATION MODEL QUESTION PAPER (2023-24)

Time: $2^1/_2$ hrs. **Max. Marks: 50**

PART- A **5 x 7 = 35 Marks**

Answer ALL the questions. Each carries SEVEN marks.

1. UNIT-I

(or)

2. UNIT-I
3. UNIT-II

(or)

4. UNIT-II

5. Write the chronology of periodic table and significance of electronic configuration in designing periodic table

(or)

6. Explain about Biomolecules with examples
7. Explain the step by step process of Drug discovery.

(or)

8. UNIT-IV
9. UNIT-V

(or)

10. UNIT-V

PART- B **5 x 3 = 15 Marks**

Answer any FIVE of the following questions. Each one carries THREE marks.

11. Unit I
12. Unit I
13. Unit II
14. Give a brief account on classification of matter.
15. Write the importance of chemistry in daily life.
16. Unit IV
17. Unit IV
18. Unit V

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. Industrial Chemistry (I Semester)			
Course Code Major-2 (General)	TITLE OF THE COURSE **Course – 2: Advances of Mathematics, Physics, chemistry & Computer Science**				
Teaching	Hours Allocated: 60 (**Theory and Activity**) (5 hrs. / wk.)	L	A	P	C
Pre-requisites	Basic knowledge about Mathematics, Physics, chemistry and Computer science	4	1	-	4

Course Objectives:

1. To provide students with an in-depth understanding of the recent advances and cutting-edge research in mathematical, physical, and chemical sciences.
2. To broaden students' knowledge beyond the foundational concepts and expose them to the latest developments in these disciplines, fostering critical thinking, research skills, and the ability to contribute to scientific advancements.

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	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.	Application
CO2	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.	Application
CO3	Understand the different sources of renewable energy and their generation processes and advances in nanomaterial's and their properties.	Application
CO4	Understandand convert between different number systems, such as octal, decimal, and hexadecimal. Differentiate between analog and digital and understand their characteristics.	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT I: ADVANCESIN BASICS MATHEMATICS 9 hrs.

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

UNIT II: ADVANCES IN PHYSICS: 9 hrs.

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.

UNIT III: ADVANCES IN CHEMISTRY: 9 hrs.

Computer aided drug design and delivery, Nano sensors, Chemical Biology,impact of chemical pollutants on ecosystems and human health,Dye removal- Catalysis method

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY 9hrs.

Mathematical Modelling applications in physics and chemistry Application of Renewable energy: Grid Integration and Smart Grids, Application of nanotechnology:Nano medicine, Application of biophysics: Biophysical Imaging, Biomechanics, Neurophysics, Application of medical physics: Radiation Therapy, Nuclear medicine Solid waste management, Environmental remediation- Green Technology, Water treatment.

UNIT V: Advanced Applications of computer Science 9 hrs.

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.

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 PrakashanMedia(P)Ltd.
4. "Renewable Energy: Power for a Sustainable Future" by Godfrey Boyle
5. "Energy Storage: A Nontechnical Guide" by Richard Baxter
6. "Biophysics: An Introduction" by Rodney Cotterill
7. "Medical Physics: Imaging" by James G. Webster
8. "Shape Memory Alloys: Properties and Applications" by Dimitris C. Lagoudas
9. Nano materials and applications by M.N.Borah
10. Environmental Chemistry by Anil.K.D.E.
11. Digital Logic Design by Morris Mano
12. Data Communication & Networking by BahrouzForouzan.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

Student Activities (15 hrs.)

UNIT I: ADVANCESIN BASIC MATHEMATICS 3 hrs.

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 and chemistry

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: 3 hrs.

1: 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.

2: 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.

UNIT III: ADVANCES IN CHEMISTRY: 3 hrs.

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 fora 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 minimizetheir impact. Encourage discussions on the ethical and environmental considerations whendealing 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 willdiscuss 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, PHYSICS & CHEMISTRY 3 hrs.

1: Mathematical Modeling Experiment Provide students with a mathematical modeling 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.

2: Case Studies and Group Discussions Assign students to analyze case studies related to the applications of mathematical modeling in nanotechnology, biophysics, and medical physics, solid waste management, environmental remediation, or water treatment..

3. Group Project

Assign students to work in groups to develop a group project that integrates mathematical modeling with one of the application areas: renewable energy, nanotechnology, biophysics, medical physics, solid waste management, environmental remediation, or water treatment.

UNIT V: Advanced Applications of computer Science 3 hrs.

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

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. INDUSTRIAL CHEMISTRY
SEMESTER - I
QUESTION PAPER BLUE PRINT
Course -1: ADVANCES OF MATHEMATICS, PHYSICS, CHEMISTRY & COMPUTER SCIENCE

TIME: $2^1/_2$ hrs. **Max. MARKS: 50**

PART-A

Answer **ALL** the Questions 5**x7 = 35 M**

1. **UNIT-I 2 Questions (Answer Q. No. 1 or 2)**
2. **UNIT- II 2 Questions (Answer Q. No. 3 or 4)**
3. **UNIT- III 2 Questions (Answer Q. No. 5 or 6)**
4. **UNIT- IV 2 Questions (Answer Q. No. 7 or 8)**
5. **UNIT- V 2 Questions (Answer Q. No. 9 or 10)**

PART – B

Answer any **FIVE** Questions **5x3 = 15 M**

11. **2 Question from UNIT- I**
12. **2 Questions from UNIT- II**
13. **2 Question from UNIT- III**
14. **1 Questions from UNIT- IV**
15. **1 Questions from UNIT- V**

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. INDUSTRIAL CHEMISTRY MAJOR
SEMESTER – I
Major-2: ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

SEMESTER END EXAMINATION MODEL QUESTION PAPER (2023-24)

Time: $2^1/_2$ hrs. **Max. Marks: 50**

PART- A **5 x 7 = 35 Marks**

Answer ALL the questions. Each carries SEVEN marks.

1. UNIT-I

(or)

2. UNIT-I
3. UNIT-II

(or)

4. UNIT-II

5. Discuss the impact of chemical pollutants on ecosystem and human health.

(or)

6. Exemplify the types of nano sensors and applications.
7. Describe the sewage water treatment.

(or)

8. UNIT-IV
9. UNIT-V

(or)

10. UNIT-V

PART- B **5 x 3 = 15 Marks**

Answer any FIVE of the following questions. Each one carries THREE marks.

11. Unit I
12. Unit I
13. Unit II
14. Unit II
15. Describe the importance of dye removal.
16. Write a note on Solid waste management.
17. Unit IV
18. Unit V

SEMESTER – II

I B.Sc. INDUSTRIAL CHEMISTRY

(Course – 3& 4)

	Government College (Autonomous) Rajamahendravaram	Program & Semester			
Course Code Major-3	**TITLE OF THE COURSE** **Course -3: INORGANIC CHEMISTRY**	I B.Sc. Industrial Chemistry (II Semester)			
Teaching	Hours Allocated: 45 (**Theory**)	L	T	P	C
Pre-requisites	Basics in inorganic chemistry and elements	3		-	3

Course Objectives:

1. To learn the preparation and structure and Diborane and Borazole.
2. To provide knowledge about different types of Interhalogen compounds.
3. To provide basic knowledge on d-block elements and f-block elements.
4. To learn the synthetic applications of Grignard reagents.

CourseOutcomes:

On Completion of the course, the students will be able to	
CO1	Acquire knowledge on preparation and structure and Diborane and Borazole.
CO2	Identify the importance of Interhalogen compounds and pseudo halogens.
CO3	Comprehend the applications of d-block elements and f-block elements.
CO4	Identify the importance of Organo metallic compounds in Organic synthesis.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development			**Employability**			**Entrepreneurship**	

Syllabus:

UNIT –I Chemistry of p-block elements – I **9 h**

Group 13: Preparation & structure of Diborane, Borazine and (BN)x

Group14: Preparation, classification and uses of silicones and Silanes.

Group 15: Preparation & structure of Phosphonitrilic Chloride $P_3N_3Cl_6$

Unit II Chemistry of p-block elements – II **9 h**

Group 16: Classification of Oxides, structures of oxides and Oxoacids of Sulphur

Group 17: Preparation and Structures of Interhalogen compounds. Pseudo halogens,.

UNIT-III Chemistry of d-block elements: **9 h**

Characteristics of d-block elements with special reference to electronic configuration, variable valence, color, magnetic properties, catalytic properties and ability to form complexes. Stability of various oxidation states of 3d series-Latimer diagrams.

UNIT-IV Chemistry of f-block elements: **9 h**

Chemistry of lanthanides - electronic configuration, oxidation states, lanthanide contraction, consequences of lanthanide contraction, color, magnetic properties. Separation of lanthanides by ion exchange method. Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

UNIT-V: ORGANOMETALLIC CHEMISTRY

Definition - classification of Organometallic compounds - nomenclature, preparation, properties and applications of alkyls of Li and Mg.

List of Reference Books:

1. Inorganic Chemistry by J.E.Huheey
2. Basic Inorganic Chemistry by Cotton and Wilkinson
3. A textbook of qualitative inorganic analysis by A.I. Vogel 4. Concise Inorganic Chemistry by J.D.Lee

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-': No Correlation)

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PS O1	PS O2	PS O3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	1	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	1	2	1	3	2	3	1	2	3	2	3	2
Avg.	2.5	2.25	2.75	2.0	2.5	1.75	2.0	2.0	2.25	2.25	2.25	2.75	2.75

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. INDUSTRIAL CHEMISTRY
SEMESTER – II
QUESTION PAPER BLUE PRINT
Course -3: INORGANIC CHEMISTRY

TIME: $2^{1}/_{2}$ hrs. **MARKS: 50 M**

PART -A

Answer ALL the Questions **5 x 7 = 35 M**

1. 2 Questions from UNIT- I
2. 2 Questions from UNIT- II
3. 2 Questions from UNIT-III
4. 2 Questions from UNIT IV
5. 2 Questions from UNIT-V

PART – B

Answer any FIVE Questions **5 x 3 = 15 M**

6. 2 Question from UNIT- I
7. 2 Questions from UNIT- II
8. 2 Question from UNIT- III
9. 1 Questions from UNIT- IV
10. 1 Questions from UNIT- V

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
I B.Sc. INDUSTRIAL CHEMISTRY
SEMESTER-II
MODEL PAPER (From 2023-234)
Course - 3: GENERAL AND INORGANIC CHEMISTRY

Time: $2^1/_2$ hrs. **Maximum Marks: 50**

PART- A

Answer ALL the questions. Each carries SEVEN marks **5 x 7 = 35 M**

1. What are silicones? Write the classification, preparation and applications of Silicones.

i. (OR)

2. Explain the preparation and structure of Borazole.

3. Explain the classification of oxides based on oxygen content.

i. (OR)

4. Explain the preparation and structures of AX_5 and AX_7 type Inter halogen compounds.

5. Explain the following characteristic properties of d-block elements.

i. Ability to exhibit variable oxidation states

ii. Ability to form complex compounds.

i. (OR)

6. Write short notes on the following.

i. i. Catalytic properties

ii. ii. Magnetic properties.

7. What is Lanthanide contraction? Explain the consequences of lanthanide contraction.

i. (OR)

8. Explain the separation of Lanthanides by ion exchange method.

9. Write the preparation and synthetic applications of Grignard reagents.

(OR)

10. Explain the preparation and synthetic applications of R-Li.

PART- B

Answer any FIVE of the following questions. Each carries THREE marks 5 x 3 = 15 M

11. Explain the structure of $P_3N_3Cl_6$.

12. Explain the preparation and the structure of Diborane

13 **.**Write a short note on pseudo halogens.

14. Describe the classification of oxides based on chemical behavior.

15. Explain the abnormal electronic configurations of Cr and Cu.

16. Write a short note on Latimer diagrams.

17. Write the differences between Lanthanides and Actinides.

18. Explain the classification of Organo metallic compounds.

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code Major-3 practical	TITLE OF THE COURSE **Course -3: ANALYSIS OF SIMPLE SALT**	I B.Sc. INDUSTRIAL CHEMISTRY (II Semester)			
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites	Qualitative analysis of inorganic simple anions and cations	-	-	2	1

Course Objectives:

1. Identification of inorganic simple anions
2. Identification of inorganic simple cations
3. Usage of different lab equipment and reagents for simple salt analysis.
4. Chemical reactions involving in the identification of acidic and basic radicals.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Understand the basic concepts of qualitative analysis of inorganic salts
CO2	Usage of glassware, equipment and chemicals involved in salt analysis
CO3	Apply the concepts of common ion effect, solubility product and concepts related to qualitative analysis
CO4	Acquire knowledge of micro scale salt analysis procedure.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	-

Syllabus:

Analysis of Inorganic SIMPLE SALT

50 M

Analysis of simple salt containing ONE anion and ONE cation from the following:

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

Reference books;

1. A Text Book of Quantitative Inorganic Analysis - Vogel, A. I.
2. A Textbook of Elementary Qualitative Analysis. Third edition (Engelder, Carl J.)
3. Systematic Qualitative Analysis. K L Kapoor.

Web Links:

1. https://youtu.be/adA8doZhqWs

CO-PO Mapping:

1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], 4: (No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	2	2	2	3	2	2	3	3
CO2	3	3	3	2	3	2	2	3	2	3	3	3	3
CO3	3	2	3	2	3	1	2	2	2	2	2	3	2
CO4	3	3	2	1	3	2	2	1	2	3	3	3	3
Avg.	3	2.75	2.75	2	3	2	2	2	2.25	2.5	2.5	3	2.75

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. INDUSTRIAL CHEMISTRY (SEMESTER – II)			
Course Code Major-4	TITLE OF THE COURSE Course -4: MATERIAL& ENERGY BALANCES AND UTILITIES IN CHEMICAL INDUSTRY				
Teaching	Hours Allocated: 45 (**Theory**) (3 hrs. / Wk.)	L	T	P	C
Pre-requisites:	Basic knowledge about material and energy balances	3	-	-	3

Course Objectives:

1. To get knowledge on dimensions and units for chemical calculations
2. Gain knowledge on material balances with and without chemical reactions
3. Get familiarity with utilities in chemical industries

Course Outcomes:

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	1. Understand about the basic units and dimensions used in chemical calculations	Understanding
CO2	2. Understand the about the material balances	Understanding
CO3	3. understand about the energy balances	Application
CO4	4. understand about the utilities in chemical industries	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

Unit – I: Dimensions and units: 9 h

Basic Chemical Calculations -Atomic weight, molecular weight, equivalent weight,
Mole, composition of (i) Liquid mixtures and (ii) gaseous mixtures.
Ideal gas law, vapor pressure, Humidity and Saturation.

UNIT - II: 9 h

Material Balance without Chemical Reactions: Flow diagram for material balance, simple material balance with or without recycle or by-pass for chemical engineering operations such as distillation, absorption, crystallization, evaporation and extraction.

Material Balance involving chemical reactions: concept of limiting reactant, conversion, yield, selectivity, and liquid phase reaction, gas phase reaction with or without recycle or bypass.

UNIT - III: 9 h

Energy Balance: Heat capacity of pure gases and gaseous mixtures at constant pressures, sensible heat changes in liquids, Enthalpy changes during phase transformation: Enthalpy of fusion, Enthalpy of vaporization, Enthalpy of condensation, Enthalpy of sublimation, Hess's law of constant, Heat Summation and its applications

UNIT - IV: 9 h

Utilities in Chemical Industry

a) **Boilers**: Types of boilers and their functioning
b) **Water**: Specifications of industrial use, various water treatments.
c) **Steam**: Generation and use.
d) **Air**: Specification of industrial use, processing of air

UNIT - V: 9 h

Fluid flow and Pumps Fluid flow:

Fans, blowers, compressors, vacuum pump, ejectors.
Pumps: Reciprocating pumps, Gear pumps, centrifugal pumps.

List of Reference Books:

1. B.I. Bhatt and S.M. Vora: Stoichiometry, Tata McGraw-Hill publishing Company Ltd, New Delhi.
2. E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK
3. R. M. Felder, R. W. Rousseau: Elementary Principles of Chemical Processes, Wiley Publishers, New Delhi.
4. J. A. Kent: Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
5. P. C. Jain, M. Jain: Engineering Chemistry, DhanpatRai& Sons, Delhi.
7. B. K. Sharma: Engineering Chemistry, Goel Publishing House, Meerut
8. S. C. Bhatia: Chemical Process Industries, Vol. I & II, CBS Publishers, New Delhi.
10. O. P. Vermani, A. K. Narula: Industrial Chemistry, GalgotiaPublicationsPvt. Ltd., New Delhi.

CO-PO Mapping:

(1: Slight[Low]; 2: Moderate[Medium]; 3: Substantial[High], '-': No Correlation)

	PO 1	PO 2	PO3	PO4	PO 5	PO6	PO 7	PO8	PO 9	PO1 0	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	1	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	1	2	1	3	2	3	1	2	3	2	3	2
Avg.	2.5	2.25	2.75	2.0	2.5	1.75	2.0	2.0	2.25	2.25	2.25	2.75	2.75

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

I B.Sc. INDUSTRIAL CHEMISTRY

SEMESTER – II

QUESTION PAPER BLUE PRINT

Course -4: MATERIAL& ENERGY BALANCES AND UTILITIES IN CHEMICAL INDUSTRY

TIME: $2^{1}/_{2}$ hrs. **MARKS: 50 M**

PART -A

Answer ALL the Questions **5 x 7 = 35 M**

1. 2 Questions from UNIT- I
2. 2 Questions from UNIT- II
3. 2 Questions from UNIT-III
4. 2 Questions from UNIT IV
5. 2 Questions from UNIT-V

PART – B

Answer any FIVE Questions **5 x 3 = 15 M**

6. 1 Question from UNIT- I
7. 2 Questions from UNIT- II
8. 2 Question from UNIT- III
9. 2 Questions from UNIT- IV
10. 1 Questions from UNIT- V

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
I B.Sc. INDUSTRIAL CHEMISTRY
SEMESTER-II
MODEL PAPER (From 2023-234)
Course - 4: MATERIAL& ENERGY BALANCES AND UTILITIES IN CHEMICAL INDUSTRY

Time: $2^{1}/_{2}$ hrs. **Maximum Marks: 50**

PART- A

Answer ALL the questions. Each carries SEVEN marks **5 x 7 = 35 M**

1. Explain with examples how v/v, w/v and w/w of liquid mixtures is calculated

(OR)

2. Write notes on i) Humidity and ii) Saturation

3. Explain the flow diagram for material balance with recycle for distillation.

(OR)

4. Explain the flow diagram for material balance with and without recycle for Evaporation.

5. Define heat capacity and explain in detail about heat capacity of pure gases at constant Pressure

(OR)

6. Explain in detail about heat capacity of mixture of gases at constant pressure.

7. Describe in detail about various water treatment procedures

. **(OR)**

8. Write an assay on different types of boilers and their functioning

9. Explain in detail about i) compressors and ii) ejectors.

(OR)

10. Explain in detail about i) Reciprocating pumps and ii) centrifugal pumps.

PART- B

Answer any FIVE of the following questions. Each carries THREE marks 5 x 3 = 15 M

11. How the equivalent weights of different compounds are calculated. Explain.
12. Explain in brief, the concept of limiting reagent.
13. Explain the flow diagram for material balance without recycle for crystallization
14. Write a note on sensible heats in liquids.
15. How enthalpy changes of gas mixtures are calculated. Explain.
16. Write a note on processing of air.
17. Describe in brief steam generation procedures.
18. Explain briefly about blowers.

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code Major-4 practical	TITLE OF THE COURSE **Course -4: VOLUMETRIC ANALYSIS**	I B.Sc. INDUSTRIAL CHEMISTRY (II Semester)			
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites	Preparation of standard solutions and handling of laboratory apparatus	-	-	2	1

Course Objectives:

1. To provide basic knowledge about the handling of laboratory apparatus
2. To provide knowledge about the preparation of standard solutions
3. To provide hands on training for the determination of different components

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Handle and calibrate the common laboratory glass apparatus
CO2	Get practical skill to the preparation of different standard solutions used for quantitative analysis
CO3	Determine different unknown components present in the given solutions
CO4	Acquire knowledge on buffer solutions

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	-

Practical Syllabus: **50 M**

1. Use and calibration of common volumetric apparatus : Burette, Pipette and Volumetricflask
2. Preparation of standard solutions: Primary and secondary standard solutions
3. Determination of Sodium carbonate by using standard HCl solution
4. Determination of zinc by using EDTA solution
5. Preparation of Buffer solutions

CO-PO Mapping:

1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], 4: (No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	2	2	2	3	2	2	3	3
CO2	3	3	3	2	3	2	2	3	2	3	3	3	3
CO3	3	2	3	2	3	1	2	2	2	2	2	3	2
CO4	3	3	2	1	3	2	2	1	2	3	3	3	3
Avg.	3	2.75	2.75	2	3	2	2	2	2.25	2.5	2.5	3	2.75

	Government College (Autonomous) Rajahmundry	Program & Semester II B.Sc. Chemistry III Semester			
Course Code *CHE-111*	**TITLE OF THE COURSE** **ORGANIC CHEMISTRY AND SPECTROSCOPY**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:	Organic functional groups, IUPAC nomenclature, aromaticity, oxidation & reduction, rearrangements	3	1	-	3

Course Objectives:

1. To study preparation, properties and reactions of halo alkanes, halo arenes and oxygen containing functional groups.
2. To learn about the functional group transformations.

Course Outcomes:

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	Acquire the knowledge of analysis of materials by using UV and Visible light which helps in identification of impurities and conjugation in organic compounds and biological macro molecules.	Applying
CO2	Capable of identifying the functional groups present in organic molecules by using I.R. spectroscopy and molecular structure determination by using NMR spectroscopy which are useful in research.	Understanding
CO3	Get the knowledge of the bond nature of C-OH and C-X and how they are used in daily life and industries.	Understanding
CO4	Acquire the knowledge about carbonyl compounds, carboxylic acids and how they become backbone of organic chemistry.	Applying

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

ORGANIC CHEMISTRY **34 h**

UNIT – I

1. Chemistry of Halogenated Hydrocarbons: **6 h**

Alkylhalides: Methods of preparation and properties, nucleophilic substitution reactions– SN1, SN2 and SNi mechanisms with stereochemical aspects and effect of solvent etc.; Williamson's synthesis.

Arylhalides: Preparation (including preparation from diazonium salts) and properties, nucleophilic aromatic substitution; SNAr, Benzyne mechanism.

2. Alcohols &Phenols **6 h**

Alcohols: preparation, properties and relative reactivity of 1°, 2°, 3° alcohols, Bouvaelt Blanc Reduction; Pinacol-Pinacolone rearrangement; Phenols: Preparation and properties; Acidity and factors effecting it, Ring substitution reactions, Reimer–Tiemann and Kolbe's–Schmidt Reactions, Fries and Claisen rearrangements with mechanism.

UNIT-II

Carbonyl Compounds **10 h**

Structure, reactivity, preparation and properties; Nucleophilic additions, Nucleophilic addition-elimination reactions with ammonia derivatives Mechanisms of Aldol and Benzoin condensation, Claisen-Schmidt, Perkin, Cannizzaro and Wittig reaction, Beckmann haloform reaction and Baeyer-Villiger oxidation,oxidations and reductions (Clemmensen, Wolf-Kishner, with LiAlH4 &NaBH4). Addition reactions of α,β-unsaturated carbonyl compounds: Michael addition.

Active methylene compounds: Keto-enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethylacetoacetate.

UNIT-III **12 h**

Carboxylic Acids and their Derivatives

General methods of preparation, physical properties and reactions of monocarboxylic acids, effect of substituents on acidic strength.Reactions of acid chlorides, anhydrides, esters and amides; Comparative study of nucleophilic substitution at acyl group-Mechanism.Acidic and alkaline hydrolysis of esters, Claisen condensation, Reformatsky reactions and Curtius rearrangement Reactions involving H, OH and COOH groups-salt formation, anhydride formation, acid chloride formation, amide formation and esterification (mechanism). Degradation of carboxylic acids by Huns-Diecker reaction, decarboxylation by Schimdt reaction, Arndt-Eistert synthesis, rignard ions by Hell- Volhard- Zelinsky reaction.

SPECTROSCOPY **26 h**

UNIT-IV

1. Electronic spectroscopy: **8 h**

Interaction of electromagnetic radiation with molecules and types of molecular spectra. Energy levels of molecular orbitals (σ, π, n). Types of electronic transitions in molecules, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic and hypsochromic shifts. Application of electronic spectroscopy and Woodward rules for calculating λmax of conjugated dienes and α,β – unsaturated compounds.

2. IR spectroscopy: **8 h**

Infrared radiation and types of molecular vibrations, functional group and fingerprint region. IR spectra of alkanes, alkenes and simple alcohols (inter and intramolecular hydrogen bonding), aldehydes, ketones, carboxylic acids and their derivatives (effect of substitution on >C=O stretching absorptions).

UNIT-V

Proton magnetic resonance spectroscopy (^{1}H-NMR) **10 h**

Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, NMR splitting of signals - spin-spin coupling, coupling constants. Applications of NMR with suitable examples - ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate, toluene and acetophenone.

List of Reference Books

1. A Text Book of Organic Chemistry by Bahl and Arun bahl
2. A Text Book of Organic chemistry by I L Finar Vol I
3. Organic chemistry by Bruice
4. Organic chemistry by Clayden
5. Spectroscopy by William Kemp
6. Spectroscopy by Pavia
7. Organic Spectroscopy by J. R. Dyer
8. Elementary organic spectroscopy by Y.R. Sharma
9. Spectroscopy by P.S.Kalsi
10. Spectrometric Identification of Organic Compounds by Robert M Silverstein,

Web Links:

1. https://youtu.be/RqBAW-uFHK0
2. https://youtu.be/OiukFtC8E04

CO-PO Mapping:

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CO2	3	2	2	3	3	2	2	2	2	3	2	2	3
CO3	1	2	3	3	2	1	1	2	3	1	2	3	1
CO4	3	3	2	2	3	2	3	1	2	3	1	2	3
Avg.	2.25	2.5	2.5	2.75	2.5	1.75	2.25	2.0	2.25	2.25	2.0	2.25	2.25

Proposed Activities:

Skill Development: 1. Esterification
2. Dibezalpropanone preparation

Employability: 1. Identification of functional groups in the IR spectra

Assignment Questions:

Unit-I:

1. Write the differences between SN^1 and SN^2 reactions.
2. Explain in detail $SN^1$and SN^2 reactions.
3. Explain the classification of alkyl halides with suitable examples.
4. Write the mechanism of Fires- rearrangement and azo coupling reaction.
5. Explain with mechanism of pinacol-pinaclone rearrangement.
6. How do you identify the alcohols with $KmnO_4$ and ceric ammonium nitrate?
7. What is Lucas reagent? What is its use?
8. Explain the mechanism of Reimer-Teimann reaction and Kolbe Schmidt reaction.
9. Write the preparation of alcohols by Grignard reagent.
10. Explain the process of dehydration of alcohols.
11. Write notes on hydrogen bonding in alcohols and phenols and its effects on boiling point.
12. Write any two preparation methods for phenols.

Unit-II:

1. Explain the reaction mechanism of the following reactions:
   a) Aldol condensation b) Benzoin condensation
2. Write any two methods for the preparation of carbonyl compounds.
3. Explain the reaction mechanism of the following reactions
   a) Perkin reaction b) Cannizaro reaction
4. Explain the following.
   a) Clemenson reduction b) Wolf-kishner reduction
5. Write the mechanism of haloform reaction.
6. What is 2,4 –DNP? Write its structure and uses.
7. Explain about Baeyer- Villiger oxidation.
8. Write about the Fehling and Schiff test.
9. Write the preparation and any three synthetic applications of diethyl malonate.
10. Write the preparation and any three synthetic applications of ethylaceto acetate.
11. Explain the tautomerism exhibited by active methylene compounds.

Unit-III:

1. Write any two preparation methods for aromatic carboxylic acids.
2. Write about differences in the acidities of aromatic and aliphatic carboxylic acids.
3. What is esterification? Write the mechanism of esterification.
4. Trichloro acetic acid is stronger than acetic acid. Explain why?
5. Explain briefly about
   a) Schmidt reaction b) Arndt-Eistert synthesis
6. How do you prepare carboxylic acid from rignard reagent? Give example.
7. Write notes on Huns-Diecker reaction.

Unit-IV:

1. Explain different types of electronic transitions occur in a molecule.

2. What is electromagnetic spectrum? What are the changes that occur during the interaction of electromagnetic radiation with molecules?
3. Write about chromophore and auxochrome with examples.
4. Explain the impact of conjugation on electronic transitions in molecules.
5. Explain the characteristic absorption bands of various functional groups in IR spectroscopy.
6. Write about the different regions of infrared radiation.
7. What are the applications of IR spectroscopy?
8. Explain about finger print region in IR spectrum.

UNIT-V:

9. Explain the salient features in the NMR spectra of ethyl acetate and acetophenone.
10. Explain the principle involved in NMR spectroscopy.
11. Explain about the position of signals and splitting of signals in NMR spectroscopy.
12. What is Chemical shift? Give the factors affecting the chemical shift.
13. Explain the following:

(i) Equivalent and Non-equivalent protons (ii) Spin-spin coupling

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
II B.Sc. CHEMISTRY SEMESTER - III
QUESTION PAPER BLUE PRINT

CHEMISTRY COURSE: ORGANIC CHEMISTRY AND SPECTROSCOPY

TIME: $2^1/_2$ hrs. **MAX. MARKS: 50**

PART -A

Answer **ALL** the Questions. **5x7 = 35 M**

1. **2 Questions from UNIT- I**
2. **2 Questions from UNIT- II**
3. **2 Questions from UNIT-III**
4. **2 Questions from UNIT IV**
5. **2 Questions from UNIT-V**

PART – B

Answer any **FIVE** Questions. **5x3 = 15 M**

6. **2 Questions from UNIT- I**
7. **1 Questions from UNIT- II**
8. **2 Questions from UNIT- III**
9. **2 Question from UNIT- IV**
10. **1 Question from UNIT- V**

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
II B.Sc. DEGREE EXAMINATIONS
SEMESTER-III MODEL PAPER (2023-24)

ORGANIC CHEMISTRY & SPECTROSCOPY

Time: $2^1/_2$ hrs. **Max. Marks: 50**

PART- A **5x7 = 35 Marks**

Answer **ALL** the questions. Each carries **SEVEN** marks

1. Give the mechanism & stereochemistry of SN1& SN2 reactions of alkyl halides with suitable examples.

(or)

2. Explain the following reactions with mechanism.
   (i) Pinacol-pinacolone rearrangement (ii) Reimer-Tiemann reaction

3. Discuss the mechanism of the following reactions.
   (i) Aldol condensation (ii) Cannizaro reaction

(or)

4. Write the preparation and any three synthetic applications of diethyl malonate.

5. Describe the acid and base hydrolysis reactions of esters with mechanism.

(or)

6. Explain the mechanisms of Claisen condensation & Reformatsky reaction.

7. Mention the Woodward rules for calculating the λ_{max} for α,β-unsaturated compounds.

(or)

8. Write about functional group region and finger print region in IR radiation.

9. What is Chemical shift? Give the factors affecting the chemical shift.

(or)

10. Write about splitting of signals and spin-spin coupling.

PART- B **5x3 = 15 Marks**

Answer any **FIVE** of the following questions. Each carries **THREE** marks.

10. Explain Williamson's synthesis.
11. Explain the mechanism for Fries rearrangement.
12. Write the mechanism of Benzoin condensation.
13. Explain Huns-Diecker reaction.
14. Write about Hell-Volhard-Zelinsky reaction.
15. Exemplify different types of electronic transitions.
16. Give the C=O stretching frequencies of aldehydes, ketones and carboxylic acids.
17. Write the principle of NMR spectroscopy.

	Government College (Autonomous) Rajahmundry	Program & Semester II B.Sc. III SEMESTER			
Course Code CHE-111P	TITLE OF THE COURSE **ORGANIC PREPARATIONS AND IR SPECTRAL ANALYSIS**				
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites:	IR spectroscopy, acylation, benzoylation, nitration	-	-	2	2

Course Objectives:

1. To interpret the IR spectra of functional groups.
2. To understand the methods of preparation like acylation, benzoylation, nitration
3. To learn about some green approaches.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Know the preparative methods of some organic compounds
CO2	Interpret IR spectra which will be used in identifying the functional groups present in unknown samples.
CO3	Apply the knowledge of organic reactions in preparing some industrially important compounds.
CO4	Create some methods for preparation in green methods.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

ORGANIC PREPARATIONS AND IR SPECTRAL ANALYSIS **50 M**

Organic preparations:

1. Acetylation of one of the following compounds:
   amines (aniline, o-, m-, ptoluidines and o- , m-, p-anisidine) and phenols (β-naphthol, vanillin, salicylic acid) by green approach (using zinc dust and acetic acid)
2. Benzolyation of aniline and phenol.
3. Nitration of Salicylic acid by green approach (using calcium nitrate and acetic acid).
4. Preparation of 1-phenylazo β-naphthol by diazotization and coupling with β-naphthol.

Organic functional group analysis

1. Phenols
2. Carboxylic acids
3. Carbonyl compounds

IR Spectral Analysis

IR Spectral Analysis of the following functional groups with examples

a) Hydroxyl groups b) Carbonyl groups c) Amino groups d) Aromatic groups

Reference and Text books:

1. Organic Qualitative Analysis - Vogel
2. Organic Spectroscopy by J. R. Dyer
3. Elementary organic spectroscopy by Y.R. Sharma
4. Spectroscopy by P.S. Kalsi
5. Spectrometric Identification of Organic Compounds by Robert M Silverstein.
6. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)
7. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. &Tatchell, A.R. Practical Organic Chemistry, 5th Ed. Pearson (2012)
8. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry:
9. Preparation and Quantitative Analysis, University Press (2000).

Web Links:

1. https://youtu.be/6Jo3AZd7NIk

CO-PO Mapping:

(1: Slight[Low]; 2: Moderate[Medium]; 3: Substantial[High], '-': No Correlation)

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CO1	3	2	3	3	2	3	3	2	2	2	3	3	2
CO2	2	2	2	2	3	3	2	3	2	3	2	2	3
CO3	2	3	2	3	1	3	2	3	3	2	2	3	1
CO4	1	2	3	3	3	3	2	2	2	3	3	2	3
Avg.	2.0	2.25	2.5	2.75	2.25	3	2.25	2.5	2.25	2.5	2.5	2.5	2.25

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
III SEMESTER END EXAMINATIONS
II B. Sc. CHEMISTRY 2023 - 24
ORGANIC PREPARATIONS AND IR SPECTRAL ANALYSIS - PRACTICAL

Scheme of Valuation

Time : 3 hrs **Max. Marks .50**

1. Record 10 Marks
2. Practical 35 Marks
3. Viva - voce 5 Marks

Splitting of Practical Marks (35)

i) Procedure : 3 Marks
ii) Equation : 3 Marks
iii) M.P. : 5 Marks
iv) Report of yield : 12 Marks

Splitting of Practical Marks for IR spectral analysis:

Identification of the frequencies of the bonds present in the given IR spectrum of an organic compound **:** 12 Marks

	Government College (Autonomous) Rajahmundry	Program & Semester II B.Sc. IV Semester			
Course Code CHE-112	TITLE OF THE COURSE **INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:	Asymmetric carbon, Optical isomerism, aromatic nature, electromagnetic spectrum.	3	1	-	3

Course Objectives:

1. To learn about the laws of absorption of light energy by molecules and the subsequent photochemical reactions.
2. To understand the concept of quantum efficiency and mechanisms of photochemical reactions.

Course Outcomes:

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	Acquire some knowledge about organic and organometallic compounds, their structures, properties which are very useful in manufacturing of different important organic compounds.	Understanding
CO2	Apply the thermodynamics related knowledge predicting the direction of spontaneous chemical transformations.	Understanding
CO3	Analyse the organic compounds in qualitatively.	Analysing
CO4	Create new routes for the preparation of compounds depending on the requirement.	Analysing

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT – I: Organometallic Compounds **6 h**

Definition and classification of organometallic compounds on the basis of bond type, Concept of haptacity of organic ligands. Metal carbonyls:18 electron rule, electron count of mononuclear, polynuclear and substituted metal carbonyls of 3d series. General methods of preparation of mono and binuclear carbonyls of 3d series. P-acceptor behaviour of carbon monoxide. Synergic effects (VB approach) - (MO diagram of CO can be referred to for synergic effect to IR frequencies).

Additional input: Total electron count, Calculation of number of M-M bonds.

UNIT–II: Carbohydrates **8 h**

Occurrence, classification and their biological importance, Monosaccharides: Constitution and absolute configuration of glucose and fructose, epimers and anomers, mutarotation, determination of ring size of glucose and fructose, Haworth projections and conformational structures; Interconversions of aldoses and ketoses; Killiani-Fischer synthesis and Ruff degradation; Disaccharides: Elementary treatment of maltose, lactose and sucrose. Polysaccharides: Elementary treatment of starch.

Additional input: Sugar moieties in RNA and DNA

UNIT-III:

Amino acids and proteins **8 h**

Introduction: Definition of Amino acids, classification of Amino acids into alpha, beta and gamma amino acids. Natural and essential amino acids - definition and examples, classification of alpha amino acids into acidic, basic and neutral amino acids with examples. Methods of synthesis: General methods of synthesis of alpha amino acids (specific examples - Glycine, Alanine, valine and leucine) by following methods: a) from halogenated carboxylic acid b) Gabriel phthalimide synthesis c) Strecker's synthesis. Physical properties: Zwitter ion structure - salt like character - solubility, melting points, amphoteric character, definition of isoelectric point. Chemical properties: General reactions due to amino and carboxyl groups - lactams from gamma and delta amino acids by heating- peptide bond (amide linkage). Structure and nomenclature of peptides and proteins.

Heterocyclic Compounds **7 h**

Introduction and definition: Simple five membered ring compounds with one hetero atom Ex. Furan, Thiophene and pyrrole - Aromatic character – Preparation from 1,4-dicarbonyl compounds, Paul-Knorr synthesis. Properties: Acidic character of pyrrole - electrophillic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation under mild conditions - Diels Alder reaction in furan. Pyridine - Structure - Basicity - Aromaticity- Comparison with pyrrole - one method of preparation and properties - Reactivity towards Nucleophilic substitution reaction.

Additional input: Hetrocyclic moiety of RNA and DNA, Structure of haemoglobin

UNIT- IV

Nitrogen Containing Functional Groups - Preparation, properties and important reactions of nitro compounds, amines and diazonium salts.

1. Nitro hydrocarbons **3 h**

Nomenclature and classification-nitro hydrocarbons, structure -Tautomerism of nitroalkanes leading to aci and keto form, Preparation of Nitroalkanes, reactivity -Discussion of the following reactions without mechanism :halogenation, reaction with HONO (Nitrous acid), Nef reaction and Mannich reaction, Micheal addition and reduction.

2. Amines **11 h**

Introduction, classification, chirality in amines (pyramidal inversion), importance and general methods of preparation. Properties: Physical properties, Basicity of amines: Effect of substituent,

solvent and steric effects. Distinction between primary, secondary and tertiary amines using Hinsberg's method and nitrous acid. Discussion of the following reactions with emphasis on the mechanistic pathway: Gabriel phthalimide synthesis, Hoffmann bromamide reaction, Carbylamine reaction. Diazonium Salts: Preparation and synthetic applications of diazonium salts including preparation of arenes, haloarenes, phenols, cyano and nitrocompounds. Coupling reactions of diazoniumsalts (preparation of azo dyes).

UNIT- V

Photochemistry **5 h**

Difference between thermal and photochemical processes, Laws of photochemistry - Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield, Photo chemical reaction mechanism - hydrogen-chlorine and hydrogen-bromine reaction. Qualitative description of fluorescence, phosphorescence, Jablonski diagram, Photosensitized reactions - energy transfer processes (simple example).

Additional input: Determination of quantum yield by actinometry.

Thermodynamics **12 h**

The first law of thermodynamics-statement, definition of internal energy and enthalpy, Heat capacities and their relationship, Joule-Thomson effect- coefficient, Calculation of work for the expansion of perfect gas under isothermal and adiabatic conditions for reversible processes, State function. Temperature dependence of enthalpy of formation- Kirchoff s equation, Second law of thermodynamics 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. Spontaneous and non-spontaneous processes, Helmholtz and Gibbs energies-Criteria for spontaneity.

Text books:

1. III B.Sc. Unified Chemistry - O.P. Agarwal
2. III B.Sc. Chemistry - Telugu Academy

Reference and Text books:

1. Concise coordination chemistry by Gopalan and Ramalingam
2. Coordination Chemistry by Basalo and Johnson
3. Organic Chemistry by G.Mareloudan, Purdue Univ
4. Text book of physical chemistry by S Glasstone
5. Concise Inorganic Chemistry by J.D.Lee
6. Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
7. A Text Book of Organic Chemistry by Bahl and Arunbahl
8. A Text Book of Organic chemistry by I L FinarVol I
9. A Text Book of Organic chemistry by I L Finar Vol II
10. Advanced physical chemistry by Gurudeep Raj

Web Links:

1. https://youtu.be/lsNalwRnaq0
2. https://youtu.be/BZ_tY88o0oI

CO-PO Mapping:

(1: Slight[Low]; 2: Moderate[Medium]; 3: Substantial[High], '-': No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	2	3	2	2	3	2	2	3	2	3	3	3
CO4	2	3	1	1	3	2	3	2	2	3	3	2	2
CO5	2.5	2.5	2.5	2	2.5	2.25	2.5	2.25	2.25	2.5	2.75	2.5	2.75

Proposed Activities:

Skill Development: 1.Analysis of organic compounds qualitatively
Employability: 1. Can work in air conditioner and refrigerators.
Entrepreneurship: 1. Can estabilish sugar and bevarages industries.

Assignment Questions:

UNIT – I: Organometallic Compounds

1. Define organometallic compound? Explain about classification of organometallic compounds on the basis of metal carbon bond with suitable examples ?
2. Write synergic effect in metal carbonyls? Explain synergic effect to IR frequencies?
3. Define metal carbonyls. Write any two general methods for preparation of mono and poly nuclear metal carbonyls of 3d series.
4. What is 18 electron rule? Describe the 18 electron rule for mono nuclear and polynuclear metal carbonyls.

UNIT–II: Carbohydrates

1. Describe the constitution, configuration of glucose. Write cyclic structure of glucose (α and β Glucopyranose) in Haworth representation?
2. Describe the constitution , configuration of fructose. Write cyclic structure of fructose (α and β Fructofuranose) in Haworth representation?
3. Describe cyclic structure of Glucose. How it explains objections to open chain structure? Write conformations of α and β Glucopyranose?
4. Explain about 1. Killiani-Fischer synthesis and 2. Ruff's degradation?
5. Explain about following interconversions
   (a) Aldose → Ketose (b) Ketose → Aldose.
6. Write a note on Mutarotation.
7. Explain about gluosazone formation.
8. What are carbohydrates ? Give classification of carbohydrates.

UNIT-III: Amino acids , proteins and Heterocyclic compounds

1. Define amino acids. Give the classification of amino acids.
2. What are amino acids? Write any three general methods of preparation of amino acids.
3. Define aromaticity. Discuss the aromatic character of pyrrole, Furan and Thiophene.
4. Write the electrophilic substitution reactions of Pyrrole, Furan and Thiophene.
5. (a) Give a general method of preparation of Pyrrole, Furan and Thiophene.
   (b) Explain why electrophilic substitution in Furan, Pyrrole and Thiophene preferentially occurs at the 2 or 5 position.
6. Describe about Zwitter ion and isoelectric point in amino acids.
7. Give two preparations of pyridine. Discuss any three nucleophilic substitution reactions of Pyridine. Why these occur at 2 position?
8. Explain the basic character of Pyridine. Why pyridine is more basic than pyrrole?
9. Explain acidic character of pyrrole?
10. Write a note on Diels Alder reaction in furan.

UNIT- IV: Nitro hydrocarbons and amines

1. What are nitro hydrocarbons? Write any three preparations of Nitroalkanes? Describe about tautomerism of nitroalkanes.
2. Describe about the following reactions
   (i) Nef reaction (ii) Mannich reaction (iii) Micheal addition.
3. How do you separate 1^0, 2^0, 3^0 – amines by using Hinsberg's method?
4. What is diazonium salt? Give the preparation and any three applications of diazonium salts.
5. Write the general methods of preparations of amines.
6. Discuss the basic nature of amines.
7. Write a note on Carbylamine reaction.
8. Write a note on Copling reaction of diazonium salts.

UNIT- V: Photochemistry and Thermodynamics

1. What is quantum yield? Explain the photochemical combination of Hydrogen-Chlorine and Hydrogen - Bromine. Write reason for high quantum yield of Hydrogen-Chlorine and low quantum yield of Hydrogen - Bromine.
2. Explain photo physical process of an excited molecule by Jablonski diagram.
3. Explain the laws of photo chemistry.
4. Derive Kirchoff's equation.
5. Explain Carnot cycle. Derive an expression for the efficiency of a heat engine.
6. Define entropy. Describe entropy changes in the reversible and irreversible processes.
7. Write the difference between the thermal and photo chemical reactions.
8. Define heat capacities at constant volume and constant pressure. Prove that C_P-C_V=R.
9. Prove that work done in reversible isothermal expansion of an ideal gas is maximum?
10. What is Fluorescence and Phosphorescence? Give examples.
11. Explain Joule –Thomson effect.
12. Give different statements of first law of thermodynamics.
13. Write a note on Photosensitization.
14. Give different statements of Second law of thermodynamics.

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
II B.Sc. CHEMISTRY SEMESTER - IV
QUESTION PAPER BLUE PRINT

Paper-IV: INORGANIC, ORGANIC & PHYSICAL CHEMISTRY

TIME: $2^1/_2$ hrs. **MAX. MARKS: 50**

PART -A

Answer **ALL** the Questions. **5x7 = 35 M**

1. **2 Questions from UNIT- I**
2. **2 Questions from UNIT- II**
3. **2 Questions from UNIT-III**
4. **2 Questions from UNIT IV**
5. **2 Questions from UNIT-V**

PART – B

Answer any **FIVE** Questions. **5x3 = 15 M**

6. **1 Questions from UNIT- I**
7. **1 Questions from UNIT- II**
8. **2 Questions from UNIT- III**
9. **2 Question from UNIT- IV**
10. **2 Question from UNIT- V**

GOVERNMENT COLLEGE (A),
RAJAMAHENDRAVARAMII B.Sc. DEGREE
EXAMINATIONS
SEMESTER-IV MODEL PAPER (2023-24)

Paper - IV: INORGANIC, ORGANIC & PHYSICAL CHEMISTRY

Time: $2^1/_2$ hrs. **Max. Marks: 50**

PART- A

Answer ALL the questions. Each carries SEVEN marks **5 x 7 = 35 Marks**

1. What are organometallic compounds? Discuss their Classification with examples.

(or)

2. Define metal carbonyls. Write any two general methods for preparation of mono and polynuclear metal carbonyls of 3d series.
3. Explain about 1. Killiani-Fischer method and 2. Ruff's degradation

(or)

4. Discuss the ring size of glucose. Draw the Haworth structures of glucose.
5. What are amino acids? Write any three general methods of preparation of amino acids.

(or)

6. Define aromaticity? Discuss the aromatic character of Furan, Thiophene and Pyrrole.
7. Describe about the following reactions
   (i) Nef reaction (ii) Mannich reaction

(or)

8. Explain about Hinsberg separation of amines.
9. Describe Jablonski diagram.

(or)

10. Derive Kirkoff's equation.

PART- B **5 x 3 = 15 Marks**

Answer any FIVE of the following questions. Each carries THREE marks

11. Describe the 18 electron rule of mono nuclear and polynuclear metal carbonyls with suitable examples.
12. Write about Mutarotation.
13. Discuss about iso electric point and zwitter ion.
14. Discuss the Paul-Knorr synthesis of five membered heterocyclic compounds.
15. Explain the tautomerism shown by nitro alkanes
16. Discuss the basic nature of amines.
17. What do you know about quantum yield?
18. Explain Joule-Thomson effect.

	Government College (Autonomous) Rajahmundry	Program & Semester II B.Sc. IV Semester			
Course Code CHE-112P	TITLE OF THE COURSE **ORGANIC QUALITATIVE ANALYSIS**				
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites:	Organic functional group reactions	-	-	2	2

Course Objectives:

1. To determine functional groups present in an unknown organic compound by their characteristic chemical reactions.
2. To understand the purpose of a synthetic derivative.
3. To learn synthesis of organic compounds (Dervatives)

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Understand the application and concepts of different organic reactions studied in theory part of organic chemistry
CO2	Determine melting and boiling points of organic compounds.Able to determine functional groups present in an unknown organic compound by their characteristic chemical reactions.
CO3	Identify extra elements and Analyse the organic compounds in qualitatively
CO4	Prepare of derivatives of a given organic compound

Syllabus:

Organic Qualitative Analysis **50 M**

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.

Reference and Text books:

1. Vogel's textbook of practical organic chemistry.

Web Links:

1. https://www.geeksforgeeks.org/qualitative-analysis-of-organic-compounds/
2. https://www.youtube.com/watch?v=EAWuP6PrEr4

CO-PO Mapping:

(1: Slight[Low]; 2: Moderate[Medium]; 3: Substantial[High], '-': No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	3	3	3	2	2	3	3	3
CO2	3	3	3	3	3	3	2	3	2	3	2	2	3
CO3	3	2	3	2	2	3	2	3	3	2	3	3	3
CO4	2	3	2	2	3	2	3	2	2	3	3	2	2
CO5	2.75	275	27.5	2.75	2.75	2.75	2.5	275	2.25	2.5	2.75	2.5	2.75

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
IV SEMESTER END EXAMINATIONS
II B. Sc. CHEMISTRY 2023 -24
LABORATORY COURSE-IV: ORGANIC QUALITATIVE ANALYSIS - PRACTICAL

Scheme of Valuation

Time : 3 hrs **Max. Marks. 50**

Record: 10 M

Viva: 5 M

Practical: 35 M

Splitting of Practical Marks:

- Colour - 1 Mark
- Physical State - 1 Mark
- Odour - 1 Mark
- MP / BP - 2 Marks
- Ignition test - 2 Marks
- Litmus test - 2 Marks
- Solubility & Classification basing on solubility data - 4 Marks
- Detection of extra elements - 4 Marks (extract -2 M)
- Unsaturation test - 4 Marks (with bromine water & Bayer's reagent)
- Identification test for functional group - 3 Marks
- Confirmatory tests (2) for functional group - 6 Marks
- One derivative of the organic compound - 3 Marks
- Report - 2 Marks

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHE-113	TITLE OF THE COURSE **PAPER V: INORGANIC AND PHYSICAL CHEMISTRY**	II B.Sc. (IV Semester)			
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites	Werner theory, EAN, properties of d-block elements, homogeneous and heterogeneous equilibrium basics of electrochemistry and chemical kinetics	3	1	-	3

Course Objectives:

1. Broad understanding and application of Theories of complex compounds, Isomerism in Coordination compounds and reaction mechanisms of complex compounds
2. Broad understanding and application of phase rule, electrochemistry and chemical kinetics

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	understand the theories of bonding in complex compounds and their stability, reaction mechanisms of complex compounds able to understand about bioinorganic compounds and their role in human metabolism	Understanding
CO2	Able to understand various phase diagrams and apply them to new systems	Understanding, Applying
CO3	Able to understand the concepts of chemical kinetics and able to apply draw solutions to various mathematical problems	Understanding, Applying
CO4	Able to understand concepts of electrochemistry	Understanding

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

INORGANIC CHEMISTRY **26 h**

UNIT–I

Coordination Chemistry **12 h**

IUPAC nomenclature of coordination compounds, Structural and stereoisomerism incomplexes with coordination numbers 4 and 6. Valence Bond Theory (VBT): Inner and outerorbital complexes. Limitations of VBT, Crystal field effect, octahedral symmetry. Crystalfield stabilization energy (CFSE), Crystal field effects for weak and strong fields. Tetrahedral symmetry, Factors affecting the magnitude of crystal field splitting energy, Spectrochemicalseries, Comparison of CFSE for Octahedral and Tetrahedral complexes, Tetragonal distortionof octahedral geometry, Jahn-Teller distortion, square planar coordination.

UNIT–II

1. Inorganic Reaction Mechanism: 4h

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

2. Stability of metal complexes: 2 h

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.

3. Bioinorganic Chemistry: 8 h

Metal ions present in biological systems, classification of elements according to their action in biological system. Geo chemical effect on the distribution of metals, Sodium/Kpump, carbonicanhydrase and carboxypeptidase. Excess and deficiency of some trace metals. Toxicity of metal ions (Hg, Pb, Cd and As), reasons for toxicity, Use of chelating agents in medicine, Cis platinasananti-cancer drug. Iron and its application in bio-systems, Haemoglobin, Myoglobin. Storage and transfer of iron.

PHYSICAL CHEMISTRY 34 h

UNIT-III

Phase rule 6 h

Concept of phase, components, degrees of freedom. Thermodynamic derivation of Gibbs phase rule. Phase diagram of one component system - water system, Study of Phase diagrams of Simple eutectic systems i) Pb-Ag system, desilverisation of lead ii) NaCl-Water system, Congruent and incongruent melting point- Definition and examples for systems having congruent and incongruent melting point, freezing mixtures.

UNIT-IV

Electrochemistry 14 h

Specific conductance, equivalent conductance and molar conductance- Definition and 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 (elementary treatment only), Application of conductivity measurements- conductometric titrations. Electrochemical Cells- Single electrode potential, Types of electrodes with examples: Metal-metal ion, Gas electrode,Inert electrode, Redox electrode, Metal-metal insoluble salt- salt anion. Determination of EMF of a cell, Nernst equation, Applications of EMF measurements - Potentiometric titrations. Fuel cells- Basic concepts, examples and applications

UNIT-V

Chemical Kinetics 14 h

The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction, Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants). Half–life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates:

Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only).Enzyme catalysis- Specificity, factors affecting enzyme catalysis, Inhibitors and Lock & key model. Michaels- Menten equation- derivation, significance of Michaelis-Menten constant.

List of Reference Books

1. Text book of physical chemistry by S Glasstone
2. Concise Inorganic Chemistry by J.D. Lee
3. Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
4. Advanced physical chemistry by Gurudeep Raj
5. Principles of physical chemistry by Prutton and Marron
6. Advanced physical chemistry by Bahl and Tuli
7. Inorganic Chemistry by J.E. Huheey
8. Basic Inorganic Chemistry by Cotton and Wilkinson
9. A textbook of qualitative inorganic analysis by A.I. Vogel
10. Atkins, P.W. & Paula, J. deAtkin's Physical Chemistry Ed., Oxford University Press 10th Ed (2014).
11. Castellan, G.W. Physical Chemistry 4th Ed. Narosa (2004).
12. Mortimer, R.G. Physical Chemistry 3rdEd. Elsevier: NOIDA, UP (2009).
13. Barrow,G.M.PhysicalChemistry

Web Links:

1. https://youtu.be/Hs5JBjX51dc
2. https://youtu.be/QrHlwgmMTq4

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	1	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.75	2.75	2	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

Proposed Activities:

Skill Development: 1. Determination of composition of complex by Jobs method, Conductometric titrations, potentiometric titrations.

Entrepreneurship: 1. Desilverisation of lead 2. Design of electrodes

Assignment Questions:

Unit-I

1. Explain Valence Bond theory with Inner and Outer orbital complexes. Write limitations of VBT
2. Define CFSE. Explain the factors effecting the magnitude of crystal field splitting energy.
3. Write note on Jahn-Teller distortion.
4. Explain the crystal field splitting in octahedral and tetrahedral complexes
5. Explain the hybridization , bond formation and magnetic properties of the complexes

Unit-2

1. Explain Trans effect. Explain the theories of trans effect and write any two applications of trans Effect
2. Explain Labile & inert complexes
3. Explain Job's method for determination of composition of complex
4. SN1 and SN2, Substitution reactions in square planar complexes.
5. Write the biological functions of Haemoglobin and Myoglobin.
6. Write note on use of chelating agents in medicines.
7. Write the significance of Sodium, potassium and chloride ions
8. Explain the toxicity of following metals
   (a) Lead (b) Arsenic (c) Mercury

Unit-3

1. Define Phase rule and terms involved in it. Explain phase diagram of Pb-Ag system
2. Explain Thermodynamic derivation of Gibb's phase rule.
3. Explain the phase diagram of water system
4. Define eutectic point
5. Explain Freezing mixtures with examples

Unit-4

1. Define Transport number. Write experimental method for the determination of transport number by Hittorf method.
2. Explain any two conductometric titrations.
3. Explain Kohlraush law and its applications
4. Explain Nernst equation
5. Write note on Fuel Cells with examples and applications.
6. Write about Hydrogen electrode and Calomel electrode
7. Explain Debye – Huckel theory of strong electrolytes

Unit-5

1. Explain general methods for determination of order of a reaction.
2. Write the difference between order and molecularity of the reaction.
3. Derive rate constant for first order reactions
4. Explain collision theory of bimolecular reactions
5. Explain Activated complex theory of bimolecular reactions
6. Derive Michaels- Menten equation.
7. What is enzyme catalysis? Write any three factors effecting enzyme catalysis.

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

II B.Sc. CHEMISTRY SEMESTER – IV

QUESTION PAPER BLUE PRINT

Paper-V: INORGANIC & PHYSICAL CHEMISTRY

TIME: $2^1/_2$ hrs. **MAX. MARKS: 50**

Blue Print of the model Question paper showing weightage given for each unit

S.No	Unit No	Essay question	Short answer question
1	I	2	1
2	II	2	2
3	III	2	1
4	IV	2	2
5	V	2	2
	Total	10	8

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
II B.Sc. DEGREE EXAMINATIONS
SEMESTER-IV MODEL PAPER (2023-24)

Paper-V: INORGANIC & PHYSICAL CHEMISTRY

Time: $2^1/_2$ hrs. **Maximum Marks: 50**

PART- A **5 x 7 = 35 Marks**

Answer ALL the questions. Each carries SEVEN marks.

1. Explain Valence Bond theory with Inner and Outer orbital complexes. Write limitations of VBT.

(or)

2. Define CFSE. Explain the factors affecting the magnitude of crystal field splitting energy.
3. Explain Trans effect. Explain the theories of trans effect and write any two applications of it.

(or)

4. (i) Write the biological functions of Haemoglobin and Myoglobin.
   (ii) Write note on use of chelating agents in medicines.
5. Define Phase rule and terms involved in it. Explain phase diagram of Pb-Ag system.

(or)

6. What is Triple point of water. Explain the phase diagram of water system
7. Define Transport number. Write experimental method for the determination of transport number by Hittorf method.

(or)

8. Explain about conductometric titrations
9. Explain general methods for determination of order of a reaction.

(or)

10. Explain Collision theory and Activated complex theory of bimolecular reactions.

PART- B **5 x 3 = 15 Marks**

Answer any FIVE of the following questions. Each one carries THREE marks.

11. Write note on Jahn-Teller distortion.
12. Explain Labile & inert complexes.
13. Explain Job's method for determination of composition of complex.
14. Explain Thermodynamic derivation of Gibb's phase rule.
15. Explain Kohlraush law and its applications
16. Write note on Fuel Cells with examples and applications.
17. What is enzyme catalysis? Write any three factors effecting enzyme catalysis.
18. Derive Michaels-Menten equation.

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	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHE-113P	TITLE OF THE COURSE **CONDUCTOMETRIC AND POTENTIOMETRIC TITRIMETRY**	II B.Sc. (IV Semester)			
Teaching	Hours Allocated: 30 (practical)	L	T	P	C
Pre-requisites	Basic Titrimetric principles	-	-	2	2

Course Objectives

1. To understand the interconnection between experimental foundation and underlying theoretical principles and to appreciate the limitations inherent in both theoretical treatments and experimental measurements.
2. To gain familiarity with a variety of physico-chemical measurement techniques.
3. To develop laboratory skills and the ability to work independently.
4. To develop the ability of scientific communications through oral quizzes, written reports and presentations.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
CO2	Apply concepts of electrochemistry in experiments
CO3	Be familiar with electroanalytical methods and techniques in analytical chemistry which study an analyte by measuring the potential (volts) and/or current (amperes) in an electrochemical cell containing the analyte Conductometric and Potentiometric Titrimetry
CO4	Able to determine rate constant for acid catalyzed ester hydrolysis

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

Conductometric and Potentiometric Titrimetry **50 M**

1. Conductometric titration- Determination of concentration of HCl solution using standard NaOH solution.
2. Conductometric titration- Determination of concentration of CH_3COOH Solution using standard NaOH solution.
3. Conductometric titration- Determination of concentration of CH_3COOH and HCl in a mixture using standard NaOH solution
4. Potentiometric titration- Determination of Fe (II) using standard $K_2Cr_2O_7$ solution.

5. Determination of rate constant for acid catalyzed ester hydrolysis.

Web Links:

1. https://youtu.be/xQ5U6McQ0XU
2. https://youtu.be/JS3ylTuks58

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
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CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	1	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.75	2.75	2	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
IV SEMESTER END EXAMINATIONS

II B. Sc. CHEMISTRY 2023 - 24

LABORATORY COURSE-V: CONDUCTOMETRIC AND POTENTIOMETRIC TITRIMETRY - PRACTICAL

Scheme of Valuation

Time : 3 hrs. **Max. Marks .50**

Record: 10 M

Viva: 5 M

Practical: 35 M

Splitting of Practical Marks:

1.	Aim, apparatus, chemicals		5 M
2.	Procedure		5 M
3.		Formula with units	5 M
4.		Neat Tabulation	5 M
5.	Report:	error < 10% error	15 M
		error 10% -15%	10 M
		error > 15%	5 M

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHE-114A	TITLE OF THE COURSE **SYNTHETIC ORGANIC CHEMISTRY**	III B.Sc. (V/VI Semester)			
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites	Addition and rearrangement reactions, electromagnetic spectrum	3	1	-	3

Course Objectives:

1. Pericyclic reactions, some synthetic reactions and some reagents.
2. Organic photochemistry and Retrosynthesis

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	Identify the importance of reagents used in the synthesis of organic compounds	Understanding
CO2	Acquire knowledge on basic concepts indifferent types of pericyclic reactions	Applying
CO3	Understand the importance of retro synthesis in organic chemistry.	Understanding
CO4	Comprehend the applications of different reactions in synthetic organic chemistry.	Applying

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

SYNTHETIC ORGANIC CHEMISTRY **60 h**

UNIT –I

Pericyclic reactions **14 h**

1. A brief introduction to synthetic organic chemistry
2. Features and classification of per cyclic reactions: Phases, nodes and symmetry properties of molecular orbital's in ethylene, 1, 3-butadiene, 1, 3, 5-hexatriene, alkylation and ally radical. Thermal and photochemical reactions.
3. Electro cyclic reactions: Definition and examples, definitions of con and dis rotation, Woodward- Hoffmann selection rules.(Correlation diagrams are not required)
4. Cyclo addition reactions: Definition and examples, definitions of suprafacial and antara

facial addition, Woodward-Hoffmann selection rules (Correlation diagrams are not required)

UNIT –II

Organic Photochemistry **10 h**

1. Jablonski diagram-singlet and triplet states
2. Photochemistry of Carbonyl compounds-$n-\pi$ and $\pi-\pi*$ transitions,Norrish type-1and type-2 reactions
3. Paterno – Buchi reaction.

UNIT-III

Retrosynthesis **14 h**

1. Important terms in Retro synthesis with examples-Disconnection, Target molecule, FGI, Synthon, Retro synthetic analysis, chemo selectivity, region selectivity
2. Importance of Order of events in organic synthesis
3. Retro synthetic analysis

UNIT-IV

Synthetic Reactions **10 h**

Shapiro reaction, Stork-enamine reaction (only alkylation), Wittig reaction, Robinson annulation, Bailys-Hillman reaction, Heck reaction, Suzuki coupling. Synthesis of aldehydes and ketones using1,3-Dithiane.

UNIT-V

Reagents in Organic Chemistry **12 h**

Oxidizing agents: PCC, PDC, SeO2 (Riley oxidation), NBS. Reducing agents: LiAlH4 (with mechanism), LTBA, Metal-solvent reduction (Birch reduction), Catalytic reduction.

List of Reference Books:

1. Pericyclic reactions by Ian Fleming, Second edition, Oxford University press.
2. Pericyclic Reactions-A Text book: Reactions, Applications and Theory by S.Sankararaman, WILEY-VCH.
3. Reaction Mechanism in Organic Chemistry by S.M. Mukherji and S.P.Singh, Revised edition, Trinity Press.
4. Pericyclic reactions-AMechanistic study by S.M.Mukherji, Macmill an India.
5. Organic synthesis: The disconnection approach by Stuart Warren, John Wiley & Sons.
6. Organic chemistry by Jonathan Clayden, Nick Greeves and Stuart Warren, Second edition, Oxford university press.
7. Reactions, Reagents and Rearrangements by S.N. Sanyal, Bharati Bhawan Publishers & Distributors.

Web Links:

1. https://www.scienceabc.com/pure-sciences/what-are-pericyclic-reactions.html
2. https://www.youtube.com/watch?v=LMtiq2KkkNA

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	3	1	2	3	1	2	3	3
CO4	2	3	2	2	3	2	3	1	2	3	3	3	2
Avg.	2.5	2.75	2.75	2.25	2.5	2.25	2.25	2	2.25	2.25	2.5	2.75	2.75

Activities proposed:

Skill Development: Reduction of nitro benzene

Enterpreneurship: Synthesis of organic molecules by retro synthesis

Assignment questions:

UNI-1

1) Define electro cyclic reactions. Describe WOODWARD-HOFFMAN rule
2) Give definition, & Woodward selection rules for Supra facial cyclo addition reaction
3) Write about classification of pericyclic reactions
4) Write note on con &dis rotation
5) Give examples for suprafacial &antar facial addition

UNIT-2

1) Write a note on photo chemistry of Carbonyl compound
1) Write a short notes on Photo chemical reaction
2) Write about singlet & triplet states in Jablonski diagram
3) Paterno buchi reaction
4) Write briefly about Norrish type 1 & type 2 reaction

UNIT-3

1) Write about retro synthetic analysis of paracetamol
2) Write the Importance of Order of events in organic synthesis
3) Write about chemo selectivity reactions.
4) Retro synthetic analysis of cyclo hexene
5) Describe about Disconnection, Target molecule, FGI, Synthon, Retro synthetic analysis, region selectivity

UNIT-4

1) Write about Robinson Annulation
2) Synthesise Aldehydes & Ketones from g1, 3-Dithiane.
3) Describe Wittig reaction, Bailys-Hillman reaction, Heck reaction, &Suzuki coupling.
4) Write the mechanism of Stark enamine reaction.

UNIT-5

1) Describe Riley oxidation
2) Write 2 reactions of PCC & PBC as oxidizing agents
3) Write a note on Birch reduction.
4) Write reducing reaction mechanism of $LiAlH_4$

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

III B.Sc. CHEMISTRY SEMESTER – V/VI

QUESTION PAPER BLUE PRINT

CHEMISTRY COURSE-VIA: SYNTHETIC ORGANIC CHEMISTRY

TIME: $2^{1}/_{2}$ hrs. **MAX. MARKS: 50**

Sl. No.	CHAPTER	Essay Question (07 M)	Knowledge - Short Answer Question (04 M)	Very short answer question (02 M)
1	UNIT-1	2	1	1
2	UNIT-II	1	2	-
3	UNIT-III	2	1	1
4	UNIT-IV	2	2	-
5	UNIT-V	1	2	1

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
III B.Sc. DEGREE EXAMINATIONS
SEMESTER – V/VI (2023-24)
CHEMISTRY COURSE - VIA : SYNTHETIC ORGANIC CHEMISTRY

TIME : $2^{1}/_{2}$ hrs. **Max.marks : 50 M**

PART- A **4 x 7 = 28 M**

Answer ALL the questions. Each carries SEVEN marks.

1. Define electrocyclic reactions. Describe Woodward-Hoffmann rule.

Or

2. Give definition & Woodward selection rules for Suprafacial cyclo addition reactions.
3. Write about retro synthetic analysis of paracetamol.

Or

4. Write the Importance of Order of events in organic synthesis.
5. Write about Robinson Annulation.

Or

6. Synthesise Aldehydes & Ketones from 1,3-Dithiane.
7. Describe Riley oxidation.

Or

8. Write briefly about Norrish type 1 & type 2 reactions.

PART-B

Answer any FOUR Questions. **4 x 4 = 16 M**

9. Write a note on N-bromo succinimide or NBS.
10. Write the mechanism of Stark enamine reaction.
11. Write about chemo selectivity reactions.
12. Write the classification of Pericyclic reactions.
13. Write Birch Reduction.
14. Write a note on Paterno Buchi reaction.
15. Explain with Examples Con & Dis rotation.
16. Describe about singlet & triplet state

PART-C

Answer any FOUR Questions. **3 x 2 = 6 M**

17. Write a short note on Photo chemical reactions.
18. What is target Molecule?
19. Give an example of catalytic reduction.

	Government College (Autonomous) Rajahmundry	Program & Semester			
CourseCode CHE-114AP	TITLE OF THE COURSE **VIA-SYNTHETIC ORGANIC CHEMISTRY**	III B.Sc. (V/VI Semester)			
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre- requisites	Green chemistry and Chromatography	-	-	2	2

Course Objectives:

1. Green methods in Organic analysis.
2. Separation of amino acids.
3. Column chromatography and Thin layer chromatography

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Perform the organic qualitative analysis for the detection of N, S and halogens using the green procedure.
CO2	Learn the procedure for the separation of mixture famine acids using paper Chromatography.
CO3	Prepare the TLC plates for TLC chromatography.
CO4	Acquire skills in conducting column chromatography for the separation of dyes in the given mixture.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus

Practical Course - VIA:

Synthetic Organic Chemistry **50 M**

1. Green procedure for organic qualitative analysis: Detection of N, S and halogens
2. Separation of given mixture of amino acids (glycine and phenyl alanine) using ascending paper chromatography.
3. Separation of a given dye mixture (methyl orange and methylene blue) using TLC (using alumina as adsorbent).
4. Separation of mixture of methyl range and methyl enable by column chromatography
5. Separation of food dyes using Column Chromatography
6. Separation of triglycerides using TLC

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 Aggarwal R. Comprehensive Practical Organic Chemistry, University press.
4. Mann F. G and Saunders B.C, Practical Organic Chemistry, Pearson Education.

Web links:CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High]; 4 : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	3	3	3	3	3	3	3	3
CO2	3	2	2	3	2	3	3	2	3	3	2	2	3
CO3	3	3	3	3	3	2	3	2	1	2	3	3	1
CO4	3	2	2	2	2	3	2	3	2	2	2	2	2
Avg.	3	2.5	2.25	2.5	2.5	2.75	2.75	2.5	2.25	2.5	2.5	2.5	2.25

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
V/VI SEMESTER END EXAMINATIONS
III B. Sc. CHEMISTRY 2023 - 24
LABORATORY COURSE-VIA: SYNTHETIC ORGANIC CHEMISTRY - PRACTICAL

Scheme of Valuation

Time : 3 hrs **Max. Marks .50**

Record: 10 M

Viva: 5 M

Practical: 35 M

Splitting of Practical Marks:

1. Aim, apparatus, chemicals 5 M
2. Principle 5 M
3. Procedure 5 M
4. Report 20 M

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHE115A	TITLE OF THE COURSE **PAPER VIB - ANALYSIS OF ORGANIC COMPOUNDS**	III B.Sc. (V/VI Semester)			
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites	Spectroscopy	3	1	-	3

Course Objectives:

1. To Learn the Importance of Spectroscopy
2. To learn various Chromatographic Methods
3. To Learn about elucidation of organic compounds by Spectroscopic techniques

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	Identify the importance of mass spectrometry in the structural elucidation of organic compounds.	Understanding
CO2	Acquire the knowledge on structural elucidation of organic compounds.	Applying
CO3	Understand various chromatography methods in the separation and identification of organic compounds.	Understanding
CO4	Apply the knowledge gained in solvent extraction for the separation of the organic compounds.	Applying

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

Unit-1:

Mass Spectrometry **12 h**

A brief introduction to analysis of organic compounds Basic principles, Instrumentation - Mass spectrometer, electron Ionization (Electron Impact ionization, EI), Molecular ions, metastable ions, Isotope abundance. Basic fragmentation types. Fragmentation patterns in Toluene, 2- Butanol, Butaraldehyde, Propionic acid.

Unit-2:

Structural elucidation of organic compounds using IR, NMR, mass spectral data **10 h**

2, 2, 3, 3-Tetra methyl butane, Butane-2, 3-dione, Prop ionic acid and methyl propionate.

Unit-3:

Structural elucidation of organic compounds using IR, NMR, Mass spectral data 10 h

Phenyl acetylene, acetophenone amines, acids and p-nitro aniline.

Unit-4:

Separation techniques-1 14 h

1. Solvent extraction - Principle and theory, Batch extraction technique, application of batch extraction in the separation of organic compounds from mixture - acid & neutral, base & neutral.
2. Chromatography - Principle and theory, classification, types of adsorbents, eluents, Rf values and factors affecting Rf values.
3. Thin layer chromatography - principle, experimental procedure, advantages & applications.

Unit-5:

Separation techniques-2 14 h

1. Paper chromatography- Principle, experimental procedure, ascending, descending, radial and two dimensional, applications.
2. Column chromatography-Principle, classification, experimental procedure, applications.
3. HPLC-Principle, Instrumentation-block diagram and applications.

References:

1. Organic Spectroscopy by William Kemp, Third Edition, Palgrave USA.
2. Introduction to Spectroscopy by Pavia, Lamp man, Kriza nd Vyvyan, Fifth edition,
3. Organic Spectroscopy: Principles and Applications by Jag Mohan, Second edition, Alpha Science.
4. Spectroscopy of Organic Compounds by P.S.Kalsi, Seventh edition, New Age International.
5. Spectroscopic Methods in Organic Chemistry by Ian Fleming and Dudley Williams, Seventh edition, Springer.
6. Fundamentals of Analytical Chemistry by F.James Holler, Stanley R Crouch, Donald M.Westand Douglas A.Skoog, Ninth edition, Cen gage.
7. Analytical Chemistry by Gary D.Christian, Purnendu K.Dasgupta and Kevin A.Schug, Seventh edition, Wiley.
8. Quantitative analysis by R.A.Day Jr. and A.L.Underwood, Sixth edition, Pearson.

Web Links:

1. https://commons.wikimedia.org/wiki/Category:Mass_spectrometry
2. https://open.uci.edu/lectures/chem_51b_lec_17_organic_chemistry_nmr_spectroscopy.html
3. https://commons.wikimedia.org/wiki/File:Pen_and_paper_chromatography.ogv

Web links:CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	2	3	2	2	3	3	3
CO2	2	2	3	2	3	2	3	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	3	2	2	3	3	2	3	1	2	3	3	2	2
Avg.	2.75	2.5	2.75	2.25	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

Proposed activities:

1) **Skill development**: Separation of colored pigments
2) **Entrepreneurship:** Analysis of organic compounds &Elucidation of structure

Assignment questions:

UNIT-1

1) Write note on electron ionization
2) Write about the instrumentation of mass spectrometer
3) Write fragmentation patterns in
   a) toluene b) 2-butanol c) butaraldehyde d) propionic acid

UNIT-2

1) Write the structural elucidation of organic compounds using IR, NMR of 2, 2, 3, 3-tetra methyl butane.
2) Write the structural elucidation of organic compounds using NMR & Mass spectral data of d methyl propionate.
3) Write the Structural elucidation of organic compounds using NMR & Mass spectral data of propionic acid

UNIT-3

1) Structural elucidation of organic compounds using IR, NMR of Phenyl acetylene
2) Structural elucidation of organic compounds using IR, Mass spectral data of p-nitro aniline
3) Structural elucidation of organic compounds using mass spectral data of Phenyl acetylene
4) Structural elucidation of organic compounds using Mass spectral data of p-nitro aniline

UNIT-4

1) Write any two applications of TLC
2) What is Rf value? Give the factors effecting Rf value.
3) Write a note on batch extraction
4) Applications of batch extraction
5) Write a note on principle of chromatography

UNIT-5

1) Write briefly about paper chromatography
2) Describe the principle & applications of HPLC
3) Write applications of column chromatography
4) Write about Two dimensional paper chromatography

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

III B.Sc. CHEMISTRY SEMESTER – V/VI

QUESTION PAPER BLUE PRINT

CHEMISTRY COURSE-VIB: ANALYSIS OF ORGANIC COMPOUNDS

TIME: $2^1/_2$ hrs. **MAX. MARKS: 50**

Sl. No.	CHAPTER	Essay Question (07 M)	Knowledge - Short Answer Question (04 M)	Very short answer question (02 M)
1	UNIT-1	2	1	1
2	UNIT-II	1	2	-
3	UNIT-III	2	1	1
4	UNIT-IV	1	2	1
5	UNIT-V	2	2	-

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
III B.Sc. DEGREE EXAMINATIONS
SEMESTER – V/VI (2023-24)
CHEMISTRY COURSE - VIB : ANALYSIS OF ORGANIC COMPOUNDS

TIME : $2^{1}/_{2}$ hrs. **Max. Marks : 50 M**

PART- A **4 x 7 = 28 M**

Answer ALL the questions. Each carries SEVEN marks.

1. Write the Fragmentation patterns in Toluene, 2-butanol,

Or

2. Describe the Instrumentation in Mass spectrometer,
3. Write the Structural elucidation of organic compounds using IR, NMR of 2, 2, 3, 3-tetra methyl butane.

Or

4. What is Rf value? Give the factors effecting Rf value
5. Structural elucidation of organic compounds using IR, NMR of Phenyl acetylene

Or

6. Structural elucidation of organic compounds using IR, Mass spectral data of p-nitro aniline.
7. Write briefly about paper chromatography

Or

8. Describe the principle & applications of HPLC

PART-B

Answer any FOUR Questions. **4 x 4 = 16 M**

9. Write about isotope abundance
10. Write the structural elucidation of propionic acid using NMR.
11. Write about role of adsorbents & eluents in Chromatography.
12. Write the applications of column chromatography.
13. Write the Structural elucidation of using Mass spectral data of d methyl propionate.
14. Write the Structural elucidation of acetophenone using NMR
15. Write one Application of Batch Extraction Process
16. Write about Two dimensional paper chromatography

PART-C

Answer any FOUR Questions. **3 x 2 = 6 M**

17. Write any two applications of Column chromatography
18. Give examples of adsorbent
19. Write short notes on Electron Impact Ionization

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHE115AP	TITLE OF THE COURSE **ANALYSIS OF ORGANIC COMPOUNDS**	III B.Sc. (V/VI Semester)			
Teaching	Hours Allocated: 30 (**PRACTICAL**)	L	T	P	C
Pre-requisites	ORGANIC ANALYSIS	-	-	2	2

Course Objectives:

1. To Learn Separation of given mixture of amino acids (glycine and phenyl alanine) using ascending paper chromatography
2. To learn Green procedure for organic qualitative analysis: Detection of N, S and halogens
3. Separation of food dyes using Column Chromatography

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Prepare acetanilide using the green synthesis. .
CO2	Demonstrate the preparation of azodye
CO3	Acquire skills in the separation of organic compounds in the given mixture using solvent extraction
CO4	Synthesis of Adipic acid

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

Analysis of Organic Compounds **50 M**

1. Identification of various equipment in the laboratory
2. Acetylating of 1^{o} amine by green method: Preparation of acetanilide
3. Rearrangement reaction in green conditions: Benzil - Benzilic acid rearrangement
4. Green oxidation reaction: Synthesis of adipic acid
5. Photo reduction of Benzophenone to Benzopinacol in the presence of sunlight
6. Separation of organic compounds in a mixture (acidic compound + neutral compound) using solvent extraction.

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 Aggarwal R. Comprehensive Practical Organic Chemistry, University press.
4. Mann F.G and Saunders B.C, Practical Organic Chemistry, Pearson Education.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	2	3	2	2	3	3	3
CO2	2	2	3	2	3	2	3	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	2	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.75	2.75	2	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
V/VI SEMESTER END EXAMINATIONS
III B. Sc. CHEMISTRY 2023 - 24
LABORATORY COURSE-VIIA: ANALYSIS OF ORGANIC COMPOUNDS - PRACTICAL

Scheme of Valuation

Time : 3 hrs **Max. Marks .50**

Record: 10 M

Viva: 5 M

Practical: 35 M

Splitting of Practical Marks:

1. Aim, apparatus, chemicals 5 M
2. Principle 5 M
3. Procedure 5 M
4. Report 20 M

	Government College (Autonomous) Rajamahendravaram	Program & Semester III B.Sc. (V/VI Semester)			
Course Code CHE-114B	TITLE OF THE COURSE **VIB-ANALYTICAL METHODS IN CHEMISTRY-1**				
Teaching	Hours Allocated: 60 (**Theory and Training**)	L	T	P	C
Pre-requisites	Basic concepts of chemical analysis	3	1	-	3

Course Objectives:

1. To provide basic awareness on chemical analysis.
2. To provide knowledge about common laboratory glass apparatus.
3. To provide knowledge about errors in chemical analysis.
4. To provide knowledge about separation techniques in Chemistry.

Course Outcomes:

On completion of the course, the students will be able to		Cognitive Domain
CO1	Understand the basic principles of volumetric analysis and gravimetric analysis.	Understanding
CO2	Understand the theories of different types of titrations.	Skill
CO3	To get awareness on errors in chemical analysis and their minimization methods.	Understanding
CO4	Learn the basic principle and applications of solvent extraction and ion exchange method.	Applications

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

Unit-1: Quantitative analysis-1 **10 h**

1. A brief introduction to analytical methods in chemistry
2. Principles of volumetric analysis, concentration terms- Molarity, Molality, 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.

Unit-2: Quantitative analysis-2 **14 h**

1. Principles of volumetric analysis: Theories of acid-base (including study of acid-base titration curves), redox, complex metric, 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.

Unit-3: Treatment of analytical data **10 h**

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.

Unit-4: Separation techniques **14 h**

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 exchange resins, applications.

UNIT-5: Analysis of water **12 h**

Determination of dissolved solids, total hardness of water, turbidity, alkalinity, Dissolved oxygen, COD, determination of chloride using Mohr's method.

Reference books:

1. Fundamentals of Analytical Chemistry by F.James Holler, Stanley R Crouch, Donald M.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.DayJr. and A.L.Underwood, Sixth edition, Pearson.
4. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.
5. Text book of Environmental Chemistry and Pollution Control by S.S.Dara and D.D.Mishra, Revised edition, S Chand & CoLtd.

Web Links:

1. https://youtu.be/xQDQNghs5dc
2. https://youtu.be/3kEKLTv1Tr0

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	1	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.75	2.75	2	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

Proposed activities:

Skill Development: 1.Preparation of standard solutions.
2. Acid-Base titrations.

Employability: 1. Separation of Organic compounds by solvent extraction technique using Separating funnel.

Entrepreneurship: 1. Determination of hardness of water using EDTA.

Assignment Questions:

Unit-1: Quantitative analysis-1

1. Explain the following terms with suitable examples.
   (i) Molarity (ii) Molality (iii) Normality
2. What are standard solutions? Explain primary and secondary standard solutions with suitable examples.
3. Explain the terms ppm and ppb.
4. Explain the terms end point and equivalence point.

Unit-2: Quantitative analysis-2

1. Write a short note on Acid-Base titration.
2. Write a short note on the following.
   (a) Redox titrations (ii) Complex metric titrations
3. Explain the following terms with suitable examples.
   (i) Coprecipitation (ii) Post precipitation
4. Write a short note on the following.
   (i) Coagulation (ii) Peptization

Unit-3: Treatment of analytical data

1. Write a short note on the following.
   (i) Accuracy and methods of expressing accuracy
   (ii) Precession and methods of expressing precession
2. Write a short note on the following.
   (i) Types of errors (ii) Minimization of errors
3. Write a brief note on Significant figures.
4. What is standard deviation?

Unit-4: Separation techniques

1. Explain the principle and applications of Batch extraction
2. Explain the principle of continuous extraction.
3. Explain the determination of Fe (III) by solvent extraction technique.
4. Explain synergism?

UNIT-5: Analysis of water

1. Explain the determination of Chlorine by using Mohr's method.
2. Explain the terms Dissolved Oxygen (DO) and COD.
3. Write a short note on determination of hardness of water.
4. How can you determine the alkalinity of water?

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

III B.Sc. CHEMISTRY SEMESTER - V/VI

QUESTION PAPER BLUE PRINT

Paper - VIB: ANALYTICAL METHODS IN CHEMISTRY-1

TIME : $2^1/2$ hrs. **Max.marks : 50**

SECTION –A

Answer ALL the Questions (With internal choice) **4 X 7 = 28 M**

1. 2 Questions from UNIT- I

2. 2 Questions from UNIT- II

3. 2 Questions from UNIT-III

4. 2 Questions from UNIT IV & UNIT-V

SECTION– B

Answer any FIVE Questions **4 x 4 = 16 M**

5. 1 Question from UNIT- I

6. 2 Questions from UNIT- II

7. 1 Question from UNIT- III

8. 2 Questions from UNIT- IV

9. 2 Questions from UNIT- V

SECTION -C

Answer ALL the Questions **3 X 2= 6 M**

10. 1 Question from UNIT- II

11. 1 Question from UNIT- III

12. 1 Question from UNIT- IV

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
III B.Sc. DEGREE EXAMINATIONS
MODEL QUESTION PAPER (2023-24)
Paper - VIB : ANALYTICAL METHODS IN CHEMISTRY-1

Time: 2 1/2 hours **Maximum Marks: 50**

SECTION- A

Answer **ALL** the questions. Each question carries **SEVEN** marks **4 x 7 = 28 Marks**

1. Explain the following terms with suitable examples.
   (i) Molarity (ii) Molality (iii) Normality

(or)

2. What are standard solutions? Explain primary and secondary standard solutions with suitable examples.
3. Write a short note on the following. (a) Redox titrations (b) Complex metric titrations

(or)

4. Explain (a) Coprecipitation (b) Post precipitation with suitable examples.
5. Write a short note on the following.
   (a) Accuracy and methods of expressing accuracy
   (b) Precession and methods of expressing precession

(or)

6. Write a short note on the following: (a)Types of errors (b) Minimization of errors
7. Explain the principle and applications of Batch extraction

(or)

8. Explain the determination of Chlorine by using Mohr's method.

SECTION- B

Answer any **FOUR** of the following questions. Each carries **FOUR** marks **4 x 4 = 16 Marks**

9. Explain the terms ppm and ppb.
10. Write a short note on the following.
    (i) Coagulation (ii) Peptization
11. Write a short note on Acid-Base titration.
12. Write a brief note on Significant figures.
13. Explain the principle of continuous extraction.
14. Explain the determination of Fe (III) by solvent extraction technique.
15. Explain the terms Dissolved Oxygen (DO) and COD.
16. Write a short note on determination of hardness of water.

SECTION- C

Answer **ALL** the questions. Each question carries **TWO** marks **2 x 2 = 4 Marks**

17. Define the terms end point and equivalence point.
18. What is standard deviation?
19. What is synergism?

	Government College (Autonomous) Rajamahendravaram	Program & Semester III B.Sc. (V/VI Semester)			
Course Code CHE-114BP	TITLE OF THE COURSE **VIB-ANALYTICAL METHODS IN CHEMISTRY-1**				
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites	Basic concepts of chemical analysis	-	-	2	2

Course Objectives:

1. To provide knowledge about common laboratory glass apparatus.
2. To provide knowledge about complex metric and redox titrations.
3. To provide knowledge about preparation of buffer solutions.
4. To provide knowledge about P^H metric titrations.

Course Outcomes:

On completion of the course, the students will be able to	
CO1	Estimate Iron (II) using standard Potassium dichromate solution.
CO2	Learn the procedure for the estimation of total hardness of water.
CO3	Demonstrate the determination of Chloride using Mohr's method.
CO4	Acquire skills in the operation and calibration of P^H meter.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

Analytical Methods in Chemistry-1 **50 M**

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 P^H of addition of HCl/NaOH to solutions of acetic acid, sodium acetate and their mixtures.
5. Preparation of buffer solutions of different P^H (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.

Reference books:

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

Web Links:

1. https://youtu.be/Sa0WfA9UGG0
2. https://youtu.be/JhBs_8DrPYo

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	1	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.75	2.75	2	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
V/VI SEMESTER END EXAMINATIONS
III B. Sc. CHEMISTRY 2023 - 24
Paper-VIB: ANALYTICAL METHODS IN CHEMISTRY-1 - PRACTICAL

Scheme of Valuation

Time: 3 Hours **Max. Marks: 50**

1. Record 10 Marks

2. Practical 35 Marks

3. Viva - voce 5 Marks

Splitting of Practical Marks:

i. Procedure in 10 minutes : 5 M

ii. Formula with units : 5 M

iii. Neat tabulation : 5 M

iv. Correct calculation : 5 M

Report Error < 1 % : 15 M

1- 2 % : 10 M

>2 % : 5 M

	Government College (Autonomous) Rajamahendravaram	Program & Semester III B.Sc. (V/VI Semester)			
Course Code CHE-115B	TITLE OF THE COURSE **VIIB-ANALYTICAL METHODS IN CHEMISTRY-2**				
Teaching	Hours Allocated: 60 (**Theory and Training**)	L	T	P	C
Pre-requisites	Basic concepts of chemical analysis, Adsorption and Atomic structure	3	1	-	3

Course Objectives:

1. To provide basic knowledge about separation techniques
2. To provide basic knowledge about chromatographic techniques
3. To provide knowledge on experimental setup of column chromatography
4. To provide knowledge about the importance of TLC and HPLC techniques in Pharmaceutical industry.

Course Outcomes:

On completion of the course, the students will be able to		Cognitive Domain
CO1	Identify the importance of chromatography in the separation and identification of compounds in a mixture	Understanding
CO2	To understand principles of various chromatographic techniques.	Understanding
CO3	Understand the principles of spectroscopy in the determination of metal ions.	Understanding
CO4	Comprehend the applications of atomic spectroscopy.	Applying

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

Unit-1: Chromatography-Introduction and classification **12 h**

Principle, Classification of chromatographic methods, Nature of adsorbents, eluents, R_f values, factors affecting R_f values.

UNIT-2: TLC and paper chromatography **14 h**

1. Thin layer chromatography: Principle, Experimental procedure, preparation of plates,

adsorbents and solvents, development of chromatogram, detection of spots, applications and advantages.

2. Paper Chromatography: Principle, Experimental procedure, choice of paper and solvents, various modes of development- ascending, descending, radial and two dimensional, applications.

UNIT-3: Column chromatography **14 h**

1. Column chromatography: Principle, classification, Experimental procedure, stationary and mobile phases, development of the Chromatogram, applications.
2. HPLC: Basic principles, instrumentation –block diagram and applications.

UNIT-4: Spectrophotometry **10 h**

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+2and Pb+2.

UNIT-5: Atomic spectroscopy **10 h**

Types, atomizer, atomic absorption and emission and applications.

References:

1. Fundamental so Analytical Chemistry by F.James Holler, Stanley R Crouch, Donald M.Westand Douglas A.Skoog, Ninth edition, Cengage.
2. Analytical Chemistry by Gary D.Christian, Purnendu K.Dasgupta and Kevin A.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.

Web Links:

1. https://youtu.be/tWg_bbByfSY
2. https://youtu.be/BGyvzCSvL-Y

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	1	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.75	2.75	2	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

Proposed activities:

Skill Development: 1. Preparation of TLC plates.
2. Separation of compounds by TLC.

Employability: 1. Verification of Beer-Lambert's law.

Entrepreneurship: 1. Method Development and Validation by HPLC.

Assignment Questions:

Unit-1: Chromatography-Introduction and classification

1. Write about the classification of Chromatographic methods
2. What is R_f value? Explain the factors affecting R_f value.
3. Explain the basic principle of Chromatography.
4. Explain Isocratic and Gradient elutions.

UNIT-2: TLC and Paper Chromatography

1. Explain the principle, experimental set up and applications of TLC.
2. Explain the principle, experimental set up and applications of Paper Chromatography.
3. Write about various methods of visualization in TLC.
4. Write a short note on Radial Paper Chromatography.

UNIT-3: Column chromatography

1. Explain the principle, instrumentation and applications of Column Chromatography.
2. Explain the principle, instrumentation and applications of HPLC.
3. Write a brief note on various detectors used in HPLC.
4. Explain Normal phase HPLC and Reverse phase HPLC.

UNIT-4: Spectrophotometry

1. Explain the Beer-Lambert's law and write the quantitative determination of Mn^{+2} using Beer-Lambert's law.
2. Explain double beam spectrophotometer briefly.
3. Explain the quantitative determination of Fe^{+2} using Beer-Lambert's law.
4. Explain Absorbance, Transmittance and Molar extinction coefficient.

UNIT-5: Atomic spectroscopy

1. Explain the principle and experimental set up of Atomic Absorption Spectroscopy.
2. Explain the applications of Atomic Absorption Spectroscopy.
3. Write a short note on Atomic Emission Spectroscopy.
4. Explain the principle and experimental set up of Atomic emission Spectroscopy.

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
III B.Sc. CHEMISTRY SEMESTER - V/VI
QUESTION PAPER BLUE PRINT

Paper - VIIB – ANALYTICAL METHODS IN CHEMISTRY-2

TIME : $2^1/2$ hrs. **Max. Marks : 50**

SECTION -A

Answer ALL the Questions (With internal choice) **4 X 7 = 28 M**

1. 2 Questions from UNIT- I
2. 2 Questions from UNIT- II
3. 2 Questions from UNIT-III
4. 2 Questions from UNIT IV & UNIT-V

SECTION – B

Answer any FOUR Questions **4 x 4 = 16 M**

5. 1 Question from UNIT- I
6. 2 Questions from UNIT- II
7. 1 Question from UNIT- III
8. 2 Questions from UNIT- IV
9. 2 Questions from UNIT- V

SECTION -C

Answer ALL the Questions **3 X 2= 6 M**

10. 1 Question from UNIT- I
11. 1 Question from UNIT- III
12. 1 Question from UNIT- IV

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
III B.Sc. DEGREE EXAMINATIONS
MODEL QUESTION PAPER (2023-24)
CHEMISTRY COURSE - VIIB : ANALYTICAL METHODS IN CHEMISTRY-2

Time: 2 1/2 hrs. **Maximum Marks: 50**

SECTION- A

Answer **ALL** the questions. Each question carries **SEVEN** marks **4 x 7 = 28 Marks**

1. Write about the classification of Chromatographic methods

(or)

2. What is R_f value? Explain the factors affecting R_f value.
3. Explain the principle, experimental set up and applications of TLC.

(or)

4. Explain the principle, experimental set up and applications of Paper Chromatography.
5. Explain the principle, instrumentation and applications of Column Chromatography.

(or)

6. Explain the principle, instrumentation and applications of HPLC.
7. Explain the Beer-Lambert's law and write the quantitative determination of Mn^{+2} using Beer-Lambert's law.

(or)

8. Explain the principle and experimental set up of Atomic Absorption Spectroscopy.

SECTION- B

Answer any **FOUR** of the following questions. Each carries **FOUR** marks **4 x 4 = 16 Marks**

9. Explain the basic principle of Chromatography.
10. Write about various methods of visualization in TLC.
11. Write a short note on Radial Paper Chromatography.
12. Write a brief note on various detectors used in HPLC.
13. Explain double beam spectrophotometer briefly.
14. Explain the quantitative determination of Fe^{+2} using Beer-Lambert's law.
15. Explain the applications of Atomic Absorption Spectroscopy.
16. Write a short note on Atomic Emission Spectroscopy.

SECTION- C

Answer **ALL** the questions. Each question carries **TWO** marks 3 **x 2 = 6 Marks**

17. Define Isocratic and Gradient elutions.
18. Define Normal phase HPLC and Reverse phase HPLC.
19. Define Absorbance and Molar extinction coefficient.

	Government College (Autonomous) Rajamahendravaram	Program & Semester III B.Sc. (V/VI Semester)			
Course Code CHE-115BP	TITLE OF THE COURSE **VIIB-ANALYTICAL METHODS IN CHEMISTRY-2**				
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites	Basic concepts of Chromatography	-	-	2	2

Course Objectives:

1. To provide basic knowledge on separation techniques.
2. To provide basic awareness on TLC and Paper Chromatography.
3. To provide knowledge on Column Chromatography
4. To provide knowledge on applications of Beer-Lambert's law.

Course Outcomes:

On completion of the course, the students will be able to	
CO1	Perform the separation of a given dye mixture using TLC
CO2	Learn the preparation of TLC plates
CO3	Demonstrate the separation of mixture of amino acids using paper chromatography
CO4	Acquire skills in using column chromatography for the separation of dye mixture

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus: **50 M**

1. Separation of a given dye mixture (Methyl orange and methylene blue) using TLC (using Alumina as adsorbent).
2. Separation of mixture of methyl orange and methylene blue by Column Chromatography.
3. Separation of given mixture of amino acids (Glycine and Phenyl alanine) using ascending Paper Chromatography.
4. Separation of food dyes using Column Chromatography
5. Separation of triglycerides using TLC
6. Verification of Beer lambert's law. (Using potassium permanganate solution) using Colorimeter/Spectrophotometer.

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.

Web Links:

1. https://youtu.be/tWg_bbByfSY
2. https://youtu.be/BGyvzCSvL-Y

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	1	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.75	2.75	2	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
V/VI SEMESTER END EXAMINATIONS
III B. Sc. CHEMISTRY 2023 - 24
LABORATORY COURSE-VIIB: ANALYTICAL METHODS IN CHEMISTRY-2 - PRACTICAL

Scheme of Valuation

Time: 3 Hours **Max. Marks: 50**

1. Record 10 Marks

2. Practical 35 Marks

3. Viva - voce 5 Marks

Splitting of Practical Marks:

i. Procedure in 10 minutes : 5 M

ii. Formula with units : 5 M

iii. Neat tabulation : 5 M

iv. Correct calculation : 5 M

Report Error < 1 % : 15 M

1- 2 % : 10 M

>2 % : 5 M

	Government College (Autonomous) Rajahmundry	Program & Semester III B.Sc. (V/VI Semester)			
Course Code CHE-114C	TITLE OF THE COURSE **VIC-ENVIRONMENTAL CHEMISTRY**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites	Atmosphere, air pollution, water pollution, chemical toxicology, bio-diversity	3	1	-	3

Course Objectives

1. Segments of atmosphere and control of air pollution
2. Conversion of hard water into soft water and purification of sewage waste water.
3. Types of bio-diversity and classification of bio geo graphicals

Course Outcomes:

On Completion of the course, the students will be able to		
CO1	Understand the environment functions and how it is affected by human activities. Engage in simple and advanced analytical tools used to measure the different types of pollution	Understanding
CO2	Explain the energy crisis and different aspects of sustainability. Learn how to convert hard water into soft water and purification of sewage waste water.	Analysing
CO3	Acquire chemical knowledge to ensure sustainable use of the world'sresources and ecosystems services.	Applying
CO4	Analyse key ethical challenges concerning biodiversity and understand the moral principles, goals and virtues important for guiding decisions that affect Earth's plantand animal life. .	Analysing

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT-I

Introduction **12 h**

Environment Definition – Concept of Environmental chemistry- Scope and importance of environment in now-a-days – Nomenclature of environmental chemistry – Segments of environment - Natural resources - Renewable Resources - Solar and biomass energy and Non-renewable resources - Thermal power and atomic energy – Reactions of atmospheric oxygen and Hydrological cycle

UNIT-II

Air Pollution **12 h**

Definition – Sources of air pollution – Classification of air pollution – Ambient air quality standards -– Global warming –- Acid rain – Photochemical smog – Greenhouse effect – Formation and depletion of ozone – Bhopal gas disaster - Instrumental techniques to monitor pollution - Controlling methods of air pollution.

UNIT-III

Water pollution **12 h**

Unique physical and chemical properties of water – Water quality standards and parameters – Turbidity- pH Dissolved oxygen – BOD, COD, Suspended solids, total dissolved solids alkalinity– Hardness of water–Methods to convert temporary hard water in to soft water Methods to convert permanent hard water into soft water – eutrophication and its effects – Industrial waste water treatment.

UNIT-IV

Chemical Toxicology **8 h**

Toxic chemicals in the environment – effects of toxic chemicals – cyanide and its toxic effects – pesticides and its biochemical effects – toxicity of lead, mercury, arsenic and cadmium - Solid waste management.

UNIT-V

Ecosystem and biodiversity **8 h**

Ecosystem

Concepts–structure–Functions and types of ecosystem–Abiotic and biotic components – Energy flow and Energy dynamics of ecosystem– Food chains – Food web– Tropic levels - Biogeochemical cycles (nitrogen, carbon and phosphorous)

Biodiversity **8 h**

Definition – level and types of biodiversity – concept- significance – magnitude and distribution of biodiversity - trends-bio geographical classification of India–biodiversity at national, global and regional level.

Additional Inputs:

Nicotine - Biological effects - Awareness on World Tobacco Day on May 31st - Radioactive pollution - Radiation effect due to cell towers - cell phones.

Text books:

1. III B.Sc. Unified Environmental Chemistry by R.K.Agarwal- Jai prakash nath publications
2. Environmental Chemistry by BK Sharma & H Kaur, Goel publishing house

Reference books

1. Fundamentals of ecology by M.C.Dash
2. A Text book of Environmental chemistry by W. Moore and F.A. Moore
3. Environmental Chemistry by Samir k.Banerji
4. Water pollution, Lalude, MC Graw Hill
5. Environmental Chemistry, Anil Kumar De, Wiley Eastern ltd.
6. Environmental analysis, SM Khopkar (IIT Bombay)
7. Fundamentals of Environmental Chemistry, Manahan, Stanley. E

Web Links: :

1. https://youtu.be/zph2PxDNH8g
2. https://youtu.be/IX4cT6sSa3s

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High]; 4 : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	1	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.75	2.75	2	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

Proposed activities :

Skill Development : Estimation of chlorine , acidity and alkanity in water samples

Employability: Water sample analysers & for determine the drinking water parameters

ASSIGNMENT QUESTIONS :

UNIT – I

1. Explain the segments of environments ?
2. What are the Renewable and Non-Renewable energy resources ? Explain the following
   i) Solar energy ii) Atomic energy
3. Write the concept of scope and importance of Environmental chemistry ?
4. Expalin the Hydrological cycle ?
5. What are the Renewable and Non-Renewable energy resources ? Explain the following
   i) Thermal power ii) Bio mass energy

UNIT- II

1. Discuss the green house effect and write the consequenttion of it ?
2. Explain the following .
   a) Write the formation and effects of Acid rain .
   b) Photo chemical smog
3. Explain the formation and depletion of ozone layer ?
4. What are controlling methods of air pollution?
5. Explain the following .
   a) Global warming and consequences of it.
   b) Bhopal gas disaster.

UNIT- III

1. Explain any two methods to convert permanent hard water into soft water .
2. Expalin the classification of water pollutants ?
3. Give the principle of wastage treatment and industrial waste water treatment ?
4. Define BOD & COD .
5. What is Eutrophication and give its effects ?

UNIT-IV

1. What are cyanide pestides ? give its toxic effects ?
2. Define chemical toxicology ? Explain toxic effects of arsenic and mercury?
3. What are pesticides ? give biochemical effects of pesticides?
4. Explain the bio chemical effects of Lead and Cadmium?
5. Expalin short note on solid waste management ?

UNIT-V

1. What is Eco- system ? Describe the types of Eco- system ?
2. Give the functions of eco-system?
3. Explain bio-geochemical cycle of Nitrogen .
4. Explain Carbon cycle in the environment.
5. Expalin food chain and food web ?
6. Explain the energy flow and energy dynamics of eco-system?
7. What is Biodiversity?Explain the types of biodiversity ?
8. Write bio-geographical classification of India ?

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
III B.Sc. CHEMISTRY SEMESTER - V/VI
QUESTION PAPER BLUE PRINT

Paper-VIC – ENVIRONMENTAL CHEMISTRY

TIME : $2^1/2$ hrs. Max. Marks : 50

PART –A

Answer **ALL** the Questions 4x7 =28 M

1. 1 Question from UNIT-I & 1 Question from UNIT- II
2. 2 Questions from UNIT – III
3. 2 Questions from UNIT – IV
4. 2 Questions from UNIT – V

PART- B

Answer any **FOUR** Questions 4 x4 =16M

5. 1 Question from UNIT-I
6. 1 Question from UNIT-II
7. 2 Questions from UNIT – III
8. 2 Questions from UNIT – IV
9. 2 Questions from UNIT – V

PART –C

Answer **ALL** Questions 3 x2 =6M

10. 1 Question from UNIT-II
11. 1 Question from UNIT – III
12. 1 Question from UNIT – V

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
III B.Sc. DEGREE EXAMINATIONS
SEMESTER – V/VI (2023-24)
CHEMISTRY COURSE - VIC : ENVIRONMENTAL CHEMISTRY

TIME : $2^1/_2$ hrs. **Max.Marks : 50 M**

PART –A

Answer **ALL** the Questions .Each carries **SEVEN** marks. 4 x7 =28 M

1. Explain about the segments of environment.

(OR)

2. Explain the formation and depletion of the Ozone layer.
3. What is hardness of water? Explain any two methods to convert permanent hard water into softwater.

(OR)

4. Give the principle of wastage treatment? Explain the industrial waste water treatment.
5. Define chemical toxicology. Give toxic effects of lead and mercury.

(OR)

6. What are pesticides? Give biochemical effects of pesticides.
7. What is ecosystem? Describe the types of ecosystem.

(OR)

8. Define Biodiversity. Explain the types of biodiversity.

PART- B

Answer any **FOUR** Questions 4 x 4 =16 M

9. Write about renewable energy resources.
10. Explain the formation of Acid rains and give it's adverse effects.
11. Write about Eutrophication and it's effects.
12. Define BOD and COD.
13. Write brief note on Solid waste management.
14. Give the biochemical effects of arsenic.
15. Explain food chain and food web.
16. Explain bio-geochemical cycle of Nitrogen.

PART –C

Answer **ALL** Questions 3 x2 =6M

17. Give importance of environment in now-a- days.
18. What is DO?
19. Give any two functions of eco system.

	Government College (Autonomous) Rajahmundry	Program & Semester III B.Sc. (V/VI Semester)			
CourseCode CHE-114CP	TITLE OF THE COURSE **VIC-ENVIRONMENTAL CHEMISTRY**				
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre- requisites	Determination of alkalinity, acidity, hardness & chloride content in water.	-	-	2	2

Course Objectives:

1. Learn the procedures of preparation of standard solutions.
2. Analyse acidity and alkalinity in water samples.
3. Acquire skills in estimate the chloride content in water.
4. Analyse water samples by using minimum quantity of reagents.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Determine the alkalinity in water samples.
CO2	Determine the acidity of water samples .
CO3	Estimate the hardness of water in laboratories for the use of industrial usage
CO4	Estimate the chloride content in water samples for drinking purpose

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus

Practical Course - VIC: Environmental Chemistry 50 M

1. Determination of alkalinity in water sample by double titration method.
2. Determination of acidity in water sample by double titration method
3. Determination of hardness of water using EDTA

a) Permanent hardness b) Temporary hardness

4. Determination of Chlorides in water samples by Mohr's method.
5. Determination of pH in soil samples using pH metry.

Text books:

1. III B.Sc. Unified Environmental Chemistry by R.K.Agarwal- Jai prakashnath publications
2. Practical volumetric analysis by Peter AC Pherson

Reference books:

1. Practical hand book of Water analysis by Kanwaljit kaur
2. Volumetric analysis by Mc grew-Hill
3. Volumetric analysis by Henry W.Schimpf

Web links:

2. https://youtu.be/Set3XdRshGo
3. https://youtu.be/zXvEmlFqicw
4. https://youtu.be/OiWMSopuuLU

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High]; 4 : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	3	3	3	3	3	3	3	3
CO2	3	2	3	3	3	3	3	2	3	3	2	3	3
CO3	3	3	3	3	3	2	3	2	1	2	3	3	1
CO4	3	2	2	2	2	3	2	3	2	2	2	2	2
Avg.	3	2.5	2.5	2.5	2.75	2.75	2.75	2.5	2.25	2.25	2.5	2.75	2.25

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
V/VI SEMESTER END EXAMINATIONS
III B. Sc. CHEMISTRY 2023 - 24
LABORATORY COURSE-VIC: ENVIRONMENTAL CHEMISTRY - PRACTICAL

Scheme of Valuation

Time : 3 hrs **Max. Marks .50**

Record: 10 M

Viva: 5 M

Practical: 35 M

Splitting of Practical Marks:

1.	Aim, apparatus, chemicals		5 M
2.	Principle		5 M
3.	Procedure		5 M
4.	Tabulation		5 M
5.	Report:	error < 10% error	15 M
		error 10% -15%	10 M
		error > 15%	5 M

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHE-115C	TITLE OF THE COURSE **VIIC-GREEN CHEMISTRY & NANO TECHNOLOGY**	III B.Sc. (V/VI Semester)			
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites	Types of syntheses, solvents selected in syntheses, catalysis, Nano technology in chemistry.	3	1	-	3

Course Objectives:

1. 100% atom economy reactions
2. Green catalysis, micro wave and ultra sonic assisted syntheses
3. Synthesis of nano particles, preparations and applications.

Course Outcomes:

On Completion of the course, the students will be able to		
CO1	Understand the importance of Green chemistry and Green synthesis. Demonstrate skills using the alternative green solvents in synthesis	Understanding
CO2	Engage in Microwave assisted organic synthesis (MAOS)	Applying
CO3	Demonstrate and explain enzymatic catalysis. Analyse alternative sources of energyand carry out green synthesis.	Evaluating
CO4	Carry out the chemical method of nanomaterial synthesis.	Applying

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT-I Green Chemistry: Part- I **10 h**

Introduction - Definition of green Chemistry, Need for green chemistry, Goals of Green chemistry Basic principles of green chemistry. Green synthesis- Evaluation of the typeof the reaction i) Rearrangements (100% atom economic), ii) Addition reaction (100% atom economic). Organic reactions by Sonication method: apparatus required and examples of sonochemical reactions (Heck,Hunds dicker and Wittig reactions).

UNIT- II Green Chemistry: Part- II **10 h**

A. Selection of solvent:

i) Aqueous phase reactions ii) Reactions in ionic liquids, Heck reaction, Suzukireactions, epoxidation, iii) Solid supported synthesis.

B. Supercritical CO2: Preparation, properties and applications, (decaffeination,drycleaning)

C. Green energy and sustainability.

UNIT-III

Microwave and Ultrasound assisted green synthesis: **10 h**

Apparatus required, examples of MAOS (synthesis of fused anthroquinones, Leukart reductive amination of ketones) - Advantages and disadvantages of MAOS.

Aldol condensation - Cannizaro reaction - Diels-Alder reactions - Strecker's synthesis.

UNIT-IV

Green catalysis and Green synthesis **15 h**

Heterogeneous catalysis, use of zeolites, silica, alumina, supported catalysis - biocatalysis: Enzymes, microbes Phase transfer catalysis (micellar /surfactant)

1. Green synthesis of the following compounds: adipic acid, catechol, disodium menudo acetate (alternative Strecker's synthesis)
2. Microwave assisted reaction in water - Hoffmann elimination – methyl benzoate tobenzoic acid – oxidation of toluene and alcohols–microwave assisted reactions in organic solvents. Diels-Alder reactions and decarboxylation reaction.
3. Ultrasound assisted reactions - sonochemical Simmons–Smith reaction (ultrasonic alternative to iodine)

UNIT – V

Nanotechnology in Green chemistry **15 h**

Basic concepts of Nano science and Nanotechnology – Bottom-up approach and Top-down approaches with examples – Synthesis of Nano materials – Classification of Nanomaterials – Properties and Application of Nanomaterials. Chemical and Physical properties of Nanoparticles – Physical synthesis of nanoparticles – Inert gas condensation - aerosol method - Chemical Synthesis of nanoparticles – precipitation and co-precipitation method, sol-gel method.

Additional Inputs:

Enzymatic catalysis - Lock & Key theory - Recent innovations in Nano technology

Text books:

1. III B.Sc. Unified Chemistry by Dr.Dasharath Domal & Y.R.Sharma
2. Green Chemistry by Rakesh K Sharma

Reference books

1. Green Chemistry Theory and Practical. P.T.Anatas and J.C. Warner
2. Green Chemistry V.K. Ahluwalia Narosa, New Delhi.
3. Real world cases in Green Chemistry M.C. Cann and M.E. Connelly
4. Green Chemistry: Introductory Text M.Lancaster: Royal Society of Chemistry(London)
6. Nanotechnology: Health and Environmental Risks, Jo Anne Shatkin, CRC Press(2008).
7. Green Processes for Nanotechnology: From Inorganic to BioinspiredNanomaterials, Vladimir A. Basiuk, Elena V. Basiuk Springer (2015)

Web Links:

1. https://youtu.be/Dam3cyRyGrI
2. https://youtu.be/2bDf7JSRvf8

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	1	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.75	2.75	2	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

Proposed activities :

Skill Development : Synthesis of 100% atom economic reactions and selection of Solvents in green synthesis

Employability: Development of nano materials

Enterpreneurship: Application of nano particals in various electronic products

ASSIGNMENT QUESTIONS :

UNIT – I

1. What is green chemistry ? Give the basic principles of green chemistry?
2. Discuss the 100% atom economy reactions ?
3. Explain the following sono chemical reactions
   i) Huds dicker reaction ii) Witting reaction
4. What is the need of green chemistry?

UNIT – II

1. What are ionic liquids ? Explain with any two examples ?
2. Describe the preparation and properties of super critical carbon dioxide ?
3. Write about the solid supported synthesis?
4. What is Green energy ?give its sustainability ?
5. What is Epoxidation ?give example.

UNIT – III

1. Explain the synthesis of fused anthro quinines by microwave assisted organic synthesis /
2. Describe the green synthesis of a) Aldol condensation b) Cannizaro's reaction
3. Explain the advantages and disadvantages of MAOS ?
4. How do you perform Strecker's synthesis by green synthesis?
5. What is Diel's-Alder reaction ?

UNIT – IV

1. How are Adipic acid and Catechol prepared by green synthesis?
2. Write about micro wave assited reactions with examples?
3. Write short note on Ultra sound assisted reactions ?
4. Give brief note on bio catalysis?
5. What are the uses of Zeolites?

UNIT – V

1. Discuss the classification ,synthesis and applications of nano materials?
2. Give any two metods for chemical synthesis of nanomaterials ?
3. Explain synthesis of nano materials by aero-sol method?
4. Explain bottom-up and top-up approaches with examples ?
5. What is sol-gel method for synthesis of nanomaterials?

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

III B.Sc. CHEMISTRY SEMESTER - V/VI

QUESTION PAPER BLUE PRINT

Paper- VIIC: GREEN CHEMISTRY & NANO TECHNOLOGY

TIME : $2^1/2$ hrs. **Max.Marks : 50**

PART –A

Answer **ALL** the Questions 4x7 =28 M

1. 1 Question from UNIT-I & 1 Question from UNIT- II
2. 2 Questions from UNIT – III
3. 2 Questions from UNIT – IV
4. 2 Questions from UNIT – V

PART- B

Answer any **FOUR** Questions 4 x4 =16M

5. 1 Question from UNIT-I
6. 1 Question from UNIT-II
7. 2 Questions from UNIT – III
8. 2 Questions from UNIT – IV
9. 2 Questions from UNIT – V

PART –C

Answer **ALL** Questions 3 x2 =6M

10. from UNIT-I
11. from UNIT – II
12. from UNIT – IV

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
III B.Sc. DEGREE EXAMINATIONS
SEMESTER – V/VI (2023-24)
CHEMISTRY COURSE - VIIC : GREEN CHEMISTRY & NANO TECHNOLOGY

TIME : $2^1/2$ hrs. **Max. Marks : 50**

PART –A

Answer **ALL** the Questions .Each carries **SEVEN** marks 4x7 =28 M

1. Explain the basic principles of green chemistry.

(OR)

2. Describe the preparation and properties of super critical carbon dioxide.
3. Explain the synthesis of fused anthro quinines by microwave assisted organicsynthesis

(OR)

4. Describe the green synthesis of a) Aldol condensation b) Cannizaro reaction.
5. How are adipic acid and catechol prepared by Green synthesis?

(OR)

6. Write about ultra sound assisted reaction ?
7. Discuss the classification and applications of Nanomaterials?

(OR)

8. Give any two methods for chemical synthesis of nanomaterials?

PART- B

Answer any **FOUR** Questions 4 x 4 =16 M

9. Discuss atom economy reactions? 10.Explain solid supported synthesis?
11. Describe advantages and disadvantages of MAOS?
12. How do you perform Strecker's synthesis by green synthesis?
13. Write brief note on bio catalysis?
14. Discuss about ultra sound assisted reactions ?
15. Explain synthesis of nanoparticals by aerosol method?
16. Expalin bottom-up and top-down approachs with examples?

PART –C

Answer **ALL** Questions 3 x 2 = 6 M

17. What is the need of green chemistry?
18. What is epoxidation?
19. What are the uses of Zeolit

	Government College (Autonomous) Rajahmundry	Program & Semester III B.Sc. (V/VI Semester)			
CourseCode CHE-115CP	**VIIC-TITLE OF THE COURSE GREEN CHEMISTRY & NANO TECHNOLOGY**				
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre- requisites	Organic synthesis, photo reduction reactions, addition reactions, rearrangement reactions.	-	-	2	2

Course Objectives:

1. To learn the skill of the conducting reaction and maintain the conditions,overallsynthesis and crystallisation.
2. To studythe various green synthesis and percentage of yield calculation.
3. To understand about the 100% atom economic green reactions .
4. To learn about the photo reduction reactions and mechanisms

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Learn the procedures of green synthesis.
CO2	Demonstrate skills in the preparation of 100% atom economic green reactions .
CO3	Acquire skills in Microwave assisted organic synthesis.
CO4	learn photo reduction reactions

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

Organic Synthesis **50 M**

1. Acetylation of 1^0 amine by green method: Preparation of acetanilide
2. Rearrangement reaction in green conditions: Benzil - Benzilic acid rearrangement
3. Benzoin condensation using Thiamine Hydrochloride as a catalyst instead of cyanide.
4. Photo reduction of Benzophenone to Benzo -pinacol in the presence of sunlight.
5. Radical coupling reaction - Preparation of 1,1-bis-(2-naphthol)

Text books:

1. 1.A.I.Vogel –A text book of quantitative organic synthesis-ELBS
2. Green chemistry practical by P.T.Anatas and J.C. Warner.

Reference books

1. Practical book of green synthesis by Dar Bashir Ahmed
2. Laboratory manual of green chemistry by Anuradha Mukherjee.

Web Links:

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1. https://youtu.be/eFh9CfQltqo
2. https://youtu.be/FxqWzZnzleg

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High]; 4 : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	3	3	3	3	3	3	2	3
CO2	3	2	3	3	3	3	3	2	3	3	3	3	3
CO3	3	3	3	3	3	2	3	2	1	2	2	3	1
CO4	3	2	2	2	2	3	2	3	2	2	3	2	2
Avg.	3	2.5	2.5	2.5	2.75	2.75	2.75	2.5	2.25	2.25	2.75	2.5	2.25

GOVERNMENT COLLEGE (A), RAJAHMUNDRYV/VI

SEMESTER END EXAMINATIONS

III B. Sc. CHEMISTRY 2023 - 24 LABORATORY

COURSE-VIIC: GREEN CHEMISTRY - PRACTICAL

Scheme of Valuation

Time : 3 hrs **Max. Marks. 50**

Record: 10 M

Viva: 5 M

Practical: 35 M

Splitting of Practical Marks:

1.	Aim, apparatus, chemicals		5 M
2.	Principle		5 M
3.	Procedure		5 M
4.	MP		5 M
5.	Yield report:	error < 5% error	15 M
		error 5% -10%	10 M
		error > 10%	5 M

B.Sc. ANALYTICAL CHEMISTRY (MCAC)

Board of Studies for the AY 2023-24

COURSE STRUCTURE UNDER CBCS

S. No.	Programme Combination	Course Code	Title of the Course	Hrs./ Week	Max. Marks	Marks in SEE	Marks In CIA	Credits
V/VI SEMESTER								
1.	MCAC	ACH-106A	Analytical Biochemistry & Environmental Chemistry	4	100	50	50	3
2.	MCAC	ACH-106AP	Analytical Biochemistry & Environmental Chemistry	2	50	50	-	2
3.	MCAC	ACH-107A	Electroanalytical techniques	4	100	50	50	3
4.	MCAC	ACH-107AP	Electroanalytical techniques	2	50	50	-	2

III B.Sc. ANALYTICAL

CHEMISTRY

SEMESTER – V

(SKILL ENHANCEMENT COURSES – SEC's)

(For Semester –V, for the domain subject Analytical chemistry, any one of the three pairs of SECs shall be chosen as a course 6 and 7, i.e., 6A & 7A

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code ACH 106A	**TITLE OF THE COURSE** **6A: ANALYTICAL BIOCHEMISTRY AND ENVIRONMENTAL CHEMISTRY**	III B.Sc. MCAC (V Semester)			
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites	Introduction to Biochemical analysis and Environmental analysis	3	1	-	3

Course Objectives:

1. To provide basic knowledge and awareness on Biomolecules
2. To give knowledge and awareness on Clinical chemistry
3. To provide knowledge and importance of water analysis
4. To provide knowledge and awareness on Air pollution

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	Understanding the importance and get awareness on Biomolecules	Understanding
CO2	Get awareness and practical skill on clinical chemistry	Skill
CO3	Get awareness and practical experience to determine water quality parameters	Application
CO4	Understand the critical effects of air pollution on environment and get awareness on air pollutants	Understanding

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

III B.Sc. ANALYTICAL CHEMISTRY

SEMESTER -V

SYLLABUS

PAPER – 6A: ANALYTICAL BIOCHEMISTRY AND ENVIRONMENTAL CHEMISTRY

UNIT-I: **15 Hrs.**

PROTEINS, CARBOHYDRATES, LIPIDS AND ENZYMES:

1. Proteins: Structure, classification and functions of proteins
2. Carbohydrates: Polysaccharides – Definition, Classification, Isolation, characterization and functions of polysaccharides
3. Lipids: Classification and properties of lipids
4. Enzymes- Nomenclature, classification, effect of pH and temperature on enzyme activity, enzyme inhibition.

UNIT – II:

CLINICAL CHEMISTRY: **15 Hrs.**

1. Blood: Composition and functions of blood, blood coagulation.
2. Blood collection and preservation of bloodsamples.
3. Anemia.
4. Estimation of glucose, urea, creatinine, cholesterol and bilirubin in blood.
5. Formation of urine.
6. Composition of normal and pathological urine.

UNIT – III:

ENVIRONMENTAL CHEMISTRY AND AIR POLLUTION: **15 Hrs.**

1. Introduction to Environmental chemistry
2. Natural cycles: hydrological cycle, Oxygen cycle, Nitrogen cycle
3. Air pollution: Definition, Sources and classification of air pollutants
4. Acid rain, photochemical smog, Green house effects
5. Formation and depletion of ozone layer
6. Bhopal gas disaster
7. Controlling methods of air pollution
8. Radioactive pollution, its biological effects and disposal mechanism

UNIT – IV:

WATER POLLUTION: **15 Hrs.**

1. Water resources and its importance
2. Unique physical and chemical properties of water
3. Water quality parameters
4. Water pollution: Definition, sources and classification of water pollutants
5. Concepts and experimental determination of water quality parameters: pH, TSS, TDS, Alkalinity, DO, BOD, COD
6. Hardness of water: Definition, types and removal methods of hardness of water
7. Environmental pollution from industrial effluents
8. Industrial waste water treatment
9. Toxic chemicals in the environment and their effects

Reference Books:

1. T. G. Cooper: Tool of Biochemistry.
2. Keith Wilson and John Walker: Practical Biochemistry.
3. Alan H Gowenlock: Varley's Practical Clinical Biochemistry.
4. Thomas M. Devlin: Textbook of Biochemistry.
5. Jeremy M. Berg, John L Tymoczko, LubertStryer: Biochemistry.
6. G. P. Talwar and M Srivastava: Textbook of Biochemistry and Human Biology.
7. Environmental chemistry by A.K.De
8. A text book of Engineering chemistry by S.S.Dara
9. A text book of Industrial chemistry by B.K.Sharma

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
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CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	1	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.75	2.75	2	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

Proposed activities:

Skill Development:

1 Qualitative and quantitative determination of Biomolecules

2 Clinical analysis of Blood and urine samples

3 Determination of Water quality parameters

Employability:

1 Principles and applications of Biomolecules

2 Determination of water quality parameters

Entrepreneurship:

1 Environmental chemistry: Analysis of water for drinking, agriculture and construction purpose

GOVERNMENT COLLEGE (A),RAJAMAHENDRAVARAM

III B.Sc. ANALYTICAL CHEMISTRY

SEMESTER -V

PAPER – 6A: ANALYTICAL BIOCHEMISTRY AND ENVIRONMENTAL CHEMISTRY

MODEL PAPER

Time: $2^{1}/_{2}$ Hrs. **Max. Marks: 50M**

SECTION-A

Answer ALL the questions **(4 X 7 = 28 M)**

1. Any One Question from Unit -I

(OR)

2. Any One Question from Unit -I

3. Any One Question from Unit -II

(OR)

4. Any One Question from Unit -II

5. Any One Question from Unit -III

(OR)

6. Any One Question from Unit -III

7. Any One Question from Unit -IV

(OR)

8. Any One Question from Unit -IV

SECTION-B

Answer any FOUR of the following **(4 X 4 = 16 M)**

9. Any One Question from Unit –I

10. Any Question from Unit –I

11. Any Question from Unit –II

12. Any Question from Unit –II

13. Any Question from Unit –III

14. Any Question from Unit –III

15. Any Question from Unit –IV

16. Any Question from Unit –IV

SECTION-C

Answer ALL questions **(3 X 2 = 6 M)**

17. One Question from Unit –I

18. One Question from Unit –III

19. One Question from Unit – IV

GOVERNMENT COLLEGE (A),
RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc. ANALYTICAL CHEMISTRY

SEMESTER -V

PAPER – 6A: ANALYTICAL BIOCHEMISTRY AND ENVIRONMENTAL CHEMISTRY

BLUE PRINT

S. No.	Course Content	Essay Questions (7M)	Short Answer Questions (4M)	Very Short Answer Questions (2M)	Total No. Of Questions from each Unit
1	**Unit –I**	2	2	1	5
2	**Unit –II**	2	2	-	4
3	**Unit – III**	2	2	1	5
4	**Unit –IV**	2	2	1	5
	TOTAL	**8**	**8**	**3**	**19**

GOVERNMENT COLLEGE (A),
RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc. ANALYTICAL CHEMISTRY

SEMESTER –IV

Paper-V: ANALYTICAL BIOCHEMISTRY AND ENVIRONMENTAL CHEMISTRY

QUESTION BANK

ESSAY QUESTIONS: 07 M

1. Write about the isolation and characterization of polysaccharides
2. Write about the classification and functions of lipids
3. Explain about the classification and structures of proteins
4. Write about the classification of enzymes and explain the effect of pH & temperature on enzymes
5. Write about composition and coagulation of blood
6. Explain about the collection and preservation of urine samples
7. Write about the collection and preservation of blood samples
8. Write about Oxygen and Nitrogen cycles
9. Explain about classification and controlling methods of air pollution
10. Write about Greenhouse effect and Bhopal gas disaster
11. Explain about the experimental determination of DO and COD in water samples
12. Write the types and removal methods of harness of water
13. Write about the industrial effluents and waste water treatment

QUESTION BANK

SHORT ANSWER QUESTIONS: 04 M

1. Explain about the functions of proteins
2. Write about enzyme inhibition
3. Explain briefly about the functions of blood
4. Write about anemia.
5. How do you estimate the bilirubin in blood sample?
6. How can you estimate the creatinine in blood sample?
7. Write about the formation of urine
8. Explain briefly about the preservation of blood samples
9. Write about the sources of air pollution
10. Explain briefly about radiochemical waste
11. Write about depletion of ozone layer
12. Explain briefly about water quality parameters
13. Write briefly about toxic chemicals and their effects on environment
14. Write about the unique physical and chemical properties of water
15. Write briefly about the classification of water pollutants

QUESTION BANK

VERY SHORT ANSWER QUESTIONS: 02 M

1. What are carbohydrates?
2. What are proteins?
3. Define air pollution
4. What is acid rain?
5. Write the consequences of acid rain
6. Define greenhouse effect
7. What are the main causes of ozone depletion?
8. Define Dissolved oxygen and write its limiting value
9. What is water pollution?
10. What are the types of hard water?
11. What is the difference between BOD and COD?

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code ACH 106AP	**TITLE OF THE COURSE** **6A: ANALYTICAL BIOCHEMISTRY AND ENVIRONMENTAL CHEMISTRY (PRACTICAL –VI)**	III B.Sc. MCAC (V Semester)			
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites	Introduction to water analysis	-	-	2	2

Course Objectives:

1. To provide basic knowledge and experimental analysis of biomolecules
2. To provide practical knowledge about the determination of iodine value of oils
3. To provide practical knowledge and quantitative determinations of Hardness of water sample

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Get practical skill on estimation of Biomolecules
CO2	Get practical knowledge to determination of iodine value of oils
CO3	Get practical skill to determine different water quality parameters
CO4	Get practical skill to determine Hardness of water sample

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development			**Employability**			**Entrepreneurship**	

III B.Sc. ANALYTICAL CHEMISTRY

SEMESTER -V

PAPER – 6A: ANALYTICAL BIOCHEMISTRY AND ENVIRONMENTAL CHEMISTRY

PRACTICAL SYLLABUS

Identification and estimation of the following:

1. Qualitative & Quantitative analysis of Carbohydrates.
2. Qualitative analysis of Lipids.
3. Qualitative analysis of Proteins.
4. Determination of proteins by Biuret reaction
5. Determination of the Saponification number of oil.
6. Determination of Iodine value of oil
7. Determination of Total dissolved salts in water sample (TDS)
8. Determination of Total suspended salts in water sample (TSS)
9. Determination of Hardness of water sample (Total, Temporary and Permanent hardness)

Reference Books:

1. T. G. Cooper: Tool of Biochemistry.
2. Keith Wilson and John Walker: Practical Biochemistry.
3. Alan H Gowenlock: Varley's Practical Clinical Biochemistry.
4. Thomas M. Devlin: Textbook of Biochemistry.
5. Jeremy M. Berg, John L Tymoczko, LubertStryer: Biochemistry.
6. G. P. Talwar and M Srivastava: Textbook of Biochemistry and Human Biology.
7. Environmental chemistry by A.K.De
8. A text book of Engineering chemistry by S.S.Dara
9. A text book of Industrial chemistry by B.K.Sharma

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CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	1	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.75	2.75	2	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

GOVERNMENT COLLEGE (A),
RAJAMAHENDRAVARAM
III B.Sc. ANALYTICAL CHEMISTRY
SEMESTER -V
PAPER – 6A: ANALYTICAL BIOCHEMISTRY AND ENVIRONMENTAL CHEMISTRY
(PRACTICAL –6A)
AT THE END OF SEMESTER –V

SCHEME OF VALUATION

Time: 03 Hrs. **Max. Marks: 50 M**

1. Record -------- 10 Marks
2. Practical -------- 35 Marks
3. Viva - voce -------- 05 Marks

Splitting of Practical Marks :(35M)

i. Procedure in 10 minutes : 10 M
ii. Principle : 05 M
iii. Experiment : 10 M
iv. Report with neat calculation : 10 M

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code ACH 107A	**TITLE OF THE COURSE** **7A: ELECTROANALYTICAL TECHNIQUES**	III B.Sc. MCAC (V Semester)			
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites	Introduction to Electroanalytical techniques and Electrochemistry	3	1	-	3

Course Objectives:

1. To provide basic knowledge and awareness on Biomolecules
2. To give knowledge and awareness on Clinical chemistry
3. To provide knowledge and importance of water analysis
4. To provide knowledge and awareness on Air pollution

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	Understand the principles of Electrochemistry and get practical skill on its applications	Application
CO2	Understand the principles of Ion selective electrodes and get skill on its applications	Skill
CO3	Understand the principles of Polarography and get awareness on its applications	Understanding
CO4	Understand the principles of Coulometry and get awareness on its applications	Understanding

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

III B.Sc. ANALYTICAL CHEMISTRY

SEMESTER -V

SYLLABUS

PAPER – 7A: ELECTROANALYTICAL TECHNIQUES

Unit-I:

ELECTROCHEMISTRY AND ITS APPLICATIONS 15 Hrs.

1. Resistance, Ohm's law, conductance, cell constant, Specific conductance
2. Types of Electroanalytical techniques
3. Conductometric titrations: Principle and Applications of conductivity measurements
4. Different types of Conductometric titrations:
    i. Strong acid Vs. Strong base
    ii. Strong acid Vs. Weak base and
    iii. Weak acid Vs. Strong base, etc.,
4. Electrochemical cells
5. Electrode potentials, cell potentials
6. Nernst equation, Determination of EMF of a cell
7. Potentiometric titrations: Principle and applications
8. Potentiometric Determination of Fe (II) Vs. Cr (VI) and Fe (II) Vs. Mn (VII)

Unit-II:

A. ION SELECTIVE ELECTRODES: 15 Hrs.

1. Ion selective electrodes: Introduction and their importance in chemical analysis
2. Reference electrodes – Hydrogen electrode, Calomel electrode, silver chloride electrode.
3. Indicator electrodes –Hydrogen and glass electrodes, Metal –metal ion electrode, inert electrode
4. Applications of ion selective electrodes: Qualitative and Quantitative determinations

B. pH METRIC TITRATIONS: Principle, Instrumental components and Applications of pH metric titrations

Unit-III:

A.POLAROGRAPHY: 15 Hrs.

1. Introduction and Basic Principles of Polarography
2. Residual current, migration current, diffusion current, half wave potential and Ilkovic equation.
3. Instrumentation and techniques of Polarography technique.
4. Dropping mercury electrode (DME), advantages and disadvantages of DME
5. Qualitative and quantitative analysis of inorganic ions by Polarography technique

B. AMPEROMETRIC TITRATIONS: Principle and applications of Amperometric titrations

Unit-IV

A. COULOMETRY: 15 Hrs.

1. Introduction and Principles of Coulometry
2. Types of Coulometric methods: Potentiostatic and amperostatic coulometric methods
3. Principle, instrumentation and applications of potentiostatic coulometric method
4. Principle, instrumentation and applications of amperostatic coulometric method
5. Principle and applications of Voltammetry
6. Principle and applications of Electrogravimetry

Reference Books:

1. Quantitative chemical analysis by Vogel's; 6th & 7th Editions

2. Fundamentals of Analytical Chemistry by Skoog and West

3. Principles of Instrumental Analysis by Skoog and Holler

4. P.W. Atkins: Physical Chemistry.

5. G.W. Castellan: Physical Chemistry.

6. C.N. Banwell: Fundamentals of Molecular Spectroscopy.

7. Brian Smith: Infra-red Spectral Interpretations: A Systematic Approach.

8. W.J. Moore: Physical Chemistry.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	1	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.75	2.75	2	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

Proposed activities:

Skill Development:

1. Conductometric titrations and its applications
2. Potentiometric titrations and its applications

Employability:

1. Principles and applications of Electrochemistry

2. Principles and applications of Ion selective electrodes

Entrepreneurship:

1. Polarography technique

GOVERNMENT COLLEGE (A),
RAJAMAHENDRAVARAM
III B.Sc. ANALYTICAL CHEMISTRY
SEMESTER –V

Paper: 7A: ELECTROANALYTICAL TECHNIQUES

MODEL PAPER

SECTION-A

Answer ALL the questions **(4 X 7 = 28 M)**

1. Any One Question from Unit -I

(OR)

2. Any One Question from Unit -I

3. Any One Question from Unit -II

(OR)

4. Any One Question from Unit -II

5. Any One Question from Unit -III

(OR)

6. Any One Question from Unit -III

7. Any One Question from Unit -IV

(OR)

8. Any One Question from Unit -IV

SECTION-B

Answer any FOUR of the following **(4 X 4 = 16 M)**

9. Any One Question from Unit –I

10. Any Question from Unit –I

11. Any Question from Unit –II

12. Any Question from Unit –II

13. Any Question from Unit –III

14. Any Question from Unit –III

15. Any Question from Unit –IV

16. Any Question from Unit –IV

SECTION-C

Answer ALL questions **(3 X 2 = 6 M)**

17. One Question from Unit –I
18. One Question from Unit –II
19. One Question from Unit – III

GOVERNMENT COLLEGE (A),

RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc. ANALYTICAL CHEMISTRY

SEMESTER -V

PAPER: 7A: ELECTROANALYTICAL TECHNIQUES

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S. No.	Course Content	Essay Questions (7M)	Short Answer Questions (4M)	Very Short Answer Questions (2M)	Total No. Of Questions from each Unit
1	**Unit –I**	2	2	1	5
2	**Unit –II**	2	2	1	5
3	**Unit –III**	2	2	1	5
4	**Unit –IV**	2	2	-	4
	TOTAL	**8**	**8**	**3**	**19**

GOVERNMENT COLLEGE (A),
RAJAMAHENDRAVARAM
III B.Sc. ANALYTICAL CHEMISTRY
SEMESTER -V
PAPER: 7A: ELECTROANALYTICAL TECHNIQUES

QUESTION BANK

ESSAY QUESTIONS: 07M

1. Explain Conductometric titrations with application
2. Write in detail about Potentiometric titrations
3. Write about Electrochemical cells
4. Explain the principle, instrumental components and applications of pH metric titrations
5. Write in detail about the reference electrodes
6. Explain about the indicator electrodes
7. Write about ion selective electrodes and their applications
8. Explain the principle and instrumentation of Polarography
9. Write the principle and applications of Amperometric titrations
10. Write about the dropping mercury electrode. Write its advantages and disadvantages.
11. Explain the principle and applications of Electrogravimetry
12. Write in detail about Potentiostatic coulometry
13. Explain about the Amperostatic coulometry

QUESTION BANK

SHORT ANSWER QUESTIONS: 04M

1. State and explain Ohm's law
2. Write briefly about types of electroanalytical techniques
3. Explain Electrode potential and cell potential
4. Explain Nernst equation and its significance
5. What are ion selective electrodes? Write their importance
6. Write about Calomel electrode
7. Explain briefly about glass electrodes
8. Write the applications of ion selective electrodes

9. Explain about Residual current and diffusion current
10. State and explain Ilkovic equation
11. Write the advantages and disadvantages of DME
12. Explain the applications of Polarography
13. Explain briefly about the types of Coulometric methods
14. Write briefly about Voltammetry
15. Write the principle and applications of Coulometry

VERY SHORT ANSWER QUESTIONS: 02M

1. Define Ohm's law
2. What is specific conductance?
3. What are electroanalytical techniques?
4. What is EMF of a cell?
5. Write Nernst equation
6. What are ion selective electrodes?
7. Define pH
8. Write any two applications of ion selective electrodes
9. Write the principle of Polarography
10. Write about half wave potential
11. Write the advantages of DME
12. State Ilkovic equation

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code ACH 107AP	**TITLE OF THE COURSE** **7A: ELECTROANALYTICAL TECHNIQUES (PRACTICAL –VII)**	III B.Sc. MCAC (V Semester)			
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites	Introduction to Electroanalytical techniques	-	-	2	2

Course Objectives:

1. To provide basic knowledge and experimental procedure of Conductometric titrations
2. To provide basic knowledge and experimental procedure of Potentiometric titrations
3. To provide basic knowledge and experimental procedure of pH metric titrations

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Get basic knowledge about electroanalytical techniques used in chemical analysis
CO2	Get practical knowledge and instrumental handling of conductivity meter
CO3	Get practical knowledge and instrumental handling of potentiometer
CO4	Get practical knowledge and instrumental handling of pH meter

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

III B.Sc. ANALYTICAL CHEMISTRY

SEMESTER -V

PAPER -7A: ELECTROANALYTICAL TECHNIQUES

PRACTICAL SYLLABUS

1. Determination of concentration of HCl Vs. NaOH by using Conductometric titration method
2. Determination of concentration of CH_3COOH Vs. NaOH by using Conductometric titration method
3. Determination of Fe (II) with Cr (VI) by using Potentiometric titration method.
4. Determination of Fe (II) with Mn (VII) by using Potentiometric titration method.
5. Determination of Acidity of water samples by using pH metric titration method
6. Determination of Alkalinity of water samples by using pH metric titration method

Reference Books:

1. Quantitative chemical analysis by Vogel's; 6th & 7th Editions

2. Fundamentals of Analytical Chemistry by Skoog and West

3. Principles of Instrumental Analysis by Skoog and Holler

4. P.W. Atkins: Physical Chemistry.

5. G.W. Castellan: Physical Chemistry.

6. C.N. Banwell: Fundamentals of Molecular Spectroscopy.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
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CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	1	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.75	2.75	2	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

GOVERNMENT COLLEGE (A),
RAJAMAHENDRAVARAM
III B.Sc. ANALYTICAL CHEMISTRY
SEMESTER -V
PAPER – 7A: ELECTROANALTICAL TECHNIQUES

(PRACTICAL –7A)

AT THE END OF SEMESTER –V

SCHEME OF VALUATION

Time: 03 Hrs. **Max. Marks: 50 M**

1. Record -------- 10 Marks
2. Practical -------- 35 Marks
3. Viva - voce -------- 05 Marks

Splitting of Practical Marks :(35M)

i. Procedure in 10 minutes : 10 M
ii. Principle : 05 M
iii. Experiment : 10 M
iv. Report with neat calculation : 10 M

III B.Sc. ANALYTICAL CHEMISTRY

SEMESTER – VI

APPRENTICSHIP/ INTERNSHIP / ON JOB TRAINING

(DURATION: ENTIRE SEMESTER)

(200 HOURS)

(TOTAL CREDITS: 12)

B.Sc., CHEMISTRY(HONORS)

Board of Studies (BOS)

2023 – 24

(SEM – III, IV & V)

B.Sc. CHEMISTRY (HONORS)
Board Of Studies for the AY 2023-24
COURSE STRUCTURE
UNDER CBCS 2023 – 24

S. No.	Programme Combination	Course Code	Title of the Course	Hrs./ Week	Max. Marks	Marks in SEE	Marks In CIA	Credits
III SEMESTER								
1.	CHEM (H)	CHH 105	Inorganic Chemistry - II	4	100	50	50	3
2.	CHEM (H)	CHH 105P	Inorganic Chemistry - Practical	2	50	50	-	2
3.	CHEM(H)	CHH 106	Organic Chemistry - II	4	100	50	50	3
4.	CHEM(H)	CHH 106P	Organic Chemistry - Practical	2	50	50	-	2
5.	CHEM(H)	CHH 107	Physical Chemistry - III	4	100	50	50	3
6.	CHEM(H)	CHH 107P	Conductometry - Practical	2	50	50	-	2
IV SEMESTER								
7.	CHEM(H)	CHH 108	Inorganic Chemistry - III	4	100	50	50	3
8.	CHEM(H)	CHH 108P	Inorganic Chemistry - Practical	2	50	50	-	2
9.	CHEM(H)	CHH 109	Organic Chemistry - III	4	100	50	50	3
10.	CHEM(H)	CHH 109P	Organic Chemistry - Practical	2	50	50	-	2
11.	CHEM(H)	CHH 110	Physical Chemistry - IV	4	100	50	50	3
12.	CHEM(H)	CHH 110P	Physical Chemistry - Practical	2	50	50	-	2
13.	CHEM(H)	CHH 111	Polymer Chemistry (DSE-I)	4	100	50	50	3
14.	CHEM(H)	CHH 111P	Polymer Chemistry (DSE-I) - Practical	2	50	50	-	2

15.	CHEM(H)	CHH 112	Industrial Chemicals and Environment(DSE-II)	4	100	50	50	3
16.	CHEM(H)	CHH 112P	Analysis of Organic Compounds	2	50	50	-	2
17.	CHEM(H)	CHH 113	Pharmaceutical and Medicinal Chemistry(DSE-III)	4	100	50	50	3
18.	CHEM(H)	CHH 113P	Pharmaceutical and Medicinal Chemistry (DSE-III) – Practical	2	50	50	-	2
	V SEMESTER							
19	CHEM(H)	CHH 114	Organic Chemistry - IV	4	100	50	50	3
20	CHEM(H)	CHH 114P	Organic Chemistry –IV Practical	2	50	50	-	2
21	CHEM(H)	CHH 115	Physical Chemistry - V	4	100	50	50	3
22	CHEM(H)	CHH 115P	Physical Chemistry – V Practical	2	50	50	-	2
23	CHEM(H)	CHH 116	Green Chemistry (DSE-IV)	4	100	50	50	3
24	CHEM(H)	CHH 116P	Green Analysis - Practical	2	50	50	-	2
25	CHEM(H)	CHH 117	Analytical methods in Chemistry (DSE-V)	4	100	50	50	3
26	CHEM(H)	CHH 117P	Analytical methods in Chemistry (DSE-V) - Practical	2	50	50	-	2
27	CHEM(H)	CHH 118	Applications of Computers in Chemistry (DSE-VI)	4	100	50	50	3
28	CHEM(H)	CHH 118P	Applications of Computers in Chemistry (DSE-VI) - Practicals	2	50	50	-	2
29	CHEM(H)	CHH 119	Research methodology for Chemistry (DSE-VII)	4	100	50	50	3
30	CHEM(H)	CHH 119P	Project Work	2	50	50	-	2

II. B.Sc., CHEMISTRY(HONORS)

SECOND YEAR
SEMESTER - III

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHH105	TITLE OF THE COURSE INORGANIC CHEMISTRY –II	II B.Sc. (Hons.) (III Semester)			
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites	S and P-block elements	-	4	-	3

Course Objectives:

- To Learn the properties of S-block elements
- Properties of P-block elements
- Metallurgical separation of metals of various elements S&P block elements

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Know various properties of S&P block elements
CO2	Structures & hybridization of various compounds
CO3	Analyze the chemical and thermodynamic properties of compounds
CO4	Industrial Importance of the inorganic Compounds of S&P block elements .

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT-I: GENERAL PRINCIPLES OF METALLURGY & S- BLOCK ELEMENTS:

(15 Lectures)

Chief modes of occurrence of metals based on standard electrode potentials.

Electrolytic Reduction, Hydrometallurgy with reference to cyanide process for silver and gold. Methods of purification of metals: Electrolytic process, van Arkel-de Boer process and Mond's process, Zone refining.

Chemistry of S- Block Elements:

i) General characteristics: melting point, flame colour, reducing nature, diagonal relationships.

i)ons of alkali and alkaline earth metals with oxygen, hydrogen, nitrogen and water

UNIT-II: REACTIONS OF ALKALI AND ALKALINE EARTH METALS: (15Lectures)

i) on features such as ease of formation, thermal stability and solubility of the following alkali and alkaline earth metal compounds: hydrides, oxides, carbonates,nitrates, sulphates.

ii) x formation tendency of s-block elements; structure of the following complexes: crown ethers and cryptates of Group I; basic beryllium acetate, beryllium nitrate, EDTA complexes of calcium and magnesium.

UNIT-III: CHEMISTRY OF P- BLOCK ELEMENTS: (7 Lectures)

i)tronic configuration, atomic and ionic size, metallic/non-metallic character,meltingpoint, ionization enthalpy, electronegativity,

Ii)Allotropy of C, P, S; inert pair effect, diagonal relationship between B and Si and Acidic/Basic Nature, , Ionic/Covalent Nature, Oxidation/Reductions of P-block elements.

UNIT-IV: PROPERTIES OF P- BLOCK ELEMENTS: (8 Lectures)

Explain about the following:

i) Hydrides: hydrides of Group 13 (only diborane), Group 14, Group 15 (EH3 where E = N and P), Group 16 and Group 17.

ii) Oxides: oxides of phosphorus, sulphur and chlorine
Halides: halides of silicon and phosphorus

UNIT-V: PREPARATION, PROPERTIES, STRUCTURE AND USES OF THE FOLLOWING COMPOUNDS: (15 Lectures)

- Borazine
- silicones
- Phosphonitrilic halides {$(PNCl_2)n$ where n = 3 and 4}
- Interhalogen and pseudohalogen compounds
- Clathrate compounds of noble gases, M.O diagram of XeF_2.

Reference Books:

1. Lee, J.D. Concise Inorganic Chemistry, Pearson Education 2010
2. Douglas, B.E., Mc. Daniel, D.H. & Alexander, J.J: Concepts &Models of InorganicChemistry 3 rd Ed., John Wiley Sons, N.Y. 1994.
3. Greenwood, N.N. & Earnshaw: Chemistry of the Elements,Butterworth- Heinemann.1997
4. Cotton, F.A. & Wilkinson, G: Advanced Inorganic Chemistry, Wiley, VCH, 1999.
5. Miessler, G. L. & Donald, A. Tarr: Inorganic Chemistry 3 rd Ed.(adapted), Pearson,2009
6. Shriver, D.F.,Atkins P.W and Langford, C.H: Inorganic Chemistry 2nd Ed., Oxford University,Press, 1994

CO-PO Mapping: (1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	1	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.75	2.75	2	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

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II B.Sc. HONOURS SEMESTER-III

FROM 2023-2024 ONWARDS

INORGANIC CHEMISTRY – II

S.No.	Chapter	Essay questions (7 M) Knowledge/ skill	Short answer question(3) Understanding
1	Unit-I:Gneral principles ofmetallurgy & S-block elements	02	02
2	Unit-II: Reactions of alkali&alkaline earth metals	02	02
3	Unit-III: Chemistry of P-block elements	02	01
4	Unit-IV: Properties of P-block elements	02	01
5	Unit-V: Preparations ,properties and usesof compounds	02	02
Total number of questions		10	08

B.Sc. CHEMISTRY (HONOURS) SECOND YEAR SEMESTER –III

MODEL PAPER FOR PAPER

INORGANIC CHEMISTRY-II

TIME: 2 ½ Hrs **MARKS: 50 M**

PART – A

Answer **ALL** Questions **(5 X 7 = 35M)**

1. What are the methods for purification of metals and explain?

(OR)

2. Write the reaction of alkali and alkali earth metals with Oxygen, Hydrogen, Nitrogen and Water?
3. Write the thermal stability and solubility of the following alkali and alkali earth metal compounds in (a) oxides (b) carbonates (a) Nitrates (d) sulphates

(OR)

4. Explain about the structures of crown ethers and cryptals of group –I elements?
5. Explain following terms:
   a) Atomic Size or Ionic Size
   b) Metallic and non-metallic character
   c) Ionization Enthalpy

(OR)

6. a) Ionic and covalent nature of P- block elements
   a) Oxidation & Reductions
   b) Acidic & Basic nature
7. Explain in detail about Diborane?

(OR)

8. Explain the halides of silicon and phosphorous
9. Write the preparation, structure and uses of silicones?

(OR)

10. Write the preparations and structures of Inter halogen compounds?

PART-B

Answer any **FIVE** Questions. (**5 X 3 = 15M)**

11. What is hydrometallurgy with reference to cyanide process for silver and gold?
12. What is diagonal relationship ?explain in S-block elements?
13. Explain EDTA complex formation tendency of S-block elements?
14. Write about the structures of beryllium acetate complexes?
15. Explain the allotropy of carbon?
16. Write about the oxides of Phosphorous?
17. Write the preparation and structure of Borazine?
18. Draw the M.O diagram of XeF_2?

B.Sc. CHEMISTRY (HONOURS) SECOND YEAR SEMESTER -III

INORGANIC CHEMISTRY-II

ASSIGNMENT TOPICS

UNIT –I :

1. What are methods for purification of metals and explain?

2. Write the reaction of alkali and alkali earth metals with Oxygen, Hydrogen, Nitrogen andWater?

3.What is hydrometallurgy with reference to cyanide process for silver and gold?

4. Write the general characteristics of S-block elements?

UNIT-II

5.Write the thermal stability and solubility of the following alkali and alkali earth metal compounds in (a) oxides (b) carbonates (c) Nitrates (d) sulphates

6.Explain about the structures of crown ethers and cryptals of group –I elements ?

7. Explain EDTA complex formation tendency of S-blockelements?

8. Write about the structures of beryllium acetate, beryllium nitrate complexes?

UNIT-III

9.Explain following terms:

a) Atomic Size or Ionic Size

b) Metallic and non-metallic character

c) Ionization Enthalpy

d) Electro Negativity

10. Explain the following

a) Ionic and covalent nature of P- block elements

b) Oxidation & Reductions

c) Acidic & Basic nature

UNIT-IV

11 .Explain in detail about Diborane?

13. Explain the allotropy of carbon ,P,S ?

14. What is diagonal relationship explain it in between B and Si ?

14.Explain Oxidation and reductions of P-block elements ?

15.Write about the oxides of Phosphorous ,Sulphur and chlorine

15. Expalin about halides of silicon and phosphorus ?

UNIT –V

16. Write the preparation, structure and uses of silicones?

17. Write the preparations and structures of Inter halogen compounds? 19.Explain the clathrate compounds og noble gases?

20. Draw the MO diagram of XeF_2

21. Write the preparation and structure of Borazine ? 22.What are pseudo halogens ,give examples?

23. Write about phosphonitrilic halides?

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHH105P	**TITLE OF THE COURSE** INORGANIC CHEMISTRY - PRACTICAL	II B.Sc. (Hons) (III Semester)			
Teaching	Hours Allocated: 30 (**PRACTICAL**)	L	T	P	C
Pre-requisites	**Qualitative Analysis**	2		-	2

Course Objectives:

1. Basic knowledge about Iodometry.
2. Basic knowledge about complexometry**.**

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Estimation of antimony –Iodometrically
CO2	Estimation of metals by using EDTA –Complexometrically
CO3	Preparation of inorganic compounds.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development			**Employability**			**Entrepreneurship**	

Syllabus:

III. Practical (Laboratory) Syllabus: **(30 hrs)**

(Max.50 Marks)

(A) Iodo / Iodimetric Titrations

(i) Estimation of Cu(II) and $K_2Cr_2O_7$ using sodium thiosulphate solution (Iodometrically).

(ii) Estimation of antimony in tartar-emetic iodimetrically

(B) Complexometric titrations using disodium salt of EDTA

(i) Estimation of Mg^{2+}, Zn^{2+}

(ii) Estimation of Ca^{2+} by substitution method

(C) Inorganic preparations

(i) Cuprous Chloride, Cu_2Cl_2

(ii) Manganese (III) phosphate, $MnPO_4.H_2O$

(iii) Aluminium potassium sulphate $KAl(SO_4)_2.12H_2O$ (Potash alum) or Chrome alum.

Reference Books:

Vogel, A.I. A Textbook of Quantitative Inorganic Analysis, ELBS.
1978 Marr, G. andRockett, R.W. Practical Inorganic Chemistry, Van Nostrand Reinhold. 1972

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	2	3	2	2	3	3	3
CO2	2	2	3	2	3	2	3	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	2	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.75	2.75	2	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

IIB.Sc. (H) SEMESTER –III

INORGANIC CHEMISTRY

PRACTICAL -II

LABORATORY COURSE-II

Practical-II Quantitative Analysis & Inorganic compound preparation

(At the end of Semester-III)

(Scheme of Valuation)

Time: 3 Hrs **Max. Marks .50**

1. Record	10 Marks
2. Practical	35 Marks
3. Viva - voce	5 Marks

Splitting of Practical Marks (35)

i. Procedure in 10 minutes	: 5 M
ii. Formula with units	: 5 M
iii. Neat tabulation and calculation	: 5 M

Error < 10 %	20 M
10- 15 %	15 M
>15 %	10 M

	Government College (Autonomous) Rajamahendravaram	Program & Semester			
Course Code CHH106	**TITLE OF THE COURSE ORGANIC CHEMISTRY-II**	II B.Sc.(Hons) (III Semester)			
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites	Basics in Organic reaction mechanism	3	1	-	3

Course Objectives:

1. To provide knowledge about different types of nucleophilic substitution reactions
2. To learn the synthetic applications of Grignard reagents
3. To provide basic knowledge on various named reactions of carbonyl compounds
4. To learn the synthetic applications of active methylene compounds

CourseOutcomes:

On Completion of the course, the students will be able to	
CO1	Acquire knowledge on different types of nucleophilic substitution reactions.
CO2	Identify the importance of Organo metallic compounds in Organic synthesis.
CO3	Comprehend the applications of different named reactions in Organic Chemistry.
CO4	Understand the synthetic applications of Acetoacetic ester and Malonic ester.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development			**Employability**			**Entrepreneurship**	

B.Sc. CHEMISTRY (HONOURS) SECOND YEAR
SEMESTER–III SYLLABUS
ORGANIC CHEMISTRY-II

Syllabus: (Total Hours: 60, 4h/w)

UNIT-I: CHEMISTRY OF HALOGENATED HYDROCARBONS (14 Hours)

Alkyl Halides: Methods of preparation, nucleophilic substitution reactions – SN1, SN2 and SNi mechanisms with stereo chemical aspects and effect of solvent etc.

Aryl Halides: Methods of preparation (including preparation from diazonium salts), nucleophilic aromatic substitution; SNAr, Benzyne mechanism. Relative reactivity of alkyl, allyl, benzyl, vinyl andaryl halides towards nucleophilic substitution reactions.

Organometallic compounds of Mg (Grignard reagent): Preparation & Synthetic applications.

UNIT-II: ALCOHOLS, PHENOLS, ETHERS AND EPOXIDES (14 Hours)

Alcohols: preparation, properties and relative reactivity of 1°, 2°, 3° alcohols, Bouvaelt- Blanc Reduction; Oxidation of diols by periodic acid and lead tetra acetate, Pinacol-Pinacolone rearrangement.

Phenols: Preparation and properties; Acidity and factors effecting it, Ring substitution reactions, Reimer–Tiemann and Kolbe's–Schmidt Reactions, Fries rearrangement and Claisen rearrangement.

Ethers and Epoxides: Preparation and reactions with acids. Reactions of epoxides with alcohols, ammonia derivatives and LiAlH4.

UNIT-III: CARBONYL COMPOUNDS (12Hours)

Structure, Reactivity, Preparation and Properties: Nucleophilic additions, Nucleophilic addition-elimination reactions with ammonia derivatives, Aldol condensation, Cannizzaro reaction, Benzoin condensation, Knoevenagel condensation, Perkin reaction, Wittig reaction, Beckmann rearrangement, Benzil-Benzilic acid rearrangement, Haloform reaction, Baeyer-Villiger oxidation,oxidations and reductions (Clemmensen reduction , Wolff-Kishner reduction,MPV reduction, reduction with $LiAlH_4$ and $NaBH_4$), Addition reactions of α, β- unsaturated carbonyl compounds: Michael addition.

UNIT-IV: ACTIVE METHYLENE COMPOUNDS: (8 Hours)

Keto-enol tautomerism, Preparation and Synthetic applications of Acetoacetic ester and Malonic ester.

UNIT-V: CARBOXYLIC ACIDS AND THEIR DERIVATIVES(12 Hours)

General methods of preparation and reactions of monocarboxylic acids,HVZ reaction, Arndt-Eistert synthesis, Hunsdiecker reaction,effect of substituents on acidic strength. Preparation and reactions of acid chlorides, anhydrides, esters and amides; Comparative study of nucleophilic substitution at acyl group - Mechanism of acidic and alkaline hydrolysis of esters, Claisen condensation, Dieckmann condensation, Reformatsky reaction, Hofmann- bromamide degradation and Curtius rearrangement.

Textbooks:

1. II B.Sc. Unified Chemistry - O.P. Agarwal
2. II B.Sc. Chemistry - Telugu Academy

Referencebooks:

1. A Text Book of Organic Chemistry by B.S. Bahl and Arun Bahl
2. A Text Book of Organic Chemistry, Vol I by I.L. Finar
3. Morrison, R. T. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt.Ltd. (Pearson Education).

WebLinks:

1. https://youtu.be/zNxPngVqa4o
2. https://youtu.be/TMcYkDfR75E

CO-POMapping:

(1:Slight[Low]; 2:Moderate [Medium]; 3:Substantial [High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	1	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.75	2.75	2	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

ASSIGNMENTQUESTIONS

UNIT-I

1. Explain the mechanism and stereochemistry of SN^1 and SN^2 reactions.
2. Explain the preparation and synthetic applications of Grignard reagents.
3. Explain SN_i mechanism with suitable examples.
4. Explain Benzyne mechanism with suitable examples.

UNIT-II

1. Explain the following reactions with mechanism and suitable examples.
   (i) Reimer–Tiemann reaction(ii) Claisen rearrangement
2. Explain the following reactions with mechanism and suitable examples.
   (i) Pinacol-Pinacolone rearrangement (ii) Fries rearrangement
3. Explain the following.
   (i) Preparation of Phenol (ii) Acidity of Phenol
4. Explain Kolbe-Schmidt reaction with mechanism and suitable examples.
5. Write a note on Lucas test.

UNIT-III

1. Explain Perkin reaction with mechanism and suitable examples.
2. Explain Benzoin condensation with mechanism and suitable examples.
3. Explain the following reactions with mechanism and suitable examples.
   (i) Wittig reaction(ii) Cannizzaro reaction
4. Explain the following reactions with mechanism and suitable examples.
   (i) Beckmann rearrangement (ii) Aldol condensation
5. Explain Benzyne mechanism with suitable examples.
6. Explain Clemenson reduction with suitable examples.

UNIT-IV

1. Write the preparation and synthetic applications of Acetoacetic ester.
2. Write the preparation and synthetic applications of Malonic ester.
3. Explain the Keto-enol tautomerism in Acetoacetic ester.
4. Write a short note on Carbanions.

UNIT-V

1. Write a short note on acidic and alkaline hydrolysis of esters.
2. Write a short note on Reformatsky reaction.
3. Explain the following reactions with mechanism and suitable examples.
   (i) Hofmann-Bromamide reaction (ii) Arndt-Eistert synthesis
4. Explain the following reactions with mechanism and suitable examples.
   (i) HVZ reaction (ii) Dieckmann condensation

OVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

CHEMISTRY (HONOURS) - SECOND YEAR (SEMESTER-III)
ORGANIC CHEMISTRY-II
QUESTION PAPER BLUE PRINT

TIME: 2 1/2 Hours. **Max Marks: 50 M**

Sl. No.	Chapter	Essay Question(7M) knowledge	Short Answer Question (3 M) Understanding
1.	UNIT-I	02	02
2.	UNIT-II	02	02
3.	UNIT-III	02	02
4.	UNIT-IV	02	01
5.	UNIT-V	02	01
Total no. of Questions		10	08

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
CHEMISTRY (HONOURS) SECOND YEAR (SEMESTER-III)
CHEMISTRY-IIIB: ORGANIC CHEMISTRY-II
MODEL QUESTION PAPER

Time: 2 1/2 hours **Maximum Marks: 50**

SECTION- A

Answer **ALL** the questions. Each question carries **SEVEN** marks **5 X 7 = 35 Marks**

1. Explain the mechanism and stereochemistry of SN^1 and SN^2 reactions.

(or)

2. Explain the preparation and synthetic applications of Grignard reagents.

3. Explain the following reactions with mechanism and suitable examples.
   (i) Kolbe's–SchmidtReactions (ii) Claisen rearrangement

(or)

4. Explain the following reactions with mechanism and suitable examples.
   (i) Pinacol-Pinacolone rearrangement (ii) Fries rearrangement

5. Explain the following reactions with mechanism and suitable examples.
   (i) Aldol condensation (ii) Perkin reaction

(or)

6.Explain the following reactions with mechanism and suitable examples.
   (i) Beckmann rearrangement (ii) Wittig reaction

7. Write the preparation and synthetic applications of Acetoacetic ester.

(or)

8. Write the preparation and synthetic applications of Malonic ester.

9. Explain the following reactions with mechanism and suitable examples.
   (i) Hofmann-Bromamide reaction (ii) Arndt-Eistert synthesis

(or)

10. Explain the following reactions with mechanism and suitable examples.
(i) HVZ reaction (ii) Dieckmann condensation

SECTION-B

Answer any **FIVE**of the following. Each question carries **Three** marks **5 X 3= 15 Marks**

11. Explain SN_i mechanism with suitable examples.
12. Explain Benzyne mechanism with suitable examples.
13. Explain Reimer-Tiemann reaction with mechanism and suitable examples.
14. Explain the following.

(i) Preparation of Phenol (ii) Acidity of Phenol

15. Explain the Cannizzaro reaction with mechanism and suitable examples.
16. Explain the Benzoin condensation with mechanism and suitable examples.
17. Explain the Keto-enol tautomerism in Acetoacetic ester.
18. Write a short note on acidic and alkaline hydrolysis of esters.

	Government College (Autonomous) Rajamahendravaram	Program & Semester			
Course Code CHH-106P	**TITLE OF THE COURSE** **ORGANIC CHEMISTRY PRACTICAL-II**	II B.Sc.(Hons) (Semester-III)			
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites	Basic reactions of different Organic functional groups	2	-	-	2

CourseObjectives:

1. To provide basic knowledge about Organic qualitative analysis.
2. To provide knowledge about determination of melting point and boiling point of Organic compounds
3. To provide knowledge about Organic synthesis.

CourseOutcomes:

On completion of the course, the students will be able to	
CO1	Learn the systematic procedure for Organic qualitative analysis.
CO2	Acquire skills about determination of melting point and boiling point of organic compounds
CO3	Understand the Acetylation and Benzoylation of different Amines and Phenols.
CO4	Acquire skills in Organic synthesis.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

B.Sc. CHEMISTRY (HONOURS) - SECOND YEAR (SEMESTER-III)
PRACTICAL SYLLABUS FOR PAPER-IIIB
ORGANIC CHEMISTRY PRACTICAL-II

.

Practical Syllabus: **(30hrs, 2h/w)(Max Marks: 50)**

1. **Functional group tests:** For Alcohols, Phenols, Carbonyl compounds and Carboxylic acids.

2. **Organic preparations:**

(i) Acetylation of one of the following compounds:
Amines (Aniline, o-, m-, p- Toluidine and o-, m-, p-Anisidine)
Phenols (β -Naphthol, Vanillin, Salicylic acid) by any one method
a. Using conventional method.
b. Using green approach

(ii) Benzolyation of one of the following compounds
Amines (Aniline, o-, m-, p- Toluidine and o-, m, p- Anisidine)
Phenols (β -Naphthol, Resorcinol, p- Cresol)

(iii) Selective reduction of meta Dinitrobenzene to m-Nitroaniline.

References:

1. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)
2. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical OrganicChemistry, 5th Ed., Pearson (2012)
3. V.K. Ahluwalia & R. Aggarwal, Comprehensive Practical Organic Chemistry-Preparation and Quantitative Analysis, University Press (2000).

Web Links:

1. https://youtu.be/csHwalWXG2M
2. https://youtu.be/n4esSHxz_J8

CO-POMapping:

(1:Slight[Low]; 2:Moderate [Medium]; 3:Substantial [High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	1	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.75	2.75	2	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

B.Sc. CHEMISTRY (HONOURS) - SECOND YEAR (SEMESTER-III)

ORGANIC CHEMISTRY PRACTICAL-II

(Scheme of Valuation)

Time: 3 Hours **Max. Marks: 50**

1. Record	10 Marks
2. Practical	35 Marks
3. Viva-voce	5 Marks

	Government College (Autonomous) Rajahmundry	Program &Semester			
Course Code CHH107	**TITLEOFTHECOURSE PHYSICALCHEMISTRY–III**	II B.Sc.(III Semester)			
Teaching	HoursAllocated:60(**Theory**)	L	T	P	C
Pre-requisites	Reduction-oxidation,Fundamentalsofdifferentiation,integration,logarithms	-	4	-	3

Course Objectives:

1. Understand the conductance of solutions
2. Working of electrochemical cells
3. Learn the mechanism of photochemical reactions

CourseOutcomes:

On Completion ofthecourse,thestudentswillbeableto	
CO1	Define the laws related to conductance of electrolytes
CO2	Apply conductivity measurements
CO3	Apply emf measurements
CO4	Understand and apply photochemistry in biological reactions

Coursewithfocusonemployability/entrepreneurship/SkillDevelopmentmodules

Skill Development		**Employability**		**Entrepreneurship**	

Syllabus:

UNIT–I: Electrical Conductance :(08h)

QuantitativeaspectsofFaraday'slawsofelectrolysis.Arrheniustheoryof electrolytic dissociation. Ostwald's dilution law. Molar conductivity at infinite dilution. Kohlrausch law and itsapplications.Applicationsofconductancemeasurement:(i)degreeofdissociation of weak electrolytes, (ii) ionic product of water (iii) solubility and solubilityproductofsparinglysolublesalts, (iv)conductometrictitrations,and (v)hydrolysis constants of salts.

UNIT–II: ElectroChemistry-1 (12h)

Debye-Hückel-Onsagerequation,Wieneffect,Debye-Falkenhageneffect,Walden'srules.Ionicvelocities,mobilitiesandtheirdeterminations,transferencenumbers and their relation to ionic mobilities, determination of transference numbersusingHittorf'smethod.

UNIT–IIIElectrochemicalCells-I:(18h)

Rulesofoxidation/reductionofionsbasedonhalf-cellpotentials.Chemicalcells,reversible andirreversible cells withexamples.

Electromotive force of a cell and its measurement, Nernst equation; Standard electrode(reduction) potential and its application to different kinds of half-cells. Application ofEMFmeasurementsindetermining(i)freeenergy,enthalpyandentropyofacellreaction,(ii)equilibriumconstants,and(iii)pHvalues,usinghydrogen,quinone-hydroquinone, glass electrodes.

UNIT–IVElectrochemicalCells-II:(6h)

Concentration cells with and without transference, liquidjunction potential; Qualitative discussion of potentiometric titrations (acid-base, redox,precipitation).

UNIT–VPhotochemistry:(16h)

Characteristicsofelectromagneticradiation,Lambert-Beer'slawanditslimitations,physical significance of absorption coefficients. Laws of photochemistry, the Jablonskidiagram.Quantumyield,examplesoflowandhighquantumyields,photochemicalreactions of chainreactions of $H_2$and Br_2, & $H_2$and Cl_2. Photosensitized reactions,quenching.photostationarystates, chemiluminescence.

Textbooks:

1. TextbookofphysicalchemistrybyKLKapoor
2. TextbookofphysicalchemistrybySGlasstone
3. PrinciplesofPhysicalChemistrybyPuri,Sharma&Pathania

Referencebooks:

1. Atkins,P.W&Paula,J.D.PhysicalChemistry,9thEd.,OxfordUniversityPress(2011).
2. Castellan,G.W.PhysicalChemistry4thEd.,Narosa(2004).
3. Mortimer,R.G.PhysicalChemistry3rdEd.,Elsevier:NOIDA,UP(2009).
4. Barrow, G.M.,PhysicalChemistry5thEd.,TataMcGrawHill:NewDelhi(2006).
5. Engel,T.&Reid,P.PhysicalChemistry3rdEd.,Prentice-Hall(2012).
6. Rogers,D.W.ConcisePhysicalChemistryWiley(2010).
7. Silbey, R. J.; Alberty, R. A. & Bawendi, M. G. Physical Chemistry 4thEd.,JohnWiley&Sons,Inc.(2005)

WebLinks:

- https://youtu.be/nfhKn7Fv9ms
- https://youtu.be/Ic9tvQpPguI
- https://youtu.be/1E1wXhcMCDI

CO-POMapping:

1:Slight[Low]; 2:Moderate[Medium];3:Substantial[High],'-':NoCorrelation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	2	2	3
CO2	2	3	3	3	2	3	3	2	3	3	3	3	3
CO3	3	3	3	3	2	2	2	2	2	3	2	2	2
CO4	3	2	2	2	2	2	3	3	1	1	1	3	2
Avg.	**2.5**	**2.75**	**2.5**	**2.75**	**2.25**	**2.5**	**2.25**	**2.25**	**2**	**2.5**	**2**	**2.5**	**2.5**

BLUEPRINT FOR

PHYSICALCHEMISTRY

S.No.	Chapter	Essay questions(7M) Knowledge/skill	Short answer question(3M) Understanding
1	**Unit-I:**ElectricalConductance	**02**	**02**
2	**Unit-II:** Electrochemistry-I	**02**	**02**
3.	**Unit-III:** Electro chemical cells-I	**02**	**01**
4.	**Unit-IV:** Electro chemical cells-II	**02**	**01**
5.	**Unit-V:**Photochemistry	**02**	**02**
Total number of questions		**10**	**08**

II B.Sc. (HONOURS) CHEMISTRY III

SEMESTERMODEL

QUESTIONPAPERPHYSICALCHEMIS

TRY– III

Time:2.1/2 hrs. **Marks :50M**

SECTION–A

Answer**ALL**questions **(5X7=35M)**

1. Define the equivalent and molar conductivity and explain the effect of dilution onweakandstrongelectrolytes.

(OR)

2. Explain the Kohlrausch law and it's applications.
3. Write the Determination of transference number by Hittorfmethod.

(OR)

4. DeriveDebye-Hückel-Onsager equation.
5. Explainabout Concentration CellswithTransference.

(OR)

6. Explainabout Concentration cells withoutTransference.

7. Define EMF? Write any three applicationsof EMF measurements.

(OR)

8. What is p^H value and explain the Glass electrode for determination of P^Hvalue.

9. 9.Write about Beer-Lambert'slawand itslimitations.

(OR)

10. Define quantum yield and explain the reasons for low and high quantum yields with examples

SECTION–B

Answerany FIVE questions **(5X3=15M)**

11. Writeaboutkohlrauschlaw
12. Explain the conductometric titration of weak acid vs strong Base
13. Explain Debye-Falkenhageneffect
14. Writeabout Liquid junctionpotential.
15. Writeabout Nernst Equation.
16. What are reversible and irreversible cells and give one example each.
17. Write the role of photochemical reactions in biochemical process
18. Discussaboutchemiluminescence

	GovernmentCollege(Autonomous) Rajahmundry	Program &Semester			
Course Code CHH107 P	**TITLEOFTHECOURSE CONDUCTOMETRY**	II B.Sc.(IIISemester)			
Teaching	HoursAllocated:30(**Practical**)	L	T	P	C
Pre-requisites	Principles of acid-base titrations, strong and weak electrolytes	2	-	-	2

Course Objectives:

1. Understandtheapplicationsofconductivitymeasurements

CourseOutcomes:

OnCompletion ofthecourse,thestudentswillbeableto	
CO1	Applyconductivitymeasurementsacid-basetitrationmethodforrealsamples
CO2	Differentiatestrongandweakelectrolytes
CO3	Understandtheworking principleofconductivitymeter
CO4	Determinethedegreeofdissociationforweakelectrolytes

Coursewithfocusonemployability/entrepreneurship/SkillDevelopmentmodules

Skill Development			**Employability**			**Entrepreneurship**	

Syllabus:

I. Determinationofcellconstant

II. Determination of conductivity, molar conductivity, degree ofdissociationand dissociationconstantofaweakacid.

III. Performthefollowingconductometrictitrations:

i. Strongacidvs.strongbase

ii. Weakacidvs.strongbase

iii. Mixtureofstrongacid andweak acidvs. strongbase

iv. Strongacid vs.weakbase

Referencebooks:

1. Khosla,B.D.;Garg,V.C.&Gulati,A.SeniorPracticalPhysicalChemistry,R.Chand&Co.:New Delhi(2011).
2. Garland,C.W.;Nibler,J.W.&Shoemaker,D.P.ExperimentsinPhysicalChemistry8thEd.;McGraw-Hill:NewYork(2003).
3. Halpern,A.M.&McBane,G.C.ExperimentalPhysicalChemistry3rdEd.; W.H. Freeman&Co.:NewYork(2003).

CO-POMapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High],'-' :NoCorrelation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	3	3	2	2	3	2	3	3	3	2
CO2	3	2	3	2	2	3	3	1	3	3	2	2	3
CO3	1	3	3	3	3	2	2	2	2	3	3	2	3
CO4	3	2	3	3	2	2	3	3	2	1	2	3	2
Avg.	**2.5**	**2.25**	**2.75**	**2.75**	**2.55**	**2.25**	**2.5**	**2.25**	**2.25**	**2.5**	2.5	2.5	2.5

II B.Sc. CHEMISTRY (HONOURS) III

SEMESTERLABORATORYCOURSEPRACTICALPAPER–IIIC

SCHEMEOFVALUATION

Max.Marks:50Marks **Time:3Hrs**

1) For Record	10Marks
2) ForPractical	40Marks

SplittingofPracticalMarks:

v)	Procedurein10min	:	5Marks
vi)	Formulawithunits	:	5Marks
vii)	Neattabulation	:	5 Marks
viii)	Correctcalculation	:	5 Marks

Error<10% 20Marks

Error10-15% 15Marks

Error>15% 10Marks(Minimum)Marks)

Total Marks -50M

II. B.Sc., CHEMISTRY (HONORS)

SECOND YEAR

SEMESTER - IV

	GovernmentCollege(Autonomous) Rajahmundry	Program&Semester			
Course CodeCHH 108	**TITLEOFTHECOURSE** INORGANICCHEMISTRY	IIB.ScChem(Hons)(IV SEMESTER)			
Teaching	HoursAllocated: 60(**Theory**)	L	T	P	C
Pre-requisites	Propertiesofd-blockandf-blockelements,stabilityandreactivityofcoordinationcomplexes.	-	4	-	4

CourseObjectives:

1. Tolearnstabilityand reactivityofthecoordinationcomplexes.
2. Tounderstandtheimportanceoftransitionandinnertransitionelementsandtheirversatilecharacterinperiodictable.
3. Tounderstandthethermodynamicandkineticstabilityofsquareplannerandoctahedralcomplexes.

CourseOutcomes:

OnCompletion ofthecourse, thestudentswillbeableto	
CO1	Learnunderstandtheversatilenatureofthed-blockelementsintheperiodictable.
CO2	Understandspectralandmagneticpropertiesofthef-blockelements
CO3	Understandtheformationofcoordinationcomplexcompounds, theirreactivityandstability
CO4	Understand the stabilityandreactivityofsquare planarandoctahedralcomplexes

Coursewithfocusonemployability/entrepreneurship/SkillDevelopmentmodules

Skill Development		**Employability**		**Entrepreneurship**	

Syllabus:

INORGANICCHEMISTRY-III

Unit I: TRANSITIONELEMENTS:15h

General group trends with special reference to electronic configuration, colour, variable valency, magnetic and catalytic properties, ability to form complexes. Stability of various oxidation states and e.m.f. (Latimer diagrams) Different between the first, second and third transition series. Chemistry of Cr,Mn,FeandCoinvariousoxidationstates withspecialreferencetothefollowingcompounds: peroxocompoundsofchromium,potassiumdichromate,potassiumpermanganate, potassium ferrocyanide,potassium ferricyanide, sodium nitroprusside and sodium cobaltinitrite.

Unit-II: LANTHANOIDSANDACTINOIDS:10h

Electronicconfiguration,oxidationstates,colour,spectralandmagneticproperties,lanthanidecontraction,separationoflanthanides(ion-exchangemethodonly).

Unit III: COORDINATIONCHEMISTRY-I 12h

Werner's theory,valence bond theory (innerand outer orbital complexes),electroneutralityprinciple and back bonding. IUPACnomenclatureofcoordinationcompounds,isomerismincoordinationcompounds.Stereochemistry of complexes with 4 and 6 coordination numbers. Polynuclearcomplexes.

Unit IV: COORDINATIONCHEMISTRY-II 13h

Crystal field theory, measurement of 10 Dq (Δo), CFSE in weak andstrong fields, pairing energies, factors affecting the magnitude of 10 Dq (Δo, Δt). Octahedral vs.tetrahedral coordination, tetragonal distortions from octahedral geometry Jahn-Teller theorem,squareplanargeometry.QualitativeaspectofLigandfieldandMOTheory.

Unit V: INORGANICREACTIONMECHANISM:10h

Introductiontoinorganicreactionmechanisms.Labileandinertcomplexes.Substitutionreactionsinsquareplanarcomplexes,Trans-effect,theoriesoftranseffect.Chelate effect.Thermodynamicand Kineticstability.

Referencebooks:

- Purcell,K.F&Kotz, J.C., InorganicChemistryW.B.SaundersCo,1977.
- Huheey,J.E.,InorganicChemistry,PrenticeHall,1993.
- Cotton,F.A.&Wilkinson,G.,AdvancedInorganicChemistryWiley-VCH,1999
- Basolo,F,andPearson,R.C.,MechanismsofInorganicChemistry,JohnWiley&Sons, NY,1967.
- Greenwood,N.N. &EarnshawA., ChemistryoftheElements,ButterworthHeinemann,1997.
- Miessler,G.L.&.Tarr,DonaldA.InorganicChemistry3rdEd.(adapted), Pearson,2009.

WebLinks:

https://www.khanacademy.orght
tps://www.sciencedirect.com

(1:Slight[Low]; 2:Moderate[Medium]; 3: Substantial[High],'-': NoCorrelation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3	2	3	3	2	2	2	3
CO2	2	2	3	3	3	3	2	3	2	1	2	3	2
CO3	3	2	3	2	2	3	2	3	3	2	2	2	3
CO4	2	2	3	2	2	3	2	1	2	3	2	2	2
Avg.	**2.5**	**2**	**2.75**	**2.25**	**2.25**	**3**	**2**	**2.5**	**2.5**	**2**	**2**	**2.25**	**2.5**

IIB.ScCHEMISTRY(HONORS)

BLUEPRINT

INORGANICCHEMISTRYSEMESTER-IV

Sl.No.	Chapter	Essay Question(7M) knowledge	Short Answer Question (3M) Understanding
1.	UNIT-I	02	02
2.	UNIT-II	02	02
3.	UNIT-III	02	01
4.	UNIT-IV	02	01
5.	UNIT-V	02	02
Total no. of Questions		10	08

B.Sc. CHEMISTRY(HONOURS)SECONDYEAR

IVSEMESTER,MODELPAPER

INORGANICCHEMISTRY-III

TIME:$2^{1/2}$hr **MARKS:50M**

PART-A

Answer **ALL** the question**(5x7=35M)**

1. Explain the following characteristic properties of d-block elements.
   (i) Ability to exhibit variable oxidation states
   (ii) (ii) Ability to form complex compounds.

(OR)

2. Write short notes on the following.
   (i) Catalytic properties (ii) Magnetic properties.
3. What is Lanthanide Contraction? Explain its consequences

(OR)

4. Explain the separation of Lanthanides by ion exchange method.
5. Explain the valence bond theory of complex compounds with suitable examples

(OR)

6. Explain the Stereochemistry of complexes with coordination number 6.
7. Write the important postulates of crystal field theory. Explain the crystal field splitting in octahedral complexes

(OR)

8. Explain the crystal field splitting in tetrahedral complexes.
9. Explainthereactionmechanismofsubstitutionreactions insquareplanarcomplexes.

(OR)

10. Explainthekinetic and thermodynamic stability of complex compounds with suitable examples.

PART-B

Answer any **FIVE** questions **(5x3=15M)**

1. Why transition metal ions exhibit colour?
2. Write a short note on Latimer diagrams.
3. Write a short note on magnetic properties of lanthanides.
4. Write the differences between lanthanides and actinides.
5. Explain the Stereochemistry of complexes with coordination number 4.
6. Write a short note on Jahn-Teller effect.
7. Explain labile and inert complexes with suitable examples.
8. Explain trans effect with suitable examples.

	GovernmentCollege(Autonomous)Rajahmundry	Program & Semester			
Course CodeCHH 108P	**TITLEOFTHECOURSE** **INORGANICCHEMISTRY**	IIB.Sc.Chem.(Hons) (IVSEMESTER)			
Teaching	HoursAllocated:30(**Practical**)	L	T	P	C
Pre-requisites	Estimationofnickelandcopperbyusinggravimetrictitration,synthesisofcoordinationcomplexes.	2		-	2

CourseObjectives:

1. Estimationofnickelandcopperbyusing gravimetrictitration
2. nthesisofcoordinationcomplexes.

CourseOutcomes:

OnCompletion ofthecourse, thestudentswillbeableto	
CO1	Ableto learnhowto use gravimetricanalysisto estimationofNiandCu.
CO2	Abletosynthesiscoordinationcomplexes indifferentmethods.
CO3	Ableto studytheirpropertiesand usesofcoordinationcomplexesinreallife.
CO4	

SkillDevelopment		**Employability**		**Entrepreneurship**	

IIB.Sc. CHEMISTRY(HONOURS)IVSEMESTER

LABORATORY COURSE PRACTICAL

PAPER –IVA FROM 2022-23ONWARDSLABORATORYCOURSE–IVA

SYLLABUSFORINORGANICPRACTICAL–III

GravimetricAnalysis:

i. Estimationofnickel(II) usingDimethylglyoxime(DMG).
ii. EstimationofcopperasCuSCN
iii. EstimationofironasFe$_2O_3$byprecipitatingironasFe(OH)$_3$.
iv. Estimation of Al(III) by precipitating with oxine and weighing as Al(oxine)$_3$(aluminiumoxinate).

InorganicPreparations:

i. Tetraamminecopper(II)sulphate,[Cu(NH$_3$)$_4$]SO$_4$.H$_2$O
ii. AcetylacetonatecomplexesofCu^{2+}/Fe^{3+}
iii. Tetraamminecarbonatocobalt(III)nitrate
iv. Potassiumtri(oxalato)ferrate(III)

PropertiesofComplexes

i. Measurementof10Dqbyspectrophotometricmethod
ii. Verificationofspectrochemicalseries.
iii. SynthesisofamminecomplexesofNi(II)anditsligandexchangereactions (e.g. bidentate ligands like acetylacetone, DMG, glycine) bysubstitutionmethod.

CO –PO Mappings:

(1:Slight[Low]; 2:Moderate[Medium]; 3: Substantial[High],'-': NoCorrelation)

	PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO1 0	PSO 1	PSO 2	PSO 3
CO1	3	2	2	2	2	3	2	3	3	2	2	3	2
CO2	2	2	3	3	3	3	2	3	2	1	3	3	2
CO3	3	2	3	2	2	3	2	3	3	2	3	3	2
CO4	2	2	3	2	2	3	2	1	2	3	3	1	2
Avg.	**2.5**	**2**	**2.75**	**2.25**	**2.25**	**3**	**2**	**2.5**	**2.5**	**2**	**2.75**	**2.5**	**2**

LABORATORYCOURSE
SYLLABUSFOR
INORGANICPRACTICAL
SCHEMEOF VALUATION

Max.Marks: 50MarkS ***Time: 3Hrs***

1) ForRecord 10Marks

2) ForPractical 40Marks

SplittingofPracticalMarks:

Procedurein10min: 5Marks

Formula withunits: 5Marks

Neattabulation: 5Marks

Correct calculation: 5Marks

Error<10% 20Marks

Error10-15% 15Marks

Error>15% 10Marks(MinimumMarks)

TotalMarks - 50M

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHH109	**TITLE OF THE COURSE ORGANIC CHEMISTRY -III**	II B.Sc. (IV Semester)			
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites	Fundamentals of Organic Chemistry and its synthetic utility	-	4	-	3

CourseObjectives:

1. Reactivity, functionality and structure of Poly nuclear compounds and nitrogen containing functional group.
2. Isolation, structural elucidation, synthesis & biological activity of natural products
3. Classification, Aromaticity, structure, basicity, Reactivity of Hetero Cyclic Compounds

CourseOutcomes:

OnCompletion of thecourse, the students willbeable to	
CO1	Learn and identify different types of organic compounds containing nitrogen as hetero atom
CO2	Understand preparation, Properties, and reactions of Poly nuclear Hydro carbons
CO3	To initiate the research work with reference to hetero cyclic compounds
CO4	Learn about Isolation, Preparation, and properties of natural products

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		**Employability**		**Entrepreneurship**	

Syllabus:

Unit-1

NITROGEN CONTAINING FUNCTIONAL GROUPS

Preparation and important reactions of nitro compounds, nitriles and isonitriles. Amines: Preparation and properties: Effect of substituent and solvent on basicity; Gabriel phthalimide synthesis, Carbylamine reaction, Mannich reaction, Hoffmann's exhaustive methylation, Hofmann- elimination reaction; Distinction between 1°, 2° and 3° amines with Hinsberg reagent and nitrous acid. Diazonium Salts: Preparation and their synthetic applications.

Unit-2

POLYNUCLEAR HYDROCARBONS

Aromaticity of polynuclear hydrocarbons, structure elucidation of naphthalene;Preparation and properties of naphthalene, phenanthrene and anthracene.

Unit-3

HETEROCYCLIC COMPOUNDS

Classification and nomenclature, Structure, aromaticity in 5-numbered and 6-membered rings containing one heteroatom; Synthesis, reactions and mechanism of substitution reactions of: Furan, Pyrrol, Thiophene, Pyridine, Indole and Quinoline

.

Unit-4

ALKALOIDS

Natural occurrence, General structural features, Isolation and their physiological action, Hoffmann's exhaustive methylation, Emde's modification; Structure elucidation and synthesis of Nicotine. Medicinal importance of Nicotine,

UNIT -5

TERPENES

Occurrence, classification, isoprene rule; Elucidation of stucture and synthesis of Citral

Referencebooks:

1. Morrison, R. T. & 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.(PearsonEducation).
3. Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry ofNatural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Acheson, R.M. Introduction to the Chemistry of Heterocyclic compounds, JohnWelly& Sons(1976).
5. Graham Solomons, T.W. Organic Chemistry, John Wiley &Sons,Inc.
6. Kalsi, P. S. Textbook of Organic Chemistry 1st Ed., New Age International (P)Ltd.Pub.
7. Clayden, J.; Greeves, N.; Warren, S.; Wothers, P.; Organic Chemistry, Oxford UniversityPress.
8. Singh, J.; Ali, S.M. & Singh, J. Natural Product Chemistry, PrajatiParakashan (2010).

Web Links:

- https://youtu.be/9vMQMQgFhA0
- https://youtu.be/sqI8cY5Unfo
- https://youtu.be/xQDhXoJwSEI

CO-POMapping:

1: Slight [Low]; 2:Moderate [Medium]; 3:Substantial [High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	2	1	3
CO2	3	2	3	3	2	3	3	1	3	3	3	3	3
CO3	3	3	3	3	2	2	2	2	2	3	2	2	2
CO4	3	2	2	2	2	2	3	3	1	1	1	3	2
Avg.	**2.75**	**2.5**	**2.5**	**2.75**	**2.25**	**2.5**	**2.25**	**2**	**2**	**2.5**	**2**	**2.25**	**2.5**

II B.Sc(HONOURS) CHEMISTRY IV-SEMESTER

BLUE PRINT

ORGANIC CHEMISTRY III

	Chapter	Essay questions(7 M) Knowledge/skill	Short answer Questions (3M) Understanding
1	**Unit-I:** NITROGENCONTAINING FUNCTIONAL GROUPS	02	02
2	**Unit-II:** POLYNUCLEAR HYDROCARBONS	02	02
3	**Unit-III**: HETEROCYCLIC COMPOUNDS	02	02
4	**Unit-IV:** ALKALOIDS &TERPENES	02	01
5	**Unit -5** TERPNOIDS	02	01
Total number of questions		10	08

II B.Sc. (HONOURS) CHEMISTRY IV-SEMESTER

MODEL QUESTION PAPER

ORGANIC CHEMISTRY – III

Time: 2.1/2 hrs. **Marks :50 M**

SECTION –A

Answer **ALL** questions **(5X 7 = 35M)**

1) How do you distinguish 1^0 ,2^0 and 3^0 amines with Heinsberg reagent and nitrous acid?

(OR)

Explain the following: a) Gabriel phthalimide synthesis b) Carbylamine reaction

2) What are polynuclear hydrocarbons? Explain structure elucidation of naphthalene?

(OR)

Write the preparation and properties of anthracene?

3) What is aromaticity? Explain the aromaticity of Furan, Pyrrole and Thiophene?

(OR)

Explain the following: a) Skraup synthesis b) Friedlander's synthesis

4) Describe about synthesis of Nicotine?

(OR)

5) Describe about structure elucidation of Nicotine?

6) Give the classification of terpenes? Write the synthesis of Citral?

(OR)

7) Describe about structure elucidation of Citral.

SECTION – B

Answer any FIVE questions **(5X 3=15M)**

8) Explain the basicity of amines?

6). How diazonium salts are prepared? Give any two applications of it.

7). Write any four properties of phenanthrene.

8) How do you prepare 5- membered hetero cyclic compounds by Paul- Knorr synthesis?

9) Write the following reactions:

a) Bischler –Napieralski reaction b) Pomeranz –Fritsch reaction

10). Explain Hoffmann's exhaustive methylation.

11). Explain Isolation and physiological action of alkaloids?

12). What is Isoprene? Explain Isoprene rule in terpenes?

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHH109P	**TITLE OF THE COURSE ORGANIC CHEMISTRY –III**	II B.Sc (IV Semester)			
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites	Identification and Conformation of Organic Compound Analysis	2	-	-	2

Course Objectives:

- Identification of Physical and Chemical Properties of an Unknown Organic Compound
- Conformation of an identified organic Compound

CourseOutcomes:

On Completion of the course, the students will be able to	
CO1	Learn the Systematic Procedure for using analysis
CO2	Identified the physical and chemical reactions of an Organic Compound
CO3	Functional group identification
CO4	Functional group Confirmation

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

SYLLABUS

B.Sc. CHEMISTRY (HONOURS) SECOND YEAR IV SEMESTER.

ORGANIC CHEMISTRY PRACTICAL-III

Functional group test for nitro, amine, and amide groups. Qualitative analysis of unknown organic compounds containing simple functional groups (alcohols, carboxylic acids, phenols, carbonyl compounds and esters)

Referencebooks:

9. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)
10. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical OrganicChemistry,
11. 5th Ed., Pearson (2012)
12. Ahluwalia, V.K. &Aggarwal, R. Comprehensive Practical Organic Chemistry:Preparation and
13. Quantitative Analysis, University Press (2000).
14. Ahluwalia, V.K. &Dhingra, S. Comprehensive Practical Organic Chemistry:Qualitative
15. Analysis, University Press (2000)

CO-POMapping:

1: Slight [Low]; 2:Moderate [Medium]; 3:Substantial [High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3			
CO2	3	2	3	3	2	3	3	1	3	3			
CO3	3	3	3	3	2	2	2	2	2	3			
CO4	3	2	2	2	2	2	3	3	1	1			
Avg	**2.75**	**2.5**	**2.5**	**2.75**	**2.25**	**2.5**	**2.25**	**2**	**2**	**2.5**			

B.Sc. CHEMISTRY (HONOURS) SECOND YEAR IV SEMESTER.

ORGANIC CHEMISTRY PRACTICAL-III

SCHEME OF VALUATION

Total – 50 Marks

Record – 10 Marks **Practical – 40 Marks**

Break up of Practical – I (40 Marks)

Identification of function group of an organic compound (Systematic procedure should be adopted).

- Colour - 1 Marks
- Physical State - 1 Marks

  Odour - 1 Marks
- MP / BP - 2 Marks
- Ignition Test - 2 Marks
- Litmus Test - 2 Marks
- Solubility & Classification basing on solubility data - 5 Marks
- Detection of extra elements - 4 Marks

  (2 Marks for extract)

  Unsaturation Test (with bromine water and Bayer's Test) - 4 Marks
- Identification of functional group - 5 Marks
- Confirmatory test for function group (1 test) - 5 Marks
- Anyone derivative of the organic compound - 4 Marks (1 x 4)

  Report - 4 Marks

Total Marks - 50 Marks

	GovernmentCollege(Autonomous) Rajahmundry	Program&Semester			
Course CodeCHH 110	TITLEOFTHECOURSE **PHYSICALCHEMISTRY-IV**	IIB.ScChem(Hons)(IV SEMESTER)			
Teaching	HoursAllocated: 60(**Theory**)	L	T	P	C
Pre-requisites	Calculus,linearalgebraandbasicclassicalmechanics		4	-	3

CourseObjectives:

1. Toprovideanintroductiontothemathematicalfoundationsofquantumchemistry.
2. To learnabout limitationsofclassicalmechanicsand solution intermsofquantummechanicsforatom/molecularsystems.
3. Tounderstandthevalencebondandmolecular orbitaltheorytosolveH_2molecule.
4. Togaininsightintothebasicprinciplesofrotational,vibrational,electronic,Raman,NMRand ESR spectroscopytointerpretthe spectraforstructureelucidation.

CourseOutcomes:

OnCompletion ofthecourse, thestudentswillbeableto	
CO1	Tostudythefundamentalconceptsofquantumchemistry
CO2	DiscussthetimeindependentformofSchrodinger waveequationapplyfor onedimensionalpotential
CO3	Tostudythefundamentalconceptsofspectroscopy
CO4	TostudyUV-Visible, IR,NMRandESRspectroscopydetail.

Coursewithfocusonemployability/entrepreneurship/SkillDevelopmentmodules

SkillDevelopment		Employability		Entrepreneurship	

Syllabus:

PAPER-IVC -SYLLABUSFORPHYSICALCHEMISTRYIV (60h)

QuantumChemistry-I

Waveequation-interpretationofwavefunction-propertiesofwavefunction– normalization andorthogonalization,Operators–linearandnon-linear-commutatoroperators.Postulatesof quantummechanics;setting upofoperatorstoobservables;Hermitianoperator– EigenvaluesandEigenfunctionsofHermitianoperator;Eigenfunctionsofcommutingoperators– significancesimultaneous measurementofpropertiesandtheuncertaintyprinciple.

QuantumChemistry-II

Schrodingerwaveequationanditsapplicationstofreeparticleand–particle-in-abox,quantizationofenergylevels,zero-pointenergy,probabilitydistributionfunctions,nodalproperties.

Chemicalbonding

Covalent bonding,valence bondandmolecularorbitalapproaches,LCAOMOtreatmentofH2 + .Bonding and antibonding orbitals. Qualitative extension to H2.Comparison of LCAO-MOandVBtreatmentofH2(onlywavefunction,detailedsolutionnotrequired)andtheirlimitations. Qualitative description of LCAO-MO treatment of homonuclear molecules (O2 &N2).

MolecularSpectroscopy-I

Interaction of electromagnetic radiation with molecules and various types of spectra.**Rotationalspectroscopy:**Selectionrules,intensitiesofspectrallines, determinationofbondlengthsofdiatomicmolecules,isotopicsubstitution.

Vibrationalspectroscopy: Classicalequationofvibration,computationofforceconstant,amplitudeo fdiatomicmolecularvibrations,overtones,hotbands,degreeoffreedomforpolyatomicmolecules,mo desofvibrations.

Electronic spectroscopy: Types of electronic transition in molecules, singlet and triplet states,fluorescence and phosphorescence, concept of chromophore and auxochrome. Bathochromicshift, hypsochromic shift, hyperchromic shift and hypochromic shift, effect of conjugation onλmax.

MolecularSpectroscopy-II

NuclearMagneticResonance(NMR)spectroscopy:

Principles of NMR spectroscopy, chemical shift, chemical shift effecting factors.Chemicalshift equivalent and non-equivalent, different scales (δ and T), spin-spin coupling interpretationofPMR spectra of organic molecules (Ethyl bromide, ethanol, acetate, acetaldehyde, ethylacetate,tolueneandacetophenone).

ElectronSpinResonance(ESR)spectroscopy:

Itsprinciple,hyperfinestructure,ESRofsimpleradicals.

AdditionalInputs:sphericalpolar(Derivationnotrequired).Separationofvariables.Sphericalharmoni cs.Discussionofsolution(Qualitative).

Referencebooks:

- Banwell,C.N&McCash,E.M,FundamentalsofMolecular Spectroscopy4thEd.TataMcGraw-Hill:NewDelhi(2006).
- Chandra,A.K.IntroductoryQuantumChemistryTataMcGraw-Hill(2001).
- House,J.E.FundamentalsofQuantumChemistry2nd Ed.Elsevier: USA(2004).
- Lowe, J.P. Peterson, K. QuantumChemistry,AcademicPress(2005)
- Kakkar,R.AtomicandMolecularSpectroscopy,CambridgeUniversityPress (2015)

WebLinks:

1. http://www.nist.com
2. http://www.sciencedirect.com

(1:Slight[Low]; 2:Moderate[Medium]; 3: Substantial[High],'-': NoCorrelation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3	2	3	3	2	3	3	2
CO2	2	2	3	3	3	3	2	3	2	1	3	3	2
CO3	3	2	3	2	2	3	2	3	3	2	3	3	2
CO4	2	2	3	2	2	3	2	1	2	3	3	1	2
Avg.	**2.5**	**2**	**2.75**	**2.25**	**2.25**	**3**	**2**	**2.5**	**2.5**	**2**	**3**	**2.5**	**2**

IIIB.ScCHEMISTRY(HONORS)

BLUEPRINT

PHYSICALCHEMISTRY-IVSEMESTER-IV

S.No	Chapter	Essayquestions (7M) Knowledge/ skill	Short answerquestions (4M)Understanding
1	UNIT-I QuantumChemistry-I	02	01
2.	UNIT-II QuantumChemistry-II	02	01
3.	UNIT-IIIChemicalbonding	02	02
4.	UNIT-IV:Molecularspectroscopy-I	02	02
5.	UNIT-V:Molecularspectroscopy-II	02	02
Totalnumberof questions		10	08

GOVERNMENTCOLLEGE(A),RAJAMAHENDRAVARAM

IIIB.Sc CHEMISTRY (HONORS)SEMESTER-IV

MODEL QUESTION

PAPERPHYSICALCHEMIS

TRY-IV

TIME:2½hrs **MARKS: 50M**

SECTION -A

Answer **ALL**questions **(5X7= 35 M)**

1. Discussthepostulates ofquantummechanics.

(OR)

2. Giveadetailaccountofsetting upofoperatorsfordifferentobservables.

3. DerivetheSchrodingerwaveequationforonedimensionalbox.

(OR)

4. Write in detail about Quantization of energy levels and Zero-point energy.

5. WriteLCAO-MOtreatment ofH_2^+andH_2

(OR)

6. WhatisLCAOmethod?Explainthemolecularorbitaldiagramsof molecules a)O_2b)N_2

7. Whatiselectronictransitionandtypesofelectronictransitionswithexamples.

(OR)

8. Explain Different modes of vibrations in IR Spectroscopy.

9. Definechemicalshiftandwritethefactorsaffectingchemicalshift?

(OR)

10. Writetheprinciple of NMRspectroscopy.Whatischemicalshiftequivalence? Howmanydifferent NMR signals you will see in the following molecules- Ethanol, Acetate andAcetophenone

SECTION -B

Answer any**FIVE** questions **(5X 3 =15M)**

11. WriteabriefnoteonHeisenberg'suncertaintyprinciple.
12. Definewavefunction.Writetheacceptablewavefunctionforψ.
13. DefineEigenvaluesandEigenfunction.Giveexamples.
14. WritethecomparisonofLCAO-MOand VBtreatment ofH_2(onlywaveequation).
15. Writethedifferencesbetweenvalance bondand molecularorbital.
16. Writeabouttheabsorptionshiftsinelectronic spectroscopy.
17. Writethefollowinga)computationofforceconstantb)Overtonesc)Hotbands
18. Whatisspin-spincoupling?

	GovernmentCollege(Autonomous) Rajahmundry	Program&Semester			
Course CodeCHH110P	TITLEOFTHECOURSE **PHYSICALCHEMISTRY-IV**	IIB.ScChem(Hons)(V SEMESTER)			
Teaching	HoursAllocated:30(**Practical**)	L	T	P	C
Pre-requisites	Toimpactafundamentalknowledgeontheprinciplesandinstrumentationofcolorimetrictechniques.	2		-	2

CourseObjectives:

3. Colourdifferenceexperiments:Colourmatchingexperiments.Numberofdesirablecolours.
4. Toestimatetheamount ofunknownsolutionbyusingcolorimetry.
5. To knowthetechniquestomeasure therateofareaction.
6. Todeterminethedissociationconstantbyseeinghowmuchofitdissociatesinwater.

CourseOutcomes:

OnCompletion ofthecourse, thestudentswillbeableto	
CO1	Understandthecolourmatchingexperiments.
CO2	Estimatetheamount ofsubstancepresentinanyunknownsolutionusingcolorimetricanalysis.
CO3	Knowthetechniquestomeasuretherateofareaction.
CO4	DeterminethepK_aofweak acid

Coursewithfocusonemployability/entrepreneurship/SkillDevelopmentmodules

SkillDevelopment		Employability		Entrepreneurship	

Syllabus:

I. Verify Lambert-Beer's law and determine the concentration of KMnO4/K2Cr2O7inasolutionofunknown concentration
II. DeterminetheconcentrationsofKMnO4andK2Cr2O7inamixture.
III. Studythekineticsofiodinationofpropanoneinacidicmedium.
IV. Determinethedissociationconstantofanindicator(phenolphthalein).
V. Studythekineticsofinteractionofcrystalviolet/phenolphthalein withsodiumhydroxide.
VI. AnalysisofthegivenvibrationrotationspectrumofHCl(g)Adsorption
VII. Verify the Freundlich and Langmuir isotherms for adsorption of acetic acid onactivatedcharcoal.

Referencebooks:

- Khosla,B.D.;Garg, V.C.&Gulati,A., SeniorPracticalPhysicalChemistry,R.Chand& Co.:New Delhi(2011).
- Garland, C. W.;Nibler, J.W. &Shoemaker, D.P.Experiments inPhysicalChemistry8th Ed.;McGraw-Hill: NewYork (2003).
- Halpern,A.M.&McBane,G.C.ExperimentalPhysicalChemistry3rd Ed.;W.H. Freeman &Co.:NewYork(2003).

WebLinks:

1. https://paramedicsworld.com
2. https://www.sciencedirect.com

(1:Slight[Low]; 2:Moderate[Medium]; 3: Substantial[High],'-': NoCorrelation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PSO1	PSO2	PSO3
CO1	3	1	2	2	2	3	2	3	3	2	3	2	2
CO2	3	1	3	3	3	3	2	3	2	1	3	3	3
CO3	3	1	3	2	2	3	2	3	3	2	3	2	3
CO4	3	1	3	2	2	3	2	1	2	3	1	2	3
Avg.	**3**	**1**	**2.75**	**2.25**	**2.25**	**3**	**2**	**2.5**	**2.5**	**2**	**2.5**	**2.25**	**2.75**

IIB.Sc.CHEMISTRY(HONORS)

IVSEMESTERLABORATORYCOURSE

PRACTICALPAPER–IVC

PHYSICALCHEMISTRYPRACTICALIV

SCHEMEOFVALUATION

Max.Marks:50Marks **Time:3Hrs**

1) ForRecord 10Marks
2) ForPractical 40Marks

SplittingofPracticalMarks:

i)	Procedurein10min	:	5Marks
ii)	Formulawithunits	:	5Marks
iii)	Neattabulation	:	5Marks
iv)	Correctcalculation	:	5Marks

Error<10%	20Marks
Error10-15%	15Marks
Error>15%	10Marks(MinimumMarks)

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHH111	TITLE OF THE COURSE **POLYMER CHEMISTRY (DSE-I)**	II B.Sc.(Hons) (IV Semester)			
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites	Importance of polymers	-	4	-	3

Course Objectives:

1. To understand the significance of the chemical perspective towards polymers and the subject gives an introduction to polymer chemistry with respect to synthesis, polymerization kinetics of macromolecules formed by step-growth and chain-growth polymerization.
2. To Study the various kinds of measuring the molecular weight, polymerization kinetics and Copolymerization.
3. To understand about the physical properties of polymers and crystalline nature
4. To study structural properties and applications of polymers

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Students will Understand about the basics of polymer and the differences between crystalline melting temperature and glass transition temperature, as well as the effect of kinetics on both
CO2	Students will develop specific skills of formulate and writing mechanism, competencies and encouragement to support further study or work in this field of Polymer Chemistry
CO3	Learn and evaluate the effect of factors such as polymer structure, molecular weight, branching and morphology
CO4	Students will also know about the structural properties and applications of natural and synthetic polymers

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

Unit-I : Introduction and history of polymeric materials: (4 Lectures)

Different schemes of classification of polymers, Polymer nomenclature, Molecular forces and chemical bonding in polymers, Texture of Polymers.

Functionality and its importance: (6 Lectures)

Synthetic polymer – Rubber, vulcanization, Types of polymerization processes and Mechanisms

Functionality – Bi functional system and poly functional system, degree of polymerization.

Unit-II : Kinetics of Polymerization: (10 Lectures)

Kinetics of step growth, radical chain growth, ionic chain (both cationic and anionic) and kinetics of copolymerization, polymerization techniques- Bulk, Solution, Emulsion and Suspension

Crystallization and crystallinity: (8 Lectures)

Determination of crystallinity and degree of crystallinity, Morphology of crystalline polymers, Factors affecting the crystallinity

Unit-III : Determination of molecular weight of polymers (8 Lectures)

(Mn, Mw, etc) by end group analysis, viscometry, light scattering and osmotic pressuremethods. Molecular weight distribution and its significance. Polydispersity index.

Unit-IV :Polymer Solution (4 Lectures)

Criteria for polymer solubility, Solubility parameter, Thermodynamics of polymer solutions, entropy, enthalpy, and free energy change of mixing of polymers solutions

Glass transition temperature (6 Lectures)

Definition of Glass transition temparature(Tg) –factors affecting –determination of glass transition temperature ,

Free volume theory, WLF equation.

Unit-V :Properties of Polymers (14 Lectures)

Brief introduction to preparation, structure, properties and application of the following polymers: i)polyolefins- polyethylene, polypropylene, polystyrene, polyvinyl chloride(PVC), acrylic polymers-PAN, ii)Fluro polymers- Teflon, polyamides- Nylon6, Nylon6.6. Phenol formaldehyde resins (Bakelite, silicone polymers, polydienes- Buna N-Rubber, Buna S-Rubber.

Text books

1. Billmeyer, F.W. Textbook of Polymer Science, 2nd Ed. Wiley Interscience, 1971.
2. P Bahadur, N V Sastry, Principles of Polymer Science, 2nd Ed, Narosa publishing house

Referencebooks:

1. Seymour, R.B. & Carraher, C.E. Polymer Chemistry: An Introduction, Marcel Dekker, Inc. New York, 1981.
2. Odian, G. Principles of Polymerization, 4th Ed. Wiley, 2004.
3. Ghosh, P. Polymer Science & Technology, Tata McGraw-Hill Education, 1991.34
4. Lenz, R.W. Organic Chemistry of Synthetic High Polymers. Interscience Publishers, NewYork, 1967.

WebLinks:

1. https://ncerthelp.com/cbse%20notes/class%2012/chemistry/Chemistry%20Notes%20for%20class%2012%20Chapter%2015%20Polymers%20.pdf
2. http://web.mit.edu/5.33/www/lec/poly.pdf
3. https://www.nios.ac.in/media/documents/313courseE/L33A.pdf

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	3	3	3	3	3	3	3	3
CO2	3	3	3	2	3	3	3	2	2	3	2	3	3
CO3	3	2	2	2	3	2	3	2	2	2	2	2	2
CO4	3	2	2	3	2	3	2	3	1	1	1	3	2
Avg.	**3**	**2.5**	**2.5**	**2.25**	**2.75**	**2.75**	**2.75**	**2.5**	**2**	**2.25**	**2**	**2.75**	**2.5**

II B.Sc(HONOURS) CHEMISTRY IV-SEMESTER BLUE

PRINT

CHEMISTRY-DSE-I: POLYMER CHEMISTRY

S.NO.	Chapter	Essay questions (7 M) Knowledge/ skill	Short answer question(4M) Understanding
1	Unit-I	02	02
2	Unit-II	02	02
3	Unit-III	02	01
4	Unit-IV	02	01
5	Unit-V	02	02
Total number of questions		10	08

GOVERNMENT COLLEGE(A), RAJAMAHENDRAVARAM DEPARTMENT OF CHEMISTRY

II B.Sc(Honours) SEMESTER-IV
POLYMER CHEMISTRY (DSE-I)

Time: 2 ½ hrs **Max.Marks: 50 M**

SECTION-A

Answer **ALL** Questions. **5 X 7 = 35 M**

1. What is polymerisation? Give the classification of polymers.

(OR)

2. Write the addition polymerisation with mechanisms.
3. Explain the kinetics of step growth polymerisation.

(OR)

4. Explain the polymerisation techniques of Bulk and Emulsion polymerisation.
5. How do you determine the molecular weight of polymers by Osmotic pressure method.

(OR)

6. How do you determine the molecular weight of polymers by Viscometry method.
7. Discuss the thermodynamics of polymerisation by Entropy and Enthalphy.

(OR)

8. Define glass transition temperature (Tg)? Discuss the factors affecting Glass transition temperature (Tg)?
9. Write the preparation and applications of PVC & Poly styrene ?

(OR)

10. Write the preparation and applications of Nylon 6.6 & Bakelite.

SECTION-B

Answer any FIVE Questions. **5X3=15 M**

11. Explain the texture of polymers.
12. What is functionality of polymers. Give its types with examples.
13. Write about solution polymerisation.
14. Discuss the morphology of crystalline polymers.
15. Determine the Number average molecular weight of polymers.
16. Explain WLF equation.
17. Give the preparation and any two applications of PAN
18. Give the preparation and any two applications of Teflon.

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHH111P	TITLE OF THE COURSE **POLYMER CHEMISTRY (DSE-I)**	II B.Sc.(Hons) (IV Semester)			
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites	Instrumental techniques introduced	2	-	-	2

Course Objectives:

1. To learn the skill of the conducting reaction and maintain the conditions, overall synthesis and crystallisation
2. To Study the various kinds of named reactions and percentage of yield calculation
3. To understand about the physical properties of polymers and crystalline nature
4. To studyprinciples and applications of instrumental techniques

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Students will Understand about the basic reactions of organic compounds and polymers
CO2	Students will develop specific skills of formulate and writing mechanism, conducting reactions and crystallisation
CO3	Learn and evaluate basic instrumental techniques
CO4	Students will also know about the structural properties and applications of different compounds

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

CHEMISTRY PRACTICAL - DSE-I LAB: POLYMER CHEMISTRY

Polymer synthesis

1. Preparation of Acetanilide
2. Preparation of Benzanilide
3. Preparation of Phenyl azo β-naphthol
4. Preparation of urea-formaldehyde resin
5. Preparation of Phenol-formaldehyde resin

Polymer analysis

1. Estimation of the amount of HCHO in the given solution by sodium sulphite method
2. IR studies of polymers

Referencebooks:

1. Instrumental Methods of Chemical Analysis - H.Kaur, Pragathi Prakashan, 2003
2. 1. A.I.Vogel - A text book of quantitative organic analysis - ELBS

WebLinks:

1.https://chem.libretexts.org/Ancillary_Materials/Laboratory_Experiments/Wet_Lab_Experiments/Organic_Chemistry_Labs/Experiments/1%3A Synthesis_of_Aspirin_(Experiment)
2.https://www.eng.uc.edu/~beaucag/Classes/IntrotoPolySci/UWaterlooLabPolyChem/experiment2.pdf
3. https://www.learncbse.in/prepare-2-naphthol-aniline-phenyl-azo-%CE%B2-naphtholdye/

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	3	3	3	3	3	2	3	3
CO2	3	2	3	3	3	3	3	2	3	3	3	3	3
CO3	3	3	3	3	3	2	3	2	1	2	3	3	1
CO4	3	2	2	2	2	3	2	3	2	2	2	2	2
Avg.	**3**	**2.5**	**2.5**	**2.5**	**2.75**	**2.75**	**2.75**	**2.5**	**2.25**	**2.25**	**2.5**	**2.75**	**2.25**

CHEMISTRY PRACTICAL - DSE-I LAB: POLYMER CHEMISTRY

Scheme of valuation

Record – 10 M

Practical – 35M

Viva – 5M

Polymer Synthesis and Analysis 35 M

(Breakup for 35 marks)

1. Aim, Chemicals & Apparatus 5 M
2. Procedure 5 M
3. Yield Report 5 M
4. Yield error ..... Less than 10% 10 M

   [Above 10% 5M]
5. IR analysis for two polymers (2x5M) 10M
6. Record 10M
7. Viva 5M

********@*****

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHE112	**TITLE OF THE COURSE** **INDUSTRIAL CHEMICALS AND ENVIRONMENT (DSE-II)**	II B.Sc. (Hons) (IV Semester)			
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites	Awareness on the environmental issues related to chemical industry.	3	1	-	4

Course Objectives:

- To Learn the industrial production of a number of important organic and inorganic compounds/chemicals.
- To evaluate the environmental issues pertaining to the chemical industry.
- Identify various concepts of industrial metallurgy which will help them to explore new innovative areas of research.
- The paper has been drafted to impart the theoretical and practical knowledge of estimation and determination of various industrially important chemicals.

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	Understand the production, storage and handling of important gases like-oxygen, argon, helium, hydrogen and acetylene.	Understand
CO2	Understand and develop efficacy in handling and preparation of frequently used inorganic chemicals like acids, bases, oxidizing and disinfecting chemicals.	Understand
CO3	Learn major causes of air pollution, its control and alarming problem of global warming	Understand& Application
CO4	Know qualitative and quantitative measurements of water treatment, conservation and handling of industrial effluent.	Understand
CO5	Learn about energy and it's Impact on Environment	Understand

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development			**Employability**			**Entrepreneurship**	

UNIT-I

Industrial Gases and Inorganic Chemicals Industrial Gases: (10 Lectures)

Large scale production, uses, storage and hazards in handling of the following gases: oxygen, nitrogen, argon, neon, helium, hydrogen, acetylene, carbon monoxide, chlorine, fluorine, sulphur dioxide and phosgene. Inorganic Chemicals: Manufacture, application, analysis and hazards in handling the following chemicals: hydrochloric acid, nitric acid, sulphuric acid, caustic soda, common salt, borax, bleaching powder, sodium thiosulphate, hydrogen peroxide, potash alum, chrome alum, potassium dichromate and potassium permanganate.

UNIT-II

Industrial Metallurgy (4 Lectures)

Preparation of metals (ferrous and nonferrous) and ultrapure metals for semiconductor technology.

Biocatalysis (6 Lectures)

Introduction to biocatalysis: Importance in ―Green Chemistry‖ and Chemical Industry.

UNIT-III

Environment and its segments Ecosystems. (30 Lectures)

Biogeochemical cycles of carbon, nitrogen and sulphur. Air Pollution: Major regions of atmosphere. Chemical and photochemical reactions in atmosphere. Air pollutants: types, sources, particle size and chemical nature; Photochemical smog: its constituents and photochemistry. Environmental effects of ozone, Major sources of air pollution. Pollution by SO2, CO2, CO, NOx, H2S and other foul smelling gases. Methods of estimation of CO, NOx, SOx and control procedures. Effects of air spollution on living organisms and vegetation.

Greenhouse effect and Global warming, Ozone depletion by oxides of nitrogen, chlorofluorocarbons and Halogens, removal of sulphur from coal. Control of particulates.

UNIT-IV

Water Pollution

Water Pollution: Hydrological cycle, water resources, aquatic ecosystems, Sources and nature of water pollutants, Techniques for measuring water pollution, Impacts of water pollution on hydrological and ecosystems. Water purification methods. Effluent treatment plants (primary, secondary and tertiary treatment). Industrial effluents from the following industries and their treatment: electroplating, textile, tannery, dairy, petroleum and petrochemicals, agro, fertilizer, etc. Sludge disposal. Industrial waste management, incineration of waste. Water treatment and purification (reverse osmosis, electro dialysis, ion exchange). Water quality parameters for waste water, industrial water and domestic water.

UNIT-V

Energy & Environment Sources of energy: (10 Lectures)

Coal, petrol and natural gas. Nuclear Fusion / Fission, Solar energy, Hydrogen, geothermal, Tidal and Hydel, etc. Nuclear Pollution: Disposal of nuclear waste, nuclear disaster and its management.

Referencebooks:

- E.Stocchi: *IndustrialChemistry*,Vol-I,EllisHorwoodLtd.UK.
- R.M. Felder, R.W. Rousseau: *Elementary Principles of Chemical Processes*, WileyPublishers,NewDelhi.
- J.A.Kent:Riegel's*HandbookofIndustrialChemistry*,CBSPublishers,NewDelhi.
- S.S.Dara:*ATextbookofEngineeringChemistry*, S.Chand&CompanyLtd.NewDelhi.
- K.De,*EnvironmentalChemistry*:NewAgeInternationalPvt., Ltd,NewDelhi.
- S.M.Khopkar,*Environmental PollutionAnalysis*:WileyEasternLtd,NewDelhi.
- S.E.Manahan,EnvironmentalChemistry, CRC Press(2005).
- G.T.Miller,EnvironmentalScience11thedition.Brooks/Cole(2006).
- A.Mishra,EnvironmentalStudies.SelectiveandScientificBooks,NewDelhi(2005).

CO-POMapping:

(1:Slight[Low]; 2:Moderate [Medium]; 3:Substantial [High], '-':No Correlation)

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CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	1	3	2	3	1	2	3	3	2	2
CO5	2	3	2	1	3	2	3	2	2	3	3	2	2
Avg	2.4	2.8	2.6	1.8	2.6	1.8	2.4	2	2.2	2.4	2.6	2.4	2.6

Proposed Activities:

Skill Development: Bio catalysis, Disposal of nuclear waste.

Employability: Effluent treatment in industries.

Entrepreneurship: Large scale production of chemicals and industrial gases

Assignment Questions:

UNIT-I

1. Explain the production, uses, storage and hazards in handling the Oxygen, Nitrogen, Acetylene gases.
2. Explain the production, uses, storage and hazards in handling the Helium, Neon, Argan gases.

3. Explain the production, uses, storage and hazards in handling the H2,Cl2,F2 gases.

4. Explain the manufacture, uses, storage and hazards in handling the HCl,HNO3.
5. Explain the manufacture, uses, storage and hazards in handling the H2SO4 ,Bleaching powder and Hydrogen peroxide.

6. Explain the manufacture, uses, storage and hazards in handling the

KMnO4,K2Cr2O7,Common salts.

UNIT-II

7. What is metallurgy? How can you prepare ferrous metals. Give two methods.

8. What are ultra pure metals. Give classification and any two methods of preparation for semiconductor technology.

UNIT-III

9. What are Biogeochemical cycle and explain about C and S cycle.

10. What are Biogeochemical cycle and explain about N and O cycle.

11. What are the major region of atmosphere and explain about air pollutants.

12. Explain about photochemical smog and green house effect.

13. What are the major sources of air pollution and how they can effect on living organisms and vegetation.

14. Explain in detail about ozone depletion and global warming.

UNIT-IV

15. Explain about hydrological cycle.

16. What is meant by water treatment and Explain about water purification methods.

17. Explain in detail about industrial waste management.

UNIT-V

18. Explain in detail about on sources of energy.

19. What is nuclear pollution and give the methods involving in the disposal of nuclear waste

20. What is the importance of biocatalyst in green chemistry and chemical industry

GOVERNMENT COLLEGE (A), RAJAHMUNDRY

II B.Sc. CHEMISTRY (Hons.) 2023-24

INDUSTRIAL CHEMICALS AND ENVIRONMENT (DSE-II)

SEMESTER-IV

S. No.	CHAPTER		Essay Question (07 M)	knowledge Short Answer Question (03 M)
1	UNIT-1		2	2
2	UNIT-II		2	2
3	UNIT-III		2	2
4.	UNIT -IV		2	1
5.	UNIT-V		2	1
Total Number of Questions			10	8

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

II B.Sc(Honours) SEMESTER-IV

INDUSTRIAL CHEMICALS AND ENVIRONMENT

Time:2 ½ hrs **Max.Marks:50 M**

SECTION-A

I. Answer all the questions. **5X7=35M**

1. Explain the Industrial production, uses and hazards in handling the Nitrogen & Acetylene gases.

.

(OR)

2. Explain the manufacture, uses and hazards in handling the chemicals HCl & HNO_3.

3. What are ultra pure metals? Give any two methods of preparation for semiconductor technology.

(OR)

4. What is the importance of biocatalyst in green chemistry and chemical industry?

5. What are the major sources of air pollution and how they can effect on living organisms and vegetation.

(OR)

6. Explain in detail about industrial waste management.

7. Give a brief discussion on Sources of Energy?

(OR)

8. What is meant by nuclear Pollution and Explain about the disposal methods of nuclear waste.
9. . Explaim in detail about Industrial Waste Management.

(OR)

10. What is meant by water treatment and Explain about water purification methods.

SECTION-B

II. Answer any FIVE questions. **5X3=15M**

9. Give an industrial method for the preparation of Helium gas?
10. What is meant by metallurgy? Give a preparation method for ferrous metals?
11. Draw a neat sketch on biogeochemical cycles of Carbon and Nitrogen?
12. Give a brief note on Greenhouse effect and Global warming?
13. Explain the process of sludge disposal?
14. Explain in detail about Hydrological cycle?
15. Give introduction to bio catalysis.
16. Give a brief note on Nuclear Disaster Management.

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHE 112P	**INDUSTRIAL CHEMICALS AND ENVIRONMENT (DSE-II)** Analysis of Organic Compounds – PRACTICAL	II B.Sc. (Hons) (IV Semester)			
Teaching	Hours Allocated: 30 (**PRACTICAL**)	L	T	P	C
Pre-requisites	Acquisition of practical laboratory skills, enabling the accurate design of an experiment and systematic collection of experimental data.	-	-	2	2

CourseObjectives:

- To Learn qualitative and quantitative measurements of water treatment, conservation and handling of industrial effluent.
- Practical knowledge of estimation and determination of various industrially important chemicals.

CourseOutcomes:

OnCompletion of thecourse, the students willbeable to	
CO1	Determination and Estimation of Chemicals in the water
CO2	Isolation of compounds
CO3	Preparation of Industrial chemicals in laboratory

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		**Employability**		**Entrepreneurship**	

Syllabus:

1. Determination of dissolved oxygen in water.
2. Determination of Chemical Oxygen Demand (COD)
3. Determination of Biological Oxygen Demand (BOD)
4. Percentage of available chlorine in bleaching powder.
5. Measurement of chloride, sulphate and salinity of water samples by simple titration method. (AgNO3and potassium chromate)
6. Estimation of total alkalinity of water samples (CO3 2-, HCO3 -) using double titration method.
7. Isolation of compound using solvent extraction method.
8. A survey based study on common bio-indicators of pollution and SPM in air samples.

9. Preparation of borax and boric acid.

1. Stocchi, E.(1990), Industrial Chemistry, Vol -I, Ellis Horwood Ltd. UK.
2. Kent, J. A. (ed) (1997),Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
3. Pani, B. (2017), Textbook of Environmental Chemistry, I.K.International Publishing House. 4. De, A. K. (2012), Environmental Chemistry, New Age International Pvt, Ltd, New Delhi.
5. Khopkar, S.M.(2010), Environmental Pollution Analysis, New Age International Publisher.

VALUATION FOR

i) Procedureinfirst10min. :5Marks
ii) ii)Formulawithunits:5Marks
iii) NeatTabulation: 5Marks
iv) CorrectCalculation:5Marks

Error<10%: 20Marks
Error10-15%:15Marks
Error >15%:10 Marks(MinimumMarks)

TOTALMARKS:50M

	Government College (Autonomous) Rajahmundry	Program & Semester II B.Sc. Chemistry (Hons.) IV Sem			
Course Code CHE	TITLE OF THE COURSE **PHARMACEUTICAL AND MEDICINAL CHEMISTRY**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:	Organic functional groups, IUPAC nomenclature, aromaticity.	3	1	-	3

Course Objectives:

1. To study the definitions of various terms used in Pharmacy.
2. To learn about the synthesis and therapeutic action of various drugs used for different medical disorders.
3. To know about the detailed knowledge about AIDS.

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	Describe the therapeutic activity of some drugs	Comprehension
CO2	Apply different chemical reactions for the synthesis of various drugs.	Application
CO3	Design some drugs useful for curing diseases.	Analysis
CO4	Justify the role of functional groups in drug action.	Evaluation

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT-I

Pharmaceutical chemistry Terminology: **11 h**

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

UNIT-II **11 h**

Drugs:

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

UNIT-III **16 h**

Synthesis and therapeutic activity of the compounds:

a. Chemotherapeutic Drugs

l. Sulpha drugs (Sulphamethoxazole)

2. Antibiotics - β-Lactam antibiotics, Macrolide antibiotics

3. Antimalarial Drugs (Chloroquine)

b. Psychotherapeutic Drugs:

1. Antipyretics (Paracetamol)

2. Hypnotics

3. Tranquilizers (Diazepam)

4. Levodopa

UNIT-IV **9 h**

Pharmacodynamic Drugs:

1. Antiasthma Drugs (Solbutamol)

2. Antianginals (Glycerol trinitrate)

3. Diuretics (Frusemide)

UNIT-V **13 h**

HIV-AIDS:

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

Reference and Text books:

1. Medicinal Chemistry by Dr. B.V. Ramana
2. Synthetic Drugs by O.D. Tyagi & M. Yadav
3. Medicinal Chemistry by Ashutosh kar
4. Medicinal Chemistry by P. Parimoo
5. Pharmacology & Pharmaco therapeutics by R.S. Satoshkar & S.D. Bhandenkar
6. Medicinal Chemistry by Kadametal P-I & P-II

Web Links:

1. https://youtu.be/7TFqRfupmSg
2. https://youtu.be/FioRil-0bZE

CO-PO Mapping:

(1: Slight[Low]; 2: Moderate[Medium]; 3: Substantial[High], '-': No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	1	2	1	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.25	2.75	2.0	2.5	1.75	2.25	2.0	2.25	2.25	2.5	2.5	2.75

Proposed Activities:

Skill Development: Preparation of Paracetamol

Employability:

Entrepreneurship:

Assignment Questions:

Unit-I

1. Give a detailed account on pharamcodynamics and pharmacokinetics.
2. Define Pharmacy and Pharmacology.
3. What is Pharmacophore? Give one example.
4. Write about Metabolite and anti-metabolite.
5. What are Gram positive bacteria and Gram negative bacteria?

Unit-II

1. Discuss the classification of drugs based on therapeutic activity.
2. Discuss about Chemotherapeutic agents.
3. Discuss about pharmacodynamic agents.
4. Write about the nomenclature of drugs.
5. Describe the types of administration of drugs.

Unit-III

1. Write about the synthesis of Chloroquine.
2. Describe the production of one β-lactam antibiotic.
3. Describe the synthesis and therapeutic activity of Levodopa.
4. Write about the synthesis and therapeutic activity of Diazepam.
5. Describe the synthesis and therapeutic activity of any one sulpha drug.
6. Write about Macrolide antibiotics with two examples.
7. Explain about Hypnotics and Tranquilizers with examples.
8. Synthesis of Paracetamol.
9. Draw the structure of Chloroquine.

Unit-IV

1. Write about the synthesis of Solbutamol.
2. Give the synthesis and therapeutic action of any one antianginal.
3. Describe the synthesis of any one diuretic.
4. Draw the structure of Solbutamol and give its importance.
5. What are cardiovascular drugs? Give one example.
6. What are diuretics? Explain the therapeutic activity of Furosemide.

Unit-V

1. Explain about CD-4 and CD-8 cells.
2. Write notes on HIV-AIDS.
3. What are PIS? Give two examples.
4. Describe the replication of retrovirus in human body.
5. Write notes on retrovirus.
6. Draw the structures of any two drugs available for AIDS.
7. Mention two measures for the prevention of AIDS.

GOVERNMENT COLLEGE (A), RAJAHMUNDRY

II B.Sc. CHEMISTRY (Hons.) 2023-24

SEMESTER – IV

Pharmaceutical and Medicinal Chemistry BLUE PRINT

Sl. No.	Chapter	Essay Question (7 M) knowledge	Short Answer Question (3 M) Under standing
1.	UNIT-I	02	02
2.	UNIT-II	02	02
3.	UNIT-III	02	02
4.	UNIT-IV	02	01
5.	UNIT-V	02	01
Total no. of Questions		10	08

MODEL QUESTION PAPER
GOVERNMENT COLLEGE (A), RAJAHMUNDRY
IV SEMESTER END EXAMINATIONS
II B. Sc. CHEMISTRY (Hons.) 2023 - 24
PHARMACEUTICAL AND MEDICINAL CHEMISTRY

Time: $2^1/_2$ hrs **Max. Marks: 50**

PART- A **5 x 7 = 35 Marks**

Answer **ALL** the questions. Each carries **SEVEN** marks.

1. Give a detailed account on pharmacodynamics.

(OR)

2. Explain about pharmacokinetics.
3. Discuss the classification of drugs based on therapeutic activity.

(OR)

4. Describe the various routes of drug administration.
5. Write the synthesis of chloroquine.

(OR)

6. Give the synthesis and therapeutic activity of diazepam.
7. Write about the synthesis of salbutamol.

(OR)

8. Describe the synthesis of any one diuretic.
9. Explain about CD-4 cells and CD-8 cells.

(OR)

10. What is Retro virus? Describe the replication of retrovirus in human body.

PART-B **5 x 3 = 15 Marks**

Answer any FIVE of the following questions. Each carries THREE marks.

11. Exemplify about Metabolites and Antimetabolites.
12. Define Pharmacophore. Give any two examples.
13. Explain about trade name with two examples.
14. Explain about Chemotherapeutic agents with two examples.
15. Describe the production of any one β-lactam antibiotic.
16. Give the synthesis of Paracetamol.
17. What are cardiovascular drugs? Give one example.
18. What are PIS? Give two examples.

	Government College (Autonomous) Rajahmundry	Program & Semester II B.Sc. Chemistry (Hons.) IV Sem			
Course Code CHE	TITLE OF THE COURSE **PHARMACEUTICAL AND MEDICINAL CHEMISTRY**				
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites:	Acylation, esterification, oxidation, reduction.	2	-	-	2

Course Objectives:

1. Synthesis of aspirin and paracetamol
2. Synthesis of benzil and fluorescein.
3. Syntheses of chlorobutanol and 1,2,3,4-tetrahydro carbazole

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Know the preparation of anesthetics, hypnotics, antifungals, antibacterials, etc.
CO2	Apply oxidation to benzoin.
CO3	Justify the role of cyclohexanone in the synthesis of pharmaceutical intermediates.
CO4	Synthesize some drugs useful for curing of diseases.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

1. Synthesis of benzil
2. Synthesis of chlorobutanol
3. Synthesis of 1,2,3,4-tetrahydro carbazole
4. Synthesis of aspirin
5. Synthesis of fluorescein
6. Synthesis of paracetamol

Reference and Text books:

1. Medicinal Chemistry by Dr. B.V. Ramana
2. Synthetic Drugs by O.D. Tyagi & M. Yadav
3. Medicinal Chemistry by Ashutosh kar
4. Medicinal Chemistry Theory and practice by K. Nagarajan, Avijit Majunder, L.K. Ghosh

Web Links:

1. https://youtu.be/ahJlaafD_wA
2. https://youtu.be/Uw5oYkpcL50

CO-PO Mapping:

(1: Slight[Low]; 2: Moderate[Medium]; 3: Substantial[High], '-': No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	2	2	2	3	1	2	2	3
CO4	2	2	2	3	3	2	1	3	2	3	3	2	2
Avg.	2.5	2.5	2.75	2.5	2.5	2.0	2.0	2.5	2.25	2.25	2.5	2.25	2.75

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
IV SEMESTER END EXAMINATIONS
II B. Sc. CHEMISTRY (Hons.) 2023 - 24
PHARMACEUTICAL AND MEDICINAL CHEMISTRY - PRACTICAL

Scheme of Valuation

Max. Marks: 50 Marks **Time: 3 hrs.**

For Record - 10 Marks

For Viva-voce - 5 Marks

For Practical - 35 Marks

Splitting of Practical Marks :

i) Procedure : 10 Marks

ii) Equation : 5 Marks

iii) M.P. : 5 Marks

iv) Report of yield : 15 Marks

III B.Sc.CHEMISTRY (HONORS)

THIRD YEARSEMESTER-V

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHH 114	TITLE OF THE COURSE **ORGANIC CHEMISTRY**	III B.Sc Chem (Hons) (V SEMESTER)			
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites	An introductory background in Nucleic acids, peptides, lipids and pharmaceutical compounds.	3	1	-	3

Course Objectives:

- To know structure, synthesis and reactivity of nucleic acids, amino acids, poly peptides and proteins.
- To learn Salient features of activesite of enzymes and coenzyme.
- To know therapeutic uses of antipyretics of pharmaceutical compounds.

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	Learn the structure, synthesis and reactivity of nucleic acids, amino acids, poly peptides and proteins.	Application
CO2	Learn the mechanism of enzyme action and factors effects the reactivity of enzymes.	Application
CO3	Understand the uses of Saponification value, acid value, iodine number for lipids.	Understand
CO4	Understand and application of therapeutic uses of antipyretic of pharmaceutical compounds.	Understand

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

III B.Sc. CHEMISTRY HONORS

SEMESTER V/VI

SYLLABUS

PAPER-VB: ORGANIC CHEMISTRY V **(60 Hours)**

UNIT-I **6 Hrs**

NUCLEIC ACIDS:

Components of nucleic acids, Nucleosides and nucleotides;

Structure, synthesis and reactions of: Adenine, Guanine, Cytosine, Uracil andThymine; Structure of polynucleotides (DNA and RNA).

UNIT-II **14 Hrs**

AMINO ACIDS, PEPTIDES AND PROTEINS:

Amino acids, Peptides and their classification. α-Amino Acids - Synthesis, ionic properties and reactions. Zwitterions, pKa values,isoelectric point and electrophoresis;

Study of peptides: determination of their primary structures-end group analysis, methods of peptide synthesis. Synthesis of peptides using N-protecting, C-protectingand C-activating groups, Solid-phase synthesis; primary, secondary and tertiary structures of proteins, Denaturation

UNIT- III **20Hrs**

ENZYMES AND LIPIDS:

Introduction, classification and characteristics of enzymes. Salient features of activesite of enzymes. Mechanism of enzyme action (taking trypsin as example), factors affectingenzyme action, coenzymes and cofactors, specificity of enzyme action (including stereo specificity), enzyme inhibitors and their importance.

Introduction to oils and fats; common fatty acids present in oils and fats, Hydrogenation of fats and oils, Saponification value, acid value, iodine number.Reversion and rancidity.

UNIT-IV **20 Hrs**

APPLICATIONS OF SPECTROSCOPY

Nuclear Magnetic Resonance (NMR) spectroscopy:
Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, NMR splitting of signals - spin-spin coupling, coupling constants. Applications of NMR with suitable examples - ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate, toluene and acetone

Application of Spectroscopy to Simple Organic Molecules Application of visible, ultraviolet and Infrared spectroscopy in organic molecules. Application of electronic spectroscopy and Woodward rules for calculating λmax of conjugated dienes and α,β – unsaturated compounds. Infrared radiation and types of molecular vibrations, functional group and fingerprint region. IR spectra of alkanes, alkenes and simple alcohols (inter and intramolecular hydrogen bonding), aldehydes, ketones, carboxylic acids and their derivatives (effect of substitution on >C=O stretching absorptions). **(20 Lectures)**

Reference books:

•Berg, J.M., Tymoczko, J.L. and Stryer, L. (2006) Biochemistry. VIth Edition. W.H. Freeman andCo. Nelson, D.L., Cox, M.M. and Lehninger, A.L. (2009) Principles of Biochemistry. IV Edition. W.H. Freeman and Co.
•Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2009) Harper'sIllustrated Biochemistry. XXVIII edition.Lange Medical Books/ McGraw-Hill.

Web Links:

1. https://www.khanacademy.org

2. https://www.sciencedirect.com

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3	2	3	3	2	2	2	3
CO2	2	2	3	3	3	3	2	3	2	1	2	3	2
CO3	3	2	3	2	2	3	2	3	3	2	2	2	3
CO4	2	2	3	2	2	3	2	1	2	3	2	2	2
Avg.	**2.5**	**2**	**2.75**	**2.25**	**2.25**	**3**	**2**	**2.5**	**2.5**	**2**	**2**	**2.25**	**2.5**

Proposed activities:

Skill Development: Learn how to synthesis poly peptide bonds for the synthesis of proteins and learn to separate amino acids.

Entrepreneurship: Synthesis of pharmaceutical compounds.

Question bank

Unit-I

1. What are nucleic acids? Explain the double helical structure of DNA.
2. Explain the structure, synthesis and reactions of Thymine.
3. Write brief note on single standard structure of DNA.
4. Write the structure of four nitrogen bases that are present in DNA.
5. Explain the structure, synthesis and reactions of Adenine.
6. Explain the structure, synthesis and reactions of Cytosine.

Unit-II

1. What are Amino acids write about the classification of amino acids based on the structure.
2. Define protein explain the primary, secondary and tertiary structure of proteins.
3. Write about the synthesis of peptides using C-activating groups.
4. What are the ionic properties of α-Amino acids?
5. What are Zwitter ions?
6. Give brief explanation about isoelectric point.
7. Give brief explanation about Solid-phase synthesis of proteins.

Unit-III

1. Explain in detail about the mechanism of action of Trypsin.
2. What are the common fatty acids present in oil and explain about the hydrogenation of fats and oils

3.What are the different factors that affect the enzyme action?
4.Write about iodine number and rancidity of oils.
5. Define saponification value.
6. Write about enzyme inhibitors and their importance.

Unit-IV

1. 1 Explain different types of electronic transitions occur in a molecule
2. Write about chromophore and auxochrome with examples.
3. Explain wood word rules for conjugated dienes with examples
4. Explain the impact of conjugation on electronic transitions in molecules.
5. Explain the salient features in the NMR spectra of ethyl acetate and acetophenone.
6. Explain the principle involved in NMR spectroscopy.
7. Explain about the position of signals and splitting of signals in NMR spectroscopy.
8. Write a note on chemical shift.
9. Explain the following
   (i) Equivalent and Non-equivalent protons (ii) Spin-spin coupling
10. Explain the characteristic absorption bands of various functional groups in IRspectroscopy.
11. Write about the different regions of infrared radiation.
12. What are the applications of IR spectroscopy?
13. Explain about finger print region in IR spectrum.

III B.Sc(HONOURS) CHEMISTRY
V/VI-SEMESTER BLUE PRINT
: ORGANIC CHEMISTRY

S.No	Chapter	Essay questions (7M) Knowledge / skill	Short answer questions (4M) Understanding	Very short answer questions (2M) Applications
1	**UNIT: I** NUCLEIC ACIDS	02	02	-
2	**UNIT- II:** AMINO ACIDS PEPTIDES & PROTEINS	02	02	01
3	**UNIT-III:** ENZYMES & LIPIDS	02	02	01
4	**UNIT-IV:** APPLICATIONS OF SPECTROSCOPY	02	02	01
Total number of questions		08	08	03

III B.Sc. (HONOURS) CHEMISTRY

V/VI-SEMESTERMODEL QUESTION

ORGANIC CHEMISTRY -V

Time: $2^{1/2}$ hrs **Marks :50 M**

SECTION –A

Answer **ALL** questions **(4 X 7 =28M)**

1. What are nucleic acids? Explain the double helical structure of DNA.

(OR)

2. Explain the structure, synthesis and reactions of Thymine.
3. What are Amino acids write about the classification of amino acids based on thestructure.

(OR)

4. Define protein explain the primary, secondary and tertiary structure of proteins.
5. Explain in detail about the mechanism of action of Trypsin.

(OR)

6. What are the common fatty acids present in oil and explain about the hydrogenation of fats and oils.
7. Explain the following

i) Equivalent and Non-equivalent protons (ii) Spin-spin coupling

(OR)

Explain wood word rules for conjugated dienes with examples

ii) Explain the salient features in the NMR spectra of ethyl acetate and acetophenone.

SECTION-B

Answer any **FOUR** questions.

(4×5=20M)

1. Write brief note on single standard structure of DNA.
2. Write the structure of four nitrogen bases that are present in DNA.
3. Write about the synthesis of peptides using C-activating groups.
4. What are the ionic properties of α-Amino acids?
5. What are the different factors that affect the enzyme action?
6. Write about rancidity of oils.

13 . Explain about finger print region in IR spectrum.

14 Write a note on chemical shift.

SECTION-C

Answer **All** questions. **(3×2=6M)**

15.What are Zwitter ions?

16.Define saponification value.

17.Write about coupling constant

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHH 114P	TITLE OF THE COURSE **ORGANIC CHEMISTRY**	III B.Sc Chem (Hons) (V SEMESTER)			
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites	Synthesis of Organic compounds.	2		-	2

Course Objectives:

- To synthesis multi-functional groups containing organic compounds.
- To synthesis pharmaceutical importance organic compounds by using different reagents and different reaction conditions.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Able to handle given experimental procedures.
CO2	Understand the importance of safe in the laboratory.
CO3	Able to understand and handle the hazard chemicals.
CO4	Know how to handle different reagents and reaction conditions.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

PAPER-VB ORGANIC CHEMISTRY V **30 Hours**

1. Synthesis of Alpha- Chloro Benzoic acid
2. Synthesis of Ortho - Ido Benzoic acid
3. Synthesis of Paracetmol
4. Synthesis of Azaraldehyde
5. Synthesis of para - Iodo Nitrobenzene
6. Synthesis of Meta - Nitro Acetanilide

Reference books:

1. Manual of Biochemistry Workshop, 2012, Department of Chemistry, University of Delhi.
2. Arthur, I. V. Quantitative Organic Analysis,

Web Links:

1. https://www.ccri.edu
2. https://www.vedantu.com

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3	2	3	3	2	2	3	2
CO2	2	2	3	3	3	3	2	3	2	1	3	3	2
CO3	3	2	3	2	2	3	2	3	3	2	3	3	2
CO4	2	2	3	2	2	3	2	1	2	3	3	1	2
Avg.	**2.5**	**2**	**2.75**	**2.25**	**2.25**	**3**	**2**	**2.5**	**2.5**	**2**	**2.75**	**2.5**	**2**

V SEMESTER LABORATORY COURSE
ORGANIC PRACTICAL
SCHEME OF VALUATION

Max.Marks: 50 MarkS **Time: 3 Hrs**

1) For Record	10 Marks
2) For Practical	40 Marks

Splitting of Practical Marks:

Procedure in 10 min :	5 Marks
Formula with units :	5 Marks
Neat tabulation :	5 Marks
Correct calculation :	5 Marks

Error < 10 %	20 Marks
Error 10-15 %	15 Marks
Error > 15 %	10 Marks (Minimum Marks)

Total Marks - **50M**

	Government College (Autonomous) Rajahmundry	Program & Semester III B.Sc Chem (Hons) (V SEMESTER)			
Course Code	TITLE OF THE COURSE **PHYSICAL CHEMISTRY**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites	An introductory background in chemistry, physics and calculus	3	4	-	4

Course Objectives:

1. To provide an introduction to the mathematical foundations of Thermodynamics and Thermochemistry.
2. To explain what is meant by the terms saturated, unsaturated and supersaturated.
3. To understand the relationship between kinetics and equilibrium.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Identify the unique vocabulary associated with Thermodynamics and explain the basic concepts of thermodynamics like system, properties, equilibrium, pressure, specific volume, temperature, zeroth law of thermodynamics, temperature measurements and temperature scales.
CO2	Describe the effects of solute concentration on the vapour pressure, boiling point, freezing point and osmotic pressure of a solution.
CO3	Understand the concept of reaction quotient *Q* and by the comparison with the value of *K*.
CO4	Explain, using LeChatelier's Principle, how the equilibrium quantities of reactants and products are shifted by changes in temperature, pressure or a volume of a gas, concentration of substances.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

PAPER-VB PHYSICAL CHEMISTRY V **60 Hours**

CHEMICAL THERMODYNAMICS:

Intensive and extensive variables; state and path functions; isolated, closed and open systems.

FIRST LAW: Concept of heat, Q, work, W, internal energy, U, and statement of first law; enthalpy, H, relation between heat capacities, calculations of Q, W, ΔU and ΔH for reversible, irreversible and free expansion of gases (ideal and van der Waals) under isothermal and adiabatic conditions.

THERMOCHEMISTRY: Heats of reactions: standard states; enthalpy of formation and enthalpy of combustion and its applications; effect of temperature (Kirchhoff's equations) and pressure on enthalpy of reactions.

SECOND LAW: Concept of entropy; thermodynamic scale of temperature, statement of the second law of thermodynamics. Calculation of entropy change for reversible and irreversible processes.

THIRD LAW: Statement of third law, concept of residual entropy, calculation of absolute entropy of molecules. Free Energy Functions: Gibbs and Helmholtz energy; variation of S, G, A with T, V, P; Free energy change and spontaneity. Relation between Joule-Thomson coefficient and other thermodynamic parameters; inversion temperature; Gibbs-Helmholtz equation; Maxwell relations; thermodynamic equation of state. **(36 Lectures)**

SYSTEMS OF VARIABLE COMPOSITION:

Partial molar quantities, dependence of thermodynamic parameters on composition; Gibbs-Duhem equation, chemical potential of ideal mixtures, change in thermodynamic functions in mixing of ideal gases. **(8 Lectures)**

CHEMICAL EQUILIBRIUM:

Criteria of thermodynamic equilibrium, degree of advancement of reaction, chemical equilibria in ideal gases. Thermodynamic derivation of relation between Gibbs free energy of reaction and reaction quotient. Equilibrium constants and their quantitative dependence on temperature, pressure and concentration (Le-Chatelier Principle, Quantitatively). Free energy of mixing and spontaneity. equilibrium between ideal gases and a pure condensed phase. **(8 Lectures)**

SOLUTIONS AND COLLIGATIVE PROPERTIES:

Dilute solutions; lowering of vapour pressure, Raoult's and Henry's Laws and their applications. Thermodynamic derivation using chemical potential to derive relations between the four colligative properties [(i) relative lowering of vapour pressure, (ii) elevation of boiling point, (iii) Depression of freezing point, (iv) osmotic pressure] and amount of solute. Applications in calculating molar masses of normal, dissociated and associated solutes in solution. **(8 Lectures)**

Reference books:

• Peter, A. & Paula, J. de. Physical Chemistry 9th Ed., Oxford University Press (2011).

• Castellan, G. W. Physical Chemistry 4th Ed., Narosa (2004).

• Engel, T. & Reid, P. Physical Chemistry 3rd Ed., Prentice-Hall (2012).

• McQuarrie, D.A. & Simon, J.D. Molecular Thermodynamics Viva Books Pvt. Ltd.: New Delhi (2004).

• Assael, M. J.; Goodwin, A. R. H.; Stamatoudis, M.; Wakeham, W. A. & Will, S. Commonly Asked Questions in Thermodynamics. CRC Press: NY (2011).

• Levine, I .N. Physical Chemistry 6th Ed., Tata Mc Graw Hill (2010).

• Metz, C.R. 2000 solved problems in chemistry, Schaum Series (2006)

Web Links:

1. https://www.khanacademy.org

2. https://www.sciencedirect.com

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3	2	3	3	2			
CO2	2	2	3	3	3	3	2	3	2	1			
CO3	3	2	3	2	2	3	2	3	3	2			
CO4	2	2	3	2	2	3	2	1	2	3			
Avg.	**2.5**	**2**	**2.75**	**2.25**	**2.25**	**3**	**2**	**2.5**	**2.5**	**2**			

III B.Sc CHEMISTRY (HONORS)
BLUEPRINT
PAPER-VB PHYSICAL CHEMISTRY-V SEMESTER-V

S.No	Chapter	Essay questions (7M) Knowledge / skill	Short answer questions (4M) Understanding	Very short answer questions (2M) Applications
1	UNIT: THERMODYNAMICS	03	03	01
2	UNIT- II: SYSTEM OF VARIABLE COMPOSITION	01	01	-
3	UNIT-III: CHEMICAL EQUILIBRIA	02	02	01
4	UNIT-IV: SOLUTIONS AND COLLIGATIVE PROPERTIES	02	02	01
Total number of questions		08	08	03

III B.Sc CHEMISTRY (HONORS) SEMESTER-V
MODEL QUESTION PAPER
PAPER-VB PHYSICAL CHEMISTRY-V

TIME: 2 ½ hrs **MARKS: 50 M**

SECTION-A

Answer **ALL** questions **(4 X 7 = 28 M)**

1. Define the internal energy and enthalpy and derive the changes of Q, W, Δ U, Δ H for irreversible and reversible process.

(OR)

2. Give the different statements of second law of thermodynamics and derive the entropy changes for reversible and irreversible process.
3. Define the third law of thermodynamics and derive the Maxwell relations.

(OR)

4. Define the partial molar quantity and derive the Gibbs- Duhem equation.
5. Derive the thermodynamic relation between Gibbs free energy of the reaction and reaction coefficient.

(OR)

6. write about the free energy mixing of ideal gases and pure condensed gas phase.
7. Define the Raoults law and henrys law and write their applications.

(OR)

8. Define the colligative property and write briefly about (a) depression in freezing point (b) osmotic pressure.

SECTION-B

Answer any **FOUR** questions. **(4 X 4 = 16 M)**

9. Explain about Kirchhoff's law.
10. Define the state and path functions and explain by giving examples.
11. Write about Gibbs and Helm-Holtz free energies.
12. Calculate the entropy of mixing 10 moles of helium and 10 moles of oxygen at constant. temperature and pressure, assuming both to be ideal gasses?
13. Explain chemical potentials of ideal mixtures.
14. Explain the effect of temperature and pressure on equilibrium constant.
15. Explain the relative lowering of vapor pressure.
16. Calculate the molar mass of dissociated and associated solutes in solution.

SECTION-C

Answer **ALL** the questions **(3X2 = 6 M)**

17. Write about intensive and extensive properties
18. Define Le Chatelier Principle.
19. Define Raoult's and Henry's law.

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code	TITLE OF THE COURSE **PHYSICAL CHEMISTRY**	III B.Sc Chem (Hons) (V SEMESTER)			
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites	Calorimetric- Heat of neutralization	2		-	1

Course Objectives:

1. To calculate the heat capacity of different solutions by using Calorimeter
2. To determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.
3. To determination of the enthalpy of ionization of ethanoic acid.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Measure the heat of a reaction under constant pressure conditions.
CO2	Calculate the enthalpy change for a reaction using the enthalpy change of two other reactions and Hess's law of heat summation.
CO3	Enthalpy of neutralization which is defined as the heat evolved when one mole of water is formed during a neutralization reaction.
CO4	

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

PAPER-VB PHYSICAL CHEMISTRY V **30 Hours**

(a) Determination of heat capacity of a calorimeter for different volumes using

(i) Change of enthalpy data of a known system (method of back calculation of heat capacity of Calorimeter from known enthalpy of solution of sulphuric acid or enthalpy of neutralization), and

(ii) Heat gained equal to heat lost by cold water and hot water respectively.

(b) Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.

(c) Determination of the enthalpy of ionization of ethanoic acid.

(d) Study of the solubility of benzoic acid in water and determination of ΔH

Reference books:

- Khosla, B. D.; Garg, V. C. & Gulati, A., Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).
- Athawale, V. D. & Mathur, P. Experimental Physical Chemistry New Age International: New Delhi (2001).

Web Links:

1.
2.

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3	2	3	3	2			
CO2	2	2	3	3	3	3	2	3	2	1			
CO3	3	2	3	2	2	3	2	3	3	2			
CO4	2	2	3	2	2	3	2	1	2	3			
Avg.	**2.5**	**2**	**2.75**	**2.25**	**2.25**	**3**	**2**	**2.5**	**2.5**	**2**			

V SEMESTER LABORATORY COURSE
PRACTICAL PAPER –V B FROM 2019-20 ONWARDS
PRACTICAL –V B : CALORIMETRY
SCHEME OF VALUATION

Max.Marks: 50 MarkS **Time: 3 Hrs**

1) For Record 10 Marks
2) For Practical 40 Marks

Splitting of Practical Marks:

Procedure in 10 min : 5 Marks

Formula with units : 5 Marks

Neat tabulation : 5 Marks

Correct calculation : 5 Marks

Error < 10 % 20 Marks

Error 10-15 % 15 Marks

Error > 15 % 10 Marks (Minimum Marks)

Total Marks - 50M

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHH116	TITLE OF THE COURSE GREEN CHEMISTRY (DSE-IV)	III B.Sc. (V Semester)			
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites	Introduction to Green chemistry & recently developed techniques	3	1	-	3

Course Objectives:

1. To learn about environmental status
2. Principle involved in green chemistry
3. Global warming and its control measures
4. Microwave and Ultrasonic techniques

CourseOutcomes:

OnCompletion of thecourse, the students willbeable to		Cognitive Domain
CO1	Learn about environmental status	Understand
CO2	Formulate the mechanisms of organic reactions by recalling and correlating thefundamental properties of reactants involved.	Understand & Application
CO3	Learn about green synthesis of various organic reactions.	Application
CO4	Learn about global warming and its control measures.	Application & Skill

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

UNIT-I **4h**

Introduction to Green Chemistry: What is Green Chemistry? Need for Green Chemistry. Limitations/Obstacles in the pursuit of the goals of Green Chemistry

UNIT-II **30 h**

Principles of Green Chemistry and Designing a Chemical Synthesis

- Twelve Principles of Green Chemistry with their explanation and special emphasis on the following with examples.
- Designing a green synthesis using these principles; Prevention of Waste/ by-products; maximum incorporation of the materials used in the process into the final products, Atom Economy, calculation of atom economy of the rearrangement, addition, substitution, and elimination reactions.
- Prevention / minimization of hazardous/ toxic products reducing toxicity. Risk= (function) hazard X exposure.
- Green solvents- super critical fluids, water as a solvent for organic reactions, ionic liquids, fluorous biphasic solvent, PEG, solventless processes.
- Energy requirements for reactions- alternative sources of energy: use of microwaves and ultrasonic energy.
- Selection of starting materials; avoidance of unnecessary derivatization- careful use of blocking/protecting groups;
- Use of catalytic reagents (wherever possible) in preference to stoichiometric reagents; catalysis and green chemistry. Comparison of heterogeneous and homogeneous catalysis, bio catalysis, asymmetric catalysis, and photo catalysis.
- Prevention of chemical accidents designing greener processes, inherent safer design, principle of ISD "What you don't have cannot harm you", greener alternative to Bhopal Gas Tragedy (safer route to carbaryl) and Flixiborough accident (safer route to cyclohexanol).
- Strengthening/ development of analytical techniques to prevent and minimize the generation of hazardous substances in chemical processes.

UNIT-III **16 h**

Examples of Green Synthesis/ Reactions and some real-world cases

- Green Synthesis of the following compounds: adipic acid, catechol (Strecker synthesis)
- Microwave assisted reactions in water: Hofmann Elimination, methyl benzoate to benzoic acid, oxidation of toluene and alcohols; microwave assisted reactions in organic solvents Diel's -Alder reaction and decarboxylation reaction.
- Ultrasound assisted reactions: sonochemical Simmons-Smith Reaction (Ultrasonic alternative to Iodine)
- Designing of Environmentally safe marine antifoulant.

- Rightfit pigments: Synthetic azopigments to replace toxic organic and inorganic pigments.
- Healthier fats and oil by Green Chemistry: Enzymatic Inter esterification for prod) uction of no Trans- Fats and Oils.
- Development of Fully Recyclable Carpet: Cradle Carpeting

UNIT-IV **10 h**

Oxidation reagents and catalysts: multifunctional reagents; Combinatorial green chemistry; Proliferation of solventless reactions; co crystal controlled solid state synthesis(C^2S^3); Green Chemistry in sustainable development.

Referencebooks:

1. Ahluwalia, V.K. and Kidwai, M.R. New Trends in Green Chemistry, Anamalaya Publishers,2005
2. Anastas, P.T. and Warner, J.K Oxford Green Chemistry- Theory and Practical, University Press, 1998
3. Matlack, A.S. Introduction to Green Chemistry, Marcel Dekker,2001
4. Cann, M.C. and Connely, M.E.Real-World cases in green chemistry, American Chemical Society, Washington,2000
5. Ryan, M.A. and Tinnesand, M., Introduction to green chemistry, American Chemical Society, Washington,2002
6. Lancaster, Mike, Green Chemistry an Introductory Text 2nd Ed., RSC Publishing, ISBN: 978-1-84755-873-2

Web- Links:

- https://youtu.be/MfhZVMnyLA
- https://youtube.com/playlist?list=PLKSeO-scpOo33zdDN0i2uw1Xh3zh_UfGO

CO-POMapping:

(1:Slight[Low];2:Moderate [Medium]; 3:Substantial [High], '-':No Correlation)

	PO1	PO 2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	2	3	2
CO2	3	2	3	3	2	3	3	1	3	3	3	3	3
CO3	3	3	3	3	2	2	2	2	2	3	1	3	3
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	**2.75**	**2.5**	**2.5**	**2.75**	**2.25**	**2.5**	**2.25**	**2**	**2**	**2.5**	2	**2.75**	**2.5**

Proposed Activities:

Skill Development: 1. Collection of plant extractions.

Employability : 1. Pollution controlling measures

Entrepreneurship : Plantation

Assignment Questions:

Unit-I

1) Discuss about catalytic reagents in green chemistry.
2) Brief discussion about needs, goals of green chemistry & its limitations.
3) Write a short note on selection of the starting material?
4) Explain photo catalysis process?
5) Give solid state synthesis

Unit-II

6) Explain principles of green chemistry with examples.
7) Write a brief note on energy requirements for reaction
8) Compare homogeneous and heterogeneous catalysis process?
9) Discuss about development of analytical techniques in green chemistry
10) Brief discussion about Homogeneous and Heterogeneous catalysis process

Unit-III

11) Write about green synthesis of the Adipic acid
12) Write about green synthesis of the Catechol
13) Explain ultrasound assisted reactions with suitable examples?
14) Write a short note on microwave assisted Hofmann elimination reaction?
15) Sonochemical Simmons Smith reaction Explain.
16) Write about Development of Fully Recyclable Carpet?

Unit-IV

17) Discuss about oxidizing reagents used in green synthesis with suitable examples?
18) Discuss about Catalysts used in green synthesis with suitable examples?
19) Write about sustainable development in green chemistry?
20) Write a short note on future trends in green chemistry?
21) Explain PEG?

III B.Sc(HONOURS) CHEMISTRY V-SEMESTER

CHEMISTRY: GREEN CHEMISTRY (DSE-IV)

S.No.	Chapter	Essay questions (7 M) Knowledge/ skill	Short answer question(4M) Understanding	Very short answer questions(2M) Applications
1	**Unit-I:** Introduction to Green Chemistry	01	00	00
2	**Unit-II:** Principles of Green Chemistry and Designing a Chemical Synthesis	03	04	01
3	**Unit-III**: Examples of Green Synthesis/ Reactions and some real-world cases	02	02	01
4	**Unit-IV:** Oxidation reagents and catalysts	02	02	01
Total number of questions		08	08	03

II B.Sc. (HONOURS) CHEMISTRY IV-SEMESTER

MODEL QUESTION PAPER

GREEN CHEMISTRY (DSE-IV)

Time: $2^{1/2}$ hrs **Marks :50M**

SECTION –A

Answer **ALL** questions **(4 X 7 =28M)**

a. Discuss about catalytic reagents in green chemistry.

(OR)

Brief discussion about needs, goals of green chemistry & its limitations.

b. Explain principles of green chemistry with examples.

(OR)

Write a brief note on energy requirements for reaction

c. Write about green synthesis of the following compounds?

i. Adipic acid b) Catechol

(OR)

Explain ultrasound assisted reactions with suitable examples?

d. Discuss about oxidising reagents used in green synthesis with suitable examples?

(OR)

Discuss about Catalysts used in green synthesis with suitable examples?

SECTION – B

Answer any **FOUR** questions **(4 X 4 =16M)**

e. Write a short note on selection of the starting material?

6). Explain photo catalysis process?

7). Compare homogeneous and heterogeneous catalysis process?

8). Discuss about development of analytical techniques in green chemistry

9). Write a short note on microwave assisted Hofmann elimination reaction?

10) Sonochemical Simmons Smith reaction Explain.

11). Write about sustainable development in green chemistry?

12) Write a short note on future trends in green chemistry?

SECTION – C

Answer **ALL** questions (**2 X 3 = 6**M)

13). Give solid state synthesis

14). Write about Development of Fully Recyclable Carpet?

15). Explain PEG?

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHH 116P	TITLE OF THE COURSE GREEN ANALYSIS (DSE-IV)	III B.Sc. (VI Semester)			
Practical	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites	Handling of Glassware & Introduction of Organic synthesis in Green Approach	-	-	2	2

Course Objectives:

- To learn about environmental status
- Principle involved in green chemistry
- Global warming and its control measures

CourseOutcomes:

On Completion of the course, the students will be able to	
CO1	Identify N,S in organic compounds through green process
CO2	Prepare Acetanilide by Green method
CO3	Nitration of phenol by green method
CO4	Synthesis of adipic acid by green oxidation process

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

SYLLABUS FOR

GREEN CHEMISTRY (DSE-IV) PRACTICAL

30 hrs (2 h / w) **50** Marks

1. Green procedure for organic qualitative analysis: Detection of N, S and halogens
2. Acetylation of 1 amine by green method: Preparation of acetanilide
3. Rearrangement reaction in green conditions: Benzil-Benzilic acid rearrangement
4. Electrophilic aromatic substitution reaction: Nitration of phenol
5. Radical coupling reaction: Preparation of 1,1-bis -2-naphthol
6. Green oxidation reaction: Synthesis of adipic acid
7. Green procedure for Diels Alder reaction between furan and maleic anhydride

Referencebooks:

1. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)
2. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical OrganicChemistry,
3. 5th Ed., Pearson (2012)

Ahluwalia, V.K. &Aggarwal, R. Comprehensive

Web- Links:

- https://youtu.be/qFm0UvdM93U

  https://youtu.be/kgyt-31IwYk

CO-POMapping:

(1:Slight[Low]; 2:Moderate [Medium]; 3:Substantial [High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	2	2	1
CO2	3	2	3	3	2	3	3	1	3	3	3	3	3
CO3	3	3	3	3	2	2	2	2	2	3	3	3	2
CO4	3	2	2	2	2	2	3	3	1	1	2	3	3
Avg.	**2.75**	**2.5**	**2.5**	**2.75**	**2.25**	**2.5**	**2.25**	**2**	**2**	**2.5**	**2.5**	**2.75**	**2.25**

IIIB.Sc. CHEMISTRY (HONOURS) V SEMESTER.

GREEN CHEMISTRY (DSE-IV) PRACTICAL

SCHEME OF VALUATION

Total – 50 Marks

Record – 10 Marks **Practical – 40 Marks**

- **Practical Procedure :10 M**
- **Practical: 25M**
- **Practical Viva: 5M**
- **Total: 50 Marks**

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHH 117	TITLE OF THE COURSE ANALYTICAL METHODS IN CHEMISTRY (DSE-V)	III B.Sc. (Hons) (V Semester)			
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites	Basic knowledge on Analytical chemistry	3	1	-	3

Course Objectives:

1. To Learn the Importance of Spectroscopy
2. To learn various Chromatographic Methods
3. To Learn about elucidation of organic compounds by Spectroscopic techniques

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	Learn the evaluation and reliability of analytical data and statistical analysis.	Application
CO2	Gain the knowledge on spectro-analytical methods of analysis.	Application
CO3	Know thermal methods of analysis and electroanalytical methods.	Application
CO4	Learn different separation methods for identification of purity of given sample.	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

SYLLABUS:

UNIT-1: QUALITATIVE AND QUANTITATIVE CHEMICAL ANALYSIS:

a) Introduction to Chemical analysis, General steps involved in chemical analysis, Qualitative chemical analysis, Quantitative chemical analysis, types of Quantitative chemical analysis - Classical methods and Instrumental methods with examples, Safety with chemicals and wastes

b) Errors in chemical analysis: Errors, types of errors and minimization of errors, accuracy and precision, Gaussian distribution,

c) Statistical analysis: Mean deviation, Standard deviation, coefficient of variance, F- test, t- test, Q test -rejection of results, significant figures, computations rules for significant figures.

(15 hours)

UNIT –II: SPECTRO-ANALYTICAL METHODS OF ANALYSIS
METHODS:

a) Flame photometry: Introduction, Theory, Instrumentation, Interference's and calibration plots, Applications: Determination of alkali and alkaline earth metals

b). Atomic Absorption Spectroscopy(AAS): Theory, Instrumentation, flame and non-flame techniques, resonance line sources, hollow cathode lamp, interference's, calibration plots, applications

(a). Thermal methods of analysis: Introduction and classification of Thermal methods

(b). Thermo Gravimetry- Principle, Instrumentation and applications of Thermogravimetry.

(c). Differential thermal analysis: Principle, Instrumentation and applications of DTA.

(d). Polarography: Principle of polarography, residual current, migration current, diffusion current, half-wave potential, Ilkovic equation, instrumentation, Dropping mercury electrode (DME), advantages and disadvantages of DME, Applications.

(c). ICP-MS: Principle, instrumentation, applications

(15 hours)

UNIT-III THERMAL METHODS OF ANALYSIS AND ELECTROANALYTICAL

(15 hours)

UNIT-IV: SEPARATION TECHNIQUES:

A. **Chromatography:** Classification, principle of chromatography separation, Stationary phases and Mobile phases, Distribution coefficients, efficiency of a chromatographic column, Development of chromatograms: Frontal analysis,Displacement development, Elution development.

B. **Thin layer chromatography:** Principle, Techniques of TLC, Adsorbents, sample application, Mobile phases and solvent systems, development of chromatography plate, types of development, visualization methods, applications

Gas chromatography: Theory, Instrumentation, columns (packed and capillary columns), Detectors. programmed temperature gas chromatography; applications.

High performance liquid chromatography: Theory, Instrumentation , columns, detectors, applications.

(15 hours)

Reference Books:

1. Vogel, Arthur I: A Text book of Quantitative Inorganic Analysis (Rev. by G.H. Jeffery and others) 5 th Ed. The English Language Book Society of Longman
2. Willard, Hobart H. et al.: Instrumental Methods of Analysis, 7th Ed. Wardsworth Publishing Company, Belmont, California, USA, 1988.
3. Christian, Gary D; Analytical Chemistry, 6 th Ed. John Wiley & Sons, New York, 2004.
4. Harris, Daniel C: Exploring Chemical Analysis, Ed. New York, W.H. Freeman, 2001.
5. Khopkar, S.M. Basic Concepts of Analytical Chemistry. New Age, International Publisher, 2009.
6. Skoog, D.A., Holler F.J. and Nieman, T.A. Principles of Instrumental Analysis, Thomson Asia Pvt. Ltd. Singapore, 1998.
7. Mikes, O. and Chalmers, R.A. Ed. Laboratory Hand Book of Chromatographic and Allied Methods, Elles Horwood Ltd. London.
8. Dilts, R.V. Analytical Chemistry – Methods of separation Van Nostrand 1974.

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	2	3	2	2	3	3	3
CO2	2	2	3	2	3	2	3	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	3	2	2	3	3	2	3	1	2	3	3	2	2
Avg.	2.75	2.5	2.75	2.25	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

Proposed Activities:

- **Skill Development:** observation of different types errors in an analysis and applying different methods to minimize errors
- **Employability**: Demonstration of Flame photometry, AAS, ICP-MS, TG, DTA, GC-MS, LC-MS
- **Entrepreneurship:** enlightening the students to invent new instruments and separation methods for analysis.

Assignment Questions:

Unit - I

1. Write about Q, F and t test?
2. What is accuracy and precision
3. Write a short note on confidence interval
4. Explain Gaussian distribution
5. Describe the methods for minimization of errors
6. What is Mean deviation, Standard deviation

Unit - II

1. Write the principle and instrumentation of flame photometry.
2. Write the principle and instrumentation of atomic absorption spectroscopy (AAS)?
3. Write a short note on spectral interferences in AAS
4. Write about ICP - MS
5. Write the difference between AAS and AES
6. Write the principle of HPLC
7. Write the principle and instrumentation of ICP-MS

Unit - III

1. Write the principle, instrumentation and applications of Thermogravimetry.
2. Write the principle of polarography and explain half-wave potential.
3. Write the principle of DTA.
4 Write about Ilkovic equation.
5. What are the advantages and disadvantages of DME.
6. Define residual current, migration current, diffusion current.

Unit - IV

1. Write the principle and instrumentation of gas chromatography.
2 Write the principle, instrumentation of HPLC.
3. Write the applications of HPLC.
4. What is gradient elution
5. Explain visualization methods in TLC
6. Give the working principles of any two GC detectors
7. Explain principle, technique, applications of HPLC.

III B.Sc. CHEMISTRY (Hons.)

SEMESTER – V

ANALYTICAL METHODS IN CHEMISTRY (DSE-V) BLUE PRINT

Sl. No.	**CHAPTER**	Essay Question (07 Marks)	Short Answer Question (05 Marks)	Very Short Answer Questions
1	**UNIT-1**	**2**	**2**	1
2	**UNIT-II**	**2**	**2**	**---**
3	**UNIT-III**	**2**	2	1
4	**UNIT-IV**	**2**	**2**	1

GOVERNMENT COLLEGE (A), RAJAHMUNDRY

V SEMESTER END EXAMINATIONS

III B.Sc. CHEMISTRY (Hons.) 2022-23
MODEL QUESTION PAPER

ANALYTICAL METHODS IN CHEMISTRY (DSE-V)

Time: 2 1 /2 hrs **Max. Marks: 50**

PART-A

Answer **ALL** the questions. Each carries **SEVEN** marks **4 x 7 = 28 Marks**

1. Explain in detail about Quantitative chemical analysis

(OR)

2. Write about Q, F and t- test?
3. Write the principle and instrumentation of flame photometry?

(OR)

4. Write the principle and instrumentation of atomic absorption spectroscopy (AAS)?
5. Write the principle, instrumentation and applications of thermogravimetry?

(OR)

6. Write the principle of polarography and explain half-wave potential?
7. Write the principle and instrumentation of gas chromatography?

(OR)

8. Write the principle, instrumentation of HPLC?

PART-B

Answer any four questions **4 x 4 = 16 Marks**

9. What is accuracy and precesion?
10. Write a short note Mean and stndard deviation?
11. Write a short note on spectral interferences in AAS?
12. Write about ICP-MS?
13. Write the principle of DTA?
14. Write about Ilkovic equation?
15. Write about TLC?
16. Write the applications of HPLC?

PART-C

Answer **All** the questions **3 x 2 = 6 Marks**

17. Write Qualitative chemical analysis?
18. Write the advantages of DME.
19. What is gradient elution?

	Government College (Autonomous) Rajahmundry	Program & Semester III B.Sc. (Hons) (V Semester)			
Course Code CHH 117P	**TITLE OF THE COURSE** **ANALYTICAL METHODS IN CHEMISTRY (DSE-V)** - PRACTICAL				
Teaching	Hours Allocated: 30 (**PRACTICAL**)	L	T	P	C
Pre-requisites	ANALYTICAL METHODS	-	-	2	2

Course Objectives:

1. To Learn Separation of given mixture of amino acids (glycine and phenyl alanine) using ascending paper chromatography
2. To learn . Green procedure for organic qualitative analysis: Detection of N, S and halogens

On Completion of the course, the students will be able to	
Course Outcomes:	Prepare acetanilide using the green synthesis
	. Demonstrate the preparation of azodye
CO1	. Acquire skills in the separation of organic compounds in the given mixture using solvent extraction
CO2	Synthesis of Adipic acid
CO3	
CO4	

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

PRACTICALS- DSE LAB: ANALYTICAL METHODS IN CHEMISTRY

Separation Techniques Chromatography:

1. Separation of mixtures: Separation of mixture of aniline and naphthalene by using acid - base solvent extraction techniques.

2. Separation of mixtures: Separation of mixture of Benzoic acid and Benzophenone by using acid -base solvent extraction techniques.

3. Separation of 2,4-DNP derivatives of acetone and 2 - Btanone by TLC

4. Separation of O- Nitro aniline and P- Nitro aniline by using Column chromatography.

5. Separation and identification of the amino acids present in the given mixture by paper chromatography. Reporting the Rf values.

6. Simultaneous determination of Mn (II) and Cr(VI) Spectrophotometrically

7. Verification of Lambert-Beer's law and determination of concentration of a coloured species ($CuSO_4$, $KMnO_4$).

8. Determination of Fe(III) by Spectrophotometric method.

Reference Books:

Vogel, Arthur I: A Text book of Quantitative Inorganic Analysis (Rev. by G.H. Jeffery and others) 5 th Ed. The English Language Book Society of Longman

• Willard, Hobart H. et al.: Instrumental Methods of Analysis, 7 th Ed. Wardsworth Publishing Company, Belmont, California, USA, 1988.

• Christian, Gary D; Analytical Chemistry, 6 th Ed. John Wiley & Sons, New York, 2004.

• Harris, Daniel C: Exploring Chemical Analysis, Ed. New York, W.H. Freeman, 2001.

• Khopkar, S.M. Basic Concepts of Analytical Chemistry. New Age, International Publisher, 2009.

• Skoog, D.A. Holler F.J. and Nieman, T.A. Principles of Instrumental Analysis, Thomson Asia Pvt. Ltd. Singapore, 1998.

• Mikes, O. & Chalmers, R.A. Laboratory Hand Book of Chromatographic & Allied Methods, Elles Horwood Ltd. London.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	2	3	2	2	3	3	3
CO2	2	2	3	2	3	2	3	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	2	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.75	2.75	2	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

GOVERNMENT COLLEGE (A), RAJAHMUNDRY

IV SEMESTER END EXAMINATIONS

III B.Sc. CHEMISTRY (Hons.) 2022-23

ANALYTICAL METHODS (DSE-V)- PRACTICAL

Scheme of Valuation

Max. Marks: 50 Marks

Time: 3 hrs.

For Record - 10 Marks

For Viva-voce - 05 Marks

Marks for Practical - 35 Marks

Marks Splitting of Practical Marks:

Procedure: 20 Marks

Report of yield: 15 Marks

	Government College (Autonomous) Rajahmundry	Program & Semester III B.Sc. Hons (V Semester)			
Course Code CHH 118	**TITLE OF THE COURSE** **GROUP THEORY & COMPUTER APPLICATIONS (DSE-VI)**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites	Basic knowledge on computers hardware and software	3	1	-	3

Course Objectives:

1. Hardware and Software; Input devices, Storage devices, Output devices, Central Processing Unit
2. Computer Programming Language- FORTRAN, (for solving some of the basic and in turn complicated chemistry problems).
3. To know about Symmetry elements and point groups for molecules.
4. To know about application in group theory

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	Learn the hardware and software of computer	Understand
CO2	Gain the knowledge on FORTRAN program commands	Understand
CO3	Apply the FORTRAN software for solving chemistry problems	Application
CO4	Use of symmetry elements and point groups	Understanding

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		**Employability**		**Entrepreneurship**	

Syllabus:

Unit-I: Introduction to computer programming- FORTRAN (15HOURS)

: Basic structures and functioning of computer with P.C. as an illustrative example- Main memory- Secondary storage memory input/output devices- computer languages- operating systems- principles of algorithms-and flow charts-constants and variables- Arithmetic expressions- Arithmetic statements Replacement statement- IF statement- logical IF and BLOCK IF statements- GOTO statements-subscripted variable and DIMENSION statement. DO statement- Rules for DO statement.

Unit-II: **Applications of FORTRAN programming: (15HOURS)**

Flow charts and computer programs for a) Program for the calculation of Cell Constant. b) Rate Constant of First order reaction or Beer's law by linear least square method. c) Hydrogen ion concentration of a strong acid solution/Quadratic equation. d) Solution for Vander Waals equation or Hydrogen ion concentration of a monotropic weak acid.

Unit-III: Molecular symmetry and Group Theory in chemistry-I: (15HOURS)

Basic concepts of symmetry and Group theory-Symmetry elements, symmetry operations and point groups. Schoenflies symbols- Classification of molecules into point groups.

Unit-IV: Molecular symmetry and Group Theory in chemistry-II: (15HOURS)

Axioms of Group theory- Group multiplication tables for C2v and C3v point groups- Similarity transformations- and classes Representations- reducible and irreducible representations, Mullikan symbols, Orthogonality theorem and its implications, Character table and its anatomy.

Text books:

1. McQuarrie, D. A. Mathematics for Physical Chemistry University Science Books(2008).
2. Mortimer, R. Mathematics for Physical Chemistry. 3rd Ed. Elsevier (2005).

Reference books:

1. McQuarrie, D. A. Mathematics for Physical Chemistry University Science Books2008).
2. .Mortimer, R. Mathematics for Physical Chemistry. 3rd Ed. Elsevier (2005).
3. Steiner, E. The Chemical Maths Book Oxford University Press (1996).
4. Yates, P. Chemical Calculations. 2nd Ed. CRC Press (2007)
5. Harris, D. C. Quantitative Chemical Analysis. 6th Ed., Freeman (2007) Chapters 3-5.
6. Levie, R. de, How to use Excel in analytical chemistry and in general scientific dataanalysis, Cambridge Univ. Press (2001) 487 pages.
7. Noggle, J. H. Physical Chemistry on a Microcomputer. Little Brown & Co. (1985).
8. Molecular symmetry and Group Theory. Robert I Carter.

Web Links:

1. https://youtu.be/xT1wo2_ZSTQ

2. https://youtu.be/Rbz5WTGyoFw

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	1	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.75	2.75	2	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

Proposed Activities:

Skill Development: 1. Drawing the chemical structures.

Assignment Questions:

Unit - I

1. Explain about a) IF statements b) GOTO statement
2. Explain DIMENTION and DO statements.
3. What are input and output devices.
4. What are FORTRAN symbols?
5. Write about basic structure and functioning of computer with PC ?

Unit – II

1. Write the flowchart for first order kinetics programme?
2. Write the flowchart for Vanderwaals equation programme?
3. Write flow chart and computer program for quadratic equation
4. Write the flowchart and program for cell constant.?
5. Write Flow char andt computer programme solution of vanderwaal Equations?

Unit – III

1. Explain about symmetry elements?
2. Explain about point groups?
3. Write about symmetry operations of i) NH_3 ii) H_2O?
4. Write a short note on Schoenflies symbols?
5. Write the point groups for H_2O and NH_3?

Unit –IV

1. What are reducible representations?
2. What are mulliken symbols?
3. What are irreducible representations?
4. State and prove orthogonality theorem?
5. Describe about axioms of group theory?
6. Write character table for C2V point Group?

GOVERNMENT COLLEGE (A), RAJAHMUNDRY

III B.Sc. CHEMISTRY (Hons.) 2022-23

SEMESTER – V

GROUP THEORY & COMPUTER APPLICATIONS (DSE-VI) BLUE PRINT

SI. No.	Chapter	Essay Question (07 M) knowledge	Short Answer Question (04 M) Under standing	Very Short Answer Question (02 M) Skill / Application
1.	UNIT-I	02	02	01
2.	UNIT-II	02	02	01
3.	UNIT-III	02	02	01
4.	UNIT-IV	02	02	------
Total no. of Questions		08	08	03

MODEL QUESTION PAPER GOVERNMENT COLLEGE (A),

RAJAHMUNDRY

V SEMESTER END EXAMINATIONS

III B.Sc. CHEMISTRY (Hons.) 2022-23

GROUP THEORY & COMPUTER APPLICATIONS (DSE-VI)

Time: 2 1 /2 hrs **Max. Marks: 50M**

PART-A

Answer **ALL** the questions. Each question carries **SEVEN** marks **4 x 7 = 28 Marks**

1. Explain about a) IF statements b) GOTO statement.

(OR)

2. Explain DIMENTION and DO statements.
3. Write flowchart and computer program for quadratic equation

(OR)

4. Write the flowchart and program for cell constant.
5. Explain about symmetry elements?

(OR)

6. Explain about point groups?
7. State and prove orthogonality theorem.

(OR)

8. Describe about axioms of group theory.

PART-B

Answer any four questions **4 x 4 = 16 Marks**

9. What are input and output devices.
10. What are FORTRAN symbols?
11. Write the flowchart for first order kinetics programme?
12. Write the flowchart for vanderwaals equation programme?
13. Write about symmetry operations of i) NH_3 ii) H_2O?
14. Write a short note on Schoenflies symbols?
15. What are reducible representations?
16. What are mulliken symbols?

PART-C

Answer **All** the questions **3 x 2 = 6 Marks**

17. What is BLOCK IF statement?
18. Write the point groups for H_2O and NH_3?
19. Draw the character table for C2V ?

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHH 118P	**TITLE OF THE COURSE** **APPLICATIONS OF COMPUTERS IN CHEMISTRY (DSE-VI)**	III B.Sc. Hons (V Semester)			
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites	Basic knowledge on computers hardware and software	-	-	2	2

Course Objectives:

- Computer programs using FORTRAN based numerical methods
- Software products used in chemistry.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Learn to solve the numerical in chemistry by using FORTRAN program.
CO2	Use different software products in chemistry.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

1. **PH metric titration of HCl vs NaOH**
2. **PH metric titration of CH3COOH vs NaOH**
3. **Determination of Mn(II) by spectrophotometry.**
4. **Determination of Fe(II) by spectrophotometry.**

Text books:

3. McQuarrie, D. A. Mathematics for Physical Chemistry University Science Books (2008) .
4. Mortimer, R. Mathematics for Physical Chemistry. 3rd Ed. Elsevier (2005).

Reference books:

1. Steiner, E. The Chemical Maths Book Oxford University Press (1996).

2. Yates, P. Chemical Calculations. 2nd Ed. CRC Press (2007).

3. Harris, D. C. Quantitative Chemical Analysis. 6th Ed., Freeman (2007) Chapters 3-5

4. Levie, R. de, How to use Excel in analytical chemistry and in general scientific data analysis, Cambridge Univ. Press (2001) 487 pages.

5. Noggle, J. H. Physical Chemistry on a Microcomputer. Little Brown & Co. (1985).

6. Venit, S.M. Programming in BASIC: Problem solving with structure and style. Jaico Publishing House: Delhi (1996).

Web Links:

1. https://youtu.be/xT1wo2_ZSTQ
2. https://youtu.be/Rbz5WTGyoFw

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CO4	2	3	2	1	3	2	3	1	2	3	3	2	2
Avg.	2.5	2.75	2.75	2	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

V SEMESTER LABORATORY COURSE

PRACTICAL PAPER

APPLICATIONS OF COMPUTERS IN CHEMISTRY (DSE-VI)

SCHEME OF VALUATION

Max.Marks: 50 MarkS **Time: 3 Hrs**

1) For Record 10 Marks
2) For Practical 40 Marks

Splitting of Practical Marks:

Procedure in 10 min : 5 Marks
Formula with units: 5 Marks
Neat tabulation: 5 Marks
Correct calculation: 5 Marks

Error < 10 % 20 Marks
Error 10-15 % 15 Marks
Error > 15 % 10 Marks (Minimum Marks)

Total Marks - 50M

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code	**TITLE OF THE COURSE** **Research Methodology & Synthetic organic chemistry**	III B.Sc Chem (Hons) (V SEMESTER)			
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites	Basic concepts of organic reaction mechanism	-	4	-	4

Course Objectives:

1. To learn writing of research paper.
2. To understand basic concepts of Pericyclic reactions.
3. To understand mechanism of recent reactions.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Write research paper
CO2	Understand mechanism of pericyclic reactions
CO3	Write mechanism of some photochemical reactions.
CO4	Write mechanism and applications of recent advanced reactions.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Research Methodology & Synthetic organic chemistry

Unit – I

Thesis and report writing 18h

Aims and objectives of good research. General format, title page, declaration, abstract, table of contents, Introduction, background information, acknowledgements, preface, theory, results, discussions, materials and methods, list of tables and list of figures, experimental details, pagination, spacing and alignment, number schemes, spacing, margins, appendixes, bibliography, abbreviations, special symbols, conclusions, recommendations, and references.

UNIT-II

Pericyclic reactions 18 h

Features and classification of per cyclic reactions: Phases, nodes and symmetry propertiesof molecular orbital's in ethylene, 1, 3-butadiene, 1, 3, 5-hexatriene in Thermal and photo chemical reactions
Electro cyclic reactions: Definition and examples, definitions of con and dis rotation,Woodward-Hoffmann selection rules.(Correlation diagrams are not required)
Cyclo addition reactions: Definition and examples, definitions of suprafacial and antarafacial addition, Woodward-Hoffmann selection rules (Correlation diagrams are not required)

UNIT-III

Organic Photochemistry 12 h

Jablonski diagram-singlet and triplet states ,ISC,IC,Flouroscence, phosphorescence.
Photochemistry of Carbonyl compounds- $n\rightarrow\pi$ and $-\pi\rightarrow\pi*$ transitions, Photosensitization Norrish type-1and Norrish type-2 reactions. Pternobuchi reaction

UNIT-IV

Synthetic Reactions 12 h

Shapiro reaction, Stork-enamine reaction (only alkylation), Wittig reaction, Robinson annulation, Bailys-Hillman reaction, Heck reaction, Suzuki coupling. Synthesis of aldehydesand ketones using1,3-Dithiane.

Reference books:

- Photochemistry and Pericyclic reactions by JAGDAMBA SINGH& JAYA SINGH.
- Organic Reaction Mechanisms by V.K. Ahluwalia & Rakesh Kumar Parashar.
- Organic chemistry by Jonathan Clayden , Nick Greeves and Stuart Warren
- Research Methodology – Methods and Techniques by C.R.KOTHARI

Web Links:

https://www.khanacademy.org
https://www.sciencedirect.com

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3	2	3	3	2	2	2	3
CO2	2	2	3	3	3	3	2	3	2	1	2	3	2
CO3	3	2	3	2	2	3	2	3	3	2	2	2	3
CO4	2	2	3	2	2	3	2	1	2	3	2	2	2
Avg.	**2.5**	**2**	**2.75**	**2.25**	**2.25**	**3**	**2**	**2.5**	**2.5**	**2**	**2**	**2.25**	**2.5**

GOVERNMENT COLLEGE (A), RAJAHMUNDRY

III B.Sc. CHEMISTRY (Hons.) 2023-24

SEMESTER – V

RESEARCH METHODOLOGY & SYNTHETIC ORGANIC CHEMISTRY

SI. No.	Chapter	Essay Question (07 M) knowledge	Short Answer Question (04 M) Under standing	Very Short Answer Question (02 M) Skill / Application
1.	UNIT-I	02	02	01
2.	UNIT-II	02	02	01
3.	UNIT-III	02	02	01
4.	UNIT-IV	02	02	------
Total no. of Questions		08	08	03

MODEL QUESTION PAPER

GOVERNMENT COLLEGE (A), RAJAHMUNDRY

V SEMESTER END EXAMINATIONS

III B.Sc. CHEMISTRY (Hons.)

RESEARCH METHODOLOGY & SYNTHETIC ORGANIC CHEMISTRY (DSE-VII)

Time: 2 1 /2 hrs **Max. Marks: 50**

PART-A

Answer **ALL** the questions. Each carries **SEVEN** marks **4 x 7 = 28 Marks**

1. Write note on General format for thesis writing

(OR)

2. Explain various factors to be considered while writing a thesis or publishing a paper.
3. Define electrocyclic reactions. Explain CON & DIS rotation with suitable example.

(OR)

4. What are cyclo addition reactions? Explain Suprafacial & anatara facial addition in cyclo addition reactions..
5. Write the mechanism for following

I. Wittig reaction

II. Heck reaction

(OR)

6. Give the mechanism for following

I. Shapiro reaction

II. Suzuki reaction

7. Write note on the following

I. ISC

II. Phosphorescence

(OR)

8. Write briefly about Norrish type 1 & type 2 reactions.

PART-B

Answer any **FOUR** questions **4 x 4 = 16 Marks**

9. Write about Tables, figures and bibliography in thesis writing
10. Write the aims and objectives of good research.
11. Define Woodward-Hoffmann selection rules for electro cyclic reactions.
12. Write nodes & symmetry properties of molecular orbitals in 1,3,5,- Hexa triene.
13. Explain patterno- Buchi reaction with mechanism.
14. Write note on photosensitization.
15. Give the mechanism for Stark enamine reactions
16. Write about Bailys –Hillmann reaction.

PART-C

Answer **All** the questions **3 x 2 = 6 Mark**

17. Define the terms HOMO & LUMO
18. What is flouroscence?
19. Write the declaration formate in thesis writing.

GOVERNMENT COLLEGE (A),

RAJAHMUNDRYV SEMESTER

END EXAMINATIONS

III B.Sc. CHEMISTRY (Hons.)

RESEARCH METHODOLOGY IN CHEMISTRY (DSE-VII)

PROJECT - 50M

	Government College (Autonomous) Rajahmundry	Program & Semester I B.A., B.Com., BBA			
Course Code MDC	TITLE OF THE COURSE **PRINCIPLES OF CHEMICAL SCIENCES**				
Teaching	Hours Allocated: 30 (**Theory**)	L	T	P	C
Pre-requisites:	Periodic table	2	-	-	2

Course Objectives:

1. Understand the structure of atom.
2. Identify the isotopes and isobars.
3. Define acids and bases and predict the nature of salts.
4. Explain ionic and covalent bonding.
5. Describe the importance of Chemistry in daily life.

Syllabus:

Unit-I: Matter, Atoms and Molecules **6 h**

Classification of matter, Dalton atomic theory, Thomson Model, Rutherford Model, Bohr's model of atom, quantum numbers, electronic configuration, Aufbau Principle, Pauli's exclusion principle, Hund's rule.

Unit-II: Nuclear Chemistry **5 h**

Isotopes-Isobars, Nuclear decay, Band of Stability, Nuclear Reaction types, Nuclear Applications.

Unit-III: Elements and Classification **6 h**

Classification of elements, Periodic Classification of elements based on electronic configuration. Types of elements - metals, non-metals and metalloids, periodic properties-atomic radii, ionisation enthalpy, electronegativity,

Unit-IV: Chemical Bonding **6 h**

Octet rule, ionic bond properties of lonic compounds-covalent bond, properties of covalent molecule.

Unit-V: Acids, Bases, Salts, Chemistry in Daily life **7 h**

Definition, types and properties of Acids, Bases, Salts, strength of acids and bases, pH, Importance of Chemistry in daily life. (food, drugs, textiles, preservatives, soaps and detergents)

List of Reference Books:

1. Inorganic Chemistry by Puri and Sharma
2. Basic concepts of Inorganic Chemistry by D.N.Singh

Co-curricular activities:

Projects on Importance of Chemistry in food, drugs, textiles, preservatives, soaps and detergents

GOVERNMENT COLLEGE (A), RAJAHMUNDRY

SEMESTER – I 2023-24

Multi-Disciplinary Course

Principles of Chemical Sciences BLUE PRINT

Sl. No.	Chapter	Essay Question (7 M) knowledge	Short Answer Question (3 M) Under standing
1.	UNIT-I	02	02
2.	UNIT-II	01	01
3.	UNIT-III	02	02
4.	UNIT-IV	01	01
5.	UNIT-V	02	02
Total no. of Questions		08	08

MODEL QUESTION PAPER
GOVERNMENT COLLEGE (A), RAJAHMUNDRY
I SEMESTER END EXAMINATIONS
I Year Degree 2023-24
MDC - PRINCIPLES OF CHEMICAL SCIENCES

Time: 2 hrs **Max. Marks: 50**

PART- A **5 x 7 = 35 Marks**

Answer **Any FIVE** of the following questions. Each carries **SEVEN** marks.

1. Explain Bohr's model of atom.
2. Explain the following:
   i) Pauli's exclusion principle ii) Aufbau principle
3. Explain the types of nuclear reactions.
4. Explain the types of elements with examples.
5. Write the classification of elements based on electronic configuration.
6. Define ionic bond. Give the properties of ionic compounds.
7. What are acids and bases? Write a note on their properties.
8. Explain the importance of chemistry in daily life.

PART-B **5 x 3 = 15 Marks**

Answer **Any FIVE** of the following questions. Each carries THREE marks.

9. What is Hund's rule?
10. Write short notes on Rutherford model of atom.
11. Give any three applications of nuclear reactions.
12. Write a note on Ionization Enthalpy.
13. Exemplify electronegativity.
14. Describe Octet rule.
15. Write the classification of compounds based on pH.
16. Define detergents. Give any two examples.

GOVERNMENT (A) ARTS COLLEGE RAJAHMUNDRY

Syllabus of Certificate Course

BASIC ANALYTICALTECHNIQUES (Credits: 02)

(Hands on Exercises: 60 Lectures)

Introduction: Introduction to Analytical Chemistry and its interdisciplinarynature.

Concept of sampling.Importance of accuracy, precision and sources of error inanalytical measurements.

Presentation of experimental data and results, from the point of view of significantfigures.

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

a. Determination of pH of soil samples.

b. Estimation of Calcium and Magnesium ions as Calcium carbonate by complexometric titration.

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

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

b. Determination of conductivity, TDS, TSS of water sample

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

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

Paper chromatographic separation of mixture of metal ions Ni (II)and Co(II).

Ion-exchange: Column, ion-exchange chromatography etc. Determination of ion exchange capacity of anion/cation exchange resin (using batch procedure if use ofcolumn is not feasible).

Suggested Applications (Any one):

a. To study the use of phenolphthalein in traps cases

b. To analyze arson

accelerants c.To carry out

analysis of gasoline.

Suggested Instrumental demonstrations:

a. Estimation of macro nutrients: Potassium, Calcium, Magnesium in soil samplesby flame photometry.

b. Spectrophotometric determination of Iron in Vitamin/Dietary Tablets.

c. Spectrophotometric Identification and Determination of Caffeine and BenzoicAcid in Soft Drink

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Reference Books:

1. Willand, H. H. Instrumental Methods of Analysis, CBS Publishers, 1988
2. Skoog, D.A. and Leary, J.J., Instrumental Methods of Analysis, Saunders CollegePublications, New York, 1992
3. Skoog, D.A.; West, D.M. and Holler, F.J. Fundamentals of Analytical Chemistry 6thEd, Saunders College Publishing, Fort Worth, 1992
4. Harris, D. C. Quantitative Chemical Analysis 7thEd. W. H. Freeman and Co., New York, 2007
5. Dean, J. A. Analytical Chemistry Handbook, McGraw Hill, 2007
6. Vogel's quantitative methods of analysis 5 th Edition.

Government College (Autonomous)

Rajahmundry

DEPARTMENT OF CHEMISTRY
BASIC ANALYTICAL TECHNIQUES

Modal question paper

TOTAL 50 M

Write **any five** of the following questions 5x8 =40 M

1. Write about importance of analytical chemistry and its interdisciplinary nature
2. Explain Presentation of experimental data and results, from the point of view of significantfigures.
3. Write about chelation and chelating agents
4. How can you determine the pH of soil sample?
5. Explain the determination of TDS and TSS of water sample
6. Explain the determination of dissolved oxygen present water sample
7. Explain paper chromatographic separation of Co (II) and Ni (II) ions
8. Explain the determination of ion exchange capacity of anion/ cation exchange resin

Write **any five** of the following questions 5x2 = 10 M

1. What is accuracy and precision?
2. Write the concept of sampling
3. Draw the [Ca-EDTA] complex structure
4. Discus the concept of p^H
5. Define pure water
6. What is alkalinity of water
7. Write the principle of chromatography
8. Write different stationary phases present in TLC

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY
Accredited by NAAC (RAF-2017) with 'A^{+}' Grade (CGPA: 3.38/4.00)
Affiliated to Adikavi Nannaya University, Rajamahendravaram

DEPARTMENT OF CHEMISTRY

CERTIFICATE COURSE-II
2023-24

ESSENTIALS OF PHARMACOLOGY - Syllabus

(2+1) hrs/week **Credits: 02**

UNIT-I

Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists(competitive and non competitive),
spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy.

UNIT-II

Drugs acting on respiratory system, Respiratory stimulants, Bronchodilators, Nasal decongestants, Expectorants and Antitussive agents.

UNIT-III

Drugs acting on digestive system-carminatives digest ants, Bitters,Antacids and drugs used in peptic ulcer, purgatives and laxatives, Antidiarrehals, Emetics, Anti-emetics, Antispasmodics.

UNIT-IV

Drugs acting on COX, Non-selective inhibitors, selective COX inhibitors, Preferential drugs, analgesics, antipyretics, antiinflammatory drugs.

Practical (15 lectures)

1. Preparation of paracetmol
2. Commonly used instruments in experimental pharmacology.
3. Study of common laboratory animals.

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
DEPARTMENT OF CHEMISTRY
Semester-IV

Certificate Course - ESSENTIALS OF PHARMACOLOGY
Model Paper

Time: 2Hrs Marks: 50M

Answer any five of the following: 5x8=40M

1. Classify different pharmacological drugs.
2. Mention different routes of administration.
3. Define bronchodilators? Write structure and MOA of Salbutamol.
4. Explain expectorants and anti tussives.
5. Define antacids? MOA of Antacids? Mention any two drugs used in treatment of peptic ulcer.
6. Write about Emetics and anti emetics.
7. Classify NSAID's. Mention MOA of paracetmol.
8. Define and classify analgesics. Mention MOA of aspirin.

Answer any five of the following: 5x2=10M

9. Define agonist and antagonist.
10. Define addiction.
11. Nasal decongestants.
12. Expectorants examples.
13. Laxatives are used for.
14. Anti spasmodic.
15. Cox inhibitors.
16. Anti inflammatory drugs examples.