	PITHAPUR RAJAH'S GOVERNMENT COLLEGE Kakinada	Program & Semester			
Course Code ORCH-V	TITLE OF THE COURSE **INORGANIC CHEMISTRY**	II B.Sc. Organic Chemistry Hons (III Semester)			
Teaching	Hours Allocated: 45 (**Theory**)	L	T	P	C
Pre-requisites	Bonding in metals, Metal carbonyls, Coordination chemistry, spectral, magnetic and stability of metal complexes	45	10	30	3+1

Course Objectives:

1. Bonding in metals
2. Metal carbonyls
3. Coordination chemistry
4. Spectral, magnetic and stability of metal complexes

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Understand the basic concepts of Metals, Conductors, insulators
CO2	Understand the basic concepts and structure of Metals carbonyls
CO3	understand the concept of Coordination Compounds.
CO4	understand the properties of complex compounds

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT-I : 6a

THEORIES OF BONDING IN METALS:

Metallic properties and its limitations, Valence bond theory, Free electron theory, Explanation of thermal and electrical conductivity of metals, limitations, Band theory, formation of bands, explanation of conductors, semiconductors and insulators.

UNIT- II :

METAL CARBONYLS :

Introduction 18 e Rule EAN rule, classification of metal carbonyls, structures and shapes of metal carbonyls of V, Cr, Mn, Fe, Co and Ni.

UNIT-III :

COORDINATION CHEMISTRY:

IUPAC nomenclature - bonding theories - Review of Werner's theory and Sidgwick's concept of coordination - Valence bond theory - geometries of coordination numbers 4-tetrahedral and square planar and 6-octahedral and its limitations, crystal filed theory - splitting of d-orbitals in octahedral, factors affecting crystal-field splitting energy, merits and demerits of crystal-field theory. Isomerism in coordination compounds - structural isomerism and stereo isomerism, stereochemistry of complexes with 4 and 6 coordination numbers.

Unit-4 : SPECTRAL AND MAGNETIC PROPERTIES OF METAL COMPLEXES:

Types of magnetic behavior, spin-only formula, calculation of magnetic moments, experimental determination of magnetic susceptibility-Gouy method.

Unit-5: STABILITY OF METAL COMPLEXES:

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

Reference & Text books:

1. Concise coordination chemistry by Gopalan and Ramalingam
2. Coordination Chemistry by Basalo and Johnson
3. Concise Inorganic Chemistry by J.D.Lee
4. Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan

Weightage to content
Semester -III
Paper-V

S.No	Course Content	Long Answer	Short Answer	Total marks	As per Blooms Taxonomy
1	Theories Of Bonding In Metals	1	2	20	Understanding, Application
2	Metal Carbonyls	1	1	15	Remembering, Understanding
3	Coordination Chemistry	2	1	25	Application & Creation
4	Spectral and Magnetic Properties of Metal Complexes	1	1	15	Remembering, Understanding
5	Stability of Metal Complexes	1	2	20	Application & Creation
	TOTAL	**6**	**7**	**95**	

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

II YEAR B.Sc Organic Chemistry Hons (2023-24 AB)
(Examination at the end of III semester)
Paper-V :: INORGANIC CHEMISTRY)
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 - III
5. Unit - IV
6. Unit – V

PART- B

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

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

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

II YEAR B.Sc Organic Chemistry Hons (2023-24 AB)
(Examination at the end of III semester)

LABORATORY COURSE
Practical Paper – V :: Inorganic Chemistry

Credits: 01

(at the end of semester III) 30 hrs (2 h / W) **50Marks**

Titrimetric Analysis 50 M

1. Determination of Fe (II) using $KMnO_4$ with oxalic acid as primary standard.
2. Determination of Cu (II) using $Na_2S_2O_3$ with $K_2Cr_2O_7$ as primary standard

	PITHAPUR RAJAH'S GOVERNMENT COLLEGE KAKINADA	Program & Semester			
Course Code **ORG CHE-6**	TITLE OF THE COURSE **COURSE 6: ORGANIC CHEMISTRY**	II B.Sc.HONORS (III Semester)			
Teaching	Hours Allocated: 45(**Theory**)	L	T	P	C
Pre-requisites	Fundamentals in organic functional groups, types of organic reactions, and reagents	45	10	30	3+1

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Handle in depth of various named reactions with mechanism
CO2	Understand the basic concepts of Hydroxy Compounds
CO3	Learn and identify halogen compounds, hydroxy compounds, carbonyl and carboxylic acids, active methylene compounds
CO4	Understand the reactivity and structure of different functional groups of compounds

Course with focus on employability/entrepreneurship/SkillDevelopment modules

Skill Development		Employability		Entrepreneurship	

Syllabus

UNIT – I : HALOGEN COMPOUNDS

Nomenclature and classification of alkyl (into primary, secondary, tertiary), aryl, alkyl, allyl, vinyl, benzyl halides. Nucleophilic aliphatic substitution reaction- classification into SN^1 and SN^2 – reaction mechanism with examples – Ethyl chloride, t-butyl chloride and optically active alkyl halide 2-bromobutane.

UNIT-II : HYDROXY COMPOUNDS

Nomenclature and classification of hydroxy compounds.

Alcohols: Preparation with hydroboration reaction, Grignard synthesis of alcohols.

Phenols: Preparation i) from diazonium salt, ii) from aryl sulphonates, iii) from cumene. Physical properties- Hydrogen bonding (intermolecular and intramolecular). Effect of hydrogen bonding on boiling point and solubility in water. Identification of alcohols by oxidation with $KMnO_4$, Ceric ammonium nitrate, Luca's reagent and phenols

by reaction with $FeCl_3$.

Chemical properties:

a) Dehydration of alcohols.
b) Oxidation of alcohols by CrO_3, $KMnO_4$.
c) Special reaction of phenols: Riemer-Tiemann reaction, Pinacol-Pinacolone rearrangement.

UNIT-III : CARBONYL COMPOUNDS

Nomenclature of aliphatic and aromatic carbonyl compounds, structure of the carbonyl group. Synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties: Reactivity of carbonyl group in aldehydes and ketones. Nucleophilic addition reaction with a) $NaHSO_3$, b) HCN, c) RMgX, d) NH2OH, e) $PhNHNH_2$, f) 2,4 DNPH, Base catalysed reactions: a) Aldol, b) Cannizzaro's reaction, c) Perkin reaction, d) Benzoin condensation, e) Haloform reaction, f) Knoevenagel reaction. Oxidation of aldehydes- Baeyer-Villiger oxidation of ketones. Reduction: Clemmensen reduction, Wolf-Kishner reduction, MPV reduction, reduction with $LiAlH_4$ and $NaBH_4$. Analysis of aldehydes and ketones with a) 2,4-DNPH test, b) Tollen's test, c) Fehling test, d) Schiff's test e) Haloform test (with equation)

UNIT-IV : CARBOXYLIC ACIDS

Nomenclature, classification and structure of carboxylic acids. Methods of preparation by a) Hydrolysis of nitriles, amides b) Hydrolysis of esters by acids and bases with mechanism c) Carbonation of Grignard Reagents. Special methods of preparation of aromatic acids by a) Oxidation of side chain. b) Hydrolysis by benzo trichlorides. c) Kolbe reaction. Physical properties: Hydrogen bonding, dimeric association, acidity- strength of acids with examples of trimethyl acetic acid and trichloroacetic acid. Relative differences in the acidities of aromatic and aliphatic acids. Chemical properties: Reactions involving H, OH and COOH groups- salt formation, anhydride formation, acid chloride formation, amide formation and esterification (mechanism). Degradation of carboxylic acids by Huns-Diecker reaction, decarboxylation by Schimdt reaction, Arndt-Eistert synthesis, halogenation by Hell- Volhard- Zelinsky reaction.

UNIT-V: ACTIVE METHYLENE COMPOUNDS

ACETOACETIC ESTER: keto-enol tautomerism, preparation by Claisen condensation, Acid hydrolysis and ketonic hydrolysis. Preparation of a) monocarboxylic acids b) Dicarboxylic acids.

c) Reaction with urea

MALONIC ESTER: preparation from acetic acid. **Synthetic applications**: Preparation of a) monocarboxylic acids (propionic acid and n-butyric acid). b) Dicarboxylic acids (succinic acid and adipic acid) c) α,β- unsaturated carboxylic acids (crotonic acid) d) Reaction with urea.

Textbooks

S.NO	AUTHOR	TITLE	PUBLISHER
1	O.P Agarwal	Unified Chemistry	JPNP publications
2	Bhal and Arun Bhal	Text book of Advanced organic chemistry	S.Chand publications

Reference books

S.NO	AUTHOR	TITLE	PUBLISHER
1	Bahl and Arun bahl	A Text Book of Organic Chemistry	S.Chand publications
2	I L Finar Vol I	A Text Book of Organic chemistry	
3.	Bruice	Organic chemistry	
4.	Clayden	Organic chemistry	

Course outcome & Program outcome mapping

On Completion of the course, the students will be able to	
CO1	Handle in depth of various named reactions with mechanism
CO2	Understand the basic concepts of Hydroxy Compounds
CO3	Learn and identify halogen compounds, hydroxy compounds, carbonyl and carboxylic acids, active methylene compounds
CO4	Understand the reactivity and structure of different functional groups of compounds

CO-PO Mapping:

CO	PO1	PO 2	PO3	PO 4	PO 5	PO6	PO 7	PSO1	PSO2	PSO 3
CO1	3	2	2	2	1	2	1	3	2	2
CO2	3	1	2	2	1	1	1	3	1	2
CO3	3	2	2	3	2	2	2	3	2	2
CO4	3	1	1	1	1	1	1	2	1	1

PROGRAMME OUTCOMES

At the completion of the B.Sc. 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

PSO2 - Demonstrate the knowledge of Chemistry in the domain of research, education and perspective entrepreneurship.

PSO3 - Evaluate distinct problems in the field of chemical data analysis, scientific interpretation and reaction mechanisms with an understanding on basic tools to be employed.

Weightage to content

S.No	Course Content	Long Answer	Short Answer	Total marks	As per Blooms Taxonomy
1	**HALOGEN COMPOUNDS**	1	1	15	Understanding, Application
2	**HYDROXY COMPOUNDS**	1	2	20	Remembering, Understanding
3	**CARBONYL COMPOUNDS**	2	1	25	Analysizing & Creation
4	**CARBOXYLIC ACIDS**	1	2	20	Evaluation, Understanding
5.	**ACTIVE METHYLENE COMPOUNDS**	1	1	15	Understanding, Application
	TOTAL	**6**	**7**	**95**	

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A), KAKINADA

II YEAR B.Sc (Examination at the end of III semester)

COURSE – 6 :: ORGANIC 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. Define Nucleophilic reactions? Apply the concept of SN1 mechanism to explain the nucleophilic substitution reaction with example
2. What are phenols? Explain the preperation of phenols from diazonium salts and cumene
3. State Benzoin reaction ? Discuss the formation of benzoin with mechanism

Part-B

4. Explain the following
   a) Wolf-Kishner reduction
   b) Baeyer-Villiger oxidation
5. Write preparation method for ethyl acetoacetate? Discuss the acid hydrolysis and ketonic hydrolysis of ethyl acetoacetae
6. Elaborate the mechanism of Hydrolysis of esters by acids and bases with mechanism

Section - II

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

7. Write a brief note on classification of alkyl halides with suitable examples
8. Subdivide alcohols with suitable examples.
9. Explain haloform reaction with suitable example
10. Discuss the acidic nature of carboxylic acids
11. Elaborate aldol condensation with example
12. Write a brief note on pinacole-pinacalone rearrangement reaction
13. Interpret keto-enol tautomerism in malonic ester with explanation?

SEMESTER-III

COURSE 6: ORGANIC CHEMISTRY

Practical Credits: 1 2 hrs/week

Practical- Organic Qualitative Analysis (At the end of Semester)

Systematic qualitative analysis of organic compounds: Phenols, Carbonyl compounds (Aldehyde and ketone), Carboxylic acid, Amine, Carbohydrate, Amide and Urea

Scheme of Evaluation

S.No	Content	Marks
1	Preliminary tests State + colour + odour Flame test + Solubility + Unsaturation	08 2 2 + 2 + 2
	Test for extra elements Procedure Nitrogen + Halogens + Sulphur	10 4 2+2+2
2	Identification tests	14
3	Confirmation test	6
4	Report	2
5	Viva voce	5
6	Record	5

	PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA DEPARTMENT OF CHEMISTY	Program & Semester Organic Chemistry II B.Sc. (III Semester)			
Course Code OC -7	TITLE OF THE COURSE **COURSE 7: PHYSICAL CHEMISTRY-I** **2024-25 AB**				
Teaching	Hours Allocated:45 (**Theory**)	**L**	T	P	**C**
Pre-requisites	Gas laws, Laws of symmetry, Intermolecular interactions	45	10	30	3+1

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Interpret crystal structures and symmetry using X-ray diffraction and classify defects in crystalline solids.
CO2	Understand and analyze the behavior of ideal and real gases using kinetic theory, van der Waal's equation, and critical phenomena.
CO3	Apply knowledge of liquid properties and liquid crystals to determine physical behavior and explain their technological applications.
CO4	Apply Gibbs phase rule and construct phase diagrams for one- and two-component systems to explain phase equilibria.
CO5	Apply these principles to calculate solubility, vapour pressures, phase behaviour,and partitioning in real-life and industrial processes.

Course with focus on Skill Development/Employability/Entrepreneurship modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT-I - Solid state (9h)

Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. Miller indices, Definition of lattice point, space lattice, unit cell. Bravais lattices and crystal systems. X-ray diffraction and crystal structure. Bragg's law. Defects in crystals. Stoichiometric and non-stoichiometric defects.

Unit II - Gaseous state (9 h)

Postulates of Kinetic theory of Gases (exclude derivation) – deduction of gas laws from kinetic gas equation-Vander Waal's equation of state. Andrew's isotherms of carbon dioxide, continuity of state. Critical phenomena. Relationship between critical constants and vander Waal's constants. Law of corresponding states. Joule- Thomson effect. Inversion temperature.

Unit III: Liquid State (9 h)

Physical properties of liquids; vapour pressure, surface tension and coefficient of viscosity, and their determination. Effect of addition of various solutes on surface tension and viscosity. Temperature variation of viscosity of liquids and comparison with that of gases.

Liquid crystals, mesomorphic state. Differences between liquid crystal and solid/liquid. Classification of liquid crystals into Smectic and Nematic. Application of liquid crystals as LCD devices.

Unit IV - Phase Rule (9 h)

The Concept of phase, components, degrees of freedom. 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 V - Solutions (9 H)

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

Text books and Reference Books:

S.NO	AUTHOR	TITLE	PUBLISHER
1	Prutton and Marron	Principles of physical chemistry	
2	Anthony R. West	Solid State Chemistry and its applications	
3	K L Kapoor	Text book of physical chemistry	JPNP publications
4	S Glasstone	Text book of physical chemistry	Oxford University Press
5	Bahl and Tuli	Advanced physical chemistry	Oxford University Press

WebLinks:

1. https://r.search.yahoo.com/_ylt=Awrx_2xJRzhntwIAF1K7HAx.;_ylu=Y29sbwNzZzMEcG9zAzEEdnRpZAMEc2VjA3Ny/RV=2/RE=1732951113/RO=10/RU=https%3a%2f%2fncert.nic.in%2fncerts%2fl%2fkech105.pdf/RK=2/RS=Vm9QfnIDc3bV3suL2OFEa2QmVNU-
2. https://ncert.nic.in/ncerts/l/kech105.pdf
3. https://ncert.nic.in/ncerts/l/lech101.pdf
4. https://in.video.search.yahoo.com/search/video;_ylt=Awr1QGxgSDhn6gEAOiO7HAx.;_ylu=Y29sbwNzZzMEcG9zAzEEdnRpZAMEc2VjA3Nj?type=E210IN885G0&p=Phase+rule+ncert+pdf&fr=mcafee&turl=https%3A%2F%2Ftse4.mm.bing.net%2Fth%3Fid%3DOVP.JxFcEpp5NbDamMSQrb4TBgHgFo%26pid%3DApi%26w%3D296%26h%3D156%26c%3D7%26p%3D0&rurl=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3DlkyOlL0yuCo&tit=PHASE+RULE+%28+Phase%2C+components+and+degree+of+freedom+in+a+single+shot+with+examples%29&pos=11&vid=81f4608b48f4687d75f45904baeaac3e&sigr=N6uflKlnj6Q5&sigt=hJJod0UFuWJ9&sigi=7h78CUEbal4Y
5. https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=13G8VouhmrFfuhs6rkiyTA==

Course outcome & Program outcome mapping

On completion of the course, the students will be able to	
CO1	Interpret crystal structures and symmetry using X-ray diffraction and classify defects in crystalline solids.
CO2	Understand and analyze the behavior of ideal and real gases using kinetic theory, van der Waal's equation, and critical phenomena.
CO3	Apply knowledge of liquid properties and liquid crystals to determine physical behavior and explain their technological applications.
CO4	Apply Gibbs phase rule and construct phase diagrams for one- and two-component systems to explain phase equilibria.
CO5	Apply these principles to calculate solubility, vapour pressures, phase behaviour,and partitioning in real-life and industrial processes.

CO-PO Mapping:

1: Low =1 ;2: Moderate = 2 ; 3: High = 3 ; 4: No Correlation = 0

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	2	2	3	2	2
CO2	3	2	2	2	1	2	1	3	2	2
CO3	3	1	2	2	1	1	1	3	1	2
CO4	3	1	1	1	1	1	1	2	1	1
CO5	3	2	2	3	1	2	2	3	1	2

PROGRAMME OUTCOMES

At the completion of the B.Sc. Chemistry program, the students 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

PSO2 - Demonstrate the knowledge of Chemistry in the domain of research, education and perspective entrepreneurship.

PSO3 - Evaluate distinct problems in the field of chemical data analysis, scientific interpretation and reaction mechanisms with an understanding on basic tools to be employed.

Weightage to content

Semester -III

Course - 7

S.No	Course Content	Long Answer	Short Answer	Total marks	As per Blooms Taxonomy
1	Solid state	1	2	20	Analyzing, Creation
2	Gaseous state	2	1	25	Understanding, Application
3	Liquid State	1	1	20	Remembering, Understanding
4	Phase Rule	1	1	15	Evaluation, Understanding
5	Solutions	1	2	20	Understanding, Application
	TOTAL	**6**	**7**	**95**	

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A) :: KAKINADA
II Year B.Sc Organic Chemistry Hons (2024-25 AB)
(Examination at the end of III semester)
Course-7 :: Physical 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 – V

SECTION -B

4. Unit - III
5. Unit - IV
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

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A) :: KAKINADA
II Year B.Sc Organic Chemistry Hons (2024-25 AB)
(Examination at the end of III semester)
Course-7 :: Physical Chemistry-I

Question Bank

Unit-1:

Essay Questions:

1. Derive the following laws from kinetic theory of gases?
   a) Boyle's law b) Avogadro's law d) Dalton's Law
2. Elaborate Vander Waal equation of state?
3. Derive the mathematical relation between Vander Waal constants and critical constants?

Short answer Questions:

1. Write the postulates of kinetic theory of gases**?**
2. Discuss the Anderw's Isotherm of carbon dioxide?
3. Explain the reduced equation of state and law of corresponding states?
4. What is Joule-Thomson effect and explain inversion temperature?

Unit-2:

Essay Questions:

1. What are liquid crystals and explain their classification?
2. Define surface tension & explain its determination by using drop count method?
3. What is the coefficient of viscosity & explain its determination by using viscometer.

Short answer Questions:

1. Write the applications of liquid crystals?
2. Explain the differences between liquid crystal and solid/liquids
3. Elaborate on the Qualitative discussion of the structure of water.

Unit-3:

Essay Questions:

1. Explain the law of symmetry in crystals?
2. Derive Bragg's equation for the determination of crystal structure?
3. Explain the stoichiometric and non-stoichiometric defects in crystals?

Short answer Questions:

1. Explain the law of constancy of interfacial angles?
2. Define space lattice, lattice point & unit cell?
3. Write about the different crystal systems with examples?
4. what is law of rational indices?

Unit-4:

Essay Questions:

1. Explain the phase diagram of the Water system?
2. Elaborate the phase diagram of the NaCl- Water system?
3. Discuss the phase diagram of the Ag-Pb system

Short answer Questions:

1. Define phase rule and explain the terms involved in it.
2. Discuss the Pattinson' s process for the desilverisation of lead?
3. Define congruent and incongruent melting points give examples?
4. Write a short note on freezing mixtures.

Unit-5:

Essay Questions:

1. What is Critical Solution temperature? Explain Critical solution temperature for Phenol - water system.
2. Explain the concept of azeotropes using the HCI-H2O and ethanol-water systems as examples. Discuss-how azeotropes affect fractional distillation processes.
3. State and explain Nernst distribution Law. Write its limitations. Explain the applications of Nernst distribution Law.

Short Answer Questions:

1. Write a brief note on Henry Law?
2. Explain Raoult's law?
3. What is an azeotrope, and how does it differ from a regular solution?
4. What are Ideal and Non Ideal solutions give examples.

III - SEMESTER

Course Code 7: Physical Chemistry - 1

Credits: 01

Course outcomes:

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

1) Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
2) Apply concepts of surface chemistry in experiments.
3) Be familiar with the concepts & practical applications of Surface tension and viscosity of liquids.

Physical Chemistry Practical Syllabus:

1. Determination of surface tension of liquid by drop count method
2. Determination of surface tension of liquid by drop weight method
3. Determination of coefficient of viscosity of an organic liquid.

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.

List of reference books:

1) A Text Book of Quantitative Inorganic Analysis(3^{rd}Edition) –A.I.Vogel

2) Web related references suggested by teacher.

	PITHAPUR RAJAH'S GOVERNMENT COLLEGE KAKINADA	Program & Semester			
Course Code **OC-8**	TITLE OF THE COURSE **COURSE 8: GENERAL CHEMISTRY**	I B.Sc. HONORS (III Semester)			
Teaching	Hours Allocated: 45(**Theory**)	L	T	P	C
Pte-requisites	Fundamental Knowledge in Gel Preperation, and Hardy Schultz rule, Adsorption and Absorption.	45	10	30	3+1

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Handle indepth of various named reactions with mechanism
CO2	**Understand the basic concepts of Colloids, emulsions, and Gels**
CO3	Learn and identify Chemical Bonding, Stereo Chemistry of Carbon compounds-I & II
CO4	**Understand the concept of VBT and LCAO Method.**

Course with focus on employability/entrepreneurship/SkillDevelopment modules

Skill Development		Employability		Entrepreneurship	

SYLLABUS

UNIT-I

COLLOIDS:

Definition of colloids. Solids in liquids(sols), preparation, properties - kinetic, optical, electrical. Stability of colloids, Hardy-Schulze law, protective colloid. Liquids in liquids (emulsions) preparation, properties, uses. Liquids in solids (gels) preparation, uses.

UNIT-II-

ADSORPTION:

Physical adsorption, chemisorption. Freundlich, Langmuir adsorption isotherms. Applicationsof adsorption, difference between physical adsorption and chemical adsorption

UNIT-III

CHEMICAL BONDING:

Valence bond theory, hybridization, VB theory as applied to ClF_3, Ni $(CO)_4$, Molecular orbital theory - LCAO method, construction of M.O. diagrams for homo-nuclear and hetero-nuclear diatomic molecules (N_2, O_2, CO and NO).

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 specifi 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- dibromo pentane.

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

Textbooks

S.NO	AUTHOR	TITLE	PUBLISHER
1	O.P Agarwal	Unified Chemistry	JPNP publications
2	Bhal and Arun Bhal	Text book of Advaced organic chemistry	S.Chand publications

Reference books

S.NO	AUTHOR	TITLE	PUBLISHER
1	K L Kapoor	Text book of physical chemistry	Macmillan publishers india Limited,2004
2	S Glasstone	Text book of physical chemistry	D. Van Nostrand Company, inc
3.	E L Eliel	Stereochemistry of Organic compounds	Wiley
4.	F A Carey and R J Sundberg	Advanced Organic Chemistry	Wiley
5.	P.S.Kalsi	Stereochemistry	New Age International Private limited
6.	D. Nasipuri	Stereochemistry of Organic compounds	New Age International Private limited
7.	Bahl and Tuli	Advanced physical chemistry	Dalal Institute

Course outcome & Program outcome mapping

On Completion of the course, the students will be able to	
CO1	In depth understanding of Structural theory in General chemistry
CO2	Understand and explain preparations and properties of colloids and gels
CO3	Learn and identifyemulsion and gel character ofvarious compounds with reference to their applications in a mechanistic and synthesis path.
CO4	To understand and apply the basic principles of stereo chemistry for structure and reactivity of Lactic acid, glyceraldehyde and alanine

CO-PO Mapping:

CO	PO1	PO 2	PO3	PO 4	PO 5	PO6	PO 7	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	2	1	3	2	2
CO2	3	1	2	2	1	1	1	3	1	2
CO3	3	2	2	3	2	2	2	3	2	2
CO4	3	1	1	1	1	1	1	2	1	1

PROGRAMME OUTCOMES

At the completion of the B.Sc. 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:

PSO1- 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.

PSO2 - Demonstrate the knowledge of Chemistry in the domain of research, education and perspective entrepreneurship.

PSO3 - 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-Curricular Activities: Mandatory:(Lab/field training of students by teacher:(lab:10+field:05)

For Teacher: Training of students by teacher in laboratory and field for not less than15 hours on the field techniques/skills of Preparation of Standard Solutions.

For Student: Student shall visit a related industry/chemistry laboratory in universities/research organizations/private sector facility and observe the techniques used for Calibration of Various Volumetric Apparatus. Write their observations and submit a handwritten fieldwork/project work report not exceeding10 pages in the given format to the teacher. Max marks for Fieldwork/project work Report:05. Suggested Format for Fieldwork/project work: Title page student details, index page, details of place visited, observations, findings, and acknowledgements Unit tests (IE). a) Suggested Co-Curricular Activities.

7. Training of students by related industrial experts.
8. 2. Assignments, Seminars and Quiz (on related topics), collection of videos and other material.
9. Visits of facilities, firms, research organizations etc.
1. Invited lectures and presentations on related topics by field/industrial experts.

Weightage to content

S.No	Course Content	Long Answer	Short Answer	Total marks	As per Blooms Taxonomy
1	**COLLOIDS**	1	1	15	Understanding, Application
2	**ADSORPTION**	1	1	15	Remembering, Understanding
3	**CHEMICAL BONDING**	1	2	20	Analysizing & Creation
4	**STEREOCHEMISTRY OF CARBON COMPOUNDS-I**	1	1	15	Evaluation, Understanding
5.	**STEREOCHEMISTRY OF CARBON COMPOUNDS-II**	2	2	30	Understanding, Application
	TOTAL	**6**	**7**	**95**	

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A), KAKINADA

II YEAR B.Sc (Examination at the end of III semester)

COURSE –8 :: ORGANIC CHEMISTRY MODEL PAPER

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

Section – 1

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

Part -A

1. Define colloids? Preparation of colloids by various methods with example.BT1 & BT3
2. What are adsorption isotherms? Explain the Freundlisch adsorption isotherms
3. State MO theory and construction of M.O. diagrams for homo-nuclear molecules N_2 & O_2 BT1 & BT2

Part-B

4. Explain the following
   a) Fischer Projection BT3
   b) Newman Projection BT_2
5. Write about D,L and R,S cofiguration methods with suitable example BT3
6. Elaborate the E,Z- configuration with examples B T 3

Section - II

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

7. Write a brief note use of colloids with suitable examples BT1
8. Subdivide physical adsorption from chemical adsorption with suitable examples. BT4
9. Explain hybridization with ClF_3 molecule BT2
10. Discuss the specific rotation BT2
11. Elaborate the postulates of VB theory BT3
12. Write a brief note on enantiomers BT1

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A), KAKINADA

II YEAR B.Sc HONORS (Examination at the end of III semester)

COURSE – 8 :: General Chemistry

QUESTION BANK

ESSAY QUESTIONS

Unit:1

1. Define colloids? Preparation of colloids by various methods with example.

2 Write about the optical and electrical properties of colloids

2. What is stability of colloids and how to protect unstable colloids

Unit: II

1. What are adsorption isotherms? Explain the Freundlisch adsorption isotherms

2. Explain about Langmuir adsorption isotherms

Unit: III

1. State MO theory and construction of M.O. diagrams for homo-nuclear molecules N_2 & O_2

2. Write about the important postulates of MO theory

3. Construct the MO diagrams of CO and NO

Unit: IV

1. Explain the following

A) Fischer Projection.

B) Newman Projection

2. Describe wedge and saw-horse representation for a molecule

Unit: V

1. Write about D, L and R, S cofiguration methods with suitable example
2. Elaborate the E,Z- configuration with examples

SHORT ANSWER QUESTIONS

Unit:1

1. Write a brief note uses of colloids with suitable examples

2. What are Emulsions and give their uses

3. What are protective colloids

Unit: 1I

1. Subdivide physical adsorption from chemical adsorption with suitable examples.

2. What are the applications of adsorption

Unit: III

1. Explain hybridization with ClF_3 molecule

2. Elaborate the postulates of VB theory

3. Explain the structure of $Ni(CO)_4$

Unit: IV

1. Discuss the specific rotation

2. What is Ordinary light and Optical light

Unit: V

1. Elaborate optical activity with example

2. Interpret glyceraldehyde as chiral molecule

3. Write a brief note on enantiomers

4. What is the criteria for the optical activity of an organic molecule

SEMESTER-III

COURSE 8: GENERAL CHEMISTRY

Practical Credits: 1 2 hrs/week

Practical- General Chemistry Lab

(i) Determination of surface tension of liquid

(ii) Determination of viscosity of liquid

(iii) Determination of molecular status and partion coefficient of benzoic acid in benzene and water

(iv) Adsorption of acetic acid on animal charcoal, verification of Freundlisch isotherm

Scheme of Valuation for Practical

Procedure in first 10mts-10M

Neat tabular forms with tabulation of values-10M

Relevant formula with terms explanation-5M

Record-10M

Marks awarded with error as follows

<10% -15M

10-15%-10M

>15%-5M