	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. (MPC, CBZ, GMC, MCAC) I Semester			
Course Code CHE-101	TITLE OF THE COURSE INORGANIC AND PHYSICAL CHEMISTRY				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites	p-block elements, fundamental properties of solids, liquids, gases and solutions.	3	1	-	3

Course Objectives:

1. Student shall be able to study and appreciate preparation and structures of inorganic compounds.
2. Learn and practice some basic physical chemistry topics.
3. Appreciate physical and chemical phenomena in solid, liquid and gaseous state.

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	Understand the basic concepts of p-block elements	Understanding
CO2	Learn the properties of d- and f- block elements	Understanding
CO3	Explain the difference between solid, liquid and gases in terms of intermolecular interactions.	Applying
CO4	Apply the concepts of gas, liquid and solids to industrial processes.	Applying

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

8 h

Group 13: Preparation & structure of diborane, borazine

Group 14: Preparation, classification and uses of silicones

Group 15: Preparation & structures of phosphonitrilic halides $\{(PNCl)_n\}$ where $n=3, 4$

Group 16: Oxides and oxoacids of sulphur (structural aspects only)

Group 17: Pseudo halogens, structures of Interhalogen compounds.

UNIT –II

1. Chemistry of d-block elements:

6 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 (explanation with Latimer diagrams & Frost diagrams).

2. Chemistry of f-block elements:

6 h

Chemistry of lanthanides - electronic configuration, oxidation states, lanthanide contraction-

definition, causes and consequences, magnetic properties.

Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

3. Theories of bonding in metals: 4 h

Valence bond theory and free electron theory- explanation of thermal and electrical conductivity of metals based on these theories, Band theory- formation of bands, explanation of conductors, semiconductors and insulators.

UNIT –III

Solid State 10 h

Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. The law of symmetry. Miller indices, Definition of lattice point, space lattice, unit cell. Bravais lattices and crystal systems. X-ray diffraction - Bragg's equation. Determination of crystal structure by powder method. Defects in crystals. Stoichiometric-Schottky and Frenkel defects.

UNIT –IV

1. Gaseous state: 7 h

Vander Waals equation of state. Andrew's isotherms of carbon dioxide. Critical phenomena. Relationship between critical constants and Vander Waals constants. Law of corresponding states. Joule- Thomson effect.

2. Liquid state: 3 h

Liquid crystals- the mesomorphic state. Classification of liquid crystals into Smectic, Nematic and cholesteric. Application of liquid crystals as LCD devices.

UNIT –V

1. Solutions: 6 h

Azeotropes-HCl-H₂O system and ethanol-water system. Partially miscible liquids-phenol-water system. Critical solution temperature (CST), Effect of impurity on consolute temperature. Immiscible liquids and steam distillation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

2. Ionic equilibrium: 3 h

Ionic product, common ion effect, solubility and solubility product. Calculations based on solubility product.

3. Dilute Solutions: 7 h

Colligative properties - Relative Lowering of Vapour Pressure (RLVP), Osmotic pressure, Elevation in boiling point and depression in freezing point. Experimental methods for the determination of molar mass of a non-volatile solute using osmotic pressure, Elevation in boiling point and depression in freezing point. Abnormal colligative properties. Van't Hoff factor.

Additional Inputs:

1. General characteristics of p-block elements.
2. Kinetic theory of gases and gas laws-derivation of ideal gas equation.
3. Mole fraction, Vapour pressure, lowering of vapour pressure.
4. Raoult's law and its limitations.

Text books:

1. A concise book of chemistry, Semester-1, by BVR, Sidvik Publishers.
2. Basic Inorganic Chemistry by Cotton and Wilkinson
3. Selected Topics in Inorganic Chemistry, W. U. Malik, G. D. Tuli, R. D. Madan, S.Chand Publishers, New Delhi, India, 2014.
4. RL Madan, Chemistry for degree students, S. Chand & Company, New Delhi.
5. Essentials of Physical Chemistry, U. Malik, G.D. Tuli, R.D. Madan.

Reference books:

1. Principles of physical chemistry by Prutton and Marron
2. Solid State Chemistry and its applications by Anthony R. West
3. Text book of physical chemistry by K L Kapoor
4. Text book of physical chemistry by S Glasstone
5. Advanced physical chemistry by Bahl and Tuli
6. Inorganic Chemistry by J.E. Huheey
7. A textbook of qualitative inorganic analysis by A.I. Vogel
8. Atkins, P.W. & Paula, .de Atkin's Physical Chemistry Ed., Oxford University Press 10th Ed (2014).
9. Castellan, G.W. Physical Chemistry 4thEd. Narosa (2004).
10. Mortimer, R. G. Physical Chemistry 3rdEd. Elsevier: NOIDA, UP (2009).
11. Barrow, G.M. Physical Chemistry

Web Links:

1. https://youtu.be/AY_nMFRAHIM
2. <https://youtu.be/F-1DS1mKMwQ>
3. https://youtu.be/pDUSCviEg_k
4. <https://youtu.be/8XFpUxez6aA>
5. <https://youtu.be/PFIQZXqPI7Y>

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

Proposed Activities:

Skill Development:

1. Elucidation of structures of different types of Inter-halogen Compounds.
2. Studying properties of substances by carrying out variations in physical properties.
3. Experimental determination of molecular weight using colligative properties.

Employability:

1. Finding out which oxidation state is more stable and used for industrial applications.
2. Creating opportunity in the study of solids.
3. Applying the concept in industries using solven extraction and allied processes.

Entrepreneurship:

1. Synthesizing new complexes by exploring catalytic ability of these metals.
2. Creating different new hue by inserting and altering the concentrations.
3. Creating new arena in the application of liquid crystals in the fast changing industrial environment.
4. Separation of inorganic ions by by applying these concepts in an innovative way.

Assignment Questions:

Unit – I:

1. Write any two preparations and explain the structure of diborane.
2. Write a note on preparation, classification and uses of silicone.
3. Explain the preparation and structures of phosphonitrilic halides.
4. Briefly write about oxides of sulphur and give structures of oxyacids of sulphur.
5. What are pseudo halogens?
6. Write the structures of interhalogen compounds.

Unit – II:

1. Write a note on electronic configuration and variable oxidation states of d-block elements.
2. Explain about magnetic and catalytic properties of d-block elements.
3. How d-block elements act as catalysts. Explain with suitable examples.
4. Transition elements form complexes. Comment.
5. Explain stability of various oxidation states with Latimer & Frost diagrams.
6. Write a note on causes and consequences of lanthanide contraction.
7. Write electronic configuration and oxidation states of lanthanides and actinides.
8. Give a comparative study of lanthanides and actinides.
9. Explain thermal and electrical properties based on valence bond theory.
10. Explain thermal and electrical properties based on free electron theory.
11. Explain band theory of solids.
12. What are conductors, semiconductors and insulators?

Unit – III:

1. Explain law of constancy of interfacial angles.
2. Write about law of rationality of indices.
3. What are symmetry elements?
4. Write about crystal systems and Bravais lattices.
5. Derive Bragg's equation.
6. Explain how crystal structure is determined by powder method.
7. Write a note on crystal defects.
8. Define lattice point, space lattice and unit cell.

Unit – IV:

1. Write about Vander Waals equation of state.
2. Explain Andrew's isotherms of carbon dioxide.
3. What are critical phenomena? Explain.
4. Give the relation between critical constants and Vander Waals constant.
5. Write a note on law of corresponding states.
6. Write a note on Joule-Thomson effect.
7. What are liquid crystals? How are they classified?
8. Give the use of liquid crystals in LCD devices.

Unit – V:

1. What is CST? Apply for phenol-water system.
2. What is the effect of impurities on CST?
3. Write a note on azeotropes.
4. Explain steam distillation in detail.
5. Explain Nernst distribution law and give its applications.
6. Write a note on common ion effect.
7. Write a note on solubility product.
8. What are colligative properties?
9. What is RLVP?
10. What is elevation in boiling point? How to determine molar mass of a non volatile solute using it, experimentally?
11. What is depression in freezing point? Give the experimental determination of molar mass using it.
12. Define osmotic pressure. Give the experimental determination of molar mass using it.
13. Write a note on Van't Hoff factor for abnormal colligative properties.

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

INORGANIC AND PHYSICAL CHEMISTRY

TIME: 2¹/₂ hrs.

Max. MARKS: 50

PART-A

Answer **ALL** the Questions

5x7 = 35 M

1. **UNIT-I 2 Questions – To answer 1 or 2**
2. **UNIT- II 2 Questions - To answer 3 or 4**
3. **UNIT- III 2 Questions - To answer 5 or 6**
4. **UNIT- IV 2 Questions - To answer 7 or 8**
5. **UNIT- V 2 Questions - To answer 9 or 10**

PART – B

Answer any **FIVE** Questions

5x3 = 15 M

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

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. DEGREE EXAMINATIONS
SEMESTER-I MODEL PAPER (From 2022-23)
(For MPC, BZC, GMC and MCAC programmes)
Paper-I: INORGANIC AND PHYSICAL CHEMISTRY

Time: 2¹/₂ hrs.

Maximum Marks: 50

PART- A

Answer **All** the questions. Each carries **Seven** marks:

5 x 7 = 35 Marks


1. Explain Classification, Preparations & uses of Silicones
(Or)
2. (i) What are Pseudohalogens?
(ii) Explain the Structures of any one AX & AX₃ type inter halogen compounds.
3. What is Lanthanide Contraction? Explain the causes and consequences of Lanthanide Contraction.
(Or)
4. (i) Explain the magnetic properties of d- block elements.
(ii) Explain about conductors, semi-conductors & insulators using band theory.
5. Write an essay on Crystal defects.
(Or)
6. Derive Bragg's equation for crystal structure.
7. Derive the relationship between Critical constants & Vanderwaals constants.
(Or)
8. What are liquid crystals? Give different types of liquid crystals and their applications.
9. Explain Nernst distribution law and its applications.
(Or)
10. What are colligative properties? Write experimental methods for determination of molar mass of a non-volatile solute by using Elevation in boiling point.

PART- B

5x3 = 15 Marks

Answer any **Five** of the following questions. Each question carries **Three** marks:

11. Explain the preparation & structures of Phosphonitrilic compounds.
12. Write a note on pseudohalogens.
13. Explain in brief, catalytic properties of d- block elements.
14. Write short note on Bravais lattices and crystal systems.
15. Describe Andrew's isotherms of carbon dioxide.
16. What are Smectic & Nematic liquid Crystals? Explain.
17. Write an account on common ion effect and solubility product.
18. Explain about osmotic pressure.

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHE-102	TITLE OF THE COURSE INORGANIC CHEMISTRY, PHYSICAL CHEMISTRY AND SOILS	I B.Sc. (BCH & ZCAq) I Semester			
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites	p-block elements, fundamental properties of solids, liquids, gases and solutions.	3	1	-	3

Course Objectives:

1. Student shall be able to study and appreciate preparation and structures of inorganic compounds.
2. Learn and practice some basic physical chemistry topics.
3. Appreciate physical and chemical phenomena in solid, liquid and gaseous state.

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	Understand the basic concepts of p-block elements	Understanding
CO2	Learn the properties of d- and f- block elements	Understanding
CO3	Explain the difference between solid, liquid and gases in terms of intermolecular interactions.	Applying
CO4	Apply the knowledge of nature of soil in getting good yields in horticulture and the knowledge of pH in aquaculture.	Applying

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

8 h

Group 13: Preparation & structure of diborane, borazine

Group 14: Preparation, classification and uses of silicones

Group 15: Preparation & structures of phosphonitrilic halides $\{(PNCl)_n\}$ where $n=3, 4$

Group 16: Oxides and oxoacids of sulphur (structural aspects only)

Group 17: Pseudo halogens, structures of Interhalogen compounds.

UNIT –II

1. Chemistry of d-block elements:

6 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 (explanation with Latimer diagrams & Frost diagrams).

2. Chemistry of f-block elements: 6 h

Chemistry of lanthanides - electronic configuration, oxidation states, lanthanide contraction- definition, causes and consequences, magnetic properties.

Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

3. Theories of bonding in metals: 4 h

Valence bond theory and free electron theory- explanation of thermal and electrical conductivity of metals based on these theories, **Band theory- formation of bands, explanation of conductors, semiconductors and insulators.**

UNIT –III

Solid State 10 h

Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. The law of symmetry. Miller indices, Definition of lattice point, space lattice, unit cell. Bravais lattices and crystal systems. **X-ray diffraction - Bragg's equation. Determination of crystal structure by powder method.** **Defects in crystals.** Stoichiometric-Schottky and Frenkel defects.

UNIT –IV

1. Gaseous state: 7 h

Vander Waals equation of state. Andrew's isotherms of carbon dioxide. Critical phenomena. Relationship between critical constants and Vander Waals constants. Law of corresponding states. Joule- Thomson effect.

2. Liquid state: 3 h

Liquid crystals- the mesomorphic state. Classification of liquid crystals into Smectic, Nematic and cholesteric. Application of **liquid crystals as LCD devices.**

UNIT –V

1. Dilute Solutions: 8 h

Colligative properties - Relative Lowering of Vapour Pressure (RLVP), Osmotic pressure, Elevation in boiling point and depression in freezing point. Experimental methods for the determination of molar mass of a non-volatile solute using osmotic pressure, Elevation in boiling point and depression in freezing point. Abnormal colligative properties. Van't Hoff factor.

2. SOILS: 8 h

Classification of soils, organic and inorganic constituents, characteristics - acidity, salinity, alkalinity, pH and its effects on nutrient availability, buffering capacity of soils.

Additional Inputs:

1. Solutions:

Azeotropes-HCl-H₂O system and ethanol-water system. Partially miscible liquids-phenol-water system. Critical solution temperature (CST), Effect of impurity on consolute temperature. Immiscible liquids and steam distillation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

2. Ionic equilibrium:

Ionic product, common ion effect, solubility and solubility product. Calculations based on solubility product.

Text books:

1. A concise book of chemistry, Semester-1, by BVR, Sidvik Publishers.
2. Basic Inorganic Chemistry by Cotton and Wilkinson
3. Selected Topics in Inorganic Chemistry, W. U. Malik, G. D. Tuli, R. D. Madan, S. Chand Publishers, New. Delhi, India, 2014.
4. RL Madan, Chemistry for degree students, S. Chand & Company, New Delhi.
5. Essentials of Physical Chemistry ... U. Malik, G.D. Tuli , R.D. Madan.

Reference books:

1. Principles of physical chemistry by Prutton and Marron
2. Solid State Chemistry and its applications by Anthony R. West
3. Text book of physical chemistry by K L Kapoor
4. Text book of physical chemistry by S Glasstone
5. Advanced physical chemistry by Bahl and Tuli
6. Inorganic Chemistry by J.E. Huheey
7. A textbook of qualitative inorganic analysis by A.I. Vogel
8. Atkins, P.W. & Paula, .de Atkin's Physical Chemistry Ed., Oxford University Press 10th Ed (2014).
9. Castellan, G.W. Physical Chemistry 4th Ed. Narosa (2004).
10. Mortimer, R. G. Physical Chemistry 3rd Ed. Elsevier: NOIDA, UP (2009).
11. Barrow, G.M. Physical Chemistry

Web Links:

1. https://youtu.be/AY_nMFRAHIM
2. <https://youtu.be/F-1DS1mKMwQ>
3. https://youtu.be/pDUSCviEg_k
4. <https://youtu.be/8XFpUxez6aA>
5. <https://youtu.be/PFIQZXqPI7Y>

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

Proposed Activities:

Skill Development:

1. Elucidation of structures of different types of Inter-halogen Compounds.
2. Studying properties of substances by carrying out variations in physical properties.
3. Experimental determination of molecular weight using colligative properties.

Employability:

1. Finding out which oxidation state is more stable and used for industrial applications.
2. Creating opportunity in the study of solids.
3. Applying the concept in industries using solven extraction and allied processes.

Entrepreneurship:

1. Synthesizing new complexes by exploring catalytic ability of these metals.
2. Creating different new hue by inserting and altering the concentrations.
3. Creating new arena in the application of liquid crystals in the fast changing industrial environment.

Assignment Questions:

Unit – I:

1. Write any two preparations and explain the structure of diborane.
2. Write a note on preparation, classification and uses of silicone.
3. Explain the preparation and structures of phosphonitrilic halides.
4. Briefly write about oxides of sulphur and give structures of oxyacids of sulphur.
5. What are pseudo halogens?
6. Write the structures of interhalogen compounds.

Unit – II:

1. Write a note on electronic configuration and variable oxidation states of d-block elements.
2. Explain about magnetic and catalytic properties of d-block elements.
3. How d-block elements act as catalysts. Explain with suitable examples.
4. Transition elements form complexes. Comment.
5. Explain stability of various oxidation states with Latimer & Frost diagrams.
6. Write a note on causes and consequences of lanthanide contraction.
7. Write electronic configuration and oxidation states of lanthanides and actinides.
8. Give a comparative study of lanthanides and actinides.
9. Explain thermal and electrical properties based on valence bond theory.
10. Explain thermal and electrical properties based on free electron theory.
11. Explain band theory of solids.
12. What are conductors, semiconductors and insulators?

Unit – III:

1. Explain law of constancy of interfacial angles.
2. Write about law of rationality of indices.

3. What are symmetry elements?
4. Write about crystal systems and Bravais lattices.
5. Derive Bragg's equation.
6. Explain how crystal structure is determined by powder method.
7. Write a note on crystal defects.
8. Define lattice point, space lattice and unit cell.

Unit – IV:

1. Write about Vander Waals equation of state.
2. Explain Andrew's isotherms of carbon dioxide.
3. What are critical phenomena? Explain.
4. Give the relation between critical constants and Vander Waals constant.
5. Write a note on law of corresponding states.
6. Write a note on Joule-Thomson effect.
7. What are liquid crystals? How are they classified?
8. Give the use of liquid crystals in LCD devices.

Unit – V:

1. What are colligative properties?
2. What is RLVP?
3. What is elevation in boiling point? How to determine molar mass of a non volatile solute using it, experimentally?
4. What is depression in freezing point? Give the experimental determination of molar mass using it.
5. Define osmotic pressure. Give the experimental determination of molar mass using it.
6. Write a note on Van't Hoff factor for abnormal colligative properties.
7. Define pH and explain its effects on nutrient availability for soils.
8. Write a note on alkalinity of soils.

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

INORGANIC CHEMISTRY, PHYSICAL CHEMISTRY AND SOILS

TIME: 2¹/₂ hrs.

Max. MARKS: 50

PART-A

Answer **ALL** the Questions

5x7 = 35 M

1. **UNIT-I 2 Questions – To answer 1 or 2**
2. **UNIT- II 2 Questions - To answer 3 or 4**
3. **UNIT- III 2 Questions - To answer 5 or 6**
4. **UNIT- IV 2 Questions - To answer 7 or 8**
5. **UNIT- V 2 Questions - To answer 9 or 10**

PART – B

Answer any **FIVE** Questions

5x3 = 15 M

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

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

I B.Sc. DEGREE EXAMINATIONS

SEMESTER-I MODEL PAPER (From 2022-23)

(For BCH & ZCAq programmes)

Paper-I: INORGANIC CHEMISTRY, PHYSICAL CHEMISTRY AND SOILS

Time: 2½ hrs.

Maximum Marks: 50

PART- A

Answer **All** the questions. Each carries **Seven** marks:

5 x 7 = 35 Marks


1. Explain Classification, Preparations & uses of Silicones
(Or)
2. (i) What are Pseudohalogens?
(ii) Explain the Structures of any one AX & AX₃ type inter halogen compounds.
3. What is Lanthanide Contraction? Explain the causes and consequences of Lanthanide Contraction.
(Or)
4. (i) Explain the magnetic properties of d- block elements.
(ii) Explain about conductors, semi-conductors & insulators using band theory.
5. Write an essay on Crystal defects.
(Or)
6. Derive Bragg's equation for crystal structure.
7. Derive the relationship between Critical constants & Vanderwaals constants.
(Or)
8. What are liquid crystals? Give different types of liquid crystals and their applications.
9. Define pH and explain its effects on nutrient availability for soils.
(Or)
10. What are colligative properties? Write experimental methods for determination of molar mass of a non-volatile solute by using Elevation in boiling point.

PART- B

5x3 = 15 Marks

Answer any **Five** of the following questions. Each question carries **Three** marks:

11. Explain the preparation & structures of Phosphonitrilic compounds.
12. Write a note on pseudohalogens.
13. Explain in brief, catalytic properties of d- block elements.
14. Write short note on Bravais lattices and crystal systems.
15. Describe Andrew's isotherms of carbon dioxide.
16. What are Smectic & Nematic liquid Crystals? Explain.
17. Write a note on alkalinity of soils.
18. Explain about osmotic pressure.

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHE-103	TITLE OF THE COURSE INORGANIC CHEMISTRY, PHYSICAL CHEMISTRY AND PESTICIDES	I B.Sc. [BBC & BBC (Ag)] I Semester			
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites	p-block elements, fundamental properties of solids, liquids, gases and solutions.	3	1	-	3

Course Objectives:

1. Student shall be able to study and appreciate preparation and structures of inorganic compounds.
2. Learn and practice some basic physical chemistry topics.
3. Appreciate physical and chemical phenomena in solid, liquid and gaseous state.

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	Understand the basic concepts of p-block elements	Understanding
CO2	Learn the properties of d- and f- block elements	Understanding
CO3	Explain the difference between solid, liquid and gases in terms of intermolecular interactions.	Applying
CO4	Suggest suitable pesticides for better growth of plants in agriculture.	Applying

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

8 h

Group 13: Preparation & structure of diborane, borazine

Group 14: Preparation, classification and uses of silicones

Group 15: Preparation & structures of phosphonitrilic halides $\{(PNCl)_n\}$ where $n=3, 4$

Group 16: Oxides and oxoacids of sulphur (structural aspects only)

Group 17: Pseudo halogens, structures of Interhalogen compounds.

UNIT –II

1. Chemistry of d-block elements:

6 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 (explanation with Latimer diagrams & Frost diagrams).

2. Chemistry of f-block elements: 6 h

Chemistry of lanthanides - electronic configuration, oxidation states, lanthanide contraction-definition, causes and consequences, magnetic properties.

Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

3. Theories of bonding in metals: 4 h

Valence bond theory and free electron theory- explanation of thermal and electrical conductivity of metals based on these theories, **Band theory- formation of bands, explanation of conductors, semiconductors and insulators.**

UNIT –III

Solid State 10 h

Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. The law of symmetry. Miller indices, Definition of lattice point, space lattice, unit cell. Bravais lattices and crystal systems. **X-ray diffraction - Bragg's equation. Determination of crystal structure by powder method.** **Defects in crystals.** Stoichiometric-Schottky and Frenkel defects.

UNIT –IV

1. Gaseous state: 7 h

Vander Waals equation of state. Andrew's isotherms of carbon dioxide. Critical phenomena. Relationship between critical constants and Vander Waals constants. Law of corresponding states. Joule- Thomson effect.

2. Liquid state: 3 h

Liquid crystals- the mesomorphic state. Classification of liquid crystals into Smectic, Nematic and cholesteric. Application of **liquid crystals as LCD devices.**

UNIT –V

1. Dilute Solutions: 8 h

Colligative properties - Relative Lowering of Vapour Pressure (RLVP), Osmotic pressure, Elevation in boiling point and depression in freezing point. Experimental methods for the determination of molar mass of a non-volatile solute using osmotic pressure, Elevation in boiling point and depression in freezing point. Abnormal colligative properties. Van't Hoff factor.

2. Pesticides 8 h

Introduction to pesticides - types - insecticides, fungicides, herbicides, weedicides, rodenticides, plant growth regulators and pheromones.

Synthesis and present status of the following: DDT, BHC, Malathion, Parathion and Baygon.

Additional Inputs:

1. Solutions:

Azeotropes-HCl-H₂O system and ethanol-water system. Partially miscible liquids-phenol-water system. Critical solution temperature (CST), Effect of impurity on consolute temperature. Immiscible liquids and steam distillation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

2. Ionic equilibrium:

Ionic product, common ion effect, solubility and solubility product. Calculations based on solubility product.

Text books:

1. A concise book of chemistry, Semester-1, by BVR, Sidvik Publishers.
2. Basic Inorganic Chemistry by Cotton and Wilkinson
3. Selected Topics in Inorganic Chemistry, W. U. Malik, G. D. Tuli, R. D. Madan,
4. RL Madan, Chemistry for degree students, S. Chand & Company, New Delhi.
5. Essentials of Physical Chemistry ... U. Malik, G.D. Tuli , R.D. Madan.

Reference books:

1. Principles of physical chemistry by Prutton and Marron
2. Solid State Chemistry and its applications by Anthony R. West
3. Text book of physical chemistry by K L Kapoor
4. Text book of physical chemistry by S Glasstone
5. Advanced physical chemistry by Bahl and Tuli
6. Inorganic Chemistry by J.E. Huheey
7. A textbook of qualitative inorganic analysis by A.I. Vogel
8. Atkins, P.W. & Paula, de Atkin's Physical Chemistry Ed., Oxford University Press 10th Ed (2014).
9. Castellan, G.W. Physical Chemistry 4th Ed. Narosa (2004).
10. Mortimer, R. G. Physical Chemistry 3rd Ed. Elsevier: NOIDA, UP (2009).
11. Barrow, G.M. Physical Chemistry

Web Links:

1. https://youtu.be/AY_nMFRAHIM
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4. <https://youtu.be/8XFpUxez6aA>
5. <https://youtu.be/PFIQZXqPI7Y>

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

Proposed Activities:

Skill Development:

1. Elucidation of structures of different types of Inter-halogen Compounds.
2. Studying properties of substances by carrying out variations in physical properties.
3. Experimental determination of molecular weight using colligative properties.

Employability:

1. Finding out which oxidation state is more stable and used for industrial applications.
2. Creating opportunity in the study of solids.
3. Applying the concept in industries using solven extraction and allied processes.

Entrepreneurship:

1. Synthesizing new complexes by exploring catalytic ability of these metals.
2. Creating different new hue by inserting and altering the concentrations.
3. Creating new arena in the application of liquid crystals in the fast changing industrial environment.
4. Separation of inorganic ions by applying these concepts in an innovative way.

Assignment Questions:

Unit – I:

1. Write any two preparations and explain the structure of diborane.
2. Write a note on preparation, classification and uses of silicone.
3. Explain the preparation and structures of phosphonitrilic halides.
4. Briefly write about oxides of sulphur and give structures of oxyacids of sulphur.
5. What are pseudo halogens?
6. Write the structures of interhalogen compounds.

Unit – II:

1. Write a note on electronic configuration and variable oxidation states of d-block elements.
2. Explain about magnetic and catalytic properties of d-block elements.
3. How d-block elements act as catalysts. Explain with suitable examples.
4. Transition elements form complexes. Comment.
5. Explain stability of various oxidation states with Latimer & Frost diagrams.
6. Write a note on causes and consequences of lanthanide contraction.
7. Write electronic configuration and oxidation states of lanthanides and actinides.
8. Give a comparative study of lanthanides and actinides.
9. Explain thermal and electrical properties based on valence bond theory.
10. Explain thermal and electrical properties based on free electron theory.
11. Explain band theory of solids.
12. What are conductors, semiconductors and insulators?

Unit – III:

1. Explain law of constancy of interfacial angles.
2. Write about law of rationality of indices.
3. What are symmetry elements?
4. Write about crystal systems and Bravais lattices.
5. Derive Bragg's equation.
6. Explain how crystal structure is determined by powder method.
7. Write a note on crystal defects.
8. Define lattice point, space lattice and unit cell.

Unit – IV:

1. Write about Vander Waals equation of state.
2. Explain Andrew's isotherms of carbon dioxide.
3. What are critical phenomena? Explain.
4. Give the relation between critical constants and Vander Waals constant.
5. Write a note on law of corresponding states.
6. Write a note on Joule-Thomson effect.
7. What are liquid crystals? How are they classified?
8. Give the use of liquid crystals in LCD devices.

Unit – V:

1. What are colligative properties?
2. What is RLVP?
3. What is elevation in boiling point? How to determine molar mass of a non volatile solute using it, experimentally?
4. What is depression in freezing point? Give the experimental determination of molar mass using it.
5. Define osmotic pressure. Give the experimental determination of molar mass using it.
6. Write a note on Van't Hoff factor for abnormal colligative properties.
7. Write about the synthesis and present status of DDT.
8. Write a note on types of pesticides.

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

INORGANIC CHEMISTRY, PHYSICAL CHEMISTRY AND PESTICIDES

TIME: 2¹/₂ hrs.

Max. MARKS: 50

PART-A

Answer **ALL** the Questions

5x7 = 35 M

1. **UNIT-I 2 Questions – To answer 1 or 2**
2. **UNIT- II 2 Questions - To answer 3 or 4**
3. **UNIT- III 2 Questions - To answer 5 or 6**
4. **UNIT- IV 2 Questions - To answer 7 or 8**
5. **UNIT- V 2 Questions - To answer 9 or 10**

PART – B

Answer any **FIVE** Questions

5x3 = 15 M

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

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

I B.Sc. DEGREE EXAMINATIONS

SEMESTER-I MODEL PAPER (From 2022-23)

(For BBC & BBC Agro programmes)

Paper-I: INORGANIC CHEMISTRY, PHYSICAL CHEMISTRY AND PESTICIDES

Time: 2¹/₂ hrs

Maximum Marks: 50

PART- A

Answer **All** the questions. Each carries **Seven** marks:

5 x 7 = 35 Marks


1. Explain Classification, Preparations & uses of Silicones
(Or)
2. (i) What are Pseudohalogens?
(ii) Explain the Structures of any one AX & AX₃ type inter halogen compounds.
3. What is Lanthanide Contraction? Explain the causes and consequences of Lanthanide Contraction.
(Or)
4. (i) Explain the magnetic properties of d- block elements.
(ii) Explain about conductors, semi-conductors & insulators using band theory.
5. Write an essay on Crystal defects.
(Or)
6. Derive Bragg's equation for crystal structure.
7. Derive the relationship between Critical constants & Vanderwaals constants.
(Or)
8. What are liquid crystals? Give different types of liquid crystals and their applications.
9. Write about the synthesis and present status of DDT.
(Or)
10. What are colligative properties? Write experimental methods for determination of molar mass of a non-volatile solute by using Elevation in boiling point.

PART- B

5x3 = 15 Marks

Answer any **Five** of the following questions. Each question carries **Three** marks:

11. Explain the preparation & structures of Phosphonitrilic compounds.
12. Write a note on pseudohalogens.
13. Explain in brief, catalytic properties of d- block elements.
14. Write short note on Bravais lattices and crystal systems.
15. Describe Andrew's isotherms of carbon dioxide.
16. What are Smectic & Nematic liquid Crystals? Explain.
17. Write a note on types of pesticides.
18. Explain about osmotic pressure.

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. (MZC, FMZC) I Semester			
Course Code CHE-104	TITLE OF THE COURSE INORGANIC CHEMISTRY, PHYSICAL CHEMISTRY AND ENZYMES				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites	p-block elements, fundamental properties of solids, liquids, gases and solutions.	3	1	-	3

Course Objectives:

1. Student shall be able to study and appreciate preparation and structures of inorganic compounds.
2. Learn and practice some basic physical chemistry topics.
3. Appreciate physical and chemical phenomena in solid, liquid and gaseous state.

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	Understand the basic concepts of p-block elements	Understanding
CO2	Learn the properties of d- and f- block elements	Understanding
CO3	Explain the difference between solid, liquid and gases in terms of intermolecular interactions.	Applying
CO4	Design different types of enzymes used industrially for good health.	Creating

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

8 h

Group 13: Preparation & structure of diborane, borazine

Group 14: Preparation, classification and uses of silicones

Group 15: Preparation & structures of phosphonitrilic halides $\{(PNCl)_n\}$ where $n=3, 4$

Group 16: Oxides and oxoacids of sulphur (structural aspects only)

Group 17: Pseudo halogens, **structures of Interhalogen compounds.**

UNIT –II

1. Chemistry of d-block elements:

6 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 (explanation with Latimer diagrams & Frost diagrams).

2. Chemistry of f-block elements: 6 h

Chemistry of lanthanides - electronic configuration, oxidation states, lanthanide contraction-definition, causes and consequences, magnetic properties.

Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

3. Theories of bonding in metals: 4 h

Valence bond theory and free electron theory- explanation of thermal and electrical conductivity of metals based on these theories, **Band theory- formation of bands, explanation of conductors, semiconductors and insulators.**

UNIT –III

Solid State 10 h

Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. The law of symmetry. Miller indices, Definition of lattice point, space lattice, unit cell. Bravais lattices and crystal systems. **X-ray diffraction - Bragg's equation. Determination of crystal structure by powder method.** **Defects in crystals.** Stoichiometric-Schottky and Frenkel defects.

UNIT –IV

1. Gaseous state: 7 h

Vander Waals equation of state. Andrew's isotherms of carbon dioxide. Critical phenomena. Relationship between critical constants and Vander Waals constants. Law of corresponding states. Joule- Thomson effect.

2. Liquid state: 3 h

Liquid crystals- the mesomorphic state. Classification of liquid crystals into Smectic, Nematic and cholesteric. Application of **liquid crystals as LCD devices.**

UNIT –V

1. Dilute Solutions: 8 h

Colligative properties - Relative Lowering of Vapour Pressure (RLVP), Osmotic pressure, Elevation in boiling point and depression in freezing point. Experimental methods for the determination of molar mass of a non-volatile solute using osmotic pressure, Elevation in boiling point and depression in freezing point. Abnormal colligative properties. Van't Hoff factor.

2. Enzymes: 8 h

Classification of enzymes, enzyme catalysis, factors affecting the enzyme catalysis, inhibitors, lock and key model, enzyme kinetics, Michaelis-Menten equation (equation only), significance of Michaelis-Menten constant.

Additional Inputs:

1. Solutions:

Azeotropes-HCl-H₂O system and ethanol-water system. Partially miscible liquids-phenol-water system. Critical solution temperature (CST), Effect of impurity on consolute temperature. Immiscible liquids and steam distillation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

2. Ionic equilibrium:

Ionic product, common ion effect, solubility and solubility product. Calculations based on solubility product.

Text books and Reference books:

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7. A textbook of qualitative inorganic analysis by A.I. Vogel
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11. Barrow, G.M. Physical Chemistry

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

Proposed Activities:

Skill Development:

1. Elucidation of structures of different types of Inter-halogen Compounds.
2. Studying properties of substances by carrying out variations in physical properties.
3. Experimental determination of molecular weight using colligative properties.

Employability:

1. Finding out which oxidation state is more stable and used for industrial applications.
2. Creating opportunity in the study of solids.
3. Applying the concept in industries using solven extraction and allied processes.

Entrepreneurship:

1. Synthesizing new complexes by exploring catalytic ability of these metals.
2. Creating different new hue by inserting and altering the concentrations.
3. Creating new arena in the application of liquid crystals in the fast changing industrial environment.

Assignment Questions:

Unit – I:

1. Write any two preparations and explain the structure of diborane.
2. Write a note on preparation, classification and uses of silicone.
3. Explain the preparation and structures of phosphonitrilic halides.
4. Briefly write about oxides of sulphur and give structures of oxyacids of sulphur.
5. What are pseudo halogens?
6. Write the structures of interhalogen compounds.

Unit – II:

1. Write a note on electronic configuration and variable oxidation states of d-block elements.
2. Explain about magnetic and catalytic properties of d-block elements.
3. How d-block elements act as catalysts. Explain with suitable examples.
4. Transition elements form complexes. Comment.
5. Explain stability of various oxidation states with Latimer & Frost diagrams.
6. Write a note on causes and consequences of lanthanide contraction.
7. Write electronic configuration and oxidation states of lanthanides and actinides.
8. Give a comparative study of lanthanides and actinides.
9. Explain thermal and electrical properties based on valence bond theory.
10. Explain thermal and electrical properties based on free electron theory.
11. Explain band theory of solids.
12. What are conductors, semiconductors and insulators?

Unit – III:

1. Explain law of constancy of interfacial angles.
2. Write about law of rationality of indices.
3. What are symmetry elements?
4. Write about crystal systems and Bravais lattices.
5. Derive Bragg's equation.
6. Explain how crystal structure is determined by powder method.
7. Write a note on crystal defects.
8. Define lattice point, space lattice and unit cell.

Unit – IV:

1. Write about Vander Waals equation of state.
2. Explain Andrew's isotherms of carbon dioxide.
3. What are critical phenomena? Explain.
4. Give the relation between critical constants and Vander Waals constant.
5. Write a note on law of corresponding states.
6. Write a note on Joule-Thomson effect.
7. What are liquid crystals? How are they classified?
8. Give the use of liquid crystals in LCD devices.

Unit – V:

1. What are colligative properties?
2. What is RLVP?
3. What is elevation in boiling point? How to determine molar mass of a non volatile solute using it, experimentally?
4. What is depression in freezing point? Give the experimental determination of molar mass using it.
5. Define osmotic pressure. Give the experimental determination of molar mass using it.
6. Write a note on Van't Hoff factor for abnormal colligative properties.
7. What is enzyme catalysis? Describe any three factors affecting enzyme catalysis.
8. Explain the significance of Michaelis-Menten constant.

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

INORGANIC CHEMISTRY, PHYSICAL CHEMISTRY AND ENZYMES

TIME: 2¹/₂ hrs.

Max. MARKS: 50

PART-A

Answer **ALL** the Questions

5x7 = 35 M

1. **UNIT-I 2 Questions – To answer 1 or 2**
2. **UNIT- II 2 Questions - To answer 3 or 4**
3. **UNIT- III 2 Questions - To answer 5 or 6**
4. **UNIT- IV 2 Questions - To answer 7 or 8**
5. **UNIT- V 2 Questions - To answer 9 or 10**

PART – B

Answer any **FIVE** Questions

5x3 = 15 M

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

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

I B.Sc. DEGREE EXAMINATIONS

SEMESTER-I MODEL PAPER (From 2022-23)

(For MZC & FMZC programmes)

Paper-I: INORGANIC CHEMISTRY, PHYSICAL CHEMISTRY AND ENZYMES

Time: 2¹/₂ hrs.

Maximum Marks: 50

PART- A

Answer **All** the questions. Each carries **Seven** marks:

5 x 7 = 35 Marks


1. Explain Classification, Preparations & uses of Silicones
(Or)
2. (i) What are Pseudohalogens?
(ii) Explain the Structures of any one AX & AX₃ type inter halogen compounds.
3. What is Lanthanide Contraction? Explain the causes and consequences of Lanthanide Contraction.
(Or)
4. (i) Explain the magnetic properties of d- block elements.
(ii) Explain about conductors, semi-conductors & insulators using band theory.
5. Write an essay on Crystal defects.
(Or)
6. Derive Bragg's equation for crystal structure.
7. Derive the relationship between Critical constants & Vanderwaals constants.
(Or)
8. What are liquid crystals? Give different types of liquid crystals and their applications.
9. What is enzyme catalysis? Describe any three factors affecting enzyme catalysis.
(Or)
10. What are colligative properties? Write experimental methods for determination of molar mass of a non-volatile solute by using Elevation in boiling point.

PART- B

5x3 = 15 Marks

Answer any **Five** of the following questions. Each question carries **Three** marks:

11. Explain the preparation & structures of Phosphonitrilic compounds.
12. Write a note on pseudohalogens.
13. Explain in brief, catalytic properties of d- block elements.
14. Write short note on Bravais lattices and crystal systems.
15. Describe Andrew's isotherms of carbon dioxide.
16. What are Smectic & Nematic liquid Crystals? Explain.
17. Explain the significance of Michaelis-Menten constant.
18. Explain about osmotic pressure.

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHE-105	TITLE OF THE COURSE INORGANIC CHEMISTRY, PHYSICAL CHEMISTRY AND SOIL CHEMISTRY	I B.Sc. (BC Agriculture) I Semester			
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites	p-block elements, fundamental properties of solids, liquids, gases and solutions.	3	1	-	3

Course Objectives:

4. Student shall be able to study and appreciate preparation and structures of inorganic compounds.
5. Learn and practice some basic physical chemistry topics.
6. Appreciate physical and chemical phenomena in solid, liquid and gaseous state.

Course Outcomes:

On Completion of the course, the students will be able to		Cognitive Domain
CO1	Understand the basic concepts of p-block elements	Understanding
CO2	Learn the properties of d- and f- block elements	Understanding
CO3	Explain the difference between solid, liquid and gases in terms of intermolecular interactions.	Applying
CO4	Apply the knowledge of nature of soil in getting good yields in agriculture	Applying

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

8 h

Group 13: Preparation & structure of diborane, borazine

Group 14: Preparation, classification and uses of silicones

Group 15: Preparation & structures of phosphonitrilic halides $\{(PNCl)_n\}$ where $n=3, 4$

Group 16: Oxides and oxoacids of sulphur (structural aspects only)

Group 17: Pseudo halogens, structures of Interhalogen compounds.

UNIT –II

1. Chemistry of d-block elements:

6 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 (explanation with Latimer diagrams & Frost diagrams).

2. Chemistry of f-block elements: 6 h

Chemistry of lanthanides - electronic configuration, oxidation states, lanthanide contraction- definition, causes and consequences, magnetic properties.

Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

3. Theories of bonding in metals: 4 h

Valence bond theory and free electron theory- explanation of thermal and electrical conductivity of metals based on these theories, **Band theory- formation of bands, explanation of conductors, semiconductors and insulators.**

UNIT –III

Solid State 10 h

Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. The law of symmetry. Miller indices, Definition of lattice point, space lattice, unit cell. Bravais lattices and crystal systems. **X-ray diffraction - Bragg's equation. Determination of crystal structure by powder method.** **Defects in crystals.** Stoichiometric-Schottky and Frenkel defects.

UNIT –IV

1. Gaseous state: 7 h

Vander Waals equation of state. Andrew's isotherms of carbon dioxide. Critical phenomena. Relationship between critical constants and Vander Waals constants. Law of corresponding states. Joule- Thomson effect.

2. Liquid state: 3 h

Liquid crystals- the mesomorphic state. Classification of liquid crystals into Smectic, Nematic and cholesteric. Application of **liquid crystals as LCD devices.**

UNIT –V

1. Dilute Solutions: 8 h

Colligative properties - Relative Lowering of Vapour Pressure (RLVP), Osmotic pressure, Elevation in boiling point and depression in freezing point. Experimental methods for the determination of molar mass of a non-volatile solute using osmotic pressure, Elevation in boiling point and depression in freezing point. Abnormal colligative properties. Van't Hoff factor.

2. SOIL CHEMISTRY: 8 h

Classification of soils, organic and inorganic constituents, characteristics - acidity, salinity, alkalinity, pH and its effects on nutrient availability, buffering capacity of soils.

Additional Inputs:

1. Solutions:

Azeotropes-HCl-H₂O system and ethanol-water system. Partially miscible liquids-phenol-water system. Critical solution temperature (CST), Effect of impurity on consolute temperature. Immiscible liquids and steam distillation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

2. Ionic equilibrium:

Ionic product, common ion effect, solubility and solubility product. Calculations based on solubility product.

Text books:

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5. <https://youtu.be/PFIQZXqPI7Y>

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

Proposed Activities:

Skill Development:

1. Elucidation of structures of different types of Inter-halogen Compounds.
2. Studying properties of substances by carrying out variations in physical properties.
3. Experimental determination of molecular weight using colligative properties.

Employability:

1. Finding out which oxidation state is more stable and used for industrial applications.
2. Creating opportunity in the study of solids.
3. Applying the concept in industries using solven extraction and allied processes.

Entrepreneurship:

1. Synthesizing new complexes by exploring catalytic ability of these metals.
2. Creating different new hue by inserting and altering the concentrations.
3. Creating new arena in the application of liquid crystals in the fast changing industrial environment.

Assignment Questions:

Unit – I:

1. Write any two preparations and explain the structure of diborane.
2. Write a note on preparation, classification and uses of silicone.
3. Explain the preparation and structures of phosphonitrilic halides.
4. Briefly write about oxides of sulphur and give structures of oxyacids of sulphur.
5. What are pseudo halogens?
6. Write the structures of interhalogen compounds.

Unit – II:

1. Write a note on electronic configuration and variable oxidation states of d-block elements.
2. Explain about magnetic and catalytic properties of d-block elements.
3. How d-block elements act as catalysts. Explain with suitable examples.
4. Transition elements form complexes. Comment.
5. Explain stability of various oxidation states with Latimer & Frost diagrams.
6. Write a note on causes and consequences of lanthanide contraction.
7. Write electronic configuration and oxidation states of lanthanides and actinides.
8. Give a comparative study of lanthanides and actinides.
9. Explain thermal and electrical properties based on valence bond theory.
10. Explain thermal and electrical properties based on free electron theory.
11. Explain band theory of solids.
12. What are conductors, semiconductors and insulators?

Unit – III:

1. Explain law of constancy of interfacial angles.
2. Write about law of rationality of indices.

3. What are symmetry elements?
4. Write about crystal systems and Bravais lattices.
5. Derive Bragg's equation.
6. Explain how crystal structure is determined by powder method.
7. Write a note on crystal defects.
8. Define lattice point, space lattice and unit cell.

Unit – IV:

1. Write about Vander Waals equation of state.
2. Explain Andrew's isotherms of carbon dioxide.
3. What are critical phenomena? Explain.
4. Give the relation between critical constants and Vander Waals constant.
5. Write a note on law of corresponding states.
6. Write a note on Joule-Thomson effect.
7. What are liquid crystals? How are they classified?
8. Give the use of liquid crystals in LCD devices.

Unit – V:

1. What are colligative properties?
2. What is RLVP?
3. What is elevation in boiling point? How to determine molar mass of a non volatile solute using it, experimentally?
4. What is depression in freezing point? Give the experimental determination of molar mass using it.
5. Define osmotic pressure. Give the experimental determination of molar mass using it.
6. Write a note on Van't Hoff factor for abnormal colligative properties.
7. Define pH and explain its effects on nutrient availability for soils.
8. Write a note on alkalinity of soils.

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

INORGANIC CHEMISTRY, PHYSICAL CHEMISTRY AND SOIL CHEMISTRY

TIME: 2¹/₂ hrs.

Max. MARKS: 50

PART-A

Answer **ALL** the Questions

5x7 = 35 M

1. **UNIT-I 2 Questions – To answer 1 or 2**
2. **UNIT- II 2 Questions - To answer 3 or 4**
3. **UNIT- III 2 Questions - To answer 5 or 6**
4. **UNIT- IV 2 Questions - To answer 7 or 8**
5. **UNIT- V 2 Questions - To answer 9 or 10**

PART – B

Answer any **FIVE** Questions

5x3 = 15 M

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

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
I B.Sc. DEGREE EXAMINATIONS
SEMESTER-I MODEL PAPER (From 2022-23)
(For BC Agriculture)
Paper-I: INORGANIC CHEMISTRY, PHYSICAL CHEMISTRY AND SOIL
CHEMISTRY

Time: 2¹/₂ hrs.

Maximum Marks: 50

PART- A

Answer **All** the questions. Each carries **Seven** marks:

5 x 7 = 35 Marks


1. Explain Classification, Preparations & uses of Silicones
(Or)
2. (i) What are Pseudohalogens?
(ii) Explain the Structures of any one AX & AX₃ type inter halogen compounds.
3. What is Lanthanide Contraction? Explain the causes and consequences of Lanthanide Contraction.
(Or)
4. (i) Explain the magnetic properties of d- block elements.
(ii) Explain about conductors, semi-conductors & insulators using band theory.
5. Write an essay on Crystal defects.
(Or)
6. Derive Bragg's equation for crystal structure.
7. Derive the relationship between Critical constants & Vanderwaals constants.
(Or)
8. What are liquid crystals? Give different types of liquid crystals and their applications.
9. Define pH and explain its effects on nutrient availability for soils.
(Or)
10. What are colligative properties? Write experimental methods for determination of molar mass of a non-volatile solute by using Elevation in boiling point.

PART- B

5x3 = 15 Marks

Answer any **Five** of the following questions. Each question carries **Three** marks:

11. Explain the preparation & structures of Phosphonitrilic compounds.
12. Write a note on pseudohalogens.
13. Explain in brief, catalytic properties of d- block elements.
14. Write short note on Bravais lattices and crystal systems.
15. Describe Andrew's isotherms of carbon dioxide.
16. What are Smectic & Nematic liquid Crystals? Explain.
17. Write a note on alkalinity of soils.
18. Explain about osmotic pressure.

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHE-101P	TITLE OF THE COURSE VOLUMETRIC ANALYSIS (Two burette method)	I B.Sc. Chemistry I SEMESTER			
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre-requisites:	Concept of Quantitative analysis - Volumetric analysis	-	-	2	2

Course Objectives:

1. To get acquainted with volumetric apparatus.
2. To understand the method of preparing a standard solution and dilution of solutions
3. To learn titration method and calculations.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Use glassware, equipment and chemicals and follow experimental procedures in the laboratory.
CO2	Understand and explain the volumetric analysis based on fundamental concepts learnt in ionic equilibria.
CO3	Learn and identify the concepts of standard solutions, primary and secondary standards.
CO4	Facilitate the learner to make solutions of various molar concentrations. This may include: The concept of the mole; Converting moles to grams; Converting grams to moles; Defining concentration; Dilution of Solutions; Making different molar concentrations.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Volumetric Analysis

50 M

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

Reference and Text books:

1. Quantitative methods of Analysis - Vogel
2. Quantitative Analysis - Alexeyev
3. Quantitative Analysis - Day and Underwood

Web Links:

1. <https://www.youtube.com/watch?v=LACDDKcX5h8>
2. <https://www.youtube.com/watch?v=q7Yyoqw06iM>
3. https://www.youtube.com/watch?v=dNEOsI_3j2g

CO-PO Mapping:

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

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

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
I SEMESTER END EXAMINATIONS
I B.Sc. CHEMISTRY 2022-23
VOLUMETRIC ANALYSIS - PRACTICAL
(Scheme of Valuation)


Time : 3 Hrs

Max. Marks .50

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

Splitting of Practical Marks (35)

i. Procedure in 10 minutes	: 5 M
ii. Formula with units	: 5 M
iii. Neat tabulation	: 5 M
iv. Correct calculation	: 5 M
Error < 1 %	15 M
1- 2 %	10 M
>2 %	5 M

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. (MPC, BZC, GMC, MCAC) SEMESTER - II			
Course Code CHE-106	TITLE OF THE COURSE ORGANIC AND GENERAL CHEMISTRY				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	IUPAC nomenclature, Organic functional groups, Fundamentals of types of organic reactions and their mechanisms, Chemical bonding.	3	1	-	3

Course Objectives:

1. To get acquaintance with structural theory of organic chemistry
2. To understand and apply various reaction mechanisms.
3. To learn and appreciate the named reactions and their mechanisms.
4. To draw the electronic flow, molecular energy level diagrams and structural formulae.

Course Outcomes:

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	1. Understand and explain the differential behaviour of organic compounds based on fundamental concepts learnt.	Understanding
CO2	2. Learn and identify many organic reaction mechanisms including Free Radical Substitution, Electrophilic Addition and Electrophilic Aromatic Substitution.	Understanding
CO3	3. Formulate the mechanism of organic reactions by recalling and correlating the fundamental properties of the reactants involved.	Application
CO4	4. Correlate and describe the stereo chemical properties of organic compounds and reactions.	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

ORGANIC CHEMISTRY

UNIT-I:

12 h

Recapitulation of Basics of Organic Chemistry :

Carbon-Carbon sigma bonds (Alkanes and Cycloalkanes)

General methods of preparation of alkanes : Wurtz and Wurtz - Fittig reactions, Corey House synthesis, physical properties - solubility, boiling point and melting point of alkanes, Isomerism and its effect on physical properties, concept of relative reactivity v/s selectivity,

chemical properties : Free radical substitutions - Halogenation, Conformational analysis of analysis of alkanes (Conformations, relative stability and energy diagrams of ethane and n-butane).

General molecular formula of cycloalkanes and relative stability, Baeyer strain theory, Cyclohexane conformations with energy diagram .

Additional input: Types of bond fission, organic reagents (Electrophilic, Nucleophilic, and free radical reagents). Bond polarization - Inductive effect, Resonance or Mesomeric effect and Hyperconjugation. Types of organic reactions, Sachse - Mohr Theory.

UNIT-II: **12 h**

Carbon-Carbon pi Bonds (Alkenes and Alkynes)

Alkenes: Mechanism of E1, E2, E1CB reactions, general methods of preparation (dehydration, dehydrohalogenation and dehalogenation of vicinal dihalides), Saytzeff and Hofmann eliminations. Electrophilic Addition reaction - general mechanism, Markovnikov & Anti Markovnikov addition (with mechanism) with suitable examples, *syn* and *anti*-addition: addition of H₂, X₂ and HX (with mechanism) - Oxymercuration - demercuration, hydroboration - oxidation, ozonolysis, hydroxylation (with alkaline KMnO₄ and HIO₄)

Dienes: 1, 2- and 1,4-addition reactions in conjugated dienes, Diels Alder reaction.

Reactions of alkynes: Acidity, electrophilic addition - (X₂, HX), nucleophilic addition - hydration to form carbonyl compounds, Alkylation of terminal alkynes.

UNIT-III: **12 h**

Benzene and its reactivity

Concept of aromaticity, Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non - Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation) Reactions - General mechanism of electrophilic aromatic substitution, mechanism of nitration, Friedal-Crafts alkylation and acylation. Orientation of aromatic substitution - 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 groups
iii. Halogens (Explanation by taking minimum of one example from each type)

GENERAL CHEMISTRY **24 h**

UNIT-IV:

1.Surface chemistry **6 h**

Colloids- Coagulation of colloids- Hardy-Schulze rule. **Stability of colloids**, Protection of Colloids, Gold number.

Adsorption-Physical and chemical adsorption, Langmuir adsorption isotherm, **applications of adsorption.**

2. Chemical Bonding **6 h**

Valence bond theory, VB theory as applied to ClF₃, Ni(CO)₄, Molecular orbital theory (MOT) - LCAO method, construction of M.O. diagrams for homo-nuclear diatomic (N₂, O₂) and hetero-nuclear diatomic molecules (CO and NO).

3. HSAB **4 h**

Pearson's concept, HSAB principle & its importance, bonding in Hard-Hard and Soft-Soft combinations.

UNIT-V:

Stereochemistry of carbon compounds

8 h

Molecular representations- Wedge, Fischer, Newman and Saw-Horse formulae.

Optical isomerism: Optical activity- wave nature of light, plane polarized light, optical rotation and specific rotation. Chiral molecules- definition and criteria (Symmetry elements - Plane, axis, center) - Definition of enantiomers and diastereomers - Explanation of optical isomerism with examples- Glyceraldehyde, Lactic acid, Alanine, Tartaric acid, 2,3-dibromopentane.

D,L, R,S and E,Z- configuration with examples.

Definition of Racemic mixture - Resolution of racemic mixtures (any 3 techniques)

Reference and Text 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. Finar, I. L. - Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Eliel, E. L. & Wilen, S. H. - Stereochemistry of Organic Compounds; Wiley: London, 1994.
5. Kalsi, P. S. - Stereochemistry Conformation and Mechanism; New Age International, 2005.

Web Links:

1. <https://www.youtube.com/watch?v=gt5Wtf00zSI>
2. <https://www.youtube.com/watch?v=1nDMRppFJ1w>
3. <https://www.youtube.com/watch?v=E7MUPmFzYT0&t=1030s>
4. <https://www.youtube.com/watch?v=sYJkqX14BYY>

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

Proposed Activities:

Skill Development: 1. Preparation of emulsion.

Employability: 1. Preparation of soap / detergent to learn its cleaning action.

Entrepreneurship: 1. Reverse Osmosis technique.

Assignment Questions:

Unit - I

1. Write preparation methods and physical properties of Alkanes.
2. Explain Baeyer's strain theory.
3. Explain conformational analysis of cyclohexane.
4. Explain chlorination of methane with mechanism.

Unit - II

1. Write any two preparation methods and two chemical properties of Alkenes.
2. Explain E1, E2 reactions with mechanisms.
3. Explain Saytzeff's & Hofmann rule with suitable examples.
4. Explain the mechanism of Markovnikov's rule with a suitable example.
5. Write about peroxide effect with suitable example.
6. Explain 1,2-and 1,4-additions of 1,3-butadiene.
7. What is Diels - Alder's reaction. Give an example.

Unit - III

1. Explain the mechanism of Friedel Craft's alkylation of benzene.
2. What are benzenoid and non-benzenoid aromatic compounds, give examples.
3. Explain orientation of aromatic substitutions.
4. Write a short note on Aromaticity.
5. What is Huckel's rule? Give an example.
6. Write about ring activating and deactivating groups.

Unit - IV

1. Explain the differences between physical and chemical adsorption and applications.
2. Write about Langmuir adsorption isotherms.
3. Write about coagulation of colloids and protection of colloids.
4. Define Hardy Schulze rule and Gold number.
5. Explain the structure of $\text{Ni}(\text{CO})_4$ molecules by valence bond theory.
6. Explain the structure of ClF_3 molecule by valence bond theory.
7. Explain the LCAO method and draw the MOED of the O_2 and CO molecules. Give its bond order and magnetic property.
8. Draw the MOED of N_2 and NO molecules. Give bond order, magnetic property.
9. Explain the HSAB principle.
10. What are soft and hard acids and bases?

Unit- V

1. Write about E, Z-configuration with suitable examples.
2. Explain optical isomerism with (i) Glyceraldehyde (ii) Alanine (iii) 2,3-dibromopentane (iv) Tartaric acid. v) Lactic acid
3. Define Racemic mixture. Explain resolution methods of racemic mixture
4. Explain R, S-configuration taking suitable examples.
5. Write a note on chiral molecules, optical activity and optical rotation with examples.
6. Explain D, L-configuration with examples.

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

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

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
I B.Sc. DEGREE EXAMINATIONS
SEMESTER-II MODEL PAPER (From 2022-23)
(For MPC, BZC, GMC & MCAC programmes)
Paper-II: ORGANIC & GENERAL CHEMISTRY

Time: 2¹/₂ hrs.

Maximum Marks: 50

PART- A

Answer ALL the questions. Each carries SEVEN marks

5 x 7 = 35 M

1. (i) Write the preparation of alkanes by Wurtz and Corey-House reaction.
(ii) Explain Halogenation of alkanes. Explain the reactivity and selectivity in free radical substitutions.

(Or)

2. (i) Explain Baeyer Strain Theory
(ii) Draw the conformations of Cyclohexane and explain their stability by drawing energy profile diagram.
3. (i) Write any two methods of preparation of alkenes.
(ii) Explain the mechanism of Markownikoff and Anti-Markovnikov addition of HBr to alkene.

(Or)

4. (i) Explain the acidity of 1-alkynes.
(ii) How will you prepare acetaldehyde and acetone from alkynes?
(iii) Write alkylation reaction of Terminal alkynes.

5. Define the Huckel rule of aromatic compounds. What are benzenoid and non- benzenoid aromatic compounds? Give examples.

(Or)

6. Explain the mechanisms of Nitration and Friedel-Crafts alkylation of Benzene.

7. Construct the Molecular Orbital diagram for O₂ and NO and explain their bond order and magnetic property.

(Or)

8. Explain Langmuir adsorption isotherms and give any three applications of adsorption.

9. Define racemic mixture. Explain any two techniques for resolution of racemic mixture.


(Or)

10. Explain R ,S and E, Z configurations with suitable examples.

PART- B

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

1. Write different conformations of n-butane. Explain their relative stability.
2. Explain 1,2- & 1,4- addition reactions of conjugated dienes.
3. Explain the orientation effect of halogens on mono substituted benzene.
4. Explain the mechanism of E1CB elimination reaction.
5. Explain the structure of ClF_3 by Valence Bond theory.
6. What are Hard & soft acids and bases? Explain with examples.
7. Define Optical activity and Specific rotation.
8. Draw the R- & S- isomers of Alanine, Glyceraldehyde.

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. (BCH & ZCAq) SEMESTER - II			
Course Code CHE-107	TITLE OF THE COURSE ORGANIC CHEMISTRY, GENERAL CHEMISTRY AND FERTILIZERS				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	IUPAC nomenclature, Organic functional groups, Fundamentals of types of organic reactions and their mechanisms, Chemical bonding.	3	1	-	3

Course Objectives:

1. To get acquaintance with structural theory of organic chemistry
2. To understand and apply various reaction mechanisms.
3. To learn and appreciate the named reactions and their mechanisms.
4. To draw the electronic flow, molecular energy level diagrams and structural formulae.

Course Outcomes:

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	1. Understand and explain the differential behaviour of organic compounds based on fundamental concepts learnt.	Understanding
CO2	2. Learn and identify many organic reaction mechanisms including Free Radical Substitution, Electrophilic Addition and Electrophilic Aromatic Substitution.	Understanding
CO3	3. Formulate the mechanism of organic reactions by recalling and correlating the fundamental properties of the reactants involved.	Application
CO4	4. Know that when fertilizers should be supplied to plants for healthy growth.	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

ORGANIC CHEMISTRY

UNIT-I:

12 h

Recapitulation of Basics of Organic Chemistry :

Carbon-Carbon sigma bonds (Alkanes and Cycloalkanes)

General methods of preparation of alkanes : Wurtz and Wurtz - Fittig reactions, Corey House synthesis, physical properties - solubility, boiling point and melting point of alkanes, Isomerism and its effect on physical properties, concept of relative reactivity v/s selectivity, chemical properties : Free radical substitutions - Halogenation, Conformational analysis of

analysis of alkanes (Conformations, relative stability and energy diagrams of ethane and n-butane).

General molecular formula of cycloalkanes and relative stability, Baeyer strain theory, Cyclohexane conformations with energy diagram .

Additional input: Types of bond fission, organic reagents (Electrophilic, Nucleophilic, and free radical reagents). Bond polarization - Inductive effect, Resonance or Mesomeric effect and Hyperconjugation. Types of organic reactions, Sachse - Mohr Theory.

UNIT-II: **12 h**

Carbon-Carbon pi Bonds (Alkenes and Alkynes)

Alkenes: Mechanism of E1, E2, E1CB reactions, general methods of preparation (dehydration, dehydrohalogenation and dehalogenation of vicinal dihalides), Saytzeff and Hofmann eliminations. Electrophilic Addition reaction - general mechanism, Markovnikov & Anti Markovnikov addition (with mechanism) with suitable examples, *syn* and *anti*-addition: addition of H₂, X₂ and HX (with mechanism) - Oxymercuration - demercuration, hydroboration - oxidation, ozonolysis, hydroxylation (with alkaline KMnO₄ and HIO₄)

Dienes: 1, 2- and 1,4-addition reactions in conjugated dienes, Diels Alder reaction.

Reactions of alkynes: Acidity, electrophilic addition - (X₂, HX), nucleophilic addition - hydration to form carbonyl compounds, Alkylation of terminal alkynes.

UNIT-III: **12 h**

Benzene and its reactivity

Concept of aromaticity, Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non - Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation) Reactions - General mechanism of electrophilic aromatic substitution, mechanism of nitration, Friedal-Crafts alkylation and acylation. Orientation of aromatic substitution - 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 groups
iii. Halogens (Explanation by taking minimum of one example from each type)

GENERAL CHEMISTRY **24 h**

UNIT-IV:

1.Surface chemistry **6 h**

Colloids- Coagulation of colloids- Hardy-Schulze rule. **Stability of colloids,** Protection of Colloids, Gold number.

Adsorption-Physical and chemical adsorption, Langmuir adsorption isotherm, **applications of adsorption.**

2. Chemical Bonding **6 h**

Valence bond theory, VB theory as applied to ClF₃, Ni(CO)₄, Molecular orbital theory (MOT) - LCAO method, construction of M.O. diagrams for homo-nuclear diatomic (N₂, O₂) and hetero-nuclear diatomic molecules (CO and NO).

3. Fertilizers: **4 h**

Different types of fertilizers. Manufacture of the following fertilizers: Urea, ammonium nitrate, calcium ammonium nitrate, ammonium phosphate, superphosphate, compound and mixed fertilizers, potassium chloride, potassium sulphate.

UNIT-V:**Stereochemistry of carbon compounds****8 h****Molecular representations-** Wedge, Fischer, Newman and Saw-Horse formulae.**Optical isomerism:** Optical activity- wave nature of light, plane polarized light, optical rotation and specific rotation. Chiral molecules- definition and criteria (Symmetry elements - Plane, axis, center)- Definition of enantiomers and diastereomers - Explanation of optical isomerism with examples- Glyceraldehyde, Lactic acid, Alanine, Tartaric acid, 2,3-dibromopentane.

D,L, R,S and E,Z- configuration with examples.

Definition of Racemic mixture - Resolution of racemic mixtures (any 3 techniques)

Reference and Text books:

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3. Finar, I. L. - Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Eliel, E. L. & Wilen, S. H. - Stereochemistry of Organic Compounds; Wiley: London, 1994.
5. Kalsi, P. S. - Stereochemistry Conformation and Mechanism; New Age International, 2005.

Web Links:

1. <https://www.youtube.com/watch?v=gt5Wtf00zSI>
2. <https://www.youtube.com/watch?v=1nDMRppFJ1w>
3. <https://www.youtube.com/watch?v=E7MUPmFzYTo&t=1030s>
4. <https://www.youtube.com/watch?v=sYJkqX14BYY>

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

Proposed Activities:**Skill Development:** 1. Preparation of emulsion.**Employability:** 1. Preparation of soap / detergent to learn its cleaning action.**Entrepreneurship:** 1. Reverse Osmosis technique.

Assignment Questions:

Unit - I

1. Write preparation methods and physical properties of Alkanes.
2. Explain Baeyer's strain theory.
3. Explain conformational analysis of cyclohexane.
4. Explain chlorination of methane with mechanism.

Unit - II

1. Write any two preparation methods and two chemical properties of Alkenes.
2. Explain E1, E2 reactions with mechanisms.
3. Explain Saytzeff's & Hofmann rule with suitable examples.
4. Explain the mechanism of Markovnikov's rule with a suitable example.
5. Write about peroxide effect with suitable example.
6. Explain 1,2-and 1,4-additions of 1,3-butadiene.
7. What is Diels - Alder's reaction. Give an example.

Unit - III

1. Explain the mechanism of Friedel Craft's alkylation of benzene.
2. What are benzenoid and non-benzenoid aromatic compounds, give examples.
3. Explain orientation of aromatic substitutions.
4. Write a short note on Aromaticity.
5. What is Huckel's rule? Give an example.
6. Write about ring activating and deactivating groups.

Unit - IV

1. Explain the differences between physical and chemical adsorption and applications.
2. Write about Langmuir adsorption isotherms.
3. Write about coagulation of colloids and protection of colloids.
4. Define Hardy Schulze rule and Gold number.
5. Explain the structure of $\text{Ni}(\text{CO})_4$ molecules by valence bond theory.
6. Explain the structure of ClF_3 molecule by valence bond theory.
7. Explain the LCAO method and draw the MOED of the O_2 and CO molecules. Give its bond order and magnetic property.
8. Draw the MOED of N_2 and NO molecules. Give bond order, magnetic property.
9. Write the manufacturing process of urea.
10. Write about super phosphate of lime.

Unit- V

1. Write about E, Z-configuration with suitable examples.
2. Explain optical isomerism with (i) Glyceraldehyde (ii) Alanine (ii) 2,3-dibromo pentane (iv) Tartaric acid. v) Lacticacid
3. Define Racemic mixture. Explain resolution methods of racemic mixture
4. Explain R, S-configuration taking suitable examples.
5. Write a note on chiral molecules, optical activity and optical rotation with examples.
6. Explain D, L-configuration with examples.

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

ORGANIC CHEMISTRY, GENERAL CHEMISTRY AND FERTILIZERS

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

GOVERNMENT COLLEGE (A), RAJAHMUNDRY

I B.Sc. DEGREE EXAMINATIONS

SEMESTER-II MODEL PAPER (From 2022-23)

(For BCH and ZCAq programmes)

Paper-II: ORGANIC CHEMISTRY, GENERAL CHEMISTRY AND FERTILIZERS

Time: 2¹/₂ hrs.

Maximum Marks: 50

PART- A

Answer ALL the questions. Each carries SEVEN marks

5 x 7 = 35 M

- (i) Write the preparation of alkanes by Wurtz and Corey-House reaction.
(ii) Explain Halogenation of alkanes. Explain the reactivity and selectivity in free radical substitutions.

(Or)
- (i) Explain Baeyer Strain Theory
(ii) Draw the conformations of Cyclohexane and explain their stability by drawing energy profile diagram.
- (i) Write any two methods of preparation of alkenes.
(ii) Explain the mechanism of Markownikoff and Anti-Markovnikov addition of HBr to alkene.

(Or)
- (i) Explain the acidity of 1-alkynes.
(ii) How will you prepare acetaldehyde and acetone from alkynes?
(iii) Write alkylation reaction of Terminal alkynes.
- Define the Huckel rule of aromatic compounds. What are benzenoid and non- benzenoid aromatic compounds? Give examples.

(Or)
- Explain the mechanisms of Nitration and Friedel-Crafts alkylation of Benzene.
- Construct the Molecular Orbital diagram for O₂ and NO and explain their bond order and magnetic property.


(Or)
- Write the manufacturing process of urea.
- Define racemic mixture. Explain any two techniques for resolution of racemic mixture.

(Or)
- Explain R ,S and E, Z configurations with suitable examples.

PART- B

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

1. Write different conformations of n-butane. Explain their relative stability.
2. Explain 1,2- & 1,4- addition reactions of conjugated dienes.
3. Explain the orientation effect of halogens on mono substituted benzene.
4. Explain the mechanism of E1CB elimination reaction.
5. Explain the structure of ClF_3 by Valence Bond theory.
6. Write about super phosphate of lime.
7. Define Optical activity and Specific rotation.
8. Draw the R- & S- isomers of Alanine, Glyceraldehyde.

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. (BBC & BBC Agro) SEMESTER - II			
Course Code CHE-108	TITLE OF THE COURSE ORGANIC CHEMISTRY, GENERAL CHEMISTRY AND CATALYSIS				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	IUPAC nomenclature, Organic functional groups, Fundamentals of types of organic reactions and their mechanisms, Chemical bonding.	3	1	-	3

Course Objectives:

1. To get acquaintance with structural theory of organic chemistry
2. To understand and apply various reaction mechanisms.
3. To learn and appreciate the named reactions and their mechanisms.
4. To draw the electronic flow, molecular energy level diagrams and structural formulae.

Course Outcomes:

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	1. Understand and explain the differential behaviour of organic compounds based on fundamental concepts learnt.	Understanding
CO2	2. Learn and identify many organic reaction mechanisms including Free Radical Substitution, Electrophilic Addition and Electrophilic Aromatic Substitution.	Understanding
CO3	3. Formulate the mechanism of organic reactions by recalling and correlating the fundamental properties of the reactants involved.	Application
CO4	4. Apply the catalysis in various fields.	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

ORGANIC CHEMISTRY

UNIT-I:

12 h

Recapitulation of Basics of Organic Chemistry :

Carbon-Carbon sigma bonds (Alkanes and Cycloalkanes)

General methods of preparation of alkanes : Wurtz and Wurtz - Fittig reactions, Corey House synthesis, physical properties - solubility, boiling point and melting point of alkanes, Isomerism and its effect on physical properties, concept of relative reactivity v/s selectivity, chemical properties : Free radical substitutions - Halogenation, Conformational analysis of

analysis of alkanes (Conformations, relative stability and energy diagrams of ethane and n-butane).

General molecular formula of cycloalkanes and relative stability, Baeyer strain theory, Cyclohexane conformations with energy diagram .

Additional input: Types of bond fission, organic reagents (Electrophilic, Nucleophilic, and free radical reagents). Bond polarization - Inductive effect, Resonance or Mesomeric effect and Hyperconjugation. Types of organic reactions, Sachse - Mohr Theory.

UNIT-II: **12 h**

Carbon-Carbon pi Bonds (Alkenes and Alkynes)

Alkenes: Mechanism of E1, E2, E1CB reactions, general methods of preparation (dehydration, dehydrohalogenation and dehalogenation of vicinal dihalides), Saytzeff and Hofmann eliminations. Electrophilic Addition reaction - general mechanism, Markovnikov & Anti Markovnikov addition (with mechanism) with suitable examples, *syn* and *anti*-addition: addition of H₂, X₂ and HX (with mechanism) - Oxymercuration - demercuration, hydroboration - oxidation, ozonolysis, hydroxylation (with alkaline KMnO₄ and HIO₄)

Dienes: 1, 2- and 1,4-addition reactions in conjugated dienes, Diels Alder reaction.

Reactions of alkynes: Acidity, electrophilic addition - (X₂, HX), nucleophilic addition - hydration to form carbonyl compounds, Alkylation of terminal alkynes.

UNIT-III: **12 h**

Benzene and its reactivity

Concept of aromaticity, Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non - Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation) Reactions - General mechanism of electrophilic aromatic substitution, mechanism of nitration, Friedal-Crafts alkylation and acylation. Orientation of aromatic substitution - 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 groups
iii. Halogens (Explanation by taking minimum of one example from each type)

GENERAL CHEMISTRY **24 h**

UNIT-IV:

1.Surface chemistry **6 h**

Colloids- Coagulation of colloids- Hardy-Schulze rule. **Stability of colloids,** Protection of Colloids, Gold number.

Adsorption-Physical and chemical adsorption, Langmuir adsorption isotherm, **applications of adsorption.**

2. Chemical Bonding **6 h**

Valence bond theory, VB theory as applied to ClF₃, Ni(CO)₄, Molecular orbital theory (MOT) - LCAO method, construction of M.O. diagrams for homo-nuclear diatomic (N₂, O₂) and hetero-nuclear diatomic molecules (CO and NO).

3. Catalysis: **4 h**

Catalysis - types - homogeneous and heterogeneous catalysis, comparison with examples, acid catalysed and base catalysed reactions, enzyme catalysis, auto catalysis (without mechanisms).

UNIT-V:**Stereochemistry of carbon compounds****8 h****Molecular representations-** Wedge, Fischer, Newman and Saw-Horse formulae.**Optical isomerism:** Optical activity- wave nature of light, plane polarized light, optical rotation and specific rotation. Chiral molecules- definition and criteria (Symmetry elements - Plane, axis, center) - Definition of enantiomers and diastereomers - Explanation of optical isomerism with examples- Glyceraldehyde, Lactic acid, Alanine, Tartaric acid, 2,3-dibromopentane.

D,L, R,S and E,Z- configuration with examples.

Definition of Racemic mixture - Resolution of racemic mixtures (any 3 techniques)

Reference and Text 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. Finar, I. L. - Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Eliel, E. L. & Wilen, S. H. - Stereochemistry of Organic Compounds; Wiley: London, 1994.
5. Kalsi, P. S. - Stereochemistry Conformation and Mechanism; New Age International, 2005.

Web Links:

1. <https://www.youtube.com/watch?v=gt5Wtf00zSI>
2. <https://www.youtube.com/watch?v=1nDMRppFJ1w>
3. <https://www.youtube.com/watch?v=E7MUPmFzYTo&t=1030s>
4. <https://www.youtube.com/watch?v=sYJkqX14BYY>

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

Proposed Activities:**Skill Development:** 1. Preparation of emulsion.**Employability:** 1. Preparation of soap / detergent to learn its cleaning action.**Entrepreneurship:** 1. Reverse Osmosis technique.

Assignment Questions:

Unit - I

1. Write preparation methods and physical properties of Alkanes.
2. Explain Baeyer's strain theory.
3. Explain conformational analysis of cyclohexane.
4. Explain chlorination of methane with mechanism.

Unit - II

1. Write any two preparation methods and two chemical properties of Alkenes.
2. Explain E1, E2 reactions with mechanisms.
3. Explain Saytzeff's & Hofmann rule with suitable examples.
4. Explain the mechanism of Markovnikov's rule with a suitable example.
5. Write about peroxide effect with suitable example.
6. Explain 1,2-and 1,4-additions of 1,3-butadiene.
7. What is Diels - Alder's reaction. Give an example.

Unit - III

1. Explain the mechanism of Friedel Craft's alkylation of benzene.
2. What are benzenoid and non-benzenoid aromatic compounds, give examples.
3. Explain orientation of aromatic substitutions.
4. Write a short note on Aromaticity.
5. What is Huckel's rule? Give an example.
6. Write about ring activating and deactivating groups.

Unit - IV

1. Explain the differences between physical and chemical adsorption and applications.
2. Write about Langmuir adsorption isotherms.
3. Write about coagulation of colloids and protection of colloids.
4. Define Hardy Schulze rule and Gold number.
5. Explain the structure of $\text{Ni}(\text{CO})_4$ molecules by valence bond theory.
6. Explain the structure of ClF_3 molecule by valence bond theory.
7. Explain the LCAO method and draw the MOED of the O_2 and CO molecules. Give its bond order and magnetic property.
8. Draw the MOED of N_2 and NO molecules. Give bond order, magnetic property.
9. Define catalysis. Write about the types of catalysis with suitable examples.
10. Write about enzyme catalysis.

Unit- V

1. Write about E, Z-configuration with suitable examples.
2. Explain optical isomerism with (i) Glyceraldehyde (ii) Alanine (iii) 2,3-dibromopentane (iv) Tartaric acid. v) Lactic acid
3. Define Racemic mixture. Explain resolution methods of racemic mixture
4. Explain R, S-configuration taking suitable examples.
5. Write a note on chiral molecules, optical activity and optical rotation with examples.
6. Explain D, L-configuration with examples.

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

ORGANIC CHEMISTRY, GENERAL CHEMISTRY AND CATALYSIS

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

GOVERNMENT COLLEGE (A), RAJAHMUNDRY

I B.Sc. DEGREE EXAMINATIONS

SEMESTER-II MODEL PAPER (From 2022-23)

(For BBC and BBC Agri programmes)

Paper-II: ORGANIC CHEMISTRY, GENERAL CHEMISTRY AND CATALYSIS

Time: 2¹/₂ hrs.

Maximum Marks: 50

PART- A

Answer ALL the questions. Each carries SEVEN marks

5 x 7 = 35 M

1. (i) Write the preparation of alkanes by Wurtz and Corey-House reaction.
(ii) Explain Halogenation of alkanes. Explain the reactivity and selectivity in free radical substitutions.

(Or)

2. (i) Explain Baeyer Strain Theory
(ii) Draw the conformations of Cyclohexane and explain their stability by drawing energy profile diagram.
3. (i) Write any two methods of preparation of alkenes.
(ii) Explain the mechanism of Markownikoff and Anti-Markovnikov addition of HBr to alkene.

(Or)

4. (i) Explain the acidity of 1-alkynes.
(ii) How will you prepare acetaldehyde and acetone from alkynes?
(iii) Write alkylation reaction of Terminal alkynes.

5. Define the Huckel rule of aromatic compounds. What are benzenoid and non- benzenoid aromatic compounds? Give examples.

(Or)

6. Explain the mechanisms of Nitration and Friedel-Crafts alkylation of Benzene.

7. Construct the Molecular Orbital diagram for O₂ and NO and explain their bond order and magnetic property.

(Or)

8. Define catalysis. Write about the types of catalysis with suitable examples.

9. Define racemic mixture. Explain any two techniques for resolution of racemic mixture.


(Or)

10. Explain R ,S and E, Z configurations with suitable examples.

PART- B

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

11. Write different conformations of n-butane. Explain their relative stability.
12. Explain 1,2- & 1,4- addition reactions of conjugated dienes.
13. Explain the orientation effect of halogens on mono substituted benzene.
14. Explain the mechanism of E1CB elimination reaction.
15. Explain the structure of ClF_3 by Valence Bond theory.
16. Write about enzyme catalysis.
17. Define Optical activity and Specific rotation.
18. Draw the R- & S- isomers of Alanine, Glyceraldehyde.

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. (MZC & FMZC) SEMESTER - II			
Course Code CHE-109	TITLE OF THE COURSE ORGANIC CHEMISTRY, GENERAL CHEMISTRY AND NUCLEIC ACIDS				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	IUPAC nomenclature, Organic functional groups, Fundamentals of types of organic reactions and their mechanisms, Chemical bonding.	3	1	-	3

Course Objectives:

1. To get acquaintance with structural theory of organic chemistry
2. To understand and apply various reaction mechanisms.
3. To learn and appreciate the named reactions and their mechanisms.
4. To draw the electronic flow, molecular energy level diagrams and structural formulae.

Course Outcomes:

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	1. Understand and explain the differential behaviour of organic compounds based on fundamental concepts learnt.	Understanding
CO2	2. Learn and identify many organic reaction mechanisms including Free Radical Substitution, Electrophilic Addition and Electrophilic Aromatic Substitution.	Understanding
CO3	3. Formulate the mechanism of organic reactions by recalling and correlating the fundamental properties of the reactants involved.	Application
CO4	4. Know about RNA and DNA structures	Understanding

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

ORGANIC CHEMISTRY

UNIT-I:

12 h

Recapitulation of Basics of Organic Chemistry :

Carbon-Carbon sigma bonds (Alkanes and Cycloalkanes)

General methods of preparation of alkanes : Wurtz and Wurtz - Fittig reactions, Corey House synthesis, physical properties - solubility, boiling point and melting point of alkanes, Isomerism and its effect on physical properties, concept of relative reactivity v/s selectivity, chemical properties : Free radical substitutions - Halogenation, Conformational analysis of alkanes (Conformations, relative stability and energy diagrams of ethane and n- butane).

General molecular formula of cycloalkanes and relative stability, Baeyer strain theory, Cyclohexane conformations with energy diagram.

Additional input: Types of bond fission, organic reagents (Electrophilic, Nucleophilic and free radical reagents). Bond polarization - Inductive effect, Resonance or Mesomeric effect and Hyperconjugation. Types of organic reactions, Sachse - Mohr Theory.

UNIT-II: **12 h**

Carbon-Carbon pi Bonds (Alkenes and Alkynes)

Alkenes: Mechanism of E1, E2, E1CB reactions, general methods of preparation (dehydration, dehydrohalogenation and dehalogenation of vicinal dihalides), Saytzeff and Hofmann eliminations. Electrophilic Addition reaction - general mechanism, Markovnikov & Anti Markovnikov addition (with mechanism) with suitable examples, *syn* and *anti*-addition: addition of H₂, X₂ and HX (with mechanism) - Oxymercuration - demercuration, hydroboration - oxidation, ozonolysis, hydroxylation (with alkaline KMnO₄ and HIO₄)

Dienes: 1, 2- and 1,4-addition reactions in conjugated dienes, Diels Alder reaction.

Reactions of alkynes: Acidity, electrophilic addition - (X₂, HX), nucleophilic addition - hydration to form carbonyl compounds, Alkylation of terminal alkynes.

UNIT-III: **12 h**

Benzene and its reactivity

Concept of aromaticity, Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non - Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation) Reactions - General mechanism of electrophilic aromatic substitution, mechanism of nitration, Friedal-Crafts alkylation and acylation. Orientation of aromatic substitution - 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 groups
iii. Halogens (Explanation by taking minimum of one example from each type)

GENERAL CHEMISTRY **24 h**

UNIT-IV:

1.Surface chemistry **6 h**

Colloids- Coagulation of colloids- Hardy-Schulze rule. **Stability of colloids,** Protection of Colloids, Gold number.

Adsorption-Physical and chemical adsorption, Langmuir adsorption isotherm, **applications of adsorption.**

2. Chemical Bonding **6 h**

Valence bond theory, VB theory as applied to ClF₃, Ni(CO)₄, Molecular orbital theory (MOT) - LCAO method, construction of M.O. diagrams for homo-nuclear diatomic (N₂, O₂) and hetero-nuclear diatomic molecules (CO and NO).

33. Nucleic acids: **4 h**

Definition and structures of nucleic acids, nitrogen bases - nucleocides - nucleotides, biological importance of nucleic acids.

UNIT-V:

Stereochemistry of carbon compounds **8 h**

Molecular representations- Wedge, Fischer, Newman and Saw-Horse formulae.

Optical isomerism: Optical activity- wave nature of light, plane polarized light, optical rotation and specific rotation. Chiral molecules- definition and criteria (Symmetry elements - Plane, axis, center) - Definition of enantiomers and diastereomers - Explanation of optical isomerism with examples- Glyceraldehyde, Lactic acid, Alanine, Tartaric acid, 2,3-dibromopentane.

D,L; R,S and E,Z- configuration with examples.

Definition of Racemic mixture - Resolution of racemic mixtures (any 3 techniques)

Reference and Text 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. Finar, I. L. - Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Eliel, E. L. & Wilen, S. H. - Stereochemistry of Organic Compounds; Wiley: London, 1994.
5. Kalsi, P. S. - Stereochemistry Conformation and Mechanism; New Age International, 2005.

Web Links:

1. <https://www.youtube.com/watch?v=gt5Wtf00zSI>
2. <https://www.youtube.com/watch?v=1nDMRppFJ1w>
3. <https://www.youtube.com/watch?v=E7MUPmFzYTo&t=1030s>
4. <https://www.youtube.com/watch?v=sYJkqX14BYY>

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

Proposed Activities:

Skill Development: 1. Preparation of emulsion.

Employability: 1. Preparation of soap / detergent to learn its cleaning action.

Entrepreneurship: 1. Reverse Osmosis technique.

Assignment Questions:

Unit - I

1. Write preparation methods and physical properties of Alkanes.
2. Explain Baeyer's strain theory.
3. Explain conformational analysis of cyclohexane.
4. Explain chlorination of methane with mechanism.

Unit - II

1. Write any two preparation methods and two chemical properties of Alkenes.
2. Explain E1, E2 reactions with mechanisms.
3. Explain Saytzeff's & Hofmann rule with suitable examples.
4. Explain the mechanism of Markovnikov's rule with a suitable example.
5. Write about peroxide effect with suitable example.
6. Explain 1,2-and 1,4-additions of 1,3-butadiene.
7. What is Diels - Alder's reaction. Give an example.

Unit - III

1. Explain the mechanism of Friedel Craft's alkylation of benzene.
2. What are benzenoid and non-benzenoid aromatic compounds, give examples.
3. Explain orientation of aromatic substitutions.
4. Write a short note on Aromaticity.
5. What is Huckel's rule? Give an example.
6. Write about ring activating and deactivating groups.

Unit - IV

1. Explain the differences between physical and chemical adsorption and applications.
2. Write about Langmuir adsorption isotherms.
3. Write about coagulation of colloids and protection of colloids.
4. Define Hardy Schulze rule and Gold number.
5. Explain the structure of $\text{Ni}(\text{CO})_4$ molecules by valence bond theory.
6. Explain the structure of ClF_3 molecule by valence bond theory.
7. Explain the LCAO method and draw the MOED of the O_2 and CO molecules. Give its bond order and magnetic property.
8. Draw the MOED of N_2 and NO molecules. Give bond order, magnetic property.
9. What are nucleic acids? Mention their biological importance.
10. Difference between nucleocides and nucleotides.

Unit- V

1. Write about E, Z-configuration with suitable examples.
2. Explain optical isomerism with (i) Glyceraldehyde (ii) Alanine (iii) 2,3-dibromopentane (iv) Tartaric acid. v) Lactic acid
3. Define Racemic mixture. Explain resolution methods of racemic mixture
4. Explain R, S-configuration taking suitable examples.
5. Write a note on chiral molecules, optical activity and optical rotation with examples.
6. Explain D, L-configuration with examples.

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

ORGANIC CHEMISTRY, GENERAL CHEMISTRY AND NUCLEIC ACIDS

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

GOVERNMENT COLLEGE (A), RAJAHMUNDRY

I B.Sc. DEGREE EXAMINATIONS

SEMESTER-II MODEL PAPER (From 2022-23)

(For MZC & FMZC programmes)

Paper-II: ORGANIC CHEMISTRY, GENERAL CHEMISTRY AND NUCLEIC ACIDS

Time: 2¹/₂ hrs.

Maximum Marks: 50

PART- A

Answer ALL the questions. Each carries SEVEN marks

5 x 7 = 35 M

1. (i) Write the preparation of alkanes by Wurtz and Corey-House reaction.
(ii) Explain Halogenation of alkanes. Explain the reactivity and selectivity in free radical substitutions.

(Or)

2. (i) Explain Baeyer Strain Theory
(ii) Draw the conformations of Cyclohexane and explain their stability by drawing energy profile diagram.

3. (i) Write any two methods of preparation of alkenes.
(ii) Explain the mechanism of Markownikoff and Anti-Markovnikov addition of HBr to alkene.

(Or)

4. (i) Explain the acidity of 1-alkynes.
(ii) How will you prepare acetaldehyde and acetone from alkynes?
(iii) Write alkylation reaction of Terminal alkynes.

5. Define the Huckel rule of aromatic compounds. What are benzenoid and non- benzenoid aromatic compounds? Give examples.

(Or)

6. Explain the mechanisms of Nitration and Friedel-Crafts alkylation of Benzene.

7. Construct the Molecular Orbital diagram for O₂ and NO and explain their bond order and magnetic property.

(Or)

8. What are nucleic acids? Mention their biological importance.

9. Define racemic mixture. Explain any two techniques for resolution of racemic mixture.


(Or)

10. Explain R ,S and E, Z configurations with suitable examples.

PART- B

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

11. Write different conformations of n-butane. Explain their relative stability.
12. Explain 1,2- & 1,4- addition reactions of conjugated dienes.
13. Explain the orientation effect of halogens on mono substituted benzene.
14. Explain the mechanism of E1CB elimination reaction.
15. Explain the structure of ClF_3 by Valence Bond theory.
16. Difference between nucleocides and nucleotides.
17. Define Optical activity and Specific rotation.
18. Draw the R- & S- isomers of Alanine, Glyceraldehyde.

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. (BCAgriculture) SEMESTER - II			
Course Code CHE-110	TITLE OF THE COURSE ORGANIC CHEMISTRY, GENERAL CHEMISTRY AND FERTILIZER CHEMISTRY				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	IUPAC nomenclature, Organic functional groups, Fundamentals of types of organic reactions and their mechanisms, Chemical bonding.	3	1	-	3

Course Objectives:

- To get acquaintance with structural theory of organic chemistry
- To understand and apply various reaction mechanisms.
- To learn and appreciate the named reactions and their mechanisms.
- To draw the electronic flow, molecular energy level diagrams and structural formulae.

Course Outcomes:

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	1. Understand and explain the differential behaviour of organic compounds based on fundamental concepts learnt.	Understanding
CO2	2. Learn and identify many organic reaction mechanisms including Free Radical Substitution, Electrophilic Addition and Electrophilic Aromatic Substitution.	Understanding
CO3	3. Formulate the mechanism of organic reactions by recalling and correlating the fundamental properties of the reactants involved.	Application
CO4	4. Know that when fertilizers should be supplied to plants for healthy growth.	Application

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

ORGANIC CHEMISTRY

UNIT-I:

12 h

Recapitulation of Basics of Organic Chemistry :

Carbon-Carbon sigma bonds (Alkanes and Cycloalkanes)

General methods of preparation of alkanes : Wurtz and Wurtz - Fittig reactions, Corey House synthesis, physical properties - solubility, boiling point and melting point of alkanes, Isomerism and its effect on physical properties, concept of relative reactivity v/s selectivity, chemical properties : Free radical substitutions - Halogenation, Conformational analysis of

analysis of alkanes (Conformations, relative stability and energy diagrams of ethane and n-butane).

General molecular formula of cycloalkanes and relative stability, Baeyer strain theory, Cyclohexane conformations with energy diagram .

Additional input: Types of bond fission, organic reagents (Electrophilic, Nucleophilic, and free radical reagents). Bond polarization - Inductive effect, Resonance or Mesomeric effect and Hyperconjugation. Types of organic reactions, Sachse - Mohr Theory.

UNIT-II: **12 h**

Carbon-Carbon pi Bonds (Alkenes and Alkynes)

Alkenes: Mechanism of E1, E2, E1CB reactions, general methods of preparation (dehydration, dehydrohalogenation and dehalogenation of vicinal dihalides), Saytzeff and Hofmann eliminations. Electrophilic Addition reaction - general mechanism, Markovnikov & Anti Markovnikov addition (with mechanism) with suitable examples, *syn* and *anti*-addition: addition of H₂, X₂ and HX (with mechanism) - Oxymercuration - demercuration, hydroboration - oxidation, ozonolysis, hydroxylation (with alkaline KMnO₄ and HIO₄)

Dienes: 1, 2- and 1,4-addition reactions in conjugated dienes, Diels Alder reaction.

Reactions of alkynes: Acidity, electrophilic addition - (X₂, HX), nucleophilic addition - hydration to form carbonyl compounds, Alkylation of terminal alkynes.

UNIT-III: **12 h**

Benzene and its reactivity

Concept of aromaticity, Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non - Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation) Reactions - General mechanism of electrophilic aromatic substitution, mechanism of nitration, Friedal-Crafts alkylation and acylation. Orientation of aromatic substitution - 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 groups
 iii. Halogens (Explanation by taking minimum of one example from each type)

GENERAL CHEMISTRY **24 h**

UNIT-IV:

1.Surface chemistry **6 h**

Colloids- Coagulation of colloids- Hardy-Schulze rule. **Stability of colloids,** Protection of Colloids, Gold number.

Adsorption-Physical and chemical adsorption, Langmuir adsorption isotherm, **applications of adsorption.**

2. Chemical Bonding **6 h**

Valence bond theory, VB theory as applied to ClF₃, Ni(CO)₄, Molecular orbital theory (MOT) - LCAO method, construction of M.O. diagrams for homo-nuclear diatomic (N₂, O₂) and hetero-nuclear diatomic molecules (CO and NO).

3. Fertilizers: **4 h**

Different types of fertilizers. Manufacture of the following fertilizers: Urea, ammonium nitrate, calcium ammonium nitrate, ammonium phosphate, superphosphate, compound and mixed fertilizers, potassium chloride, potassium sulphate.

UNIT-V:**Stereochemistry of carbon compounds****8 h****Molecular representations-** Wedge, Fischer, Newman and Saw-Horse formulae.**Optical isomerism:** Optical activity- wave nature of light, plane polarized light, optical rotation and specific rotation. Chiral molecules- definition and criteria (Symmetry elements - Plane, axis, center)- Definition of enantiomers and diastereomers - Explanation of optical isomerism with examples- Glyceraldehyde, Lactic acid, Alanine, Tartaric acid, 2,3-dibromopentane.

D,L, R,S and E,Z- configuration with examples.

Definition of Racemic mixture - Resolution of racemic mixtures (any 3 techniques)

Reference and Text books:

- Morrison, R. N. & Boyd, R. N. - Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. - Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. - Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Eliel, E. L. & Wilen, S. H. - Stereochemistry of Organic Compounds; Wiley: London, 1994.
- Kalsi, P. S. - Stereochemistry Conformation and Mechanism; New Age International, 2005.

Web Links:

- <https://www.youtube.com/watch?v=gt5Wtf00zSI>
- <https://www.youtube.com/watch?v=1nDMRppFJ1w>
- <https://www.youtube.com/watch?v=E7MUPmFzYTo&t=1030s>
- <https://www.youtube.com/watch?v=sYJkqX14BYY>

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

Proposed Activities:**Skill Development:** 1. Preparation of emulsion.**Employability:** 1. Preparation of soap / detergent to learn its cleaning action.**Entrepreneurship:** 1. Reverse Osmosis technique.

Assignment Questions:

Unit - I

5. Write preparation methods and physical properties of Alkanes.
6. Explain Baeyer's strain theory.
7. Explain conformational analysis of cyclohexane.
8. Explain chlorination of methane with mechanism.

Unit - II

8. Write any two preparation methods and two chemical properties of Alkenes.
9. Explain E1, E2 reactions with mechanisms.
10. Explain Saytzeff's & Hofmann rule with suitable examples.
11. Explain the mechanism of Markovnikov's rule with a suitable example.
12. Write about peroxide effect with suitable example.
13. Explain 1,2- and 1,4-additions of 1,3-butadiene.
14. What is Diels - Alder's reaction. Give an example.

Unit - III

7. Explain the mechanism of Friedel Craft's alkylation of benzene.
8. What are benzenoid and non-benzenoid aromatic compounds, give examples.
9. Explain orientation of aromatic substitutions.
10. Write a short note on Aromaticity.
11. What is Huckel's rule? Give an example.
12. Write about ring activating and deactivating groups.

Unit - IV

11. Explain the differences between physical and chemical adsorption and applications.
12. Write about Langmuir adsorption isotherms.
13. Write about coagulation of colloids and protection of colloids.
14. Define Hardy Schulze rule and Gold number.
15. Explain the structure of $\text{Ni}(\text{CO})_4$ molecules by valence bond theory.
16. Explain the structure of ClF_3 molecule by valence bond theory.
17. Explain the LCAO method and draw the MOED of the O_2 and CO molecules. Give its bond order and magnetic property.
18. Draw the MOED of N_2 and NO molecules. Give bond order, magnetic property.
19. Write the manufacturing process of urea.
20. Write about super phosphate of lime.

Unit- V

7. Write about E, Z-configuration with suitable examples.
8. Explain optical isomerism with (i) Glyceraldehyde (ii) Alanine (ii) 2,3-dibromo pentane (iv) Tartaric acid. v) Lactic acid
9. Define Racemic mixture. Explain resolution methods of racemic mixture
10. Explain R, S-configuration taking suitable examples.
11. Write a note on chiral molecules, optical activity and optical rotation with examples.
12. Explain D, L-configuration with examples.

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

**ORGANIC CHEMISTRY, GENERAL CHEMISTRY AND FERTILIZER
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. 1 Question from UNIT- I
2. 2 Questions from UNIT- II
3. 1 Question from UNIT- III
4. 2 Questions from UNIT- IV
5. 2 Questions from UNIT- V

GOVERNMENT COLLEGE (A), RAJAHMUNDRY

I B.Sc. DEGREE EXAMINATIONS

SEMESTER-II MODEL PAPER (From 2022-23)

(For BCH and ZCAq programmes)

Paper-II: ORGANIC CHEMISTRY, GENERAL CHEMISTRY AND FERTILIZER CHEMISTRY

Time: 2¹/₂ hrs.

Maximum Marks: 50

PART- A

Answer ALL the questions. Each carries SEVEN marks

5 x 7 = 35 M

- (i) Write the preparation of alkanes by Wurtz and Corey-House reaction.
(ii) Explain Halogenation of alkanes. Explain the reactivity and selectivity in free radical substitutions.

(Or)
- (i) Explain Baeyer Strain Theory
(ii) Draw the conformations of Cyclohexane and explain their stability by drawing energy profile diagram.
- (i) Write any two methods of preparation of alkenes.
(ii) Explain the mechanism of Markownikoff and Anti-Markovnikov addition of HBr to alkene.

(Or)
- (i) Explain the acidity of 1-alkynes.
(ii) How will you prepare acetaldehyde and acetone from alkynes?
(iii) Write alkylation reaction of Terminal alkynes.
- Define the Huckel rule of aromatic compounds. What are benzenoid and non- benzenoid aromatic compounds? Give examples.

(Or)
- Explain the mechanisms of Nitration and Friedel-Crafts alkylation of Benzene.
- Construct the Molecular Orbital diagram for O₂ and NO and explain their bond order and magnetic property.


(Or)
- Write the manufacturing process of urea.
- Define racemic mixture. Explain any two techniques for resolution of racemic mixture.

(Or)
- Explain R ,S and E, Z configurations with suitable examples.

PART- B

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

11. Write different conformations of n-butane. Explain their relative stability.
12. Explain 1,2- & 1,4- addition reactions of conjugated dienes.
13. Explain the orientation effect of halogens on mono substituted benzene.
14. Explain the mechanism of E1CB elimination reaction.
15. Explain the structure of ClF_3 by Valence Bond theory.
16. Write about super phosphate of lime.
17. Define Optical activity and Specific rotation.
18. Draw the R- & S- isomers of Alanine, Glyceraldehyde.

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHE-106P	TITLE OF THE COURSE ANALYSIS OF SALT MIXTURE (Micro-scale method)	I B.Sc. (II Semester)			
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre-requisites	Analysis of acidic and basic radicals	-	-	2	2

Course Objectives:

1. Determination of acidic and basic ions in a given mixture.
2. Usage of different lab equipment and reagents for radical analysis.
3. 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 mixture
CO2	Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
CO3	Apply the concepts of common ion effect, solubility product and concepts related to qualitative analysis
CO4	Acquire knowledge of microscale salt analysis procedure.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	-
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Syllabus:

Analysis of SALT MIXTURE

50 M

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

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

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

Reference books:

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

Web Links:

1. <https://youtu.be/adA8doZhqWs>

CO-PO Mapping:

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

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

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
II SEMESTER END EXAMINATIONS
I B.Sc. CHEMISTRY 2022-23
ANALYSIS OF SALT MIXTURE - PRACTICAL
(Micro-scale method)

Scheme of Valuation

Time: 3 hrs.

Max. Marks: 50


For Record - 10 Marks

For Viva-voce - 5 Marks

For Practical - 35 Marks

Splitting of Practical Marks:

S.No.	Description	Marks
1.	Colour	01
2.	State	01
3.	Odour	01
4.	Solubility	02
5.	Flame Test	02
6.	Action of Heat	02
7.	Marks for each radical (4 radicals)	06
8.	Preparation of SCE	02

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

Course Objectives:

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

Course Outcomes:

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

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

ORGANIC CHEMISTRY

34 h

UNIT – I

1. Chemistry of Halogenated Hydrocarbons:

6 h

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

Arylhalides: Preparation (including preparation from diazonium salts) and properties, nucleophilic aromatic substitution; SNAr, Benzyne mechanism. Relative reactivity of alkyl, allyl, benzyl, vinyl and arylhalides towards nucleophilic substitution reactions.

2. Alcohols & Phenols

6 h

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

UNIT-II

Carbonyl Compounds

10 h

Structure, reactivity, preparation and properties; Nucleophilic additions, Nucleophilic addition-elimination reactions with ammonia derivatives Mechanisms of Aldol and Benzoin condensation, Claisen-Schmidt, Perkin, Cannizzaro and Wittig reaction, Beckmann haloform reaction and Baeyer-Villiger oxidation, α substitution reactions, oxidations and reductions (Clemmensen, Wolf-Kishner, with LiAlH_4 & NaBH_4). Addition reactions of α,β -unsaturated carbonyl compounds: Michael addition. Active methylene compounds: Keto-enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethylacetoacetate.

UNIT-III

12 h

Carboxylic Acids and their Derivatives

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

SPECTROSCOPY

26 h

UNIT-IV

Molecular Spectroscopy:

18 h

Interaction of electromagnetic radiation with molecules and various types of spectra;

Rotation spectroscopy: Selection rules, intensities of spectral lines, determination of bond lengths of diatomic and linear triatomic molecules, isotopic substitution.

Vibrational spectroscopy: Classical equation of vibration, computation of force constant, Harmonic and anharmonic oscillator, Morse potential curve, vibrational degrees of freedom for polyatomic molecules, modes of vibration. Selection rules for vibrational transitions, Fundamental frequencies, overtones and hotbands.

Electronic spectroscopy: Energy levels of molecular orbitals (σ , π , n). Selection rules for electronic spectra. Types of electronic transitions in molecules, effect of conjugation. Concept of chromophore. bathochromic and hypsochromic shifts. Beer-Lambert's law and its limitations.

Nuclear Magnetic Resonance (NMR) spectroscopy: Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, NMR

splitting of signals - spin-spin coupling, coupling constants. Applications of NMR with suitable examples - ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate, toluene and acetophenone.

UNIT-V

8 h

Application of Spectroscopy to Simple Organic Molecules Application of visible, ultraviolet and Infrared spectroscopy in organic molecules. Application of electronic spectroscopy and Woodward rules for calculating λ_{max} of conjugated dienes and α, β - unsaturated compounds. Infrared radiation and types of molecular vibrations, functional group and fingerprint region. IR spectra of alkanes, alkenes and simple alcohols (inter and intramolecular hydrogen bonding), aldehydes, ketones, carboxylic acids and their derivatives (effect of substitution on $>C=O$ stretching absorptions).

List of Reference Books

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

Web Links:

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

CO-PO Mapping:

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

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

Proposed Activities:

- Skill Development:**
1. Esterification
 2. Dibenzalpropanone preparation

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

Assignment Questions:

Unit-I:

1. Write the differences between SN^1 and SN^2 reactions.
2. Explain in detail SN^1 and SN^2 reactions.
3. Explain the classification of alkyl halides with suitable examples.
4. Write the mechanism of Fries- rearrangement and azo coupling reaction.
5. Explain with mechanism of pinacol-pinacolone rearrangement.
6. How do you identify the alcohols with KMnO_4 and ceric ammonium nitrate?
7. What is Lucas reagent? What is its use?
8. Explain the mechanism of Reimer-Teimann reaction and Kolbe Schmidt reaction.
9. Write the preparation of alcohols by Grignard reagent.
10. Explain the process of dehydration of alcohols.
11. Write notes on hydrogen bonding in alcohols and phenols and its effects on boiling point.
12. Write any two preparation methods for phenols.

Unit-II:

1. Explain the reaction mechanism of the following reactions:
 - a) Aldol condensation
 - b) Benzoin condensation
2. Write any two methods for the preparation of carbonyl compounds.
3. Explain the reactivity of carbonyl compounds with the following compounds.
 - a) NaHSO_3
 - b) HCN
 - c) NH_2OH
4. Explain the reaction mechanism of the following reactions
 - a) Knoevenagel reaction
 - b) Cannizzaro reaction
5. Explain the following.
 - a) Clemmenson reduction
 - b) Wolf-kishner reduction
6. Write the mechanism of haloform reaction.
7. 2. What is 2,4 -DNP? Write its structure and uses.
8. Explain about Baeyer- Villiger oxidation.
9. Write about the Fehling and Schiff test.
10. Explain the mechanism of Perkin's reaction.
11. Explain the reactivity of carbonyl compounds with Grignard reagent.
12. Explain the reduction of carbonyl compounds with LiAlH_4 and NaBH_4 .

Unit-III:

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

Unit-IV:

1. Explain different types of electronic transitions occur in a molecule.
2. Explain about modes of vibrations in polyatomic molecules.

3. What is electromagnetic spectrum? What are the changes that occur during the interaction of electromagnetic radiation with molecules?
4. Write about chromophore and auxochrome with examples.
5. Write the selection rules for electronic spectra.
6. Explain the impact of conjugation on electronic transitions in molecules.
7. Explain the salient features in the NMR spectra of ethyl acetate and acetophenone.
8. Explain the principle involved in NMR spectroscopy.
9. Explain about the position of signals and splitting of signals in NMR spectroscopy.
10. Write a note on chemical shift.
11. Explain the following:
 - (i) Equivalent and Non-equivalent protons
 - (ii) Spin-spin coupling

UNIT-V:

1. Explain the characteristic absorption bands of various functional groups in IR spectroscopy.
2. Write about the different regions of infrared radiation.
3. What are the modes of vibrations in diatomic and poly atomic molecules?
4. What are the applications of IR spectroscopy?
5. Define force constant? How it is related to the mass of the atoms in a bond?
6. What are the selection rules of simple harmonic oscillator.
7. Explain about finger print region in IR spectrum.

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

CHEMISTRY COURSE-III: ORGANIC CHEMISTRY AND SPECTROSCOPY

TIME: 2¹/₂ hrs.

MAX. MARKS: 50

PART -A

Answer **ALL** the Questions

4x7 = 28 M

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

PART – B

Answer any **FOUR** Questions

4x4 = 16 M

5. **1 Question from UNIT- I**
6. **2 Questions from UNIT- II**
7. **1 Question from UNIT- III**
8. **2 Questions from UNIT- IV**
9. **2 Questions from UNIT- V**

PART-C

Answer **ALL** Questions

3x2 = 6M

10. **UNIT- I**
11. **UNIT- III**
12. **UNIT- IV**

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
II B.Sc. DEGREE EXAMINATIONS
SEMESTER-III MODEL PAPER (2022-23)

Paper-III: ORGANIC CHEMISTRY & SPECTROSCOPY

Time: 2¹/₂ hrs.

Maximum Marks: 50

PART- A

4x7 = 28 Marks

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

1. Give the mechanism & stereochemistry of SN1 & SN2 reactions of alkyl halides with suitable example.
(or)
2. Explain the following reactions with mechanism.
(i) Reimer-Tiemann reaction (ii) Fries rearrangement.
3. Discuss the mechanism for following reactions.
(i) Perkin reaction. (ii) Cannizzaro reaction
(or)
4. Write the preparation and any three synthetic applications of diethyl malonate.
5. Explain acid and base hydrolysis reaction of esters with mechanism.
(or)
6. Explain the mechanisms of Curtius rearrangement & Arndt-Eistert reaction.
7. (i) Write a note on vibrational degrees of freedom for polyatomic molecules.
(ii) Explain different modes of vibrations & selection rules in IR spectroscopy.
(or)
8. What is Fingerprint region? Explain its significance with an example.
(ii) Write IR spectral data for any one alcohol, aldehyde and ketone.

PART- B

4x4 = 16 Marks

Answer any **FOUR** of the following questions. Each carries **FOUR** marks


9. Discuss two methods for preparation of aryl halides.
10. Explain the mechanism for Pinacol-Pinacolone rearrangement.
11. Discuss the mechanism for Bayer-villiger oxidation reaction.
12. Explain the effect of substituents on acidic strength of mono-carboxylic acids.
13. Write the mechanism for Claisen Condensation reaction.
14. Write the selection rules in rotational spectroscopy.
15. Explain Spin – Spin coupling and Coupling Constant.
16. Explain types of electronic transitions in UV spectroscopy.

PART- C

3x2 = 6 Marks

Answer any of the following questions. Each carries **TWO** marks

17. How do you distinguish 1°, 2°, 3° alcohols with KMnO₄?
18. What is Hypsochromic shift?
19. Write about Tautomerism.

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

Course Objectives:

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

Course Outcomes:

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

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

ORGANIC PREPARATIONS AND IR SPECTRAL ANALYSIS

50 M

Organic preparations:

1. Acetylation of one of the following compounds:
amines (aniline, o-, m-, p-toluidines and o-, m-, p-anisidine) and phenols (β -naphthol, vanillin, salicylic acid) by green approach (using zinc dust and acetic acid)
2. Benzoylation of aniline and phenol.
3. Nitration of Salicylic acid by green approach (using calcium nitrate and acetic acid).
4. Preparation of benzylidene aniline by condensation of benzaldehyde with aniline.
5. Preparation of dibenzalpropanone from benzaldehyde and acetone by adopting green aldol condensation.
6. Preparation of 1-phenylazo β -naphthol by diazotization and coupling with β -naphthol.

IR Spectral Analysis

IR Spectral Analysis of the following functional groups with examples

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

Reference and Text books:

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

Web Links:

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

CO-PO Mapping:

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

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

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
III SEMESTER END EXAMINATIONS
II B.Sc. CHEMISTRY 2022-23
ORGANIC PREPARATIONS AND IR SPECTRAL ANALYSIS - PRACTICAL

Scheme of Valuation

Time : 3 hrs

Max. Marks .50


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

Splitting of Practical Marks (35)

i) Procedure	: 10 Marks
ii) Equation	: 5 Marks
iii) M.P.	: 5 Marks
iv) Report of yield	: 5 Marks

Splitting of Practical Marks for IR spectral analysis:

Identification of the frequencies of the bonds present
in the given IR spectrum of an organic compound : 10 Marks

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

Course Objectives:

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

Course Outcomes:

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

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

UNIT – I: Organometallic Compounds

6 h

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

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

UNIT-II: Carbohydrates

8 h

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

Additional input: Sugar moieties in RNA and DNA

UNIT-III:

Amino acids and proteins

8 h

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

Heterocyclic Compounds

7 h

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

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

UNIT- IV

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

1. Nitro hydrocarbons

3 h

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

2. Amines

11 h

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

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

UNIT- V

Photochemistry

5 h

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

Additional input: Determination of quantum yield by actinometry.

Thermodynamics

12 h

The first law of thermodynamics-statement, definition of internal energy and enthalpy, Heat capacities and their relationship, Joule-Thomson effect- coefficient, Calculation of work for the expansion of perfect gas under isothermal and adiabatic conditions for reversible processes, State function. Temperature dependence of enthalpy of formation- Kirchoff's equation, Second law of thermodynamics Different Statements of the law, Carnot cycle and its efficiency, Carnot theorem, Concept of entropy, entropy as a state function, entropy changes in reversible and irreversible processes. Entropy changes in spontaneous and equilibrium processes. Spontaneous and non-spontaneous processes, Helmholtz and Gibbs energies-Criteria for spontaneity.

Text books:

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

Reference and Text books:

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

Web Links:

1. <https://youtu.be/IsNalwRnaq0>
2. https://youtu.be/BZ_tY88o0oI

CO-PO Mapping:

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

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CO2	2	3	3	3	3	2	2	2	2	3	2	2	3
CO3	3	2	3	2	2	3	2	2	3	2	3	3	3
CO4	2	3	1	1	3	2	3	2	2	3	3	2	2
CO5	2.5	2.5	2.5	2	2.5	2.25	2.5	2.25	2.25	2.5	2.75	2.5	2.75

Proposed Activities:

Skill Development: 1. Analysis of organic compounds qualitatively

Employability: 1. Can work in air conditioner and refrigerators.

Entrepreneurship: 1. Can establish sugar and beverages industries.

Assignment Questions:

UNIT – I: Organometallic Compounds

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

UNIT–II: Carbohydrates

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

UNIT-III: Amino acids , proteins and Heterocyclic compounds

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

UNIT- IV: Nitro hydrocarbons and amines

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

UNIT- V: Photochemistry and Thermodynamics

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

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

Paper-IV: INORGANIC, ORGANIC & PHYSICAL CHEMISTRY

TIME: 2¹/₂ hrs.

MAX. MARKS: 50

PART -A

Answer ALL the Questions

4x7 = 28 M

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

PART – B

Answer any FOUR Questions

4x4 = 16 M

5. 1 Question from UNIT- I
6. 1 Questions from UNIT- II
7. 2 Question from UNIT- III
8. 2 Questions from UNIT- IV
9. 2 Questions from UNIT- V

PART-C

Answer ALL Questions

3x2 = 6M

10. UNIT- III
11. UNIT- IV
12. UNIT- V

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
II B.Sc. DEGREE EXAMINATIONS
SEMESTER-IV MODEL PAPER (2022-23)

Paper - IV: INORGANIC, ORGANIC & PHYSICAL CHEMISTRY

Time: 2¹/₂ hrs.

Max. Marks: 50

PART- A

Answer ALL the questions. Each carries SEVEN marks

4 x 7 = 28 Marks

1. What are organometallic compounds? Discuss their Classification on the basis of type of bonds with examples.
(or)
2. Discuss the constitution, configuration and ring size of glucose. Draw the Haworth structures of glucose.
3. What are amino acids? Write any three general methods of preparation of amino acids.
(or)
4. Define aromaticity? Discuss the aromatic character of Furan, Thiophene and Pyrrole.
5. Describe about the following reactions
(i) Nef reaction (ii) Mannich reaction (iii) Micheal addition
(or)
6. (i) Explain Hinsberg separation of amines.
(ii) Discuss any three synthetic applications of diazonium salts.
7. What is quantum yield? Explain the photochemical combination of Hydrogen-Chlorine and Hydrogen - Bromine.
(or)
8. Define entropy. Describe entropy changes in the reversible and irreversible process.

PART- B

4 x 4 = 16 Marks

Answer any FOUR of the following questions. Each carries FOUR marks


9. Describe the 18 electron rule of mono nuclear and polynuclear metal carbonyls with suitable examples.
10. What are epimers and anomers? Give examples.
11. Discuss about iso electric point and zwitter ion.
12. Discuss the Paul-Knorr synthesis of five membered heterocyclic compounds.
13. Explain Tautomerism shown by nitro alkanes
14. Discuss the basic nature of amines.
15. Write the differences between thermal and photochemical reactions.
16. Derive heat capacities and derive $C_p - C_v = R$

PART- C

3 x 2 = 6 Marks

Answer ALL the following questions. Each one carries TWO marks

17. What is Mutarotation?
18. Write the structures of Alanine, Glycine
19. Define Molar Heat Capacity at constant Pressure.

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

Course Objectives:

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

Course Outcomes:

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

Syllabus:

Organic Qualitative Analysis

50 M

Analysis of an organic compound through systematic qualitative procedure for functional group identification including the determination of melting point and boiling point with suitable derivatives.

Alcohols, Phenols, Aldehydes, Ketones, Carboxylic acids, Aromatic primary amines, amides and simple sugars.

Reference and Text books:

1. Vogel's textbook of practical organic chemistry.

Web Links:

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

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

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

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
IV SEMESTER END EXAMINATIONS
II B.Sc. CHEMISTRY 2022-23
LABORATORY COURSE-IV: ORGANIC QUALITATIVE ANALYSIS - PRACTICAL

Scheme of Valuation

Time : 3 hrs

Max. Marks. 50


Record: 10 M

Viva: 5 M

Practical: 35 M

Splitting of Practical Marks:

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

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

Course Objectives:

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

Course Outcomes:

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

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

INORGANIC CHEMISTRY

26 h

UNIT-I

Coordination Chemistry

12 h

IUPAC nomenclature of coordination compounds, Structural and stereoisomerism in complexes with coordination numbers 4 and 6. Valence Bond Theory (VBT): Inner and outer orbital complexes. Limitations of VBT, Crystal field effect, octahedral symmetry. Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Tetrahedral

symmetry, Factors affecting the magnitude of crystal field splitting energy, Spectrochemical series, Comparison of CFSE for Octahedral and Tetrahedral complexes, Tetragonal distortion of octahedral geometry, Jahn-Teller distortion, square planar coordination.

UNIT-II

1. Inorganic Reaction Mechanism:

4h

Introduction to inorganic reaction mechanisms. Concept of reaction pathways, transition state, intermediate and activated complex. Labile and inert complexes, ligand substitution reactions - SN1 and SN2, Substitution reactions in square planar complexes, Trans-effect, theories of trans effect and its applications

2. Stability of metal complexes:

2 h

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

3. Bioinorganic Chemistry:

8 h

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

PHYSICAL CHEMISTRY

34 h

UNIT-III

Phase rule

6 h

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

UNIT-IV

Electrochemistry

14 h

Specific conductance, equivalent conductance and molar conductance- Definition and effect of dilution. Cell constant. Strong and weak electrolytes, Kohlrausch's law and its applications, Definition of transport number, determination of transport number by Hittorf's method. Debye-Huckel-Onsagar's equation for strong electrolytes (elementary treatment only), Application of conductivity measurements- **conductometric titrations.** Electrochemical Cells- Single electrode potential, Types of electrodes with examples: Metal-metal ion, Gas electrode, Inert electrode, Redox electrode, Metal-metal insoluble salt- salt anion. Determination of EMF of a cell, Nernst equation, Applications of EMF measurements - **Potentiometric titrations.** Fuel cells- Basic concepts, examples and applications

UNIT-V

Chemical Kinetics

14 h

The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction, Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants).

Half-life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only). Enzyme catalysis- Specificity, factors affecting enzyme catalysis, Inhibitors and Lock & key model. Michaels- Menten equation- derivation, significance of Michaelis-Menten constant.

List of Reference Books

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

Web Links:

1. <https://youtu.be/Hs5JBjX51dc>
2. <https://youtu.be/OrHlwgmMTq4>

CO-PO Mapping:

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

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

Proposed Activities:

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

Entrepreneurship: 1. De silverisation of lead.

Assignment Questions:

Unit-I

1. Explain Valence Bond theory with Inner and Outer orbital complexes.
1. Write limitations of VBT
2. Define CFSE. Explain the factors effecting the magnitude of crystal field splitting energy.
3. Explain Labile & inert complexes.
4. Explain Job's method for determination of composition of complex.
5. Write note on Jahn-Teller distortion.
6. Explain the crystal field splitting in octahedral and tetrahedral complexes
7. Explain the hybridization, bond formation and magnetic properties of the complexes

Unit-2

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

Unit-3

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

Unit-4

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

Unit-5

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

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

II B.Sc. CHEMISTRY SEMESTER – IV

QUESTION PAPER BLUE PRINT

Paper-V: INORGANIC & PHYSICAL CHEMISTRY

TIME: 2¹/₂ hrs.

MAX. MARKS: 50

PART -A

Answer **ALL** the Questions

4x7 = 28 M

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

PART – B

Answer any **FOUR** Questions

4x4 = 16 M

5. **1 Question from UNIT- I**
6. **1 Questions from UNIT- II**
7. **2 Question from UNIT- III**
8. **2 Questions from UNIT- IV**
9. **2 Questions from UNIT- V**

PART-C

Answer **ALL** Questions

3x2 = 6M

10. **UNIT- III**
11. **UNIT- IV**
12. **UNIT- V**

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
II B.Sc. DEGREE EXAMINATIONS
SEMESTER-IV MODEL PAPER (2022-23)

Paper-V: INORGANIC & PHYSICAL CHEMISTRY

Time: 2¹/₂ hrs.

Maximum Marks: 50

PART- A

4 x 7 = 28 Marks

Answer ALL the questions. Each carries SEVEN marks.

1. Explain Valence Bond theory with Inner and Outer orbital complexes. Write limitations of VBT.
(or)
2. Define CFSE. Explain the factors affecting the magnitude of crystal field splitting energy.
3. Explain Trans effect. Explain the theories of trans effect and write any two applications of it.
(or)
4. (i) Write the biological functions of Haemoglobin and Myoglobin.
(ii) Write note on use of chelating agents in medicines.
5. Define Phase rule and terms involved in it. Explain phase diagram of Pb-Ag system.
(or)
6. Define Transport number. Write experimental method for the determination of transport number by Hittorf method.
7. Explain general methods for determination of order of a reaction.
(or)
8. Explain Collision theory and Activated complex theory of bimolecular reactions.

PART- B

4 x 4 = 16 Marks

Answer any FOUR of the following questions. Each one carries FOUR marks.


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

PART- C

3 x 2 = 6 Marks

Answer any TWO of the following questions. Each one carries TWO marks.

17. Define Eutectic Point.
18. Write the difference between order and molecularity of the reaction.
19. Write Nernst Equation.

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

Course Objectives

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

Course Outcomes:

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

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Conductometric and Potentiometric Titrimetry 50 M

1. Conductometric titration- Determination of concentration of HCl solution using standard NaOH solution.
2. Conductometric titration- Determination of concentration of CH₃COOH Solution using standard NaOH solution.

3. Conductometric titration- Determination of concentration of CH_3COOH and HCl in a mixture using standard NaOH solution
4. Potentiometric titration- Determination of Fe (II) using standard $\text{K}_2\text{Cr}_2\text{O}_7$ solution.
5. Determination of rate constant for acid catalyzed ester hydrolysis.

Web Links:

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

CO-PO Mapping:

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

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

**GOVERNMENT COLLEGE (A), RAJAHMUNDRY
IV SEMESTER END EXAMINATIONS**

II B.Sc. CHEMISTRY 2022-23

**LABORATORY COURSE-V: CONDUCTOMETRIC AND POTENTIOMETRIC
TITRIMETRY - PRACTICAL**

Scheme of Valuation

Time : 3 hrs.

Max. Marks .50


Record: 10 M

Viva: 5 M

Practical: 35 M

Splitting of Practical Marks:

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

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

Course Objectives:

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

Course Outcomes:

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

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

SYNTHETIC ORGANIC CHEMISTRY **60 h**

UNIT –I

Pericyclic reactions **14 h**

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

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

UNIT –II

Organic Photochemistry

10 h

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

UNIT-III

Retrosynthesis

14 h

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

UNIT-IV

Synthetic Reactions

10 h

Shapiro reaction, Stork-enamine reaction (only alkylation), Wittig reaction, Robinson annulation, Bailys-Hillman reaction, Heck reaction, Suzuki coupling. Synthesis of aldehydes and ketones using 1,3-Dithiane.

UNIT-V

Reagents in Organic Chemistry

12 h

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

List of Reference Books:

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

Web Links:

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

CO-PO Mapping:

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

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

Activities proposed:

Skill Development: Reduction of nitro benzene

Entrepreneurship: Synthesis of organic molecules by retro synthesis

Assignment questions:

UNI-1

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

UNIT-2

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

UNIT-3

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

UNIT-4

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

UNIT-5

- 1) Describe Riley oxidation
- 2) Write 2 reactions of PCC & PBC as oxidizing agents
- 3) Write a note on Birch reduction.
- 4) Write reducing reaction mechanism of LiAlH₄

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
III B.Sc. CHEMISTRY SEMESTER – V/VI
QUESTION PAPER BLUE PRINT
CHEMISTRY COURSE-VIA: SYNTHETIC ORGANIC CHEMISTRY

TIME: 2¹/₂ hrs.

MAX. MARKS: 50

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

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
III B.Sc. DEGREE EXAMINATIONS
SEMESTER – V/VI (2022-23)
CHEMISTRY COURSE - VIA : SYNTHETIC ORGANIC CHEMISTRY

TIME : 2¹/₂ hrs.

Max.marks : 50 M

PART- A

4 x 7 = 28 M

Answer ALL the questions. Each carries SEVEN marks.

1. Define electrocyclic reactions. Describe Woodward-Hoffmann rule.
Or
2. Give definition & Woodward selection rules for Suprafacial cyclo addition reactions.
3. Write about retro synthetic analysis of paracetamol.
Or
4. Write the Importance of Order of events in organic synthesis.
5. Write about Robinson Annulation.
Or
6. Synthesise Aldehydes & Ketones from 1,3-Dithiane.
7. Describe Riley oxidation.
Or
8. Write briefly about Norrish type 1 & type 2 reactions.

PART-B

Answer any FOUR Questions.

4 x 4 = 16 M


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

PART-C

Answer any FOUR Questions.

3 x 2 = 6 M

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

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

Course Objectives:

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

Course Outcomes:

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

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus

Practical Course - VIA:

Synthetic Organic Chemistry

50 M

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

Reference books:

1. Vogel A. I. Practical Organic Chemistry, Longman Group Ltd.
2. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley-Eastern.
3. Ahluwalia V. K. and Aggarwal R. Comprehensive Practical Organic Chemistry, University press.
4. Mann F. G and Saunders B.C, Practical Organic Chemistry, Pearson Education.

Web links:CO-PO Mapping:

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

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

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
V/VI SEMESTER END EXAMINATIONS
III B.Sc. CHEMISTRY 2022-23
LABORATORY COURSE-VIA: SYNTHETIC ORGANIC CHEMISTRY - PRACTICAL

Scheme of Valuation

Time : 3 hrs

Max. Marks .50


Record: 10 M

Viva: 5 M

Practical: 35 M

Splitting of Practical Marks:

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

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

Course Objectives:

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

Course Outcomes:

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

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit-1:

Mass Spectrometry

12 h

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

Unit-2:

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

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

Unit-3:**Structural elucidation of organic compounds using IR, NMR, Mass spectral data 10 h**

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

Unit-4:**Separation techniques-1 14 h**

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

Unit-5:**Separation techniques-2 14 h**

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

References:

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

Web Links:

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

Web links: CO-PO Mapping:

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

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

Proposed activities:

- 1) **Skill development:** Separation of colored pigments
- 2) **Entrepreneurship:** Analysis of organic compounds & Elucidation of structure

Assignment questions:**UNIT-1**

- 1) Write note on electron ionization
- 2) Write about the instrumentation of mass spectrometer
- 3) Write fragmentation patterns in
 - a) toluene
 - b) 2-butanol
 - c) butaraldehyde
 - d) propionic acid

UNIT-2

- 1) Write the structural elucidation of organic compounds using IR, NMR of 2, 2, 3, 3-tetra methyl butane.
- 2) Write the structural elucidation of organic compounds using NMR & Mass spectral data of d methyl propionate.
- 3) Write the Structural elucidation of organic compounds using NMR & Mass spectral data of propionic acid

UNIT-3

- 1) Structural elucidation of organic compounds using IR, NMR of Phenyl acetylene
- 2) Structural elucidation of organic compounds using IR, Mass spectral data of p-nitro aniline
- 3) Structural elucidation of organic compounds using mass spectral data of Phenyl acetylene
- 4) Structural elucidation of organic compounds using Mass spectral data of p-nitro aniline

UNIT-4

- 1) Write any two applications of TLC
- 2) What is R_f value? Give the factors effecting R_f value.
- 3) Write a note on batch extraction
- 4) Applications of batch extraction
- 5) Write a note on principle of chromatography

UNIT-5

- 1) Write briefly about paper chromatography
- 2) Describe the principle & applications of HPLC
- 3) Write applications of column chromatography
- 4) Write about Two dimensional paper chromatography

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

III B.Sc. CHEMISTRY SEMESTER – V/VI

QUESTION PAPER BLUE PRINT

CHEMISTRY COURSE-VIB: ANALYSIS OF ORGANIC COMPOUNDS

TIME: 2¹/₂ hrs.

MAX. MARKS: 50

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

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
III B.Sc. DEGREE EXAMINATIONS
SEMESTER – V/VI (2022-23)
CHEMISTRY COURSE - VIB : ANALYSIS OF ORGANIC COMPOUNDS

TIME : 2¹/₂ hrs.

Max. Marks : 50 M

PART- A

4 x 7 = 28 M

Answer ALL the questions. Each carries SEVEN marks.

1. Write the Fragmentation patterns in Toluene, 2-butanol,
Or
2. Describe the Instrumentation in Mass spectrometer,
3. Write the Structural elucidation of organic compounds using IR, NMR of 2, 2, 3, 3-tetra methyl butane.
Or
4. What is R_f value? Give the factors effecting R_f value
5. Structural elucidation of organic compounds using IR, NMR of Phenyl acetylene
Or
6. Structural elucidation of organic compounds using IR, Mass spectral data of p-nitro aniline.
7. Write briefly about paper chromatography
Or
8. Describe the principle & applications of HPLC

PART-B

Answer any FOUR Questions.

4 x 4 = 16 M


9. Write about isotope abundance
10. Write the structural elucidation of propionic acid using NMR.
11. Write about role of adsorbents & eluents in Chromatography.
12. Write the applications of column chromatography.
13. Write the Structural elucidation of using Mass spectral data of d methyl propionate.
14. Write the Structural elucidation of acetophenone using NMR
15. Write one Application of Batch Extraction Process
16. Write about Two dimensional paper chromatography

PART-C

Answer any FOUR Questions.

3 x 2 = 6 M

17. Write any two applications of Column chromatography
18. Give examples of adsorbent
19. Write short notes on Electron Impact Ionization

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHE115AP	TITLE OF THE COURSE ANALYSIS OF ORGANIC COMPOUNDS	III B.Sc. (V/VI Semester)			
Teaching	Hours Allocated: 30 (PRACTICAL)	L	T	P	C
Pre-requisites	ORGANIC ANALYSIS	-	-	2	2

Course Objectives:

1. To Learn Separation of given mixture of amino acids (glycine and phenyl alanine) using ascending paper chromatography
2. To learn Green procedure for organic qualitative analysis: Detection of N, S and halogens
3. Separation of food dyes using Column Chromatography

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Prepare acetanilide using the green synthesis. .
CO2	Demonstrate the preparation of azodye
CO3	Acquire skills in the separation of organic compounds in the given mixture using solvent extraction
CO4	Synthesis of Adipic acid

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Analysis of Organic Compounds

50 M

1. Identification of various equipment in the laboratory
2. Acetylation of 1° amine by green method: Preparation of acetanilide
3. Rearrangement reaction in green conditions: Benzil - Benzilic acid rearrangement
4. Green oxidation reaction: Synthesis of adipic acid
5. Photo reduction of Benzophenone to Benzopinacol in the presence of sunlight
6. Separation of organic compounds in a mixture (acidic compound + neutral compound) using solvent extraction.

Reference books:

1. Vogel A. I. Practical Organic Chemistry, Longman Group Ltd.
2. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley-Eastern.
3. Ahluwalia V. K. and Aggarwal R. Comprehensive Practical Organic Chemistry, University press.
4. Mann F.G and Saunders B.C, Practical Organic Chemistry, Pearson Education.

CO-PO Mapping:

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

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

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
V/VI SEMESTER END EXAMINATIONS
III B.Sc. CHEMISTRY 2022-23
LABORATORY COURSE-VIA: ANALYSIS OF ORGANIC COMPOUNDS -
PRACTICAL

Scheme of Valuation

Time : 3 hrs

Max. Marks .50


Record: 10 M

Viva: 5 M

Practical: 35 M

Splitting of Practical Marks:

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

	Government College (Autonomous) Rajamahendravaram	Program & Semester III B.Sc. (V/VI Semester)			
Course Code CHE-114B	TITLE OF THE COURSE ANALYTICAL METHODS IN CHEMISTRY-1				
Teaching	Hours Allocated: 60 (Theory and Training)	L	T	P	C
Pre-requisites	Basic concepts of chemical analysis	3	1	-	3

Course Objectives:

1. To provide basic awareness on chemical analysis.
2. To provide knowledge about common laboratory glass apparatus.
3. To provide knowledge about errors in chemical analysis.
4. To provide knowledge about separation techniques in Chemistry.

Course Outcomes:

On completion of the course, the students will be able to		Cognitive Domain
CO1	Understand the basic principles of volumetric analysis and gravimetric analysis.	Understanding
CO2	Understand the theories of different types of titrations.	Skill
CO3	To get awareness on errors in chemical analysis and their minimization methods.	Understanding
CO4	Learn the basic principle and applications of solvent extraction and ion exchange method.	Applications

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit-1: Quantitative analysis-1

10 h

1. A brief introduction to analytical methods in chemistry
2. Principles of volumetric analysis, concentration terms- Molarity, Molality, Normality, v/v, w/v, ppm and ppb, preparing solutions- Standard solution, primary standards and secondary standards.
3. Description and use of common laboratory apparatus- volumetric flask, burette, pipette, beakers, measuring cylinders.

Unit-2: Quantitative analysis-2**14 h**

1. Principles of volumetric analysis: Theories of acid-base (including study of acid-base titration curves), redox, complex metric, iodometric and precipitation titrations-choice of indicators for the saturations.

2. Principles of gravimetric analysis: precipitation, coagulation, peptization, co precipitation, post precipitation, digestion, filtration, and washing of precipitate, drying and ignition.

Unit-3: Treatment of analytical data**10 h**

Types of errors- Relative and absolute, significant figures and its importance, accuracy -methods of expressing accuracy, errors- Determinate and indeterminate and minimization of errors, precision-methods of expressing precision, standard deviation and confidence interval.

Unit-4: Separation techniques**14 h**

1. Solvent Extraction: Introduction, principle, techniques, factors affecting solvent extraction, Batch extraction, continuous extraction and counter current extraction. Synergism. Application-Determination of Iron (III).

2. Ion Exchange method: Introduction, action of ion exchange resins, applications.

UNIT-5: Analysis of water**12 h**

Determination of dissolved solids, total hardness of water, turbidity, alkalinity, Dissolved oxygen, COD, determination of chloride using Mohr's method.

Reference books:

1. Fundamentals of Analytical Chemistry by F.James Holler, Stanley R Crouch, Donald M.Westand Douglas A.Skoog, Ninth edition, Cengage.
2. Analytical Chemistry by Gary D.Christian, Purnendu K.Dasgupta and KevinA.Schug,Seventh edition, Wiley.
3. Quantitative analysis by R.A.DayJr. and A.L.Underwood, Sixth edition, Pearson.
4. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.
5. Text book of Environmental Chemistry and Pollution Control by S.S.Dara and D.D.Mishra, Revised edition, S Chand & CoLtd.

Web Links:

1. <https://youtu.be/xQDQNghs5dc>
2. <https://youtu.be/3kEKLTV1Tr0>

CO-PO Mapping:

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

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

Proposed activities:

Skill Development: 1. Preparation of standard solutions.
2. Acid-Base titrations.

Employability: 1. Separation of Organic compounds by solvent extraction technique using Separating funnel.

Entrepreneurship: 1. Determination of hardness of water using EDTA.

Assignment Questions:

Unit-1: Quantitative analysis-1

1. Explain the following terms with suitable examples.
(i) Molarity (ii) Molality (iii) Normality
2. What are standard solutions? Explain primary and secondary standard solutions with suitable examples.
3. Explain the terms ppm and ppb.
4. Explain the terms end point and equivalence point.

Unit-2: Quantitative analysis-2

1. Write a short note on Acid-Base titration.
2. Write a short note on the following.
(a) Redox titrations (ii) Complex metric titrations
3. Explain the following terms with suitable examples.
(i) Coprecipitation (ii) Post precipitation
4. Write a short note on the following.
(i) Coagulation (ii) Peptization

Unit-3: Treatment of analytical data

1. Write a short note on the following.
(i) Accuracy and methods of expressing accuracy
(ii) Precision and methods of expressing precision
2. Write a short note on the following.
(i) Types of errors (ii) Minimization of errors
3. Write a brief note on Significant figures.
4. What is standard deviation?

Unit-4: Separation techniques

1. Explain the principle and applications of Batch extraction
2. Explain the principle of continuous extraction.
3. Explain the determination of Fe (III) by solvent extraction technique.
4. Explain synergism?

UNIT-5: Analysis of water

1. Explain the determination of Chlorine by using Mohr's method.
2. Explain the terms Dissolved Oxygen (DO) and COD.
3. Write a short note on determination of hardness of water.
4. How can you determine the alkalinity of water?

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

III B.Sc. CHEMISTRY SEMESTER - V/VI

QUESTION PAPER BLUE PRINT

Paper - VIB: ANALYTICAL METHODS IN CHEMISTRY-1

TIME : 2¹/₂ hrs.

Max.marks : 50

SECTION -A

Answer ALL the Questions (With internal choice)

4 X 7 = 28 M

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

SECTION- B

Answer any FIVE Questions

4 x 4 = 16 M

5. 1 Question from UNIT- I
6. 2 Questions from UNIT- II
7. 1 Question from UNIT- III
8. 2 Questions from UNIT- IV
9. 2 Questions from UNIT- V

SECTION -C

Answer ALL the Questions

3 X 2= 6 M

10. 1 Question from UNIT- II
11. 1 Question from UNIT- III
12. 1 Question from UNIT- IV

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
III B.Sc. DEGREE EXAMINATIONS
MODEL QUESTION PAPER (2022-23)
Paper - VIB : ANALYTICAL METHODS IN CHEMISTRY-1

Time: 2 1/2 hours

Maximum Marks: 50

SECTION- A

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

4 x 7 = 28 Marks

1. Explain the following terms with suitable examples.
(i) Molarity (ii) Molality (iii) Normality
(or)
2. What are standard solutions? Explain primary and secondary standard solutions with suitable examples.
3. Write a short note on the following. (a) Redox titrations (b) Complex metric titrations
(or)
4. Explain (a) Coprecipitation (b) Post precipitation with suitable examples.
5. Write a short note on the following.
(a) Accuracy and methods of expressing accuracy
(b) Precision and methods of expressing precision
(or)
6. Write a short note on the following: (a) Types of errors (b) Minimization of errors
7. Explain the principle and applications of Batch extraction
(or)
8. Explain the determination of Chlorine by using Mohr's method.

SECTION- B

Answer any **FOUR** of the following questions. Each carries **FOUR** marks

4 x 4 = 16 Marks


9. Explain the terms ppm and ppb.
10. Write a short note on the following.
(i) Coagulation (ii) Peptization
11. Write a short note on Acid-Base titration.
12. Write a brief note on Significant figures.
13. Explain the principle of continuous extraction.
14. Explain the determination of Fe (III) by solvent extraction technique.
15. Explain the terms Dissolved Oxygen (DO) and COD.
16. Write a short note on determination of hardness of water.

SECTION- C

Answer **ALL** the questions. Each question carries **TWO** marks

2 x 2 = 4 Marks

17. Define the terms end point and equivalence point.
18. What is standard deviation?
19. What is synergism?

	Government College (Autonomous) Rajamahendravaram	Program & Semester III B.Sc. (V/VI Semester)			
Course Code CHE-114BP	TITLE OF THE COURSE ANALYTICAL METHODS IN CHEMISTRY-1				
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre-requisites	Basic concepts of chemical analysis	-	-	2	2

Course Objectives:

1. To provide knowledge about common laboratory glass apparatus.
2. To provide knowledge about complex metric and redox titrations.
3. To provide knowledge about preparation of buffer solutions.
4. To provide knowledge about P^H metric titrations.

Course Outcomes:

On completion of the course, the students will be able to	
CO1	Estimate Iron (II) using standard Potassium dichromate solution.
CO2	Learn the procedure for the estimation of total hardness of water.
CO3	Demonstrate the determination of Chloride using Mohr's method.
CO4	Acquire skills in the operation and calibration of P^H meter.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Analytical Methods in Chemistry-1

50 M

1. Estimation of Iron (II) using standard Potassium dichromate solution (using DPA indicator)
2. Estimation of total hardness of water using EDTA
3. Determination of chloride ion by Mohr's method
4. Study the effect on P^H of addition of HCl/NaOH to solutions of acetic acid, sodium acetate and their mixtures.
5. Preparation of buffer solutions of different P^H (i) Sodium acetate-acetic acid, (ii) Ammonium Chloride - Ammonium hydroxide.
6. P^H metric titration of (i) strong acid vs strong base, (ii) weak acid vs strong base.
7. Determination of dissociation constant of a weak acid.

Reference books:

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

Web Links:

1. <https://youtu.be/Sa0WfA9UGG0>
2. https://youtu.be/JhBs_8DrPYo

CO-PO Mapping:

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

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

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
V/VI SEMESTER END EXAMINATIONS
III B.Sc. CHEMISTRY 2022-23
Paper-VIIB: ANALYTICAL METHODS IN CHEMISTRY-1 - PRACTICAL

Scheme of Valuation


Time: 3 Hours

Max. Marks: 50

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

Splitting of Practical Marks:

i. Procedure in 10 minutes	: 5 M
ii. Formula with units	: 5 M
iii. Neat tabulation	: 5 M
iv. Correct calculation	: 5 M
Report Error < 1 %	: 15 M
1- 2 %	: 10 M
>2 %	: 5 M

	Government College (Autonomous) Rajamahendravaram	Program & Semester III B.Sc. (V/VI Semester)			
Course Code CHE-115B	TITLE OF THE COURSE ANALYTICAL METHODS IN CHEMISTRY-2				
Teaching	Hours Allocated: 60 (Theory and Training)	L	T	P	C
Pre-requisites	Basic concepts of chemical analysis, Adsorption and Atomic structure	3	1	-	3

Course Objectives:

1. To provide basic knowledge about separation techniques
2. To provide basic knowledge about chromatographic techniques
3. To provide knowledge on experimental setup of column chromatography
4. To provide knowledge about the importance of TLC and HPLC techniques in Pharmaceutical industry.

Course Outcomes:

On completion of the course, the students will be able to		Cognitive Domain
CO1	Identify the importance of chromatography in the separation and identification of compounds in a mixture	Understanding
CO2	To understand principles of various chromatographic techniques.	Understanding
CO3	Understand the principles of spectroscopy in the determination of metal ions.	Understanding
CO4	Comprehend the applications of atomic spectroscopy.	Applying

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit-1: Chromatography-Introduction and classification **12 h**
Principle, Classification of chromatographic methods, Nature of adsorbents, eluents, R_f values, factors affecting R_f values.

UNIT-2: TLC and paper chromatography **14 h**

1. **Thin layer chromatography: Principle, Experimental procedure, preparation of plates,**

adsorbents and solvents, development of chromatogram, detection of spots, applications and advantages.

2. Paper Chromatography: Principle, Experimental procedure, choice of paper and solvents, various modes of development- ascending, descending, radial and two dimensional, applications.

UNIT-3: Column chromatography **14 h**

1. Column chromatography: Principle, classification, Experimental procedure, stationary and mobile phases, development of the Chromatogram, applications.

2. HPLC: Basic principles, instrumentation –block diagram and applications.

UNIT-4: Spectrophotometry **10 h**

Principle, Instrumentation: Single beam and double beam spectrometer, Beer-Lambert's law- Derivation and deviations from Beer-Lambert's law, applications of Beer-Lambert's law- Quantitative determination of Fe⁺², Mn⁺² and Pb⁺².

UNIT-5: Atomic spectroscopy **10 h**

Types, atomizer, atomic absorption and emission and applications.

References:

1. Fundamental so Analytical Chemistry by F.James Holler, Stanley R Crouch, Donald M.Westand Douglas A.Skoog, Ninth edition, Cengage.
2. Analytical Chemistry by Gary D.Christian, Purnendu K.Dasgupta and Kevin A.Schug, Seventh edition, Wiley.
3. Quantitative analysis by R.A.Day Jr. and A.L.Underwood, Sixth edition, Pearson.
4. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition/ Pearson.

Web Links:

1. https://youtu.be/tWg_bbByfSY
2. <https://youtu.be/BGyvzCSvL-Y>

CO-PO Mapping:

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

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

Proposed activities:

Skill Development: 1. Preparation of TLC plates.

2. Separation of compounds by TLC.

Employability: 1. Verification of Beer-Lambert's law.

Entrepreneurship: 1. Method Development and Validation by HPLC.

Assignment Questions:

Unit-1: Chromatography-Introduction and classification

1. Write about the classification of Chromatographic methods
2. What is R_f value? Explain the factors affecting R_f value.
3. Explain the basic principle of Chromatography.
4. Explain Isocratic and Gradient elutions.

UNIT-2: TLC and Paper Chromatography

1. Explain the principle, experimental set up and applications of TLC.
2. Explain the principle, experimental set up and applications of Paper Chromatography.
3. Write about various methods of visualization in TLC.
4. Write a short note on Radial Paper Chromatography.

UNIT-3: Column chromatography

1. Explain the principle, instrumentation and applications of Column Chromatography.
2. Explain the principle, instrumentation and applications of HPLC.
3. Write a brief note on various detectors used in HPLC.
4. Explain Normal phase HPLC and Reverse phase HPLC.

UNIT-4: Spectrophotometry

1. Explain the Beer-Lambert's law and write the quantitative determination of Mn^{+2} using Beer-Lambert's law.
2. Explain double beam spectrophotometer briefly.
3. Explain the quantitative determination of Fe^{+2} using Beer-Lambert's law.
4. Explain Absorbance, Transmittance and Molar extinction coefficient.

UNIT-5: Atomic spectroscopy

1. Explain the principle and experimental set up of Atomic Absorption Spectroscopy.
2. Explain the applications of Atomic Absorption Spectroscopy.
3. Write a short note on Atomic Emission Spectroscopy.
4. Explain the principle and experimental set up of Atomic emission Spectroscopy.

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
III B.Sc. CHEMISTRY SEMESTER - V/VI
QUESTION PAPER BLUE PRINT

Paper - VIIB – ANALYTICAL METHODS IN CHEMISTRY-2

TIME : 2¹/₂ hrs.

Max. Marks : 50

SECTION -A

Answer ALL the Questions (With internal choice)

4 X 7 = 28 M

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

SECTION – B

Answer any FOUR Questions

4 x 4 = 16 M

5. 1 Question from UNIT- I
6. 2 Questions from UNIT- II
7. 1 Question from UNIT- III
8. 2 Questions from UNIT- IV
9. 2 Questions from UNIT- V

SECTION -C

Answer ALL the Questions

3 X 2= 6 M

10. 1 Question from UNIT- I
11. 1 Question from UNIT- III
12. 1 Question from UNIT- IV

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
III B.Sc. DEGREE EXAMINATIONS
MODEL QUESTION PAPER (2022-23)
CHEMISTRY COURSE - VIIB : ANALYTICAL METHODS IN CHEMISTRY-2

Time: 2 1/2 hrs.

Maximum Marks: 50

SECTION- A

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

4 x 7 = 28 Marks

1. Write about the classification of Chromatographic methods
(or)
2. What is R_f value? Explain the factors affecting R_f value.
3. Explain the principle, experimental set up and applications of TLC.
(or)
4. Explain the principle, experimental set up and applications of Paper Chromatography.
5. Explain the principle, instrumentation and applications of Column Chromatography.
(or)
6. Explain the principle, instrumentation and applications of HPLC.
7. Explain the Beer-Lambert's law and write the quantitative determination of Mn^{+2} using Beer-Lambert's law.
(or)
8. Explain the principle and experimental set up of Atomic Absorption Spectroscopy.

SECTION- B

Answer any **FOUR** of the following questions. Each carries **FOUR** marks

4 x 4 = 16 Marks


9. Explain the basic principle of Chromatography.
10. Write about various methods of visualization in TLC.
11. Write a short note on Radial Paper Chromatography.
12. Write a brief note on various detectors used in HPLC.
13. Explain double beam spectrophotometer briefly.
14. Explain the quantitative determination of Fe^{+2} using Beer-Lambert's law.
15. Explain the applications of Atomic Absorption Spectroscopy.
16. Write a short note on Atomic Emission Spectroscopy.

SECTION- C

Answer **ALL** the questions. Each question carries **TWO** marks

3 x 2 = 6 Marks

17. Define Isocratic and Gradient elutions.
18. Define Normal phase HPLC and Reverse phase HPLC.
19. Define Absorbance and Molar extinction coefficient.

	Government College (Autonomous) Rajamahendravaram	Program & Semester III B.Sc. (V/VI Semester)			
Course Code CHE-115BP	TITLE OF THE COURSE ANALYTICAL METHODS IN CHEMISTRY-2				
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre-requisites	Basic concepts of Chromatography	-	-	2	2

Course Objectives:

1. To provide basic knowledge on separation techniques.
2. To provide basic awareness on TLC and Paper Chromatography.
3. To provide knowledge on Column Chromatography
4. To provide knowledge on applications of Beer-Lambert's law.

Course Outcomes:

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

CO1	Perform the separation of a given dye mixture using TLC
CO2	Learn the preparation of TLC plates
CO3	Demonstrate the separation of mixture of amino acids using paper chromatography
CO4	Acquire skills in using column chromatography for the separation of dye mixture

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

50 M

1. Separation of a given dye mixture (Methyl orange and methylene blue) using TLC (using Alumina as adsorbent).
2. Separation of mixture of methyl orange and methylene blue by Column Chromatography.
3. Separation of given mixture of amino acids (Glycine and Phenyl alanine) using ascending Paper Chromatography.
4. Separation of food dyes using Column Chromatography
5. Separation of triglycerides using TLC
6. Verification of Beer lambert's law. (Using potassium permanganate solution) using Colorimeter/Spectrophotometer.

References:

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

Web Links:

1. https://youtu.be/tWg_bbByfSY
2. <https://youtu.be/BGyvzCSvL-Y>

CO-PO Mapping:

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

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

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
V/VI SEMESTER END EXAMINATIONS
III B.Sc. CHEMISTRY 2022-23
LABORATORY COURSE-VIIB: ANALYTICAL METHODS IN CHEMISTRY-2 -
PRACTICAL

Scheme of Valuation


Time: 3 Hours

Max. Marks: 50

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

Splitting of Practical Marks:

i. Procedure in 10 minutes	: 5 M
ii. Formula with units	: 5 M
iii. Neat tabulation	: 5 M
iv. Correct calculation	: 5 M
Report Error < 1 %	: 15 M
1- 2 %	: 10 M
>2 %	: 5 M

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code CHE-114C	TITLE OF THE COURSE ENVIRONMENTAL CHEMISTRY	III B.Sc. (V/VI Semester)			
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites	Atmosphere, air pollution, water pollution, chemical toxicology, bio-diversity	3	1	-	3

Course Objectives

1. Segments of atmosphere and control of air pollution
2. Conversion of hard water into soft water and purification of sewage waste water.
3. Types of bio-diversity and classification of bio geo graphical

Course Outcomes:

On Completion of the course, the students will be able to		
CO1	Understand the environment functions and how it is affected by human activities. Engage in simple and advanced analytical tools used to measure the different types of pollution	Understanding
CO2	Explain the energy crisis and different aspects of sustainability. Learn how to convert hard water into soft water and purification of sewage waste water.	Analysing
CO3	Acquire chemical knowledge to ensure sustainable use of the world's resources and ecosystems services.	Applying
CO4	Analyse key ethical challenges concerning biodiversity and understand the moral principles, goals and virtues important for guiding decisions that affect Earth's plant and animal life. .	Analysing

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

UNIT-I

Introduction

12 h

Environment Definition – Concept of Environmental chemistry- Scope and importance of environment in now-a-days – Nomenclature of environmental chemistry – Segments of environment - Natural resources - Renewable Resources - Solar and biomass energy and Non-renewable resources - Thermal power and atomic energy – Reactions of atmospheric oxygen and Hydrological cycle

UNIT-II

Air Pollution

12 h

Definition – Sources of air pollution – Classification of air pollution – Ambient air quality standards – Global warming – Acid rain – Photochemical smog – Greenhouse effect – Formation and depletion of ozone – Bhopal gas disaster - Instrumental techniques to monitor pollution - Controlling methods of air pollution.

UNIT-III

Water pollution

12 h

Unique physical and chemical properties of water – Water quality standards and parameters – Turbidity- pH Dissolved oxygen – BOD, COD, Suspended solids, total dissolved solids alkalinity- Hardness of water–Methods to convert temporary hard water in to soft water Methods to convert permanent hard water into soft water – eutrophication and its effects – Industrial waste water treatment.

UNIT-IV

Chemical Toxicology

8 h

Toxic chemicals in the environment – effects of toxic chemicals – cyanide and its toxic effects – pesticides and its biochemical effects – toxicity of lead, mercury, arsenic and cadmium - Solid waste management.

UNIT-V

Ecosystem and biodiversity

8 h

Ecosystem

Concepts–structure–Functions and types of ecosystem–Abiotic and biotic components – Energy flow and Energy dynamics of ecosystem– Food chains – Food web– Tropic levels - Biogeochemical cycles (nitrogen, carbon and phosphorous)

Biodiversity

8 h

Definition – level and types of biodiversity – concept- significance – magnitude and distribution of biodiversity - trends-bio geographical classification of India–biodiversity at national, global and regional level.

Additional Inputs:

Nicotine - Biological effects - Awareness on World Tobacco Day on May 31st - Radioactive pollution - Radiation effect due to cell towers - cell phones.

Text books:

1. III B.Sc. Unified Environmental Chemistry by R.K.Agarwal- Jai prakash nath publications
2. Environmental Chemistry by BK Sharma & H Kaur, Goel publishing house

Reference books

1. Fundamentals of ecology by M.C.Dash
2. A Text book of Environmental chemistry by W. Moore and F.A. Moore
3. Environmental Chemistry by Samir k.Banerji
4. Water pollution, Lalude, MC Graw Hill
5. Environmental Chemistry, Anil Kumar De, Wiley Eastern ltd.
6. Environmental analysis, SM Khopkar (IIT Bombay)
7. Fundamentals of Environmental Chemistry, Manahan, Stanley. E

Web Links:

1. <https://youtu.be/zph2PxDNH8g>
2. <https://youtu.be/IX4cT6sSa3s>

CO-PO Mapping:

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

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

Proposed activities :

Skill Development : Estimation of chlorine , acidity and alkanity in water samples

Employability: Water sample analysers & for determine the drinking water parameters

ASSIGNMENT QUESTIONS :

UNIT – I

1. Explain the segments of environments ?
2. What are the Renewable and Non-Renewable energy resources ? Explain the following
i) Solar energy ii) Atomic energy
3. Write the concept of scope and importance of Environmental chemistry ?
4. Explain the Hydrological cycle ?
5. What are the Renewable and Non-Renewable energy resources ? Explain the following
i) Thermal power ii) Bio mass energy

UNIT- II

1. Discuss the green house effect and write the consequence of it ?
2. Explain the following .
a) Write the formation and effects of Acid rain .
b) Photo chemical smog
3. Explain the formation and depletion of ozone layer ?
4. What are controlling methods of air pollution?
5. Explain the following .
a) Global warming and consequences of it.
b) Bhopal gas disaster.

UNIT- III

1. Explain any two methods to convert permanent hard water into soft water .
2. Explain the classification of water pollutants ?
3. Give the principle of wastewater treatment and industrial wastewater treatment ?
4. Define BOD & COD .
5. What is Eutrophication and give its effects ?

UNIT-IV

1. What are cyanide pesticides ? give its toxic effects ?
2. Define chemical toxicology ? Explain toxic effects of arsenic and mercury?
3. What are pesticides ? give biochemical effects of pesticides?
4. Explain the biochemical effects of Lead and Cadmium?
5. Explain short note on solid waste management ?

UNIT-V

1. What is Eco- system ? Describe the types of Eco- system ?
2. Give the functions of eco-system?
3. Explain bio-geochemical cycle of Nitrogen .
4. Explain Carbon cycle in the environment.
5. Explain food chain and food web ?
6. Explain the energy flow and energy dynamics of eco-system?
7. What is Biodiversity? Explain the types of biodiversity ?
8. Write biogeographical classification of India ?

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
III B.Sc. CHEMISTRY SEMESTER - V/VI
QUESTION PAPER BLUE PRINT

Paper-VIC – ENVIRONMENTAL CHEMISTRY

TIME : 2¹/₂ hrs.

Max. Marks : 50

PART -A

Answer **ALL** the Questions

4x7 =28 M

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

PART- B

Answer any **FOUR** Questions

4 x4 =16M

5. 1 Question from UNIT-I
6. 1 Question from UNIT-II
7. 2 Questions from UNIT – III
8. 2 Questions from UNIT – IV
9. 2 Questions from UNIT – V

PART -C

Answer **ALL** Questions

3 x2 =6M

10. 1 Question from UNIT-II
11. 1 Question from UNIT – III
12. 1 Question from UNIT – V

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
III B.Sc. DEGREE EXAMINATIONS
SEMESTER – V/VI (2022-23)
CHEMISTRY COURSE - VIC : ENVIRONMENTAL CHEMISTRY

TIME : 2¹/₂ hrs.

Max.Marks : 50 M

PART –A

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

4 x7 =28 M

1. Explain about the segments of environment.
(OR)
2. Explain the formation and depletion of the Ozone layer.
3. What is hardness of water? Explain any two methods to convert permanent hard water into softwater.
(OR)
4. Give the principle of wastage treatment? Explain the industrial waste water treatment.
5. Define chemical toxicology. Give toxic effects of lead and mercury.
(OR)
6. What are pesticides? Give biochemical effects of pesticides.
7. What is ecosystem? Describe the types of ecosystem.
(OR)
8. Define Biodiversity. Explain the types of biodiversity.

PART- B

Answer any **FOUR** Questions

4 x 4 =16 M


9. Write about renewable energy resources.
10. Explain the formation of Acid rains and give it's adverse effects.
11. Write about Eutrophication and it's effects.
12. Define BOD and COD.
13. Write brief note on Solid waste management.
14. Give the biochemical effects of arsenic.
15. Explain food chain and food web.
16. Explain bio-geochemical cycle of Nitrogen.

PART –C

Answer **ALL** Questions

3 x2 =6M

17. Give importance of environment in now-a- days.
18. What is DO?
19. Give any two functions of eco system.

	Government College (Autonomous) Rajahmundry	Program & Semester			
CourseCode CHE-114CP	TITLE OF THE COURSE ENVIRONMENTAL CHEMISTRY	III B.Sc. (V/VI Semester)			
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre- requisites	Determination of alkalinity, acidity, hardness & chloride content in water.	-	-	2	2

Course Objectives:

1. Learn the procedures of preparation of standard solutions.
2. Analyse acidity and alkalinity in water samples.
3. Acquire skills in estimate the chloride content in water.
4. Analyse water samples by using minimum quantity of reagents.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Determine the alkalinity in water samples.
CO2	Determine the acidity of water samples .
CO3	Estimate the hardness of water in laboratories for the use of industrial usage
CO4	Estimate the chloride content in water samples for drinking purpose

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus

Practical Course - VIC: Environmental Chemistry

50 M

1. Determination of alkalinity in water sample by double titration method.
2. Determination of acidity in water sample by double titration method
3. Determination of hardness of water using EDTA
 - a) Permanent hardness
 - b) Temporary hardness
4. Determination of Chlorides in water samples by Mohr's method.
5. Determination of pH in soil samples using pH metry.

Text books:

1. III B.Sc. Unified Environmental Chemistry by R.K. Agarwal- Jai prakashnath publications
2. Practical volumetric analysis by Peter AC Pherson

Reference books:

1. Practical hand book of Water analysis by Kanwaljit kaur
2. Volumetric analysis by Mc grew-Hill
3. Volumetric analysis by Henry W.Schimpf

Web links:

2. <https://youtu.be/Set3XdRshGo>
3. <https://youtu.be/zXvEmlFqicw>
4. <https://youtu.be/OiWMSopuuLU>

CO-PO Mapping:

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

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

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
V/VI SEMESTER END EXAMINATIONS
III B.Sc. CHEMISTRY 2022-23
LABORATORY COURSE-VIC: ENVIRONMENTAL CHEMISTRY - PRACTICAL

Scheme of Valuation

Time : 3 hrs

Max. Marks .50


Record: 10 M

Viva: 5 M

Practical: 35 M

Splitting of Practical Marks:

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

	Government College (Autonomous) Rajahmundry	Program & Semester			
	Course Code CHE-115C	TITLE OF THE COURSE GREEN CHEMISTRY & NANO TECHNOLOGY	III B.Sc. (V/VI Semester)		
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites	Types of syntheses, solvents selected in syntheses, catalysis, Nano technology in chemistry.	3	1	-	3

Course Objectives:

- 100% atom economy reactions
- Green catalysis, micro wave and ultra sonic assisted syntheses
- Synthesis of nano particles, preparations and applications.

Course Outcomes:

On Completion of the course, the students will be able to		
CO1	Understand the importance of Green chemistry and Green synthesis. Demonstrate skills using the alternative green solvents in synthesis	Understanding
CO2	Engage in Microwave assisted organic synthesis (MAOS)	Applying
CO3	Demonstrate and explain enzymatic catalysis. Analyse alternative sources of energy and carry out green synthesis.	Evaluating
CO4	Carry out the chemical method of nanomaterial synthesis.	Applying

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

UNIT-I Green Chemistry: Part- I

10 h

Introduction - Definition of green Chemistry, Need for green chemistry, Goals of Green chemistry Basic principles of green chemistry. Green synthesis- Evaluation of the type of the reaction **i) Rearrangements (100% atom economic), ii) Addition reaction (100% atom economic).** Organic reactions by Sonication method: apparatus required and examples of sonochemical reactions (Heck, Hunsdiecker and Wittig reactions).

UNIT- II Green Chemistry: Part- II

10 h

A. Selection of solvent:

i) Aqueous phase reactions ii) Reactions in ionic liquids, Heck reaction, Suzuki reactions, epoxidation, iii) Solid supported synthesis.

B. Supercritical CO₂: Preparation, properties and applications, (decaffeination, drycleaning)

C. Green energy and sustainability.

UNIT-III

Microwave and Ultrasound assisted green synthesis:

10 h

Apparatus required, examples of MAOS (synthesis of fused anthraquinones, Leuckart reductive amination of ketones) - Advantages and disadvantages of MAOS.

Aldol condensation - Cannizzaro reaction - Diels-Alder reactions - Strecker's synthesis.

UNIT-IV

Green catalysis and Green synthesis

15 h

Heterogeneous catalysis, use of zeolites, silica, alumina, supported catalysis - biocatalysis: Enzymes, microbes Phase transfer catalysis (micellar /surfactant)

1. Green synthesis of the following compounds: adipic acid, catechol, disodium menudo acetate (alternative Strecker's synthesis)
2. Microwave assisted reaction in water - Hoffmann elimination – methyl benzoate to benzoic acid – oxidation of toluene and alcohols–microwave assisted reactions in organic solvents. Diels-Alder reactions and decarboxylation reaction.
3. Ultrasound assisted reactions - sonochemical Simmons–Smith reaction (ultrasonic alternative to iodine)

UNIT – V

Nanotechnology in Green chemistry

15 h

Basic concepts of Nano science and Nanotechnology – Bottom-up approach and Top-down approaches with examples – Synthesis of Nano materials – Classification of Nanomaterials – Properties and Application of Nanomaterials. Chemical and Physical properties of Nanoparticles – Physical synthesis of nanoparticles – Inert gas condensation - aerosol method - Chemical Synthesis of nanoparticles – precipitation and co-precipitation method, sol-gel method.

Additional Inputs:

Enzymatic catalysis - Lock & Key theory - Recent innovations in Nano technology

Text books:

1. III B.Sc. Unified Chemistry by Dr.Dasharath Domal & Y.R.Sharma
2. Green Chemistry by Rakesh K Sharma

Reference books

1. Green Chemistry Theory and Practical. P.T.Anatas and J.C. Warner
2. Green Chemistry V.K. Ahluwalia Narosa, New Delhi.
3. Real world cases in Green Chemistry M.C. Cann and M.E. Connelly
4. Green Chemistry: Introductory Text M.Lancaster: Royal Society of Chemistry(London)
6. Nanotechnology: Health and Environmental Risks, Jo Anne Shatkin, CRC Press(2008).
7. Green Processes for Nanotechnology: From Inorganic to Bioinspired Nanomaterials, Vladimir A. Basiuk, Elena V. Basiuk Springer (2015)

Web Links:

1. <https://youtu.be/Dam3cyRyGrI>
2. <https://youtu.be/2bDf7JSRvf8>

CO-PO Mapping:

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

Proposed activities :

Skill Development : Synthesis of 100% atom economic reactions and selection of Solvents in green synthesis

Employability: Development of nano materials

Entrepreneurship: Application of nano particles in various electronic products

ASSIGNMENT QUESTIONS :**UNIT – I**

1. What is green chemistry ? Give the basic principles of green chemistry?
2. Discuss the 100% atom economy reactions ?
3. Explain the following sono chemical reactions
i) Huds dicker reaction ii) Witting reaction
4. What is the need of green chemistry?

UNIT – II

1. What are ionic liquids ? Explain with any two examples ?
2. Describe the preparation and properties of super critical carbon dioxide ?
3. Write about the solid supported synthesis?
4. What is Green energy ?give its sustainability ?
5. What is Epoxidation ?give example.

UNIT – III

1. Explain the synthesis of fused anthro quinines by microwave assisted organic synthesis /
2. Describe the green synthesis of a) Aldol condensation b) Cannizaro's reaction
3. Explain the advantages and disadvantages of MAOS ?
4. How do you perform Strecker's synthesis by green synthesis?
5. What is Diel's-Alder reaction ?

UNIT – IV

1. How are Adipic acid and Catechol prepared by green synthesis?
2. Write about micro wave assisted reactions with examples?
3. Write short note on Ultra sound assisted reactions ?
4. Give brief note on bio catalysis?
5. What are the uses of Zeolites?

UNIT – V

1. Discuss the classification ,synthesis and applications of nano materials?
2. Give any two methods for chemical synthesis of nanomaterials ?
3. Explain synthesis of nano materials by aero-sol method?
4. Explain bottom-up and top-up approaches with examples ?
5. What is sol-gel method for synthesis of nanomaterials?

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

III B.Sc. CHEMISTRY SEMESTER - V/VI

QUESTION PAPER BLUE PRINT

Paper- VIIC: GREEN CHEMISTRY & NANO TECHNOLOGY

TIME : 2¹/₂ hrs.

Max.Marks : 50

PART -A

Answer **ALL** the Questions

4x7 =28 M

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

PART- B

Answer any **FOUR** Questions

4 x4 =16M

5. 1 Question from UNIT-I
6. 1 Question from UNIT-II
7. 2 Questions from UNIT – III
8. 2 Questions from UNIT – IV
9. 2 Questions from UNIT – V

PART -C

Answer **ALL** Questions

3 x2 =6M

10. from UNIT-I
11. from UNIT – II
12. from UNIT – IV

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
III B.Sc. DEGREE EXAMINATIONS
SEMESTER – V/VI (2022-23)
CHEMISTRY COURSE - VIIC : GREEN CHEMISTRY & NANO TECHNOLOGY

TIME : 2¹/₂ hrs.

Max. Marks : 50

PART –A

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

4x7 =28 M

1. Explain the basic principles of green chemistry.
(OR)
2. Describe the preparation and properties of super critical carbon dioxide.
3. Explain the synthesis of fused anthro quinines by microwave assisted organicsynthesis
(OR)
4. Describe the green synthesis of a) Aldol condensation b) Cannizaro reaction.
5. How are adipic acid and catechol prepared by Green synthesis?
(OR)
6. Write about ultra sound assisted reaction ?
7. Discuss the classification and applications of Nanomaterials?
(OR)
8. Give any two methods for chemical synthesis of nanomaterials?

PART-B

Answer any **FOUR** Questions

4 x 4 =16 M


9. Discuss atom economy reactions? 10.Explain solid supported synthesis?
11. Describe advantages and disadvantages of MAOS?
12. How do you perform Strecker's synthesis by green synthesis?
13. Write brief note on bio catalysis?
14. Discuss about ultra sound assisted reactions ?
15. Explain synthesis of nanoparticles by aerosol method?
16. Expalin bottom-up and top-down approachs with examples?

PART –C

Answer **ALL** Questions

3 x 2 = 6 M

17. What is the need of green chemistry?
18. What is epoxidation?
19. What are the uses of Zeolit

	Government College (Autonomous) Rajahmundry	Program & Semester			
CourseCode CHE-115CP	TITLE OF THE COURSE GREEN CHEMISTRY & NANO TECHNOLOGY	III B.Sc. (V/VI Semester)			
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre- requisites	Organic synthesis, photo reduction reactions, addition reactions, rearrangement reactions.	-	-	2	2

Course Objectives:

1. To learn the skill of the conducting reaction and maintain the conditions, overall synthesis and crystallisation.
2. To study the various green synthesis and percentage of yield calculation.
3. To understand about the 100% atom economic green reactions .
4. To learn about the photo reduction reactions and mechanisms

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Learn the procedures of green synthesis.
CO2	Demonstrate skills in the preparation of 100% atom economic green reactions .
CO3	Acquire skills in Microwave assisted organic synthesis.
CO4	learn photo reduction reactions

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Organic Synthesis

50 M

1. Acetylation of 1^o amine by green method: Preparation of acetanilide
2. Rearrangement reaction in green conditions: Benzil - Benzilic acid rearrangement
3. Benzoin condensation using Thiamine Hydrochloride as a catalyst instead of cyanide.
4. Photo reduction of Benzophenone to Benzo -pinacol in the presence of sunlight.
5. Radical coupling reaction - Preparation of 1,1-bis-(2-naphthol)

Text books:

1. I.A.I.Vogel –A text book of quantitative organic synthesis-ELBS
2. Green chemistry practical by P.T.Anatas and J.C. Warner.

Reference books

1. Practical book of green synthesis by Dar Bashir Ahmed
2. Laboratory manual of green chemistry by Anuradha Mukherjee.

Web Links:

1. <https://youtu.be/eFh9CfQltqo>
2. <https://youtu.be/FxqWzZnzleg>

CO-PO Mapping:

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

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

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
V/VI SEMESTER END EXAMINATIONS
III B.Sc. CHEMISTRY 2022-23
LABORATORY COURSE-VIIC: GREEN CHEMISTRY - PRACTICAL

Scheme of Valuation

Time : 3 hrs

Max. Marks. 50

Record: 10 M

Viva: 5 M

Practical: 35 M

Splitting of Practical Marks:

1. Aim, apparatus, chemicals	5 M
2. Principle	5 M
3. Procedure	5 M
4. MP	5 M
5. Yield report:	
error < 5% error	15 M
error 5% -10%	10 M
error > 10%	5 M