

SEMESTER-IV

PHYSICAL CHEMISTRY - I
(Solutions & Electro Chemistry Syllabus)

Unit I Solutions (9 h)

Classification - Miscible, Partially miscible and Immiscible - Raoult's Law - 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**

Unit II Colligative Properties (9 h)

Relative lowering of Vapour Pressure, Elevation in boiling point depression in freezing point and Osmotic pressure. Determination of molecular mass of non-volatile solute by **Ostwald Walker method, Cottrell's method, Rast method and Berkeley-Hartley method**. Abnormal colligative properties. Van't Hoff factor.

Unit III - Photochemistry (9h)

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, chemiluminescence - Photosensitized reactions- energy transfer processes (simple example), quenching, Photo stationary state.

Unit IV Electrochemistry-I (9 h)

Conductance, Specific conductance, equivalent conductance and molar conductance - 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 (derivation excluded), Application of conductivity measurements- conductometric titrations.

Unit V Electrochemistry-II (9 h)

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

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	
4	S Glasstone	Text book of physical chemistry	
5	Bahl and Tuli	Advanced physical chemistry	
6	GurudeepRaj	Advanced physical chemistry	
7	Puri, Sharma and Pathania	Principles of physical chemistry	

WebLinks:

Course outcome & Program outcome mapping

On Completion of the course, the students will be able to	
CO1	Understand the ideal and non ideal behaviour of solutions
CO2	Determine the molecular mass of non-volatile solutes.
CO3	Discuss the basic concepts of Photochemistry.
CO4	Apply the principles of electrical conductivity.
CO5	Explain the importance of emf and its applications

CO-PO Mapping: 1: Low = 1 ; 2: Moderate = 2 ; 3: High = 3 ; 4: No Correlation = 0

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	3	1	2	3	1	4	1	4	2
CO2	2	4	1	4	1	3	2	1	3	2
CO3	2	3	2	3	1	2	4	2	1	2
CO4	2	4	2	2	3	2	1	2	3	1
CO5	1	3	2	2	2	3	1	2	2	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 modern 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 undergraduates 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 of basic tools to be employed

Weightage to content**Semester -IV****Course - 9**

S.No	CourseContent	Long Answer	ShortAnswer	Totalmarks	As per Blooms Taxonomy
1	Unit I Solutions	2	2	30	Understanding, Application
2	Unit II Colligative Properties	1	1	15	Remembering, Understanding
3	Unit III - Photochemistry	1	1	15	Analysizing & Creation
4	Unit IV Electrochemistry-I	1	1	15	Evaluation, Understanding
5.	Unit V Electrochemistry-II	1	2	20	Understanding, Application
	TOTAL	6	7	95	

P.R. GOVERNMENT COLLEGE (A), KAKINADA

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

COURSE - 9 - PHYSICAL CHEMISTRY - 2
(Solutions & Electro Chemistry)

MODEL PAPER

Duration: 2hr

Max.Marks:50M

Section -I

Answer any three of the following questions. Must attempt atleast one question from each part.

Each question carries 10 Marks.

3 X 10 = 30M

Part - A

1. UNIT-I
2. UNIT-I
3. UNIT-II

Part - B

4. UNIT-III
5. UNIT-IV
6. UNIT-V

Section II

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

7. UNIT-I
8. UNIT-I
9. UNIT-I I
10. UNIT-III
11. UNIT-IV
12. UNIT-V
13. UNIT-V

Practical- PHYSICAL CHEMISTRY -I (PHYSICAL CHEMISTRY) 50 M

I. Course outcomes: At the end of the course, the student will be able to;

- Apply the principles of phase equilibrium to determine the critical solution temperature (CST) for a binary system.
- Understand the role of electrolytes in altering the intermolecular forces and interactions between solvent and solute molecules.
- Understand the principles of conductometric titration, including the equivalence point, conductivity changes, and titration curves.
- Apply the principles of conductometric titration to determine the concentration of weak acid solutions.
- Interpret experimental data to calculate the concentration of acetic acid solution using standard sodium hydroxide solution.
- Understand the principles of potentiometric titration, including the use of a pH meter to monitor changes in solution acidity.
- Apply titration calculations and the Nernst equation to determine the concentration of hydrochloric acid solution accurately.

Laboratory course syllabus: CST, Conductometric and Potentiometric Titrimetry 50 M

1. Determination of CST for Phenol-water system.
2. Effect of electrolyte on CST.
3. Conductometric titration - Determination of concentration of HCl solution using standard NaOH solution.
4. Conductometric titration - Determination of concentration of CH₃COOH Solution using standard NaOH solution.
5. Potentiometric titration-Determination of concentration of HCl using standard NaOH solution.

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

SCHEME OF VALUATION

a. Procedure in first 20 Minutes	10 M
b. Tabular form & Formula	10 M
c. Graph & Calculation	10 M
d. Result with error <2% >2%	10 M 05 M
e. Viva voce	05 M
f. Record	05 M
TOTAL	50 marks

	PITHAPUR RAJAH'S GOVERNMENT COLLEGE Kakinada	Program & Semester Gen Chemistry ^④ II B.Sc. (IV Semester) AB 2023-24 ^⑤			
Major 10	TITLE OF THE COURSE GENERAL & PHYSICAL CHEMISTRY				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
	Stereochemistry of carbon compounds, Bioinorganic chemistry, Ionic equilibrium, Chemical kinetics-I, Chemical kinetics-II.	45	10	30	3+1

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Correlate and describe the stereochemical properties of organic compounds
CO2	Explain the biological significance of various elements present in the human body.
CO3	Apply the concepts of ionic equilibrium for the qualitative and quantitative analysis..
CO4	Determine the order of a chemical reaction
CO5	Describe the basic concepts of enzyme catalysis.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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UNIT-I : Stereo chemistry of carbon compounds

(9 h)

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. 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.

Unit II: Bioinorganic Chemistry

(9 h)

Metal ions present in biological systems, classification of elements according to their action in biological system. Geochemical effect on the distribution of metals, Na / K- pump, carbonic anhydrase and carboxy peptidase. Toxicity of metal ions (Hg, Pb,), reasons for toxicity, Use of chelating agents in medicine, Cisplatin as an anti-cancer drug. Iron and its applications in biosystems (Hemoglobin).

Unit III: Ionic equilibrium

(9 h)

Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, Buffer solutions-Henderson's equation. Indicators-theories of acid – base Indicators, selection of Indicators,

Common ion effect Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.

Unit IV : Chemical Kinetics-I

(9 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 (similar and different reactants). Half-life of a reaction. General methods for determination of order of a reaction.

Unit V : Chemical Kinetics-II

(9 h)

Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions.

Enzyme catalysis- Specificity, factors affecting enzyme catalysis, Inhibitors and Lock & key model. Michaels- Menten equation- derivation and significance of Michaels- Menten constant.

Reference & Text books

1. Text book of physical chemistry by S Glasstone
2. Concise Inorganic Chemistry by J.D. Lee
3. Advanced physical chemistry by Gurudeep Raj
4. Advanced physical chemistry by Bahl and Tuli
5. Inorganic Chemistry by J.E. Huheey
6. Basic Inorganic Chemistry by Cotton and Wilki

Blooms Taxonomy:

Code	Meaning	Description
K1	Remembering	Describe, relate, tell, find
K2	Understanding	Out line, expect, credit
K3	Applying	Illustrate, complete, solve
K4	Analyse	Compare, explain, categorise
K5	evaluating	Prioritize, rate, justify
K6	create	Imagine, desine, plan

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	1	2	2	2	2	1	2	2	2
CO2	2	3	3	3	3	2	2	2	2	2	2	2	2
CO3	2	3	3	3	3	2	2	2	2	2	2	2	2
CO4	2	1	1	2	2	2	1	1	1	2	2	2	2
Avg.	2	2.5	2.2	2.7	2.2	2	1.7	1.7	1.7	1.7	2	2	2

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

PO1: Knowledge in Chemistry: Apply the basic knowledge about the fundamental's principles, essential facts and applications of general and physical chemistry

PO2: Problem analysis: Identify, formulate, review research literature, and analyze simple to complex problems reaching substantiated conclusions using fundamental

principles of chemistry.

PO3: Design/development of solutions: Design solutions for simple to complex problems and designing novel studies for the development of new methods.

PO4: Conduct investigations of complex problems: Use fundamental research-based knowledge and available research methods including design of experiments, analysis and interpretation of data, and adapting new physical methods.

PO5 : Modern tool usage: Create, select, and apply appropriate techniques, resources, and IT tools for modeling and interpretation of simple to complex molecules.

PO6 : The Chemist & Society: Applying the contextual knowledge to assess societal, health, safety, legal and cultural issues.

PO7: Environment and sustainability: Understand the importance of synthetic organic chemistry for various solutions in societal and environmental context and demonstrate the knowledge and need for sustainable development.

PO8 : Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the science-based practice.

PO9 : Communication: Communicate effectively on complex Chemical activities with the Chemistry community and with society at large, such as, being able to comprehend and write effective reports, design documentation and make effective presentations

PO10: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PSO-1: To identify, formulate and analyze the problems in Chemistry by using principles of Organic, Inorganic and Physical Chemistry fundamentals

PSO-2: Applying Chemistry knowledge to design a system, analyze and interpret data to obtain valid conclusions

PSO-3: Use of various Simulation tools such as CADD Vault, Dotmatics, Schrodinger etc for Molecular design and analysis of various systems.

Weightage to the Content ^⑥
C-10 :: Gen Chem Hons

S.No	Course Content	Long Answer	Short Answer	Total marks	As per Blooms Taxonomy
1	Stereochemistry of carbon compounds	2	1	25	Understanding, Application
2	Bioinorganic chemistry	1	2	20	Remembering, Understanding
3	Ionic equilibrium	1	1	15	Application & Creation
4	Chemical kinetics-I	1	2	20	Remembering, Understanding
5	Chemical kinetics-II	1	1	15	Application & Creation
	TOTAL	6	7	95	

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

II YEAR B.Sc Gen Chem (Hons)^⑦

(Examination at the end of IV semester)

(GENERAL & PHYSICAL CHEMISTRY), Course Code 04

MODEL PAPER

Duration: 2hrs

Max. Marks: 50

Section -I

Answer any THREE questions choosing at least one from each part. Each question carries TEN marks. 3 X 10 = 30 Marks

PART-A

1. Unit-I
2. Unit-II
3. Unit-V

PART-B

4. Unit-III
5. Unit-IV
6. Unit-I

Section-II

Answer any four of the following questions. Each question carries FIVE marks. 4x5=20 Marks

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

QUESTION BANK
Semester -IV
(GENERAL & PHYSICAL CHEMISTRY), Course code 10⁸

Unit-I

Essay Questions:

1. Explain the different types of Molecular representations of stereo chemistry of carbon compounds
2. Explain the optical isomerism of Tartaric acid .
3. Explain the optical isomerism of 2,3-dibromopentane.

Short Questions:

1. Explain symmetry of Elements.
2. Explain the Enantiomers and Diastereomers.
3. Write about Specific rotation
4. Explain optical isomerism of Glyceraldehyde and Alanine.

Unit-II

Essay Questions:

1. Explain the Structure and functions of Hemoglobin.
2. What is Toxicity? Explain the toxicity of Lead and Mercury.
3. Explain Na/K⁺ pump in bioinorganic chemistry.

Short Questions:

1. Write about cisplatin.
2. Explain briefly about Myoglobin.
3. Write about carbonic anhydrase.
4. Write about carboxy peptidase.

Unit-III

Essay Questions:

1. Explain Theory of acid-base indicators.
2. Explain the factors affecting degree of ionization.

Short Questions:

1. Write about Buffer solution.
2. Explain the Solubility product and Common ion effect.

Unit -IV

Essay Questions:

1. Define first order reaction. Derive first order rate constant equation.
2. Define Second order reaction. Derive second order rate constant equation.
3. Explain the general methods for determination of order of reaction,

Short Questions:

1. Define Order of reaction and Molecularity. Give examples.
2. What is zero order reaction. Give one example.

Unit-V

Essay Questions:

1. Explain collision theory of reaction rates?
2. Derive Michaelis-Menten equation and write significance Michaelis-Menten constant.

Short Questions:

1. Write a note on Enzyme catalysis.
2. Write about concept of activation energy.

**IV SEMESTER
LABORATORY COURSE**

Course Code: 10⁹, Physical Chemistry - Volumetric Analysis (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. Understand and explain the volumetric analysis based on fundamental concepts learnt in ionic equilibria
3. Learn and identify the concepts of a standard solutions, primary and secondary standards
4. Facilitate the learner to make solutions of various molar concentrations.

Volumetric analysis:

1. Estimation of sodium hydroxide using standardized HCl solution.
2. Estimation of sodium carbonate and sodium hydroxide present in a mixture.

3. Determination of Fe (II) using KMnO_4 with oxalic acid as primary standard. (internal indicator method)
4. Determination of Fe (II) using $\text{K}_2\text{Cr}_2\text{O}_7$ ¹⁰ with oxalic acid as primary standard. (internal¹¹ indicator method)
5. Estimation of water of crystallization in Mohr's salt by titrating with KMnO_4

List of reference books:

1. A Text Book of Quantitative Inorganic Analysis(3rdEdition) –A.I.Vogel
2. Web related references suggested by teacher.

SCHEME OF VALUATION

a. Procedure in first 20 Minutes	10 M
b. Tabular form & Formula	10 M
c. Graph & Calculation	10 M
d. Result with error <2%	10 M
>2%	05 M
e. Viva voce	05 M
f. Record	05 M
TOTAL	50 marks

	PITHAPUR RAJAH'S GOVERNMENT COLLEGE Kakinada	Program & Semester			
Course Code CHE-XI	TITLE OF THE COURSE Nitrogen containing Organic Compounds & Spectroscopy 2023-24 AB	II B.Sc. Chemistry Hons (IV Semester)			
Teaching	Hours Allocated: 45 (Theory)	L	T	P	C
Pre-requisites	Halogen compounds, Hydroxy compounds, Carbonyl compounds, Carboxylic acids, Carbohydrates,	45	10	30	3+1

Course Objectives:

1. Amines
2. Amino acids
3. Nitro hydrocarbons
4. Heterocyclic compounds
5. Spectroscopy

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Distinguish primary secondary and tertiary amines and their properties.
CO2	Describe the preparation and properties of amino acids
CO3	Explain the reactivity of nitro hydrocarbons.
CO4	Discuss heterocyclic compounds with N, O and S.
CO5	Apply the concepts of UV and IR to ascertain the functional group in an organic compound.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit I :: Amines:

(9 h)

Classification, chirality in amines (pyramidal inversion), preparations - Gabriel synthesis, Hoffmann- Bromamide reaction (with mechanism), reduction of amides and Schmidt reaction. 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: Carbylamine reaction, Hoffmann's exhaustive methylation, Hofmann and Cope elimination.

Diazonium Salts: Preparation and synthetic applications of diazonium salts including preparation of arenes, haloarenes, phenols, cyano and nitro compounds. Coupling reactions of diazonium salts (preparation of azo dyes).

UNIT- II :: Amino acids (9 h)

Definition and 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: 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.

UNIT- III :: Nitro hydrocarbons (9h)

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

Unit IV :: Heterocyclic Compounds (9 h)

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

Unit V :: UV-Visible & IR Spectroscopy (9 h)

Selection rules for electronic spectra, types of electronic transitions in molecules, concept of chromophore and auxochrome, effect of conjugation in dienes and α,β unsaturated compounds. Woodward Fischer rules for calculating λ_{max} of conjugated dienes and α,β unsaturated compounds.

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

Unit No	Additions	Deletions	Remarks as per Blooms Taxonomy
1			
2			
3			
4			
5			

Reference & Text books:

1. A Text Book of Organic Chemistry by Bahl and Arunbahl
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, Francis X Webster

Weightage to content

Semester -IV Paper-XI

S.No	Course Content	Long Answer	Short Answer	Total marks	As per Blooms Taxonomy
1	Amines	1	2	20	Understanding, Application
2	Amino acids	1	1	15	Remembering, Understanding
3	Nitro hydrocarbons	1	1	15	Application & Creation
4	Heterocyclic compounds	1	2	20	Remembering, Understanding
5	Spectroscopy	2	1	25	Application & Creation
	TOTAL	6	7	95	

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

II YEAR B.Sc Chemistry Hons (2023-24 AB)

(Examination at the end of IV semester)

Paper-XI :: Nitrogen containing Organic Compounds & Spectroscopy

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 - 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 - IV
13. Unit - V

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A) :: KAKINADA
II YEAR B.Sc Chemistry Hons (2023-24 AB)
(Examination at the end of IV semester)

Practical Paper - XI :: Organic preparations and IR Spectral Analysis

Credits: 01

30 hrs (2 h / W)

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) Calculate limiting reagent, theoretical yield, and percent yield.
- 3) Engage in safe laboratory practices by handling laboratory glassware, equipment, and chemical reagents appropriately.
- 4) Dispose of chemicals in a safe and responsible manner.
- 5) Perform common laboratory techniques including reflux, distillation, recrystallization, vacuum filtration.
- 6) Create and carry out work up and separation procedures.

Syllabus

A. Organic preparations: 40M

- 1) Acetylation of one of the following compounds: amines (aniline, o-, m-, p- toluidines and o-, m-, p-anisidine) a. Using conventional method and b. Using green approach
- 2) Benzoylation of one of the following amines (aniline, o-, m-, p- toluidines and o-, m-, p-anisidine)
- 3) Nitration of any one of the following: Acetanilide/nitrobenzene by conventional method

B. IR Spectral Analysis 10M

IR Spectral Analysis of the following functional groups with examples

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

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. Vogel A.I. Practical Organic Chemistry, Longman Group Ltd.
2. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley-Eastern.
3. Ahluwalia V. K. and Agarwal R. Comprehensive Practical Organic Chemistry, University press.
4. Web related references suggested by teacher

Scheme of Evaluation

S.No	Content	Marks
1	Preparation (write up)	10
2	Preparation (practical)	15
3	Report Principle Appearance Yield Melting point	5
4	IR spectral analysis	10
5	Viva voce	5
6	Record	5

	PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA DEPARTMENT OF CHEMISTRY	Program & Semester			
Course Code CHE-3	TITLE OF THE COURSE COURSE 3: PHYSICAL CHEMISTRY-I	Minor Chemistry II B.Sc. (IV Semester)			
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	Explain the difference between solids liquids and gases in terms of intermolecular interactions
CO2	Understand the basic concepts of crystallography.
CO3	Discuss the basic concepts of two component systems
CO4	Apply the concepts of adsorption

Course with focus on Skill Development/Employability/Entrepreneurship modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit I - 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 II: 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. Qualitative discussion of the structure of water.

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-III - 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 and its derivation. Powder method. Defects in crystals. Stoichiometric and non-stoichiometric defects.

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 Surface Chemistry (9 h)

Definition and classification of Colloids- Coagulation of colloids- Hardy-Schulze rule. Stability of colloids, Protection of Colloids, Gold number.

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

Textbooks:

S.NO	AUTHOR	TITLE	PUBLISHER
1	K L Kapoor Vol.1	Text book of physical chemistry	JPNP publications
2	Puri, Sharma and Pathania.	Principles of physical chemistry	S.Chand publications

Reference books

S.NO	AUTHOR	TITLE	PUBLISHER
1	Anthony R. West	Solid State Chemistry and its applications	
2	S Glasstone	Text book of physical chemistry	Oxford University Press
3	Bahl and Tuli.	Advanced physical chemistry	Oxford University Press

WebLinks:

- https://r.search.yahoo.com/_ylt=AwrX_2xJRzhntwIAF1K7HAX.; ylu=Y29sbwNzZzMEcG9zAzEEdnRpZAMEc2VjA3Ny/RV=2/RE=1732951113/RO=10/RU=https%3a%2f%2fncert.nic.in%2fncerts%2f%2fkech105.pdf/RK=2/RS=Vm9QfnIDc3bV3suL2OFEa2QmVNU-
- <https://ncert.nic.in/ncerts/l/kech105.pdf>
- <https://ncert.nic.in/ncerts/l/lech101.pdf>
- <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&sig=hlJod0UFuWJ9&sigi=7h78CUEbal4Y>
- <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	
CO 1	Explain the difference between solids liquids and gases in terms of intermolecular interactions
CO 2	Understand the basic concepts of crystallography.
CO 3	Discuss the basic concepts of two component systems
CO 4	Apply the concepts of adsorption

CO-PO Mapping: 1: Low =1 ;2: Moderate = 2 ; 3: High = 3 ; 4:

No Correlation = 0

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.

(P04): Usage of modern tools: Create data using modern 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

(P05): 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.

(P06): 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.

(P07) 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 -IV
Course - 3

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

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

II YEAR B.Sc Chemistry Hons (2023-24 AB)

(Examination at the end of IV semester)

Course-3 :: Physical Chemistry-II

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 Chemistry Hons (2023-24 AB)
(Examination at the end of IV semester)
Course-3 :: 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.

SEMESTER-IV
COURSE 3: PHYSICAL CHEMISTRY-I

Practical

Credits: 1

2 hrs/week

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 surface tension of mixture (liquid + detergent) using stalagmometer.
4. Determination of coefficient of viscosity of an organic liquid.
5. Determination of composition of a glycerol in glycerol + water mixture using viscometer.
6. Adsorption of acetic acid on animal charcoal, verification of Freundlich isotherm

Co-Curricular Activities:

a) Mandatory:(Lab/field training of students by teacher:(lab:10+field:05):

1. For Teacher: Training of students by teacher in laboratory and field for not less than 15 hours on the field techniques/skills of preparation of acetanilide, preparation of azodye, use of separating funnel for solvent extraction, separation of organic compounds in a mixture.

2. For Student: Student shall visit a related industry/chemistry laboratory in universities/research organizations/private sector facility and observe the techniques used for the separation of organic compounds. Write their observations and submit a hand written fieldwork/project work report not exceeding 10 pages in the given format to the teacher.

3. Max marks for Fieldwork/project work Report:05.

4. Suggested Format for Fieldwork/project work: Title page, student details, index page, details of place visited, observations, findings, and acknowledgements.

5. Unit tests (IE).

b) **Suggested Co-Curricular Activities**

1. Training of students' by related industrial experts.

2. Assignments, Seminars and Quiz (on related topics), collection of videos and other material.

3. Visits of facilities, firms, research organizations etc.

4. Invited lectures and presentations on related topics by field/industrial experts

Unit-5:

Essay Questions:

1. Define is Langmuir adsorption isotherm and explain?
2. What is physisorption and Chemisorption and write their differences?
3. Explain the various factors that effecting adsorption of gases on solids?
4. Explain the following
 - a) Hardy-Schulze rule.
 - b) Gold number
 - c) Coagulation

Short answer Questions:

1. Define colloids and their classification?
2. Write a short note on Freundlich adsorption isotherm.
3. Write the applications of adsorption?

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA
II BSc HONORS IN CHEMISTRY
III - SEMESTER

Paper 3: Physical Chemistry - 1

Scheme of Valuation

Max Marks:50M

- | | | |
|-------------------------------------|--------------------------|---------------|
| 11. Experiment Procedure | : 10 M | |
| 12. Table and Calculation | : 5 M | |
| 13. Practical : Final Result | : < 5% | - 25 M |
| | : 5% and < 10% | - 20 M |
| | : < 10% | - 10 M |
| 14. Viva Voce | : 5 M | |
| 15. Record | : 5 M | |

	PITHAPUR RAJAH'S GOVERNMENT COLLEGE Kakinada	Program & Semester II B.Sc. (IV Semester)			
Minor Course Code 04	TITLE OF THE COURSE GENERAL & PHYSICAL CHEMISTRY				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
	Stereochemistry of carbon compounds, Bioinorganic chemistry, Ionic equilibrium, Chemical kinetics-I, Chemical kinetics-II.	45	10	30	3+1

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Correlate and describe the stereochemical properties of organic compounds
CO2	Explain the biological significance of various elements present in the human body.
CO3	Apply the concepts of ionic equilibrium for the qualitative and quantitative analysis..
CO4	Determine the order of a chemical reaction
CO5	Describe the basic concepts of enzyme catalysis.

Course with focus on employability/entrepreneurship/Skill Development modules

Skill Development		Employability		Entrepreneurship	
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UNIT-I : Stereo chemistry of carbon compounds

(9 h)

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. 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.

Unit II: Bioinorganic Chemistry

(9 h)

Metal ions present in biological systems, classification of elements according to their action in biological system. Geochemical effect on the distribution of metals, Na / K- pump, carbonic anhydrase and carboxy peptidase. Toxicity of metal ions (Hg, Pb,), reasons for toxicity, Use of chelating agents in medicine, Cisplatin as an anti-cancer drug. Iron and its applications in biosystems (Hemoglobin).

Unit III: Ionic equilibrium

(9 h)

Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, Buffer solutions-Henderson's equation. Indicators-theories of acid – base Indicators, selection of Indicators,

Common ion effect Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.

Unit IV : Chemical Kinetics-I

(9 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 (similar and different reactants). Half-life of a reaction. General methods for determination of order of a reaction.

Unit V : Chemical Kinetics-II

(9 h)

Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Enzyme catalysis- Specificity, factors affecting enzyme catalysis, Inhibitors and Lock & key model. Michaels- Menten equation- derivation and significance of Michaels- Menten constant.

Reference & Text books

1. Text book of physical chemistry by S Glasstone
2. Concise Inorganic Chemistry by J.D. Lee
3. Advanced physical chemistry by Gurudeep Raj
4. Advanced physical chemistry by Bahl and Tuli
5. Inorganic Chemistry by J.E. Huheey
6. Basic Inorganic Chemistry by Cotton and Wilki

Blooms Taxonomy:

Code	Meaning	Description
K1	Remembering	Describe, relate, tell, find
K2	Understanding	Out line, expect, credit
K3	Applying	Illustrate, complete, solve
K4	Analyse	Compare, explain, categorise
K5	evaluating	Prioritize, rate, justify
K6	create	Imagine, desine, plan

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	1	2	2	2	2	1	2	2	2
CO2	2	3	3	3	3	2	2	2	2	2	2	2	2
CO3	2	3	3	3	3	2	2	2	2	2	2	2	2
CO4	2	1	1	2	2	2	1	1	1	2	2	2	2
Avg.	2	2.5	2.2	2.7	2.2	2	1.7	1.7	1.7	1.7	2	2	2

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

PO1: Knowledge in Chemistry: Apply the basic knowledge about the fundamental's

principles, essential facts and applications of general and physical chemistry

PO2: Problem analysis: Identify, formulate, review research literature, and analyze simple to complex problems reaching substantiated conclusions using fundamental principles of chemistry.

PO3: Design/development of solutions: Design solutions for simple to complex problems and designing novel studies for the development of new methods.

PO4: Conduct investigations of complex problems: Use fundamental research-based knowledge and available research methods including design of experiments, analysis and interpretation of data, and adapting new physical methods.

PO5 : Modern tool usage: Create, select, and apply appropriate techniques, resources, and IT tools for modeling and interpretation of simple to complex molecules.

PO6 : The Chemist & Society: Applying the contextual knowledge to assess societal, health, safety, legal and cultural issues.

PO7: Environment and sustainability: Understand the importance of synthetic organic chemistry for various solutions in societal and environmental context and demonstrate the knowledge and need for sustainable development.

PO8 : Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the science-based practice.

PO9 : Communication: Communicate effectively on complex Chemical activities with the Chemistry community and with society at large, such as, being able to comprehend and write effective reports, design documentation and make effective presentations

PO10: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PSO-1: To identify, formulate and analyze the problems in Chemistry by using principles of Organic, Inorganic and Physical Chemistry fundamentals

PSO-2: Applying Chemistry knowledge to design a system, analyze and interpret data to obtain valid conclusions

PSO-3: Use of various Simulation tools such as CADD Vault, Dotmatics, Schrodinger etc for Molecular design and analysis of various systems.

**Weightage to Content
Semester -IV Minor**

S.No	Course Content	Long Answer	Short Answer	Total marks	As per Blooms Taxonomy
1	Stereochemistry of carbon compounds	2	1	25	Understanding, Application
2	Bioinorganic chemistry	1	2	20	Remembering, Understanding
3	Ionic equilibrium	1	1	15	Application & Creation
4	Chemical kinetics-I	1	2	20	Remembering, Understanding
5	Chemical kinetics-II	1	1	15	Application & Creation
	TOTAL	6	7	95	

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

II YEAR B.Sc

(Examination at the end of IV semester)

(GENERAL & PHYSICAL CHEMISTRY), Course Code 04

MODEL PAPER

Duration: 2hrs

Max. Marks: 50

Section -I

Answer any THREE questions choosing at least one from each part. Each question carries TEN marks.

3 X 10 = 30 Marks

PART-A

1. Unit-I
2. Unit-II
3. Unit-V

PART-B

4. Unit-III
5. Unit-IV
6. Unit-I

Section-II

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

4x5=20 Marks

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

QUESTION BANK
Semester -IV
(GENERAL & PHYSICAL CHEMISTRY), Course code 04

Unit-I

Essay Questions:

1. Explain the different types of Molecular representations of stereo chemistry of carbon compounds
2. Explain the optical isomerism of Tartaric acid .
3. Explain the optical isomerism of 2,3-dibromopentane.

Short Questions:

1. Explain symmetry of Elements.
2. Explain the Enantiomers and Diastereomers.
3. Write about Specific rotation
4. Explain optical isomerism of Glyceraldehyde and Alanine.

Unit-II

Essay Questions:

1. Explain the Structure and functions of Hemoglobin.
2. What is Toxicity? Explain the toxicity of Lead and Mercury.
3. Explain Na/K⁺ pump in bioinorganic chemistry.

Short Questions:

1. write about cisplatin.
2. Explain briefly about Myoglobin.
3. Write about carbonic anhydrase.
4. Write about carboxy peptidase.

Unit-III

Essay Questions:

1. Explain Theory of acid-base indicators.
2. Explain the factors affecting degree of ionization.

Short Questions:

1. Write about Buffer solution.
2. Explain the Solubility product and Common ion effect.

Unit -IV

Essay Questions:

1. Define first order reaction. Derive first order rate constant equation.
2. Define Second order reaction. Derive second order rate constant equation.
3. Explain the general methods for determination of order of reaction,

Short Questions:

1. Define Order of reaction and Molecularity. Give examples.
2. What is zero order reaction. Give one example.

Unit-V

Essay Questions:

1. Explain collision theory of reaction rates?
2. Derive Michaels-Menten equation and write significance Michaels-Menten constant.

Short Questions:

1. Write a note on Enzyme catalysis.
2. Write about concept of activation energy.

IV SEMESTER LABORATORY COURSE

Course Code:04 , Physical Chemistry - Volumetric Analysis (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. Understand and explain the volumetric analysis based on fundamental concepts learnt in ionic equilibria
3. Learn and identify the concepts of a standard solutions, primary and secondary standards
4. Facilitate the learner to make solutions of various molar concentrations.

Volumetric analysis:

1. Estimation of sodium hydroxide using standardized HCl solution.
2. Estimation of sodium carbonate and sodium hydroxide present in a mixture.
3. Determination of Fe (II) using KMnO_4 with oxalic acid as primary standard. (internal indicator method)
4. Determination of Fe (II) using KMnO_4 with oxalic acid as primary standard. (external indicator method)
5. Estimation of water of crystallization in Mohr's salt by titrating with KMnO_4

List of reference books:

1. A Text Book of Quantitative Inorganic Analysis(3rdEdition) –A.I.Vogel
2. Web related references suggested by teacher.
