	PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A) KAKINADA DEPARTMENT OF CHEMISTY	Program & Semester I B.Sc. Org.Chemistry (I Semester)			
Course Code ORCH-1	TITLEOFTHECOURSE **COURSE 1 : INORGANIC CHEMISTRY**				
Teaching	HoursAllocated:45 (**Theory**)	L	T	P	C
Pre-requisites	Properties of P and d block elements ,characteristics of lanthanides and Actinides	45		30	3+1

CourseOutcomes:

On Completion of the course, the students will be able to	
CO1	Explain the structures and preparation of key p-block compounds.
CO2	Interpret and classify oxides, oxoacids, interhalogens, and pseudo halogens of Groups 16–17.
CO3	Analyze magnetic, catalytic, and color properties of transition metals.
CO4	Compare and contrast lanthanides and actinides based on electronic configuration.
CO5	Explain and classify the Organometallic compounds

Syllabus:

UNIT-I CHEMISTRY OF p-BLOCK ELEMENTS – I (9 Hrs.)

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

Group 14: Preparation, classification and uses of silicones.

Group 15: Preparation and reactions of hydrazine, hydroxylamine.

UNIT-II CHEMISTRY OF p-BLOCK ELEMENTS – II (9 Hrs.)

Group 16: Classification of oxides, structures of oxides and oxoacids of Sulphur.

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

UNIT-III CHEMISTRY OF d-BLOCK ELEMENTS (9 Hrs.)

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, Colour formation.

UNIT-IV: CHEMISTRY OF f-BLOCK ELEMENTS (9 Hrs.)

Chemistry of Lanthanides: Electronic configuration, oxidation states, colour, magnetic properties, lanthanide contraction, consequences of lanthanide contraction. Chemistry of Actinides: Electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

UNIT-V: ORGANOMETALLIC CHEMISTRY **(9 Hrs)**

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

Textbooks:

S.NO	AUTHOR	TITLE	PUBLISHER
1	J.D. Lee	Concise Inorganic Chemistry	Blackwell Science, London
2	James E. Hughey	Inorganic Chemistry: Principles of Structure and Reactivity	Pearson publications

Reference books

S.NO	AUTHOR	TITLE	PUBLISHER
1	B. R. Puri, L.R. Sharma, K.C. Kalia	Principles of Inorganic Chemistry	Shoban Lal Nagin Chand and Co
2	D.F. Shriver, P.W. Atkins	Inorganic Chemistry	S W. H. Freeman and Co, London
3	A.K. Das	Fundamentals of Metallurgy.	Tata McGraw Hill Education,

WebLinks:

1. https://www.dalalinstitute.com/wp-content/uploads/Books/A-Textbook-of-Inorganic-Chemistry-Volume-1/ATOICV1-10-1-Structure-and-Bonding-in-Higher-Boranes.pdf
2. https://www.youtube.com/watch?v=Sx7cjRjkZvU
3. https://www.khanacademy.org/science/chemistry/chemical-reactions
4. https://www.khanacademy.org/science/chemistry
5. https://www.notopedia.com/school-board

COURSE OUTCOME & PROGRAM OUTCOME MAPPING

CO-PO Mapping:

CO	PO1 Knowledge	PO2 Develop skills	PO3 Usage of Modern Tools	PO4 Scientific interpretation	PO5 Apply chemical knowledge	PO6 Ethical Practices and Social Responsibility	PO7 Communication
CO1	3	2	2	3	2	2	1
CO2	3	2	3	3	2	2	1
CO3	3	3	3	3	2	3	2
CO4	3	2	3	3	2	3	1
CO5	3	2	3	3	3	3	2

1: Low =1 ; 2: Moderate = 2 ; 3: High = 3

UNIT-I CHEMISTRY OF p-BLOCK ELEMENTS – I
CO1: Explain the structures and preparation of key p-block compounds

Mapping to POs:

- **PO1 (Knowledge):** Enables students to apply fundamental chemical principles to interpret structure and properties of P block elements.
- **PO4 (Data Interpretation, and Experimental Design.):** Develops scientific reasoning to explain observed bonding in P block elements
- **UNIT-II CHEMISTRY OF p-BLOCK ELEMENTS – II**

CO2: Interpret and classify oxides, oxoacids, interhalogens, and pseudo halogens of Groups 16–17

Mapping to POs:

- **PO1 (Knowledge):** Builds on chemical principles to explain bonding types oxides, oxoacids, interhalogens, and pseudo halogens of Groups 16–17
- **PO3 (Usage Modern Tools and Techniques):** Applies theoretical models and visualization tools to understand compound structures
- **PO4 (Data Interpretation, and Experimental Design.):** Develops scientific reasoning to explain observed bonding in pseudo halogens

UNIT-III: CHEMISTRY OF d-BLOCK ELEMENTS
CO3: Analyze magnetic, catalytic, and color properties of transition metals

Mapping to POs:

- **PO1 (Knowledge):** Integrates core scientific concepts to explain variable oxidation states, colour, magnetism, and catalytic behaviour.
- **PO2 (Analytical, Logical, and Problem-Solving skills):** Strengthens analytical thinking by requiring stepwise application of analyse the properties of d-block elements.
- **PO3 (Usage Modern Tools and Techniques):** Involves use of modeling kits, computational chemistry software, and diagrammatic techniques.
- **PO4 (Data Interpretation, and Experimental Design):** Fosters reasoning through evaluation of catalytic behaviour.

UNIT-IV: **CHEMISTRY OF f-BLOCK ELEMENTS**
CO4: Compare and contrast lanthanides and actinides based on electronic configuration

Mapping to POs:

- **PO1 (Knowledge):** Reinforces chemical principles in terms of electronic configuration, oxidation states, and contraction effect
- **PO3 (Usage Modern Tools and Techniques):** Involves use of modeling kits, computational chemistry software, and diagrammatic techniques
- **PO4 (Data Interpretation, and Experimental Design):** Enhances reasoning by interpreting experimental and theoretical results that explain contraction effects

Unit 5: ORGANOMETALLIC CHEMISTRY

CO5: Explain and classify various Organometallic compounds - nomenclature, preparation, properties and applications of alkyls of Li and Mg

Mapping to POs:

- **PO1 (Knowledge):** Strengthens core understanding of organometallic compounds
- **PO3 (Usage Modern Tools and Techniques):** Involves use of modeling kits, computational chemistry software, and diagrammatic techniques
- **PO4 (Data Interpretation, and Experimental Design):** Enhances reasoning by interpreting applications of organometallic compounds.

Weightage to content

Semester -I

Course - I

S.No	Course Content	Long Answer	Short Answer	Total marks
1	CHEMISTRY OF p-BLOCK ELEMENTS – I	2	1	25
2	CHEMISTRY OF p-BLOCK ELEMENTS – II	1	2	20
3	CHEMISTRY OF d-BLOCK ELEMENTS	1	2	20
4	CHEMISTRY OF f-BLOCK ELEMENTS	1	1	15
5.	ORGANOMETALLIC CHEMISTRY	1	1	15
	TOTAL	**6**	**7**	**95**

P.R. GOVERNMENT COLLEGE (A), KAKINADA

I YEAR B.Sc Organic Chemistry (Examination at the end of I semester)
(MAJOR – 1 INORGANIC CHEMISTRY)
MODEL PAPER

Duration: 2hr **Max.Marks:50M**

Section – 1

Answer any three of the following questions. Must attempt at least one question from each part. Each question carries 10 Marks. **3 X 10M = 30M**

Part -A

1. UNIT 1
2. UNIT 2
3. UNIT 3

Part-B

4. UNIT1
5. UNIT4
6. UNIT 5

Section - II

Answer any four of the following questions. Each carries 5 marks. **4 X 5M= 20M**

7. UNIT 1
8. UNIT 2
9. UNIT 2
10. UNIT 3
11. U INIT 3
12. UNIT 4
13. UNIT 5

SEMESTER-I

COURSE – 1 INORGANIC CHEMISTRY

Practical Credits: 1 2 hrs/week

Learning Out comes:

1. To understand and apply stoichiometry and principles of inorganic salt preparation.
2. To learn techniques such as crystallization, filtration, and drying
3. To calculate percentage yields.
4. To handle reagents and lab apparatus safely and precisely

Syllabus:

1. Preparation of Potash alum.

2. Preparation of Ferrous oxalate

3. Preparation of Ferrous ammonium sulphate.

4. Preparation of Cuprous chloride.

5. Preparation of Chrome alum.

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SCHEME OF VALUATION

Practical Paper – 1:: Inorganic Chemistry(at the end of semester I)

Systematic analysis of each component which involves following	
a. Procedure with equation	05 marks
b. lab procedure	15 Marks
b. Yield report	10 marks
c. Viva voce	10 marks
d. Record	10 marks
TOTAL	**50 marks**

Lab References:

S.NO	AUTHOR	TITLE	PUBLISHER
1	G. Svehla	Vogel's Textbook of Qualitative Inorganic Analysis	Pearson Education, 2008
2	G.H. Jeffery, J. Bassett, J. Mendham, R.C. Denney	Vogel's Textbook of Quantitative Chemical Analysis	John-Wiley & Sons

Co-Curricular Activities:

1. Internal Practical Assessment
2. Lab Record Evaluation
3. Final Practical Examination
4. Oral/Viva Voce
5. Continuous Internal Evaluation (CIA): Monitoring the progress of student's learning.
6. Class Tests, Worksheets, Quizzes, Industrial/Field visits, Student seminars, Poster and PPT presentations, Peer learning, Project based learning, Assignments, Debates, Group Discussions: Enhances critical thinking skills.
7. Semester End Examination (SEE): Critical indicator of student's learning and teaching methods adopted by teachers throughout the semester

P.R. GOVERNMENT COLLEGE (A), KAKINADA

I YEAR B.Sc Organic Chemistry (Examination at the end of I semester)
(COURSE – 1 INORGANIC CHEMISTRY)

QUESTION BANK

UNIT-1 LONG ANSWER QUESTIONS 10 MARKS

1. Discuss the preparation and structure of Diborane. Explain the nature of bonding in it
2. Describe the preparation, properties, and their classification of silicones.

SHORT ANSWER QUESTIONS 5 MARKS

1. Write the structure of Borazine
2. Give one method of preparation of P3N3Cl6..

UNIT-2 LONG ANSWER QUESTIONS 10 MARKS

1. Discuss the classification of oxides with suitable examples
2. Describe the structure of oxoacids of Sulphur with examples
3. Describe the Born-Haber cycle with its application to the formation of an ionic compound

SHORT ANSWER QUESTIONS 5 MARKS

1. Define interhalogen compounds with examples
2. What are pseudo halogens? Give one example
3. Write difference between interhalogen compounds and pseudo halogens

UNIT-3 LONG ANSWER QUESTIONS 10 MARKS

1. Explain the colour and magnetic properties of transition metals
2. Discuss the catalytic properties and complex-forming ability of transition metals.
3. Explain the general characteristics of d-block elements.

SHORT ANSWER QUESTIONS 5 MARKS

1. What are transition elements? Give examples.
2. What are coordination complexes? Give an example.
3. Write a note on variable oxidation states

UNIT-4 LONG ANSWER QUESTIONS 10 MARKS

1. Explain the similarities and differences between lanthanides and actinides..
2. Discuss the causes and consequences of lanthanide contraction

SHORT ANSWER QUESTIONS 5 MARKS

1. What is actinide contraction?
2. Write the general electronic configuration of lanthanides. And Actinides

UNIT-5 LONG ANSWER QUESTIONS 10 MARKS

1. What are organometallic compounds explain their classification with examples?
2. Write the preparation and properties of organo lithium compounds?

SHORT ANSWER QUESTIONS 5 MARKS

1. What are Grignard reagents write their preparation?
2. Explain the applications of Grignard reagents?

Course Code OC-II			**PITHAPUR RAJAH'S GOVERNMENT COLLEGE** **Kakinada** I B.Sc. Organic Chemistry Hons - I Semester
L 45	P 30	C 3+1	**Course – II :: Organic Chemistry - I** **2025-26 AB**

Course outcomes

On Completion of the course, the students will be able to	
CO1	Understand the concept of Structural theory in organic chemistry
CO2	Able to get knowledge on preparation, chemical properties of alkanes, cycloalkanes, alkenes and alkenes
CO3	Understand the concept of Stereochemistry of carbon compounds

Unit – I : STRUCTURAL THEORY IN ORGANIC CHEMISTRY

Types of bond fission and organic reagents (Electrophilic, Nucleophilic, and free radical reagents including neutral molecules like H_2O,NH_3& $AlCl_3$).

Inductive effect. Application of inductive effect (a) Basicity of amines (b) Acidity of carboxylic acids (c) Stability of carbonium ions. Resonance or Mesomeric effect, application to (a) acidity of phenol, and (b) acidity of carboxylic acids. Hyper conjugation and its application to stability of carbonium ions, Free radicals and alkenes, carbanions..

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

UNIT-II : SATURATED HYDROCARBONS (ALKANES & CYCLOALKANES) (9 h)

Alkanes: Preparation of alkanes by Corey House synthesis, Substitution reactions of alkanes. Conformational analysis of alkanes (Conformations, relative stability and energy diagrams of Ethane, Propane)

Cycloalkanes: Cycloalkanes and their relative stability, Baeyer strain theory, Cyclohexane conformations with energy diagram.

UNIT-III: UNSATURATED HYDROCARBONS (ALKENES & ALKYNES) (9 h)

Alkenes: Preparation of alkenes by dehydration of alcohols, Saytzeff and Hofmann eliminations, Electrophilic Additions of X2, H2O, HX to alkene, Markownikoff and Anti-markownikoff addition, Ozonolysis, Diels-Alder reaction, 1,2- and 1,4-addition reactions in conjugated dienes.

Alkynes: Preparation by dehydrohalogenation of dihalides, dehalogenation of tetrahalides, Properties - Acidity of acetylenic hydrogen (formation of Metal acetylides) - Additions of X2, H2O, HX to alkynes and alkylation of terminal alkynes.

Unit – IV : STEREOCHEMISTRY OF CARBON COMPOUNDS-I

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

Optical isomerism: Optical activity- wave nature of light, plane polarised light, optical rotation and specific rotation.

Unit – V : STEREOCHEMISTRY OF CARBON COMPOUNDS-II

Chiral molecules- definition and criteria (Symmetry elements)- Definition of enantiomers and diastereomers – Explanation of optical isomerism with examples Glyceraldehyde, Lactic acid, Alanine, Tartaric acid, 2,3- dibromopentane.

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

Weightage to content

Unit No	Course Content	LAQ	SAQ	Total marks
1	Structural theory in organic chemistry	2	1	25
2	Saturated Hydrocarbons (Alkanes & Cycloalkanes)	1	1	15
3	Unsaturated Hydrocarbons (Alkenes & Alkynes)	1	2	20
4	Stereochemistry of carbon compounds-I	1	1	15
5	Stereochemistry of carbon compounds-II	1	2	20
	TOTAL	**6**	**7**	**95**

LAQ = Long Answer Questions

SAQ = Short Answer Questions

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A) :: KAKINADA

I YEAR B.Sc Organic Chemistry Hons (2025-26 AB)

(Examination at the end of I semester)

Paper-II :: ORGANIC CHEMISTRY - I

MODEL PAPER

Duration: 2hrs **Max. Marks: 50**

PART- A

Answer any **THREE** of the following questions by choosing at least **ONE** from each section. Each carries **TEN** marks 3 X 10 = 30 M

SECTION -A

1. Unit - I
2. Unit - II
3. Unit – III

SECTION -B

4. Unit - IV
5. Unit - V
6. Unit – I

PART- B

Answer any **FOUR** questions. Each carries FIVE marks 4 X 5 = 20 Marks

7. Unit – I
8. Unit – II
9. Unit – III
10. Unit – III
11. Unit – IV
12. Unit – V
13. Unit – V

Reference and Text books

1. Organic Chemistry by Morrisson and Boyd
2. A Text Book of Organic chemistry by I L Finar Vol I

COURSE OUTCOME & PROGRAM OUTCOME MAPPING

COURSE OUTCOMES

On Completion of the course, the students will be able to	
CO1	Understand the concept of Structural theory in organic chemistry
CO2	Able to get knowledge on preparation, chemical properties of alkanes, cycloalkanes, alkenes and alkenes
CO3	Understand the concept of Stereochemistry of carbon compounds

PROGRAMME OUTCOMES

At the completion of the B.Sc. Organic Chemistry program, the students of our Department will be able to:

(PO1) Knowledge: Attain in depth knowledge about the fundamental principles, essential facts, conclusions and applications of chemical and scientific theories in various domains of chemistry.

(PO2) Critical Thinking: Carry out experiments in the area of organic analysis, estimation, derivative process, inorganic semi micro analysis, preparation, Kinetic, conductometric and potentiometric experiments and spectral analysis applying the domain of critical thinking.

(PO3) Problem Solving: Define the background of reaction mechanisms, complex chemical structures, instrumental method of chemical analysis, and separation techniques and apply appropriate techniques for analyzing specific problems both qualitatively and quantitatively in laboratories and in industries.

(PO4): Usage of modern tools: Create data using modem chemical tools and ICT for modeling and analyze the data obtained from sophisticated instruments (like UV-Vis, FTIR, NMR, GCMS, Fluorescence, SEM, TEM and XRD) for chemical analysis.

(PO5): Communication: Develop Skills to evaluate, analyze and interpret the chemical information and data and to communicate effectively within the chemical community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

(PO6): Life-long Learning: Demonstrate scholarly attitude to pursue a career in the field of chemical education and research and have the zeal and vision to engage in independent and

life-long learning in the broadest context of technological and social change.

(PO7) Ethical Practices and Social Responsibility: Generate ideas and solutions for green and sustainable chemistry and approach towards planning and execution of research in frontier areas of chemical sciences.

PROGRAM SPECIFIC OUTCOMES (PSO's)

At the time of graduation, our under graduates would be able to:

PSO 1- Evaluate, analyze, interpret and effectively apply the basic laws, principles, phenomena, processes and mechanisms involved in the domain of organic, inorganic, physical and analytical Chemistry

PSO 2 - Demonstrate the knowledge of Chemistry in the domain of research, education and perspective entrepreneurship.

PSO 3 - Evaluate distinct problems in the field of chemical data analysis, scientific interpretation and reaction mechanisms with an understanding on basic tools to be employed.

CO-PO Mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3
CO1	3	2	3	1	3	2	1	2	3	2
CO2	2	3	1	2	1	3	3	2	1	3
CO3	1	1	3	1	2	2	1	2	1	3

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A) :: KAKINADA

I B.Sc Organic Chemistry Hons (2025-26 AB)

(Practical Syllabus at the end of I semester)

Paper-II :: ORGANIC CHEMISTRY - I

Practical Credits: 01 30 hrs (2 hrs/week) 50Marks

Course outcomes:

On completion of the course, the student will be able to:

1) Use glassware, equipment and chemicals and follow experimental procedures in the laboratory.

2) Engage in safe laboratory practices by handling laboratory glassware, equipment, and chemical reagents appropriately.

3) Dispose of chemicals in a safe and responsible manner.

4) Understand how the functional groups reacts with different reagents

Syllabus

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

Alcohols, phenols, aldehydes, ketones, carboxylic acids and Amines

Co-curricular activities and assessment methods:

1. Continuous Evaluation: Monitoring the progress of student's learning

2. Class Tests, Worksheets and Quizzes

3. Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality

4. SEMESTER -End Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the SEMESTER .

Scheme of Evaluation

S. No	Content	Marks
1	Preliminary tests State + colour + odour Flame test + Litmus test + Solubility + Unsaturation	10 2 2 + 2 + 2 + 2
2	Identification tests	20
3	Confirmation test	8
4	Report	2
5	Viva voce	5
6	Record	5