


B.SC. CHEMISTRY(H) SYLLABUS

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code	TITLE OF THE COURSE Course – 1: Essentials of Mathematics, Physics, chemistry & Computer Science	I B.Sc. Chemistry (H) I Semester			
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

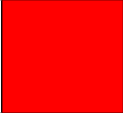


Course Objectives:

- To provide students with a comprehensive understanding of the essential concepts and applications of mathematical, physical, and chemical sciences.
- 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 broad range of fundamental areas of chemistry and to Connect their knowledge of chemistry to daily life.	Application
CO4	Understand the history and evolution of the Internet and to gain an understanding of network security concepts, including threats, vulnerabilities, and countermeasures.	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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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:

Functions of one complex variable by John.B.Conway, Springer- Verlag.

Elementary Trigonometry by H.S.Hall and S.R.Knight

Vector Algebra by A.R.Vasishtha, Krishna Prakashan Media(P)Ltd.

Basic Statistics by B.L.Agarwal, New age international Publishers

University Physics with Modern Physics by Hugh D. Young and Roger A. Freedman

Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker

Chemistry in daily life by Kirpal Singh

Chemistry of bio molecules by S. P. Bhutan

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: 2¹/₂ 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 (Autonomous) Rajahmundry	Program & Semester			
Course Code	TITLE OF THE COURSE Course – 2: Advances of Mathematics, Physics, chemistry & Computer Science	I B.Sc. Chemistry (H) I Semester			
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:

- To provide students with an in-depth understanding of the recent advances and cutting-edge research in mathematical, physical, and chemical sciences.
- 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, decimal, and hexadecimal. Differentiate between analog and digital signals and understand their characteristics.	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

UNIT I: ADVANCES IN 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 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 Bahrouz Forouzan.

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: ADVANCES IN 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, 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. CHEMISTRY
(H)**

SEMESTER - I QUESTION PAPER BLUE

PRINT

Course -2: ADVANCES OF MATHEMATICS, PHYSICS, CHEMISTRY & COMPUTER SCIENCE

TIME: 2¹/₂ 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 Questions from UNIT- I (Q. No 11 & 12)**
- 7. 2 Questions from UNIT- II (Q. No 13 & 14)**
- 8. 2 Questions from UNIT- III (Q. No 15 & 16)**
- 9. 1 Question from UNIT- IV (Q. No 17)**
- 10. 1 Question from UNIT- V (Q. No 18)**

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

Course Objectives:

- To learn the preparation and structure of Diborane and Borazole.
- To provide the knowledge about different types of Interhalogen compounds.
- To provide the basic knowledge on d-block elements and f-block elements.
- 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 of Diborane and Borazole.
CO2	Identify the importance of Interhalogen compounds and Pseudo halogens.
CO3	Comprehend the characteristic properties 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	
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Syllabus

UNIT –I Chemistry of p-block elements – I

9 h

Group 13: Preparation & Structure of Diborane, Borazine.

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, 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

9 h

Definition - classification of Organometallic compounds - nomenclature, preparation, properties and synthetic applications of

Organometallic compounds 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	PO2	PO 3	PO4	PO5	PO 6	PO7	PO 8	PO9	PO1 0	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: INORGANIC CHEMISTRY

TIME: 2¹/₂ 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. CHEMISTRY Hons. (SEMESTER-II)
MODEL PAPER
Course - 3: INORGANIC CHEMISTRY

Time: 2¹/₂ Hrs.

Maximum Marks: 50

PART- A

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

1. Explain the preparation and structure of Diborane. [BT2,CO1]

(OR)

2. What are Silicones? Explain the classification, preparation and applications of Silicones. [BT3,CO1]

3. What are Oxides? Explain the classification of Oxides based on Oxygen content.

[BT2,CO2]

(OR)

4. Explain the preparation and structures of AX₃ and AX₅ type Inter halogen compounds.

[BT2,CO2]

5. Why d- block elements exhibit variable oxidation states? Explain the variable oxidation states exhibited by d- block elements. [BT4,CO3]

(OR)

6. Explain the following characteristic properties of d-block elements. [BT2,CO3]

(a) Complex forming ability

(b) Magnetic properties.

7. What is Lanthanide contraction ? Explain the consequences of Lanthanide contraction. [BT2,CO3]

(OR)

8. How can you separate the Lanthanides by ion exchange method? [BT4,CO3]

9. What are Grignard reagents? Write the preparation and synthetic applications of Grignard reagents. [BT3,CO4]

(OR)

10. What are Organometallic compounds? Explain the classification of Organometallic compounds based on Carbon-Metal (C-M) bond. [BT3,CO4]

PART- B

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

5 x 3M = 15M

11. Why Borazole is called as Inorganic Benzene? Explain in detail. [BT4,CO1]
12. Illustrate the structure of $P_3N_3Cl_6$. [BT2,CO1]
13. Write a short note on pseudo halogens. [BT1,CO2]
14. Describe the classification of oxides based on chemical behavior. [BT2,CO2]
15. Why Cr and Cu exhibit abnormal electronic configurations? [BT4,CO3]
16. Why particularly d- block elements act as catalysts? Explain with suitable examples. [BT4,CO3]
17. Write the differences between Lanthanides and Actinides. [BT1,CO3]
18. Describe the classification of organometallic compounds. [BT2,CO4]



Course Code C3	TITLE OF THE COURSE Course -3: ANALYSIS OF SIMPLE SALT	Semester I B.Sc. CHEMISTRY(H) (Semester - II)			
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre-requisites	Basic principles of inorganic qualitative analysis	-	-	2	1

Course Objectives:

1. To learn the systematic procedure for identification of simple inorganic anions.
2. To learn the systematic procedure for identification of simple inorganic cations.
3. To learn the laboratory techniques involved in the inorganic qualitative analysis.
4. To understand the chemical reactions involved 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	Learn the 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	-
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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.

References:

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.

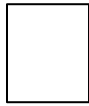
Web Links:

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
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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	3	3	3	3	3
Avg.	3	2.75	2.75	2	3	2	2	2	2.5	2.5	2.5	3	2.75

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. CHEMISTRY (H) SEMESTER - II			
Course Code C4	TITLE OF THE COURSE Course -4: 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	
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Syllabus:

Unit - I: Atomic Structure and Periodic table

9 h

Electronic configuration: Bohr theory, dual 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 . 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

Valence 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 , I_7^- effect of bonding and nonbonding electron on the structure of molecules, effect of electronegativity,

Isoelectronic principle, illustration of structures by VESPR model: NH_3 , H_2O , SF_4 , XeF_4 , XeF_6

Molecular orbital theory -LCAO method, construction of M.O. diagrams for homonuclear and hetero-nuclear diatomic molecules (N_2 , O_2 , 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, 3rd 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
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. CHEMISTRY (H)

SEMESTER – II

QUESTION PAPER BLUE PRINT

Course -4: GENERAL AND INORGANIC CHEMISTRY

TIME: 2½ 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 - 4: GENERAL AND INORGANIC CHEMISTRY

Time: 2¹/₂ 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)

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?

2. 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)

What is the Born-Haber cycle, and how does it help us calculate the enthalpy of formation of an ionic compound?

3. Explain the geometries of BeCl₂, CH₄ and PCl₅ based on Valence bond

theory (OR)

Construct Molecular Orbital diagrams for N₂ and NO

NO molecules

4. Explain in detail about the Band theory of metals

(OR)

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

Marks	BL	CLO	PLO	PI
7	2	2	4	
7	2	3	5	
7	3	2	4	
7	2	2	3	
7	3	3	4	

7	2	2	3	
7	3	3	6	
7	2	3	5	
7	3	2	2	
7	2	2	4	

5. Discuss Lewis acid – base theory with examples

(OR)

Explain HSAB principle with examples

PART- B


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

15

6. What is the inert-pair effect, and how does it manifest in heavier elements?
7. Discuss different scales of electronegativity briefly
8. Name two properties that are influenced by the polarization of ionic compounds.
9. Illustrate molecular structures of NH_3 and SF_4 by using the VSEPR model
10. Explain isoelectronic principle
11. Explain free electron theory of metals
12. Explain BRONSTED-LOWRY theory of acids and bases

Marks	BL	CLO	PLO
3	2	1	3
3	2	2	4
3	2	3	5
3	2	2	6
3	1	2	7
3	2	3	6
3	1	2	5
3	2	3	4

11. Define pH, pKa & pKb

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code	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	-
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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 Quantitative 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

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. CHEMISTRY (H) (SEMESTER – III)			
Course Code C5	TITLE OF THE COURSE Course -5: ORGANIC CHEMISTRY-1				
Teaching	Hours Allocated: 45 (Theory) (3 hrs. / Wk.)	L	T	P	C
Pre-requisites:	Basic knowledge organic chemistry	3	-	-	3

Course Objectives:

12. To provide basic knowledge about structural theory in organic chemistry
13. To provide knowledge on alkenes, alkynes and its applications
14. 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
CLO1	Know the concepts of inductive effect, mesomeric effect and hyper conjugation	Knowledge
CLO2	Understand the basic concepts in Organic chemistry	Understanding
CLO3	Apply the knowledge of structural theories of organic compounds	Applying
CLO4	Synthesis of Alkenes, Alkynes, Cycloalkanes and Benzene	Evaluating
CLO5	Properties of Alkene, Alkynes, Cycloalkanes, Benzenes and its mechanisms	Analysing

Course with focus o

n employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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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 Freund's 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

List of Reference Books

1. NCERT +1 and +2
2. Unified chemistry textbook, O.P.Agarwal

CLO-PLO Mapping:

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

	CLO\ PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
Inorganic Chemistry	CLO1	3	2	2	1	1	0	0	0	3	0
	CLO2	3	1	2	1	1	0	0	0	3	0
	CLO3	3	3	3	1	1	0	0	0	3	0
	CLO4	3	3	3	2	2	0	0	0	3	0
	CLO5	3	3	3	2	2	0	0	0	3	0
	Avg.	3	2.4	2.6	1.4	1.4	0	0	0	3	0

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

II B.Sc. CHEMISTRY (Hons.) SEMESTER-III 2024-25

CHEMISTRY COURSE-5 : ORGANIC CHEMISTRY-I

QUESTION PAPER BLUE PRINT

TIME: 2¹/₂ hrs.

MAX. MARKS: 50

PART – A

Answer **ALL** the following questions.

5x7 = 35 M

1a Question from UNIT-I

OR

1b Question from UNIT-I

2a Question from UNIT-II

OR

2b Question from UNIT-II

3a Question from UNIT-III

OR

3b Questions from UNIT-III

4a Question from UNIT-IV

OR

4b Question from UNIT-IV

5a Question from UNIT-V

OR

5b Question from UNIT-V

PART – B

Answer any **FIVE** of the following questions.

5x3 = 15 M

6 Questions from UNIT-I

7 Questions from UNIT-II

8 Questions from UNIT-III

9 Questions from UNIT-III

10 Questions from UNIT-III

11 Questions from UNIT-III

12 Questions from UNIT-IV

13 Questions from UNIT-V

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
II B.Sc. CHEMISTRY (Hons.) SEMESTER-III 2024-25
CHEMISTRY COURSE-5: ORGANIC CHEMISTRY-I

MODEL QUESTION PAPER

TIME: 2¹/₂ hrs.

MAX. MARKS: 50

PART – A

Answer **ALL** the following questions.

5x7 = 35 M


	Marks	BL	CLO	PLO	PI
1a) What is inductive effect? Explain its applications <i>OR</i>	7	2	1	1	
1b) Explain types of organic reactions with examples	7	2	2	2	
2a) Explain the preparation methods and chemical properties of alkenes <i>OR</i>	7	2	1	2	
2b) Explain 1,2 – and 1,4 – addition reactions in conjugated dienes	7	2	3	2	
3a) Write the preparations and chemical properties of alkynes <i>OR</i>	7	5	1	9	
3b) Explain the chemical properties of higher alkynes	7	2	2	5	
4a) Explain the preparation and chemical properties of cycloalkanes <i>OR</i>	7	4	1	3	
4b) How Baeyer strain theory is used for explaining the stability of cycloalkanes.	7	3	4	2	
5a) Explain the concept of aromaticity based on Huckels rule <i>OR</i>	7	6	5	5	
5b) Explain aromatic substitution reactions of Benzene.	7	3	4	4	

PART – B

Answer any **FIVE** of the following questions.

5x3 = 15 M

	Marks	BL	CLO	PLO	PI
6) Write briefly about organic reagents	3	1	1	1	
7) Explain the acidity of phenols by using mesomeric effect	3	2	2	2	
8) Discuss Markonikov's rule	3	2	1	3	
9) What is Diels - Alder reaction? Give example	3	6	3	5	
10) Write briefly about the acidity of alkynes.	3	5	3	9	
11) What are cyclo alkanes? Give example	3	2	5	2	
12) What are ring activation groups? give example	3	4	4	3	
13) Differentiate between benzenoid and non – benzenoid aromatic compounds.	3	5	5	4	

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code	TITLE OF THE COURSE Course -5: ORGANIC FUNCTIONAL GROUP ANALYSIS	I B.Sc. CHEMISTRY(H) (III Semester)			
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre-requisites	Organic qualitative analysis and functional groups	-	-	2	1

Course Objectives:

15. To provide basic knowledge about organic functional groups
16. To provide knowledge about the analysis of organic functional groups
17. 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	-
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Practical Syllabus:

50 M

Organic functional group analysis:

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

Alcohols, Phenols, Aldehydes, ketones, Carboxylic Acids and Amines

CLO-PLO Mapping:

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

	CLO\ PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
Titrimetric Analysis	CLO1	3	2	2	3	2	1	0	0	3	0
	CLO2	3	2	2	3	2	1	0	0	3	0
	CLO3	3	3	3	3	2	1	0	0	3	0
	CLO4	3	3	3	3	2	1	0	0	3	0
	Avg.	3	2.5	2.5	3	2.0	1	0	0	3	0

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

II B.Sc. CHEMISTRY (Hons.)2024-25

III SEMESTER END EXAMINATIONS

LABORATORY COURSE-2: ORGANIC FUNCTIONAL GROUP ANALYSIS - 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. Preliminary examination in 10 minutes | : 5 M |
| ii. Confirmation test | : 10 M |
| iii. Preparation derivative | : 10 M |
| v. Report | : 10 M |

	Government College (Autonomous) Rajahmundry	Program & Semester II B.Sc. CHEMISTRY (H) (SEMESTER – III)			
Course Code	TITLE OF THE COURSE Course -6: ORGANIC CHEMISTRY (Halogen and Oxygen containing organic compounds)				
Teaching	Hours Allocated: 45 (Theory) (3 hrs. / Wk.)	L	T	P	C
Prerequisites:	Basic knowledge on structure and reactivity of organic compounds	3	-	-	3

Course Objectives:

18. To provide knowledge on reactivity of Halogen and Oxygen containing organic compounds
19. To provide basic awareness on preparatory methods of Halogen and Oxygen containing organic compounds
20. To understand classification of carbohydrates and structural elucidation of glucose & fructose

Course Outcomes:

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	Understand the concept of SN ₁ and SN ₂ mechanisms	Understanding
CO2	Describe the reactivity of alkyl halides, alcohols and phenols.	Application
CO3	Achieve the skills required to propose various mechanisms	Skill
CO4	Apply the concepts for synthesising various Halogen & oxygen containing organic compounds	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit – I Halogen compounds (9 h)

Alkyl halides: Preparation of alkyl halides from i) alkanes, ii) alkenes and iii) alcohols. Properties - nucleophilic substitution reactions– SN_1 and SN_2 mechanisms with energy profile diagrams and stereo chemical aspects . Williamson’s synthesis.

Aryl halides: Preparation i) from phenols ii) Sandmeyer’s reaction, nucleophilic aromatic substitution (Benzyne mechanism); relative reactivity of alkyl, allyl, vinyl and benzyl, aryl halides towards nucleophilic substitution reactions.

Unit II Alcohols and Phenols (9 h)

Alcohols: Nomenclature, classification, Preparation of $1^0, 2^0, 3^0$ alcohols from Grignard’s reagent, Bouveault–Blanc Reduction; Chemical properties –A) Reactions involving only the hydrogen atom of -OH group B) Reactions involving -OH group as a whole. Distinction between $1^0, 2^0, 3^0$ alcohols with Lucas reagent. Pinacol Pinacolone arrangement with mechanism.

Phenols : Preparation from diazonium salt and Cumene. Reactions and mechanism–Reimer–Tiemann, Kolbe–Schmitt Reactions, Fries and Claisen rearrangements

Unit III Carbonyl Compounds (9 h)

Preparation from Acid chlorides, 1,3-dithiane and nitriles; Structure and reactivity of carbonyl group, Nucleophilic addition reactions with HCN, $NaHSO_3$ and alcohols. addition-elimination reactions with hydroxylamine, hydrazine, phenyl hydrazine, 2,4DNP, semicarbazide. Oxidations and reductions (Baeyer -Villiger oxidation, $KMnO_4$, Clemmensen’s, Wolf–Kishner’s, with $LiAlH_4$ & $NaBH_4$).

Reaction & Mechanism- Aldol condensation, Cannizzaro reaction, Perkin reaction, Benzoin condensation, Claisen-Schmidt reaction, Haloform reaction

Unit-IV Carboxylic acid and Active methylene Compounds (9h)

Carboxylic Acids: Preparation from Grignard reagent and hydrolysis of nitriles, Reactions of monocarboxylic acids- Reactions involving -H, -OH and -COOH groups, formation of salts, esters, acid chlorides, amides and anhydrides. C, Arndt-Eistert synthesis, halogenation by Hell-Volhard- Zelinsky reaction. Mechanisms of acidic and alkaline hydrolysis of esters, Reformatsky reactions, Curtius rearrangement.

Active methylene compounds: Ketoenol tautomerism, preparation of Aceto Acetic Ester(AAE) by Claisen condensation with mechanism, synthetic applications of AAE in the preparation of mono carboxylic acids, di carboxylic acids, α,β -unsaturated acids and heterocyclic compounds.

Unit V : Carbohydrates (9 h)

Classification and their biological importance, Monosaccharides: Structural elucidation of glucose and fructose, epimers and anomers, mutarotation, determination of ring size of glucose and fructose, Haworth projections and conformational structures; Interconversions of aldoses and ketoses; Killiani-Fischer synthesis and Ruff degradation.

List of Reference Books

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

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	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	1	1	3	2	3	1	2	3	2	3	2
Avg.	2.25	2.25	2.5	2.0	2.5	1.75	2.0	2.0	2.25	2.25	2.25	2.75	2.75

**GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM II B.Sc.
CHEMISTRY(H) SEMESTER – III**

Course -6: ORGANIC CHEMISTRY

(Halogen and Oxygen containing organic compounds)

WEIGHTAGE TO CONTENT & BLUE PRINT

S.NO.	COURSE CONTENT	LONG ANSWER QUESTIONS	SHORT ANSWER QUESTIONS	TOTAL MARKS	
1.	UNIT - I	2	1	17	
2.	UNIT – II	2	2	20	
3.	UNIT – III	2	2	20	
4.	UNIT – IV	2	2	20	
5.	UNIT - V	2	1	17	
	TOTAL	10	8	94	

GOVERNMENT COLLEGE (A), RAJAHMUNDRY II B.Sc.

CHEMISTRY(H)

SEMESTER-III MODEL PAPER

Course - 6: ORGANIC CHEMISTRY (Halogen and Oxygen containing organic compounds)

Time: 2¹/₂ hrs.

Maximum Marks: 50

PART-

PART -A

Answer ALL the questions. Each carries SEVEN marks

5 x 7 = 35 M

1. Discuss the mechanism and stereochemistry of SN¹ and SN² reactions taking suitable examples. BT2 CO1

(OR)

2. Write a short note on the following BT1 CO3

i) Sandmeyer reaction b) Benzyne mechanism

3. a) Write the preparation of alcohols using Grignard reagent and Bouveault - Blanc reduction BT1 CO4

b) Explain Lucas method for identification of 1^o, 2^o, 3^o alcohols. BT3 CO2

(OR)

4. Explain the mechanism of Reimer-Tiemann and Kolbe-Schmidt reaction. BT1 CO3

5. How does Acetone react with the following reagents BT3 CO3

i) HCN ii) NaSHO₃ iii) NH₂OH iv) NH₂NH₂

(OR)

6. Discuss the mechanism of Aldol condensation and Cannizzaro reaction BT1 CO2

7. Explain the acidic and alkaline hydrolysis of esters with mechanism. BT2 CO2

(OR)

8. Write the preparation and any two synthetic applications of Aceto Acetic Ester. BT2 CO1

9. Discuss the constitution and configuration of glucose with experimental evidence and Write objections for open chain structure of glucose. BT3 CO3


(OR)

10. How do you convert i) Glucose to Fructose ii) Aldopentose to Aldohexose BT2 CO4

PART- B

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

11. Compare the reactivity of alkyl halides and vinyl halides BT4 CO2
12. Write the mechanism for Pinacol-Pinacolone rearrangement. BT2 CO1
13. Write a short note on Fries rearrangement. BT1 CO3
14. Give any two reduction reactions of carbonyl compounds. BT1 CO4
15. Explain the mechanism of Perkin reaction BT2 CO1
16. Write any two preparation methods for carboxylic acids. BT1 CO4
17. Write the mechanism of Huns-Diecker's reaction BT2 CO3
18. What is mutarotation? Why glucose shows mutarotation? BT2 CO2

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code C6 -P	TITLE OF THE COURSE Course -6: ORGANIC PREPARATIONS (Halogen and Oxygen containing organic compounds)	II B.SC CHEMISTRY(H) (III Semester)			
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre-requisites	Basic knowledge on handling of glassware and chemicals	-	-	2	1

Course Objectives:

- 1.To provide basic knowledge about the handling of laboratory apparatus
2. To provide knowledge on calculating limiting reagent, theoretical yield, and percent yield.
3. To provide hands on training on laboratory techniques including reflux, distillation, recrystallization, vacuum filtration.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	How to use glassware, equipment and chemicals and follow experimental procedures in the laboratory.
CO2	How to calculate limiting reagent, theoretical yield, and percent yield.
CO3	How to perform common laboratory techniques including reflux, distillation, recrystallization, vacuum filtration.
CO4	How to critically evaluate data collected to determine the identity, purity and percent yield of products and to summarize findings in writing in a clear and concise manner.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	-
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Syllabus - Organic preparations (50M)


- a. Acetylation of β -naphthol, vanillin and salicylic acid by:
 - i. Using conventional method.
- b. Using green approach Preparation of Nerolin

Reference books:

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

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	2	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.	2.75	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(H) III Semester			
	TITLE OF THE COURSE: PHYSICAL CHEMISTRY	Course 7			
Course Code 7					
Teaching	Hours Allocated: (Theory) 45	L	T	P	C
Pre-requisites:	Basic Knowledge about Solids, Liquids, Gases and Solutions	3		-	3

Course Objectives:

The objective of this course is to provide students with a comprehensive understanding of the essential concepts and applications of Solids, liquids, gases, solutions and ionic equilibria. The course aims to develop students' critical thinking, problem-solving, and analytical skills in

these areas, enabling them to apply scientific principles to real-world situations.

On Completion of the course, the students will be able to-		Cognitive Domain
CLO 1	Gain Knowledge about the concepts of Solutions . solids. Liquids .gases and ionic equilibrium	Knowledge
CLO 2	At the end of the course , the students will be able to Understand the basic concepts of Solids, Liquids, Gases. Solutions and ionic equilibria	Understanding
CLO 3	application of Distribution law to various systems, application of liquid crystals to LCD devices	Application
CLO 4	compare and conclude theoretical concepts and applications today to situations	Evaluation
CLO 5	Analyze and calculate the mathematical problems on different concepts	Analysis

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

PHYSICAL CHEMISTRY

3 hrs/week.

UNIT-I

9h

SOLID STATE: **Symmetry in crystals**. Law of constancy of interfacial angles. The law of rationality of indices. The law of symmetry. Definition of lattice point, space lattice, unit cell. **X-ray diffraction and crystal structure**. Bragg's law. Defects in crystals. Stoichiometric and non-stoichiometric defects.

UNIT-II

9h

GASEOUS STATE Introduction and derivation of Ideal Gas Equation. Vander Waal's equation of state. P-V Isotherms of real gases, Andrew's isotherms of carbon dioxide. Critical phenomena. The vanderwaal's equation and the critical state. Law of corresponding states. Relationship between critical constants and vander Waal's constants. **Joule Thomson effect**.

UNIT-III:

9h

LIQUID STATE Structural differences between solids, liquids and gases. Liquid crystals, the mesomorphic state. Classification of liquid crystals into Smectic and Nematic. Differences between liquid crystal and solid/liquid. **Application of liquid crystals as LCD devices**.

UNIT-IV

9h

SOLUTIONS Liquid-liquid - ideal solutions, Raoult's law. Ideally dilute solutions, Henry's law. Non-ideal solutions. Azeotropes-HCl-H₂O, ethanol-water systems **and fractional distillation**. Partially miscible liquids-phenol-water. Effect of impurity on consolute temperature. Immiscible liquids and **steam distillation**. Nernst distribution law. Calculation of the partition coefficient. **Applications of distribution law**.

UNIT-V

9h

IONIC EQUILIBRIUM AND HSAB Ionic Product, common ion effect, solubility and solubility product. Definition of acid and base with examples, Pearson concept, HSAB Principle & its importance definition of **buffer solution**. **Henderson –Hassel batch Equation**

List of Reference Books

1. Principles of physical chemistry by Prutton and Marron
2. Solid State Chemistry and its applications by Anthony R. West
3. Text book of physical chemistry by K L Kapoor
4. Text book of physical chemistry by S Glasstone
5. Advanced physical chemistry by Bahl and Tuli

Web Links:

<https://youtu.be/IPN0WWfwts?list=PLHhInNg2PQWVHNecGWt3YAxFcKTW44nJX>

<https://youtu.be/cmnqmdTZU80>

CLO-PLO Mapping:

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

Proposed Activities:

Skill Development: 1.

Employability

	PL O1	PL O2	PL O3	PL O4	PL O5	PL O6	PL O7	PL O8	PL O9	P L O 10
CLO1	3	2	2	1	1	0	0	0	3	0
CLO2	3	1	2	1	1	0	0	0	3	0
CLO3	3	3	3	1	1	0	0	0	3	0
CLO4	3	3	3	2	2	0	0	0	3	0
CLO5	3	3	3	2	2	0	0	0	3	0
Avg.	3	2.4	2.6	1.4	1.4	0	0	0	3	0

**GOVERNMENT COLLEGE (A)
RAJAMAHENDRAVARAM**

II B.Sc. ,CHEMISTRY (H)

**SEMESTER-III
QUESTION PAPER
BLUEPRINT**

Course -7: PHYSICAL CHEMISTRY

TIME: 2½ 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. 2 Questions from UNIT- IV
10. 1 Questions from UNIT- V

GOVERNMENT COLLEGE (A), RAJAHMUNDRY II B.Sc.

CHEMISTRY (H)

SEMESTER-III

MODEL PAPER (From 2024-25)

Course – 7 Physical chemistry

Time: 2½ hrs.

Maximum Marks: 50

PART-A

Answer ALL the questions. Each carries SEVEN marks

5 x 7 = 35 M

1) Explain Crystal defects (or)

2) What is Bragg's Law. Derive Bragg's equation

3) Derive the relationship between
Critical & Vanderwaal constants

(or)

4) Derive the Vander Waal's equation of state

5) Differentiate between liquid
crystals & liquids

(or)

6) Discuss any three applications
of Liquid crystals.

7) Explain Nernst distribution Law.
Explain its applications

(or)

8) Explain what azeotropes are
, Discuss the behavior of HCl-H₂O
and
ethanol-water systems as azeotropes

9) Explain the Hard and Soft Acids
and Bases (HSAB) principle

(or)

10) Using the Henderson-Hasselbalch Eq
describe how the pH of a buffer solution
can be calculated

Marks	BL	CLO	PLO	PI
7	2	1	1	
7	2	2	2	
7	2	1	2	
7	2	3	2	
7	5	1	9	
7	2	2	5	
7	4	1	3	
7	3	4	2	
7	6	5	5	
7	3	4	4	


PART-B

Answer any FIVE Questions

5 × 3 = 15 M

- 11) write number of atoms in fcc and bcc unit cells
- 12) Discuss the Law of Constancy of Interfacial Angles
- 13) Explain the Joule-Thomson effect and its importance in thermodynamics.
- 14) using Andrew's isotherms how do you explain behavior of carbon dioxide near its critical point?
- 15) What are Smectic & Nematic liquid Crystals? Explain
- 16) Describe the principle of steam distillation. Why is it particularly useful for immiscible liquids?
- 17) A solid X is added to a mixture of benzene and water. After shaking well and allowing to stand, 10 ml of the benzene layer was found to contain 0.13 g of X and 100 ml of water layer contained 0.22g of X. Calculate the value of distribution coefficient.
- 18) , Explain common ion effect

Marks	BL	CLO	PLO	PI
3	1	1	1	
3	2	2	2	
3	2	1	3	
3	6	3	5	
3	5	3	9	
3	2	5	2	
3	4	4	3	
3	5	5	4	

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code Major7 practical	TITLE OF THE COURSE Course -7: Physical chemistry practical	B.Sc CHEMISTRY (H) (III Semester)			
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre-requisites	Theoretical Knowledge about liquid properties like surface tension and viscosity, Knowledge about partition coefficient	-	-	2	1

Course Objectives:

- a. Measurement of liquid property like Surface tension, Viscosity
- b. Measurement of partition coefficient of substance between two liquids
- c. Correct Usage of different lab equipment

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Understand the basic concepts surface tension. viscosity and partition coefficient
CO2	Usage of glassware, equipment used for surface tension, viscosity and Partition coefficient measurement
CO3	Acquire knowledge of measurement of surface tension. viscosity of different liquids and distribution coefficient of substance between two liquids procedure.
CO4	Acquire knowledge of accurate measurement . tabulation of readings and calculation of results

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	-
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SYLLABUS

Credits: 1 (2 hrs/week)

i. Determination of molecular status and partition coefficient of benzoic acid in Benzene and water.

ii. Determination of Surface tension of liquid 1

iii. Determination of Surface tension of liquid 2

iv. Determination of Viscosity of liquid.1

v. Determination of Viscosity of liquid.2

List of Reference Books

- c. O.P. Pandey, D.N. Bajpai & S. Giri, Practical Chemistry, S. Chand & Company Ltd.
- d. 2. B. D. Khosla, V. C. Garg & A. Gulati, Senior Practical Physical Chemistry, S. Chand & Co.: New Delhi (2011).
- e. 3. C. W. Garland, J.W. Nibler, & D.P. Shoemaker, Experiments in Physical Chemistry 8th Ed.; McGrawHill: New York (2003).
- f. 4. R.C. Das and B. Behra, Experiments in Physical Chemistry,; Tata McGraw Hill.


Web Links:

<https://youtu.be/xGIXcpcPgYs>

CLO-PLO Mapping:

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

	PL O1	PL O2	PL O3	PL O4	PL O5	PL O6	PL O7	PL O8	PL O9	P L O 10
CLO1	3	2	2	3	2	1	0	0	3	0
CLO2	3	2	2	3	2	1	0	0	3	0
CLO3	3	3	3	3	2	1	0	0	3	0
CLO4	3	3	3	3	2	1	0	0	3	0
Avg.	3	2.5	2.5	3	2	1	0	0	3	0

	Government College (Autonomous) Rajahmundry	Program & Semester II B.Sc. CHEMISTRY (H) SEMESTER-III			
Course Code Major-8	TITLE OF THE COURSE COURSE CODE 8: INORGANIC AND PHYSICAL 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) Apply IUPAC nomenclature for Coordination compounds
- 2) Understand the various theories, structure and stereo chemistry of coordination compounds.
- 3) Explain the reaction mechanism in complexes.
- 4) Apply the 18 electron rule.
- 5) Discuss the basic concepts of thermodynamics.

Course Outcomes:

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	1. Understand the IUPAC nomenclature for Coordination compounds	Understanding
CO2	2. Understand the basic concepts of thermodynamics	Understanding
CO3	3. Explain Reaction mechanism and stereo chemistry of coordination compounds	Application
CO4	4. Application and problems on 18 electron rule	Application
CO5	Compare the theoretical and practical results regarding the properties of compounds.	Evaluating

Course with focus on Employability / Entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit I Coordination Chemistry-I (9 h)

IUPAC nomenclature of Coordination compounds, structural and stereo isomerism in complexes with coordination numbers 4 and 6. Valence Bond Theory(VBT): Postulates- magnetic properties- Inner and outer orbital complexes. Limitations of VBT, CFT- Postulates- Splitting in Octahedral, tetrahedral, tetragonal and square planar fields. Crystal field stabilization energy(CFSE), Crystal field effects for weak and strong fields. Factors affecting the magnitude of crystal field splitting energy, Spectro chemical series.

UNIT-II Coordination Chemistry II (9 h)

1. Inorganic molecular Reaction Mechanism: (6 h)

Introduction to inorganic reaction mechanisms. Labile and inert complexes, ligand substitution reactions – SN_1 and SN_2 , Substitution reactions in square planar complexes, Trans-effect and its applications

2. Stability of metal complexes: (3 h)

Thermodynamic stability and kinetic stability, factors affecting the stability of metal complexes, chelate effect, determination of composition of complex by Job's method

Unit III Organo metallic compounds (9 h)

Definition and classification of organo metallic Compounds on the basis of bond type, Metalcarbonyls: 18electron rule, electron count of mononuclear, poly nuclear and substituted metal carbonyls of 3d series. General methods of preparation of mono and binuclear carbonyls of 3d series. π -acceptor behaviour of CO

Unit IV Thermodynamics- I (9 h)

Concept of heat(q), work(w), internal energy(U), State function and Path function- statement of first law; enthalpy(H), relation between heat capacities, calculations of q, w, U and H for reversible, irreversible processes, Joule-Thomson effect- coefficient.

Calculation of work for the expansion of perfect gas under **isothermal and adiabatic conditions for reversible processes**. Temperature dependence of enthalpy of **formation-Kirchoff's equation**.

Unit V Thermodynamics II

(9 h)

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. Third law of thermodynamics.

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);

	CLO \ PLO	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
Inorganic & Physical Chemistry	CLO1	3	2	2	1	1	0	0	0	3	0
	CLO2	3	2	2	1	1	0	0	0	3	0
	CLO3	3	3	3	1	1	0	0	0	3	0
	CLO4	3	3	3	2	2	0	0	0	3	0
	CLO5	3	3	3	2	2	0	0	0	3	0
	Avg.	3	2.6	2.6	1.4	1.4	0	0	0	3	0

**GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM II B.Sc.
CHEMISTRY (H)**

**SEMESTER – III
QUESTION PAPER BLUE PRINT**

Course -8: INORGANIC AND PHYSICAL CHEMISTRY

TIME: 2¹/₂ 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. 1 Questions from UNIT- II
3. 2 Question from UNIT- III
4. 1 Questions from UNIT- IV
5. 2 Questions from UNIT- V

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
II B.Sc. CHEMISTRY Hons. (SEMESTER-III)
MODEL PAPER

MODEL PAPER (From 2024-25)

Course -8: INORGANIC AND PHYSICAL CHEMISTRY

Time: 2¹/₂ Hrs.

Maximum Marks: 50

PART- A

Answer ALL the questions. Each question carries SEVEN marks.

5 x 7M = 35 M

	Ma rks	BL	CLO	PLO	PI
1a Discuss the stereo chemistry of compounds involving coordination number six.	7	2	1	1	
OR					
1b Describe the splitting of d- orbitals in octahedral complexes	7	2	2	2	
2a Describe JOB's Method for the determination of composition of a complex.	7	2	1	2	
OR					
2b Write briefly about SN2 reactions of square planar complexes?	7	2	3	2	
3a Explain the general methods of preparation of mono and binuclear carbonyls with examples	7	5	1	9	
OR					
3b Define 18 electron rule? Give one example for each mononuclear, poly nuclear and substituted metal carbonyls?	7	4	1	3	
4a State and explain first law of thermodynamics? Give its limitations.	7	3	5	2	
OR					
4b Derive Kirchoff's equation and indicate some of its applications					

5a Describe Carnot cycle and show that the work efficiency of a heat engine in a cyclic process is

7	6	4	5	
7	3	5	4	

maximum.

OR

5b Write about the entropy changes in reversible processes.


PART – B

Answer any **FIVE** of the following questions.

5x3 = 15 M

- 6 Write a short note on spectrochemical series.
- 7 Discuss about back bonding.
- 8 Explain the Trans effect.
- 9 Write the classification of organo metallic compounds on the basis of metal carbon bond?
- 10 Explain about Chelate effect.
- 11 Brief discuss about Joule-Thomson effect.
- 12 Write a short note on second law of thermodynamics
- 13 What is Carnot theorem.

Marks	BL	CLO	PLO	PI
3	1	1	1	
3	2	2	2	
3	2	1	3	
3	6	3	5	
3	5	3	9	
3	2	4	2	

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code Major-8 practical	TITLE OF THE COURSE Course -8: ANALYSIS OF INORGANIC MIXTURE	II B.Sc. CHEMISTRY(H) (III 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	-
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Syllabus

Analysis of Inorganic mixture

50 M

Analysis of simple salt containing TWO anions and TWO cations (from two different groups) 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

References:

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);

	CLO\ PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
Analysis of simple salt Analysis	CLO1	3	2	2	3	2	1	0	0	3	0
	CLO2	3	2	2	3	2	1	0	0	3	0
	CLO3	3	3	3	3	2	1	0	0	3	0
	CLO4	3	3	3	3	2	1	0	0	3	0
	Avg.	3	2.5	2.5	3	2.0	1	0	0	3	0

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

III SEMESTER END EXAMINATIONS


LABORATORY Course -8: ANALYSIS OF INORGANIC MIXTURE -- PRACTICAL

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 II B.Sc. ORGANIC CHEMISTRY (SEMESTER – IV)			
Course Code 9	TITLE OF THE COURSE Course -9: SPECTROSCOPY				
Teaching	Hours Allocated: 45 (Theory) (3 hrs. / Wk.)	L	T	P	C
Pre-requisites:	Basic knowledge about spectrum and its classification	3	-	-	3

Course Objectives:

1. To inculcate basic knowledge on basic concepts like Beer-Lambert's law
2. To understand the concept of Spectroscopy
3. To illustrate the classification of spectroscopies
4. To provide knowledge and applications on various spectroscopies

Course Outcomes:

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	Understand the basic governing law of spectroscopy – Beer lamberts law and interaction of electromagnetic radiation with matter	Knowledge
CO2	Learn Principles of Electronic, IR and NMR spectroscopies	Understand
CO3	Understand Applications of Electronic, IR and NMR spectroscopies	Application
CO4	Applying principles of various spectroscopies to various organic compounds	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

UNIT-I

GENERAL FEATURES OF ABSORPTION

Beer-Lambert's law and its limitations, transmittance, Absorbance, and molar absorptivity. Single and double beam spectrophotometers. Application of Beer-Lambert's law for quantitative analysis of 1. Chromium in $K_2Cr_2O_7$ 2. Manganese in Manganous sulphate

UNIT-II

ELECTRONIC SPECTROSCOPY:

Interaction of electromagnetic radiation with molecules and types of molecular spectra. Energy levels of molecular orbitals (σ , π , n). Selection rules for electronic spectra. Types of electronic transitions in molecules.

Concept of chromophore and auxochrome. Bathochromic shift, Hypsochromic shift, hyper chromic shift, hypochromic shift. Effect of conjugation on λ_{\max} .

UNIT-III

INFRA RED SPECTROSCOPY:

Different Regions in Infrared radiations. Modes of vibrations in diatomic and polyatomic molecules. Characteristic absorption bands of various functional groups. Interpretation of spectra-Alkanes, Aromatic, Alcohols carbonyls, and amines with one example to each. Significance of Functional group and fingerprint Region.

UNIT-IV

PROTON MAGNETIC RESONANCE SPECTROSCOPY (1H-NMR)

Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, NMR splitting of signals - spin-spin coupling, coupling constants.

UNIT-V

APPLICATIONS

Application of electronic spectroscopy-Woodward-Fieser rules for calculating λ_{\max} of conjugated dienes and α,β -unsaturated carbonyl compounds. Applications of IR Spectroscopy NMR Spectra of Ethyl bromide, Ethanol, Acetaldehyde, 1,1,2-Tribromo ethane, Ethyl acetate, Toluene and Acetophenone.

List of Reference Books:

1. Spectroscopy by William Kemp
2. Spectroscopy by Pavia
3. Organic Spectroscopy by J. R. Dyer
4. Elementary organic spectroscopy by Y.R. Sharma
5. Spectroscopy by P.S. Kalsi
6. Organic spectroscopy by Jagmohan

CLO-PLO Mapping:

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

	CL O/P LO	PL O1	PL O2	PL O3	PL O4	PL O5	PL O6	PL O7	PL O8	PLO 9	PLO1 0	CLO \PLO	PLO1
CLO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CLO2	2	3	3	3	3	2	1	2	2	3	2	2	3
CLO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CLO4	2	1	2	1	3	2	3	1	2	3	2	3	2
CLO5	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
II B.Sc. ORGANIC CHEMISTRY (Hons.) SEMESTER-IV 2024-25
CHEMISTRY COURSE-9: SPECTROSCOPY

QUESTION PAPER BLUE PRINT

TIME: 2½ Hrs.

MAX. MARKS: 50 PART – A

Answer **ALL** the following questions.

5x7 = 35 M

1a Question from UNIT-I

OR

1b Question from UNIT-I

2a Question from UNIT-II

OR

2b Question from UNIT-II

3a Question from UNIT-III

OR

3b Questions from UNIT-III

4a Question from UNIT-IV

OR

4b Question from UNIT-IV

5a Question from UNIT-V

OR

5b Question from UNIT-V

PART – B

Answer any **FIVE** of the following questions.

5x3 = 15 M

6 Question from UNIT-I

7 Question from UNIT-II

8 Question from UNIT-III

9 Question from UNIT-IV

10 Question from UNIT- V

11 Question from UNIT-II

12 Question from UNIT-III

13 Question from UNIT- V

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
II B.Sc. ORGANIC CHEMISTRY
SEMESTER-IV
MODEL PAPER (From 2024-25)
Course - 9: SPECTROSCOPY

Time: 2½ hrs

Max.Marks:50

PART- A

Answer ALL the questions. Each carry SEVEN marks

5 x 7 = 35 M

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
II B.Sc. ORGANIC CHEMISTRY, SEMESTER-IV 2024-25
CHEMISTRY COURSE-9: SPECTROSCOPY

MODEL QUESTION PAPER

TIME: 2½ hrs.

MAX. MARKS: 50

PART – A

Answer ALL the following questions.

5x7 = 35

	Marks	BL	CLO	PLO	PI
1a State and explain Beer-Lambert's law. OR	7	2	2	1	
1b Give the experimental procedure for determination of Chromium in Potassium dichromate using Beer-Lambert's law.	7	2	2	2	
2a What are electronic transitions? Explain different types of electronic transitions with suitable examples. OR	7	2	1	2	
2b Explain different types of Absorption-Intensity shifts in Electronic Spectroscopy.	7	2	3	2	
3a Explain the significance of functional group region and fingerprint region with suitable examples. OR	7	5	1	7	
3b Discuss different modes of vibrations in IR spectroscopy.	7	2	2	5	
4a What is chemical shift? Write the factors effecting chemical shift. OR	7	4	1	3	
4b What is spin-spin coupling? Describe different types of coupling constants.	7	3	4	2	
5a How many different NMR signals you will observe in the following organic compounds? (i)Ethanol (ii)Ethyl bromide (iii)Toluene OR	7	6	5	5	
5b Describe the Woodward-Fieser rules for calculating λ_{\max} of α,β – unsaturated carbonyl compounds.	7	3	3	4	

PART – B

Answer any **FIVE** of the following questions.

5x3 = 15 M

	Marks	BL	CLO	PLO	PI
6	Define Absorbance, transmittance and molar absorptivity.	3	1	1	1
7	Write a short note on Chromophores.	3	2	1	2
8	Write the characteristic absorption bands of various organic functional groups.	3	2	1	3
9	What are equivalent and non-equivalent protons?	3	6	3	5
10	Write any two applications of UV- Vis spectroscopy with suitable examples.	3	5	3	7
11	Explain Auxochromes with suitable examples..	3	2	5	2
12	Mention the important IR vibrational frequencies of Carbonyl compounds and Amines.	3	4	4	3
13	Describe the NMR spectrum of Acetaldehyde.	3	5	4	3

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
II B.Sc. ORGANIC CHEMISTRY, SEMESTER-IV 2024-25
CHEMISTRY COURSE-9: SPECTROSCOPY

QUESTION BANK


Essay Questions

1. Define Absorbance, transmittance, and molar absorptivity. State and explain Beer-Lambert law
2. Give the experimental procedure of simultaneous determination of chromium in potassium dichromate and manganese in Manganous Sulphate using Beer-Lambert's law.
3. Explain types of molecular spectra and selection rules for the formation of spectra.
4. Write about different energy levels of electronic spectroscopy.
5. Define Chromophore and auxochrome. How does the conjugation, affect the λ_{\max} .
6. Write about characteristic absorption bands of various functional groups.
7. Explain the Fingerprint region. Explain its significance with an example. Write IR spectral data for any one alcohol, aldehyde and ketone.
8. Explain Functional group and finger print regions.
9. Discuss different modes of vibrations in IR spectroscopy.
10. Give a detailed explanation on the principle of NMR spectroscopy. What is a chemical shift equivalence?
11. Describe the role of equivalent and non-equivalent protons in NMR spectroscopy.
12. Explain the position of signals.
13. How many different NMR signals you will see in the following molecules? Ethanol, Ethyl Acetate, toluene and Acetophenone.
14. Explain the applications of UV – Vis and IR spectroscopies in structure determination of organic compounds.
15. Application of NMR to ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate, toluene and acetophenone.

Short Answer Questions

16. Discuss single and double-beam spectrophotometers.
17. Write briefly about different shifts in UV – Vis Spectroscopy.

18. Explain types of electronic transitions in UV – Vis Spectroscopy.
19. Write a short note on different regions in IR.
20. Write IR stretching frequencies of alkanes and amines.
21. Explain about spin-spin coupling in NMR.
22. Define principle of NMR.
23. Define coupling constant with examples.
24. Write any two applications of UV- Vis spectroscopy with examples.

	Government College (Autonomous) Rajahmundry	Program & Semester II B.Sc. CHEMISTRY (H) (SEMESTER – IV)			
Course Code 9	TITLE OF THE COURSE Course 9: SPECTROSCOPY				
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre-requisites	Preparation of standard solutions and handling of laboratory apparatus and instruments	-	-	2	1

Course Objectives:

- To demonstrate basic knowledge about the handling of laboratory apparatus
- To illustrate knowledge about the preparation of standard solutions
- To provide hands-on training for the determination of different organic compounds

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Learn to Handle and calibrate the common laboratory glass apparatus and instruments
CO2	Get practical skill to the preparation of different standard solutions used for quantitative analysis
CO3	Identify and confirm the structure of a given organic compounds
CO4	Principles and applications of different molecular spectra

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	-
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IR spectral analysis of the following functional groups with examples

i. Hydroxyl Groups

ii. Carbonyl Groups


iii. Amino Groups

iv. Aromatic Groups

CLO-PLO Mapping:

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

	CL OP LO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO1 0	CLO\ PLO	PLO1
CLO1	3	3	3	2	3	2	2	2	3	2	2	3	3
CLO2	3	3	3	2	3	2	2	3	2	3	3	3	3
CLO3	3	2	3	2	3	1	2	2	2	2	2	3	2
CLO4	3	3	2	1	3	2	2	1	2	3	3	3	3
CLO5	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 (H),			
Course Code C10	TITLE OF THE COURSE Course -10: PHYSICAL CHEMISTRY-II				
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 on Colligative Properties
2. To provide basic awareness on concepts of electrochemistry
3. To understand the basic concepts of Electrodes and their usage
4. To provide knowledge and understand ability on phase systems
5. To Provide the knowledge on photochemistry

Course Outcomes:

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	Understand the concept of Colligative Properties.	Knowledge and Application
CO2	Understand the basic concepts of electrochemistry	Knowledge
CO3	Understand the basic concepts of Electrodes and their usage	Understand and application
CO4	To understand basic concepts of phase rule	Application

CO5	Understand the laws of photochemistry and learn how to calculate the quantum yields of different photo physical processes	Knowledge
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Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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SYLLABUS

UNIT-I DILUTE SOLUTIONS

Colligative properties. Raoult's law, relative lowering of vapour pressure, its relation to molecular weight of non-volatile solute. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. osmotic pressure, experimental determination. Theory of dilute solutions. Determination of molecular weight of non-volatile solute from osmotic pressure. Abnormal Colligative properties- Van't Hoff factor.

UNIT-II ELECTROCHEMISTRY-I

Specific conductance, equivalent conductance. Variation of equivalent conductance with dilution. Migration of ions, Kohlrausch's law. Arrhenius theory of electrolyte dissociation and its limitations. Ostwald's dilution law. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Definition of transport number, determination by Hittorfs method. Application of conductivity measurements- conductometric titrations.

UNIT-III ELECTROCHEMISTRY-II

Single electrode potential, sign convention, Reversible and irreversible cells Nernst Equation- Reference electrode, Standard Hydrogen electrode, calomel electrode, Indicator electrode, metal – metal ion electrode, Inert electrode, Determination of EMF of cell, Applications of EMF measurements - Potentiometric titrations.

UNIT-IV PHASE RULE

Concept of phase, components, degrees of freedom. Thermodynamic Derivation of Gibbs phase rule. Phase equilibrium of one component system - water system. Phase equilibrium of two- component system, solid-liquid equilibrium. Simple eutectic diagram of Pb-Ag system, simple eutectic diagram, desilverisation of lead., NaCl-Water system, Freezing mixtures.

UNIT-V PHOTOCHEMISTRY

Difference between thermal and photochemical processes. Laws of photochemistry- Grothus- Draper's law and Stark-Einstein's law of photochemical equivalence. Quantum yield-Photochemical reaction mechanism- hydrogen- chlorine, hydrogen- bromine reaction. Qualitative description of fluorescence, phosphorescence, Photosensitized

LIST OF REFERENCE BOOKS

19. Modern Electrochemistry by J.O. M. Bockris and A.K.N.Reddy
20. Advanced Physical Chemistry by Atkins
21. Introduction to Electrochemistry by S. Glasstone

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

II B.Sc. CHEMISTRY (H), ORG CHEMISTRY, ANALYTICAL CHEMISTRY & INDUSTRIAL
CHEMISTRY

SEMESTER – IV

PHYSICAL CHEMISTRY-II WEIGHTAGE TO CONTENT
& BLUE PRINT

S.NO.	COURSE CONTENT	LONG ANSWER QUESTIONS	SHORT ANSWER QUESTIONS	TOTAL MARKS	AS PER BLOOMS TAXONOMY
1.	UNIT - I	2	1	17	Understanding, Application
2.	UNIT – II	2	2	20	Remembering, Understanding
3.	UNIT – III	2	2	20	Analyzing, Creation
4.	UNIT – IV	2	2	20	Evaluation, Understanding
5.	UNIT - V	2	1	17	Understanding, Application
	TOTAL	10	8	94	

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
II B.Sc. CHEMISTRY (H), ORG CHEMISTRY, ANALYTICAL CHEMISTRY & INDUSTRIAL
CHEMISTRY
SEMESTER-IV
MODEL PAPER (From 2024-25)
Course - 10: PHYSICAL CHEMISTRY-II

Time: 2¹/₂ hrs.

Maximum Marks: 50

PART- A

Answer ALL the questions. Each carry SEVEN marks


5 x 7 = 35 M

1. What is elevation in boiling point and derive the relation between molecular weight of solute and elevation in boiling point? BT2 CO1 PO1
(OR)
2. Define osmotic pressure and explain their experimental determination? BT2 CO1 PO1
3. Explain Arrhenius theory of dissociation and its limitations BT2 CO2 PO2
(OR)
4. Define the transport number and determine the transport number by Hittorf's method BT1 CO2 PO2
5. Derive the Nernst equation BT2 CO3 PO3
(OR)
6. Describe the following electrodes (a) Calomel electrode (b) Indicator electrode BT2 CO3 PO3
7. Derive the Gibbs phase rule? BT1 CO4 PO4
(OR)
8. Explain phase diagram of Pb-Ag System BT3 CO4 PO4
9. Describe the laws of photo chemistry BT2 CO5 PO5
(OR)
10. Derive the quantum yield of Hydrogen chloride photochemical reaction through mechanism BT3 CO5 PO5

PART- B

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

11. Why ethylene glycol used as an antifreeze explain? BT1 CO1 PO1
12. Explain the Kohlrausch law BT2 CO2 PO2
13. How does dilution effect the conductivity of electrolyte solution? BT2 CO2 PO2
14. How does the standard hydrogen electrode (SHE) serve as reference point for measuring electrode potentials? BT3 CO3 PO3
15. Explain how a metal-metal ion electrode works? BT1 CO3 PO3
16. How does pressure influence the phase equilibrium of water? BT3 CO4 PO4
17. How is the eutectic point utilized in the desilverisation process? BT2 CO4 PO5
18. Define fluorescence and phosphorescence? BT1 CO5 PO5

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code	TITLE OF THE COURSE Course -10: PHYSICAL CHEMISTRY LAB	II B.Sc. CHEMISTRY (H), IV 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:

- To provide hands-on experience in determining the CST of the phenol-water system through laboratory experiments.
- To guide students in designing and conducting experiments to study the effect of NaCl on the CST and analyze the resultant data.
- To train students in performing conductometric titrations using standard NaOH solutions for the accurate determination of HCl concentration.
- To equip students with the skills necessary to conduct conductometric titrations to determine the concentration of CH₃COOH using standard NaOH solutions.

Course Outcomes:

On Completion of the course, the students will be able to

CO1	Analyze the phase behavior of the phenol-water system at different temperatures and concentrations.
CO2	Predict and explain the shifts in CST due to the addition of NaCl to the phenol-water system.
CO3	Develop the skills to perform conductometric titrations using standard NaOH solutions.
CO4	Interpret conductometric titration curves and derive accurate concentrations of CH ₃ COOH from experimental data

Course with focus on employability / entrepreneurship / Skill Development modules


Skill Development		Employability		Entrepreneurship	-
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1. Critical solution temperature of phenol-water system
2. Effect of NaCl on CST (phenol water system)
3. Determination of concentration of HCl conductometrically using standard NaOH Solutions
4. Determination of concentration of CH₃COOH conductometrically using standard NaOH 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			
Course Code C11	TITLE OF THE COURSE Course 11: ORGANIC CHEMISTRY		II B.Sc. CHEMISTRY (H) (SEMESTER – IV)			
Teaching	Hours Allocated: 60 (Theory)		L	T	P	C
Pre-requisites	Basic knowledge on structure and reactivity of organic compounds		3	1	-	3

Course Objectives:

1. To provide knowledge on reactivity of Nitro hydrocarbons and Nitrogen compounds.
2. To provide basic awareness on preparatory methods and chemical properties of Carbohydrates and Amino acids.
3. To understand classification of Aromatic and aliphatic Nitrogen compounds

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	Understand the chemical properties of nitrogen compounds and carbohydrates.	Understanding
CO2	Describe the basicity of different types of amines.	Skill
CO3	Achieve the skills required to propose various mechanisms	Skill
CO4	Apply the concepts for synthesis of various nitrogen containing organic compounds	Understanding

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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SYLLABUS

UNIT – I: NITRO HYDROCARBONS

7hrs

Nomenclature and classification-nitro hydrocarbons, structure -Tautomerism of nitroalkanes leading to aci and keto form, Preparation of Nitroalkanes, reactivity -halogenation, reaction with HONO (Nitrous acid), Nef reaction and Mannich reaction leading to Micheal addition and reduction.

UNIT – II: NITROGEN COMPOUNDS 7hrs

ALIPHATIC AMINES: Nomenclature, Classification into 1°, 2°, 3° Amines and Quarternary ammonium compounds. Preparative methods —

1. Ammonolysis of alkyl halides 2. Gabriel synthesis 3. Hoffman's bromamide reaction (mechanism).

Reduction of Amides and Schmidt reaction. Physical properties and basic character - Comparative basic strength of Ammonia, methyl amine, dimethyl amine, trimethyl amine.

UNIT – III: AROMATIC AMINES:

15hrs

Introduction comparative basic strength of aniline, N-methylaniline and N,N-dimethyl aniline (in aqueous and non-aqueous medium), steric effects and substituent effects. Chemical properties: a) Alkylation b) Acylation c) Carbylamine reaction d) Hinsberg separation e) Reaction with Nitrous acid of 1°, 2°, 3° (Aliphatic and aromatic amines). Electrophillic substitution of Aromatic amines — Bromination and Nitration. Oxidation of aryl and Tertiary amines, Diazotization.

UNIT – IV: CARBOHYDRATES

15hrs

Monosaccharides: (+) Glucose (aldo hexose) - Evidence for cyclic structure of glucose (some negative aldehydes tests and mutarotation) - Proof for the ring size (methylation, hydrolysis and oxidation reactions) - Pyranose structure (Haworth formula and chair conformational formula).

(-) Fructose (keto hexose) - Evidence of 2 - keto hexose structure (formation of pentaacetate, formation of cyanohydrin its hydrolysis and reduction by HI). Cyclic structure for fructose (Furanose structure and Haworth formula) - osazone formation from glucose and fructose — Definition of anomers with examples.

Interconversion of Monosaccharides: Aldopentose to Aldo hexose (Arabinose to

D- Glucose, D-Mannose) (Kiliani - Fischer method). Epimers, Epimerisation - Lobry de bruyn van Ekenstein rearrangement. Aldo hexose to Aldopentose (D-Glucose to

D- Arabinose) by Ruff degradation. Aldo hexose to Keto hexose

[(+)] Glucose to (-) Fructose] and Keto hexose to Aldo hexose (Fructose to Glucose)

UNIT – IV: AMINO ACIDS**15hrs**

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) Malonic ester 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).

Reference books:

- A. Organic Chemistry by G.Mare loudan, Purdue Univ
- B. A Text Book of Organic Chemistry by Bahl and Arun bahl
- C. A Text Book of Organic chemistry by I L Finar Vol

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	2	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	1.75	2.5	1.75	2.25	2	2.25	2.25	2.5	2.5	2.75

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM II B.Sc.

CHEMISTRY(H) SEMESTER – IV

Course -11 : ORGANIC CHEMISTRY

WEIGHTAGE TO CONTENT & BLUE PRINT

S.NO.	COURSE CONTENT	LONG ANSWER QUESTIONS	SHORT ANSWER QUESTIONS	TOTAL MARKS
1.	UNIT - I	2	1	17
2.	UNIT – II	2	2	20
3.	UNIT – III	2	2	20
4.	UNIT – IV	2	2	20
5.	UNIT - V	2	1	17
	TOTAL	10	8	94

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
II B.Sc. CHEMISTRY(H)
SEMESTER-IV MODEL
PAPER

Course - 11: ORGANIC CHEMISTRY

Time: 2½ hrs.

Maximum Marks: 50

PART-A

Answer ALL the questions. Each question carries SEVEN marks

5 x 7 = 35 M

1. Describe about the following reactions (i) Nef reaction (ii) Mannich reaction. BT2 CO1

(OR)
2. What are nitro hydrocarbons? Write any three preparations of Nitroalkanes? Describe about tautomerism of nitroalkanes. BT1 CO3
3. Describe about the following reactions (i) Gabriel synthesis (ii) Hoffman's bromamide reaction. BT3 CO2

(OR)
4. How do you separate 1°, 2°, 3° – amines by using Heinsberg's method?. BT1 CO3
5. Give brief explanation about Chemical properties of Aromatic amines a) Alkylation b) Acylation c) Carbylamine reaction.

(OR)
6. Describe steric effect and substitution effects to explain the comparative basic strength of aniline, N-methyl aniline and N,N-dimethylaniline. BT1 CO2
7. Describe the constitution, configuration of Glucose. Write cyclic structure of glucose (α and β Glucopyranose) in Haworth representation. BT2 CO2


(OR)
8. Describe the constitution, configuration of Fructose. Write cyclic structure of glucose (α and β Fructopyranose) in Haworth representation. BT2 CO1
9. What are amino acids? Write any three general methods of preparation of α - amino acids. BT3 CO3

(OR)
10. Define amino acids. Give the classification of amino acids. BT2 CO4

PART- B

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

11. Write chemical reactivity of Nitro hydrocarbon with HONO, BT4 CO2
12. Explain the classification of aliphatic amines with a suitable example. BT2 CO1
- 13. Describe the basic strength of Ammonia, Methyl amine, dimethyl amine and Trimethyl amine. BT1 CO3**
14. Write the chemical reactivity of Aliphatic and Aromatic amines with HONO. BT1 CO4
15. Write a note on Carbylamine reaction. BT2 CO1
16. What are Epimers and explain about Epimerisation with Example. BT1 CO4
17. Write a short note on Killiani – Fischer method. BT2 CO3
18. Write physical properties of Amino acids.? BT2 CO2

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code	TITLE OF THE COURSE Course -11: ORGANIC CHEMISTRY	II B.SC CHEMISTRY(H) (IV Semester)			
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre-requisites	Knowledge on calculating limiting reagent, theoretical yield, and percent yield	-	-	2	2

Course Objectives:

- i. To provide basic knowledge about the handling of laboratory apparatus
- ii. To provide knowledge on calculating limiting reagent, theoretical yield, and percent yield.
- iii. To provide hands on training on laboratory techniques including reflux, distillation, recrystallization, vacuum filtration.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	How to use glassware, equipment and chemicals and follow experimental procedures in the laboratory.
CO2	How to calculate limiting reagent, theoretical yield, and percent yield.
CO3	How to perform common laboratory techniques including reflux, distillation, recrystallization, sublimation and distillation..
CO4	How to critically evaluate data collected to determine the identity, purity and percent yield of products and to summarize findings in writing in a clear and concise manner.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus - Organic preparations (50M)

1. Give a brief introduction on

(a) Re-crystallisation (b) sublimation (c) distillation (d) M.P & B.P

2. Single step preparations

Preparation of P-Nitro acetanilide (b) Preparation of Aspirin

Text books:

A. Vogel A.I .Practical Organic Chemistry, Longman Group Ltd.

B. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley-Eastern.

C. Ahluwalia V. K. and Agarwal R. Comprehensive Practical Organic Chemistry, University press

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	2	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	2	2.25	2.25	2.5	2.5	2.75

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

II B.Sc. CHEMISTRY(H)

SEMESTER -IV

C11- Organic Chemistry (PRACTICAL –III) AT THE
END OF SEMESTER –IV

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
ii. Experimental set up	: 05 M
iii. Effective separation	: 15 M