	PITHAPUR RAJAH'SGOVERNMENT COLEGE(A) Kakinada DEPARTMENT OF CHEMISTRY	Program & Semester II B.Sc. Analytical Chemistry (IV Semester)			
Course Code AC-9	TITLE OF THE COURSE PHYSICAL CHEMISTRY – 2 (Solutions & Electro Chemistry)				
Teaching	Hours Allocated:45 (**Theory**)	L	T	P	C
Pre-requisites		45	10	30	3+1

Course Objectives:

1. Understanding Solutions
2. Electrochemical Concepts
3. Equilibrium in Electrochemical Systems
4. Applications of Electrochemistry
5. Problem-solving Skills

Course Outcomes:

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

Course with focus on Skill Development/Employability/Entrepreneurship modules

Skill Development		Employability		Entrepreneurship	

PHYSICAL CHEMISTRY – I

(Solutions & Electro Chemistry **Syllabus)**

Unit I Solutions (9h)

Classification - Miscible, Partially miscible and Immiscible - Raoult's Law - AzeotropesHCl-H2O system and ethanol-water system. Partially miscible liquids-phenol- water system. Critical solution temperature (CST), Effect of impurity on consulate 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 boing point depression in freezing point and Osmotic pressure. Determination of molecular mass of non-volatile solute by OstwaldWalker method, Cottrell's method, Rast method and Barkeley-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	Gurudeep Raj	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 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 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 analyticalChemistry

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	Course Content	Long Answer	Short Answer	Total marks	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-II
10. UNIT-III
11. UNIT-IV
12. UNIT-V
13. UNIT-V

SEMESTER-III

COURSE 9: PHYSICAL CHEMISTRY - 2

Practical Credits: 1 2 hrs/week

Practical- PHYSICAL CHEMISTRY - 2 (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**

	P.R. GOVERNMENT COLLEGE(A) **KAKINADA**	**Program & Semester** **II B.Sc** **ANALYTICAL CHEMISTRY(H)** **(SEMESTER – IV)**			
Course Code AC-10	TITLE OF THE COURSE **COURSE -10 : SPECTROSCOPY**				
Teaching	Hours Allocated: 45 (**Theory**) (3 hrs. / Wk.)	L	T	P	C
Pre-requisites:	Basic knowledge about spectrum and its classification	3	-	-	3

Course Objectives:

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

Course Outcomes:

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

Skill Development			Employability			Entrepreneurship	

Syllabus:

UNIT-I

GENERAL FEATURES OF ABSORPTION

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

UNIT-II

ELECTRONIC SPECTROSCOPY:

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

transitions in molecules effect of conjugation. Concept of chromophore and auxochrome.

UNIT-III

INFRA RED SPECTROSCOPY:

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

UNIT-IV

PROTON MAGNETIC RESONANCE SPECTROSCOPY (1H-NMR)

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

UNIT-V
APPLICATIONS

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

Applications of UV-Visible and IR-Spectroscopy

List of Reference Books:

- Spectroscopy by William Kemp
- Spectroscopy by Pavia
- Organic Spectroscopy by J. R. Dyer
- Elementary organic spectroscopy by Y.R. Sharma
- Spectroscopy by P.S. Kalsi
- Organic spectroscopy by Jagmohan

CLO-PLO Mapping:

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

	CLO\PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	CLO\PLO	PLO1
CLO1	3	2	3	2	2	2	3	3	2	2	3	3	3
CLO2	2	3	3	3	3	2	1	2	2	3	2	2	3
CLO3	3	3	3	2	2	1	1	2	3	1	2	3	3
CLO4	2	1	2	1	3	2	3	1	2	3	2	3	2
CLO5	2.5	2.25	2.75	2.0	2.5	1.75	2.0	2.0	2.25	2.25	2.25	2.75	2.75

WEIGHTAGE TO CONTENT

S No.	Course Content	Essay (10M)	Short (5M)	Total marks	Question Relates as per Bloom's Taxonomy
1.	UNIT-I	1	1	15	Remembering, understanding
2.	UNIT-II	1	2	20	Analyzing, Remembering
3.	UNIT-III	1	2	20	Analyzing, Remembering
4.	UNIT-IV	2	1	25	Analyzing, Evaluating
5.	UNIT-V	1	1	15	Evaluating
	Total	6	7	95	

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A), KAKINADA

II B.Sc. ANALYTICAL CHEMISTRY. SEMESTER–IV

COURSE-10: SPECTROSCOPY

MODEL QUESTION PAPER

TIME: 2 hrs. **MAX. MARKS: 50**

SECTION-A

Answer any THREE questions choosing at least ONE question from each section Each carries 10 Marks

3x10=30M

1. One question is to be set from unit-I
2. One question is to be set from unit-II
3. One question is to be set from unit-III

SECTION-B

4. One question is to be set from unit-IV
5. One question is to be set from unit-IV
6. One question is to be set from unit-V

SECTION-C

Answer any FOUR questions each carries FIVE marks. **4x5=20M**

7.One question is to be set from unit-I

8. One question is to be set from unit-II
9. One question is to be set from unit-II
10. One question is to be set from unit-III
11. One question is to be set from unit-III
12. One question is to be set from unit-IV
13. One question is to be set from unit-V

P.R. GOVERNMENT COLLEGE(A), KAKINADA

II B.Sc ANALYTICAL CHEMISTRY SEMESTER–IV 2024-25AB

CHEMISTRY COURSE-10: SPECTROSCOPY

QUESTION BANK

UNIT-I

GENERAL FEATURES OF ABSORPTION

1. What is Beer-Lambert's law. What are its limitations.
2. Describe Single beam and double beam spectrophotometer.
3. Explain the determination of Chromium in $K_2Cr_2O_7$ using spectrophotometer.
4. Explain the determination of Manganese in MnSO4 using spectrophotometer.
5. Define the following terms.
   a) Transmittance b) Absorbance c) Molar absorptivity
6. Write the working principle of Spectrophotometer.

UNIT-II

ELECTRONIC SPECTROSCOPY

7. Explain different types of electronic transitions occur in a molecule.
8. Write about Chromophore and Auxochrome with examples.
9. What is electromagnetic spectrum.
10. Write the selection rules for electronic spectra.
11. Explain the impact of conjugation on electronic transitions in a molecule.
12. Write about different types of molecular spectra.
13. Explain energy levels of molecular orbitals.

UNIT-III

INFRA RED SPECTROSCOPY

14. Explain the characteristic absorption bands of various functional groups in IR spectroscopy.
15. Write about the different regions of Infrared radiations.
16. What are the modes of vibrations in diatomic and poly atomic molecules.
17. What are the applications of IR spectroscopy.
18. Explain about Finger print region in IR spectrum.

UNIT-IV

NMR SPECTROSCOPY

19. Explain the Principle involved in NMR spectroscopy.

20. Explain the following

    a) Equivalent and Non-Equivalent protons b) Spin – Spin coupling

21. Write a note on Chemical shift.

22. Explain about the position of signals and splitting of signals in NMR spectroscopy.

UNIT-V

APPLICATIONS NMR SPECTROSCOPY

23. Explain the Applications of NMR spectra of

    a) Ethyl bromide b) Ethyl alcohol c) Acetaldehyde d) 1,1,2-Tribromoethane

    e) Ethyl Acetate f) Acetophenone.

24. Applications of UV-Visible and IR spectroscopy.

	P.R. GOVERNMENT COLLEGE(A), KAKINADA	Program & Semester II B.Sc. ANALYTICAL CHEMISTRY (SEMESTER – IV)			
Course Code AC-10	TITLE OF THE COURSE **COURSE 10: SPECTROSCOPY**				
Teaching	Hours Allocated: 30 (**Practical**)	L	T	P	C
Pre-requisites	Preparation of standard solutions and handling of laboratory apparatus and instruments	-	-	2	1

Course Objectives:

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

Course Outcomes:

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

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development			**Employability**			**Entrepreneurship**	-

Practical- IR-Spectral Analysis **50 M**

IR spectral analysis of the following functional groups with examples

- Hydroxyl Groups
- Carbonyl Groups
- Amino Groups
- Aromatic Groups

CLO-PLO Mapping:

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

	CLO\PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	CLO\PLO	PLO1
CLO1	3	3	3	2	3	2	2	2	3	2	2	3	3
CLO2	3	3	3	2	3	2	2	3	2	3	3	3	3
CLO3	3	2	3	2	3	1	2	2	2	2	2	3	2
CLO4	3	3	2	1	3	2	2	1	2	3	3	3	3
CLO5	3	2.75	2.75	2	3	2	2	2	2.25	2.5	2.5	3	2.75

	P.R.GOVERNMENT COLLEGE(A) KAKINADA	Program & Semester II B.Sc Analytical chemistry Semester-IV			
Course Code AC-11	**TITLE OF THE COURSE** **COURSE-11-SEPARATION METHODS- II**				
Teaching	Hours Allocated: (**Theory**)	L	T	P	C
Pre-requisites	fundamental knowledge on different separation techniques.	45	10	30	4+1

Course Objectives:

Upon completion of this course the student should be able to:

- Understand the Fundamental Principles of Separation
- Identify Different Separation Method
- Evaluate the Efficiency and Suitability of Separation Method
- Analyze the Applications of Separation Techniques in Industry

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Demonstrate Proficiency in Applying Separation Methods
CO2	Evaluate and Choose Appropriate Separation Techniques
CO3	Analyze and Interpret Data from Separation Processes
CO4	Understand the Practical and Ethical Implications of Separation Techniques

SYLLABUS

UNIT–I

ION EXCHANGE AND ION EXCHANGE CHROMATOGRAPHY

A. **ION EXCHANGE**: principles of ion exchange systems, synthetic ion -exchange systems, synthetic ion-exchange resins, ion-exchange mechanism, ion-exchange equilibria, selectivity, ion-exchange capacity, applications, separation of inorganic mixtures
B. **ION-EXCHANGE CHROMATOGRAPHY:** principle, equipment and experimental set up, procedure aand applications of ion exchange chromatography

UNIT-II

GEL AND AFFINITY CHROMATOGRAPHY

A. Gel chromatography, principle, types of gels, separation by gel chromatography, applications
B. Affinity chromatography , principle , materials, selection and attachement of ligand, practical procedure and applications.

UNIT-III

GAS CHROMATOGRAPHY

Gas chromatography: Principle, theory, apparatus and instrumentation, columns, preparation and application of samples, carrier gas, detectors, applications.

UNIT-IV

A.ELECTROPHORESIS-I

Electrolysis and electro-osmosis phenomenon , theory and classification of electrophoresis, factors affecting electrophoresis phenomenon(mobility, size and charge interactions with the supporting electrolytes, pH, and concentration discontinuities) ,applications.

B.ELECTROPHORESIS-II

Capillary electrophoresis: principle, instrumentation and applications

Zone electrophoresis: principle, instrumentation and applications

UNIT –V

A. DIALYSIS AND MEMBRANE FILTRATION

Filters -nitrocellulose, fiber glass, polycarbonate, general laboratory methods

B. CENTRIFUGATION METHODS

Introduction, sedimentation and relative centrifugal force, different types of rotors, density gradients, types of centrifugal techniques**.**

REFERENCES

1. "Introduction to Chemical Engineering: Tools for Today's Informed Decision Maker" by Kenneth A. Solen and John N. Harb
2. "Separation Process Principles: Chemical and Biochemical Operations" by J. D. Seader and Ernest J. Henley
3. "Principles of Chemical Engineering Processes: Material and Energy Balances" by Nayef Ghasem and Redhouane Henda
4. "Fundamentals of Analytical Chemistry" by Douglas A. Skoog, Donald M. West, and F. James Holler

CO-POMapping:

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

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

PO1 : Knowledge in Pharmaceutical Chemistry : Apply the knowledge of different dosage forms and their routes of administration.

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

PO3: Design/development of solutions: Design solutions for simple to complex problems and designing novel routes for the synthesis of bioactive / active pharmaceutical ingredients.

PO4: Conduct investigations on new drug discoveries: Use fundamental research-based knowledge and available research methodologies including design of experiments, analysis and interpretation of data, and synthesis of the drug molecules.

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

PO6 :Society: Applying the contextual knowledge to assess societal, health, safety, legal issues.

PO7: Environment and sustainability: Understand the importance of synthetic drug chemistry for various discoveries in the field of health science and demonstrate the knowledge for sustainable development.

PO8 : Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the pharmaceutical manufacturing practice.

PO9 : Communication: Communicate effectively on issues related to pharmaceutical chemistry with the medical community, being able to write the effective reports and documentations and 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 new drug investigations for new diseases.

PSO-1: To have a firm foundation in the fundamentals/concepts/theories and its applications in pharmaceutical chemistry.

PSO-2: To understand the structure and properties of drugs, Characteristics mechanisms of chemical reactions and their usage in pharmaceutical chemistry

PSO-3: To acquaint with safety measures that are to be taken in pharmaceutical chemistry laboratory and develop skills in proper manufacturing methods of pharmaceuticals and usage of different apparatus/instruments and carry out experimental procedures, record the observations and results and present the inference/conclusion

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA

II B.SC ANALYTICAL CHEMISTRY SEMESTER-IV

COURSE-11 SEPARATION METHODS-II

WEIGHTAGE TO CONTENT

S No.	Course Content	Essay (10M)	Short (5M)	Total marks	Question Relates as per Bloom's Taxonomy
1.	UNIT-I	1	2	20	Remembering, understanding
2.	UNIT-II	2	1	25	Analyzing, Remembering
3.	UNIT-III	1	2	20	Analyzing, Remembering
4.	UNIT-IV	1	1	15	Analyzing, Evaluating
5.	UNIT-V	1	1	15	Evaluating
	Total	6	7	95	

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA
II B.SC ANALYTICAL CHEMISTRY SEMESTER-IV
COURSE-11 SEPARATION METHODS-II

MODEL QUESTION PAPER

Time2hrs **Max.Marks-50**

SECTION-A

Answer any THREE questions choosing at least ONE question from each section 3x10=30M

1. One question is to be set from unit-I
2. One question is to be set from unit-II
3. One question is to be set from unit-II

SECTION-B

4. One question is to be set from unit-III
5. One question is to be set from unit-IV
6. One question is to be set from unit-V

Answer any FOUR questions **4x5=20M**

7. One question is to be set from unit-I
8. One question is to be set from unit-I
9. One question is to be set from unit-II
10. One question is to be set from unit-III
11. One question is to be set from unit-III
12. One question is to be set from unit-IV
13. One question is to be set from unit-V

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA

II B.SC ANALYTICAL CHEMISTRY SEMESTER-IV

COURSE-11 SEPARATION METHODS-II

QUESTION BANK

ESSAY QUESTIONS(10 MARKS)

UNIT:I

1. Explain the principles of ion exchange systems and describe the mechanism behind ion exchange.
2. Describe the principle, experimental setup, and procedure of ion-exchange chromatography.
3. Discuss the various applications of ion-exchange systems in industrial and laboratory settings.

UNIT:II

1. Explain the principle and procedure involved in gel chromatography
2. What is affinity chromatography, and how does it work to isolate specific molecules?
3. Describe the different types of gels used in gel chromatography

UNIT:III

1. Explain the principle and theory behind gas chromatography.
2. Describe the components of a gas chromatography system, including the apparatus and instrumentation.
3. What are the detectors of gas chromatography

UNIT:IV

1. Explain the electrolysis and electro-osmosis phenomena and their role in electrophoresis.
2. Describe the theory and classification of electrophoresis. What are the factors that affect the electrophoresis phenomenon?
3. Discuss capillary electrophoresis and zone electrophoresis, comparing their principles, instrumentation, and applications.

UNIT -V

1. Explain the principle of dialysis and membrane filtration, and describe the types of filters used in these processes.

2. Describe the process of centrifugation and explain the importance of sedimentation and relative centrifugal force in this method.

SHORT QUESTIONS

UNIT-I

1. What is ion-exchange capacity, and why is it important in ion exchange systems?
2. Define ion-exchange equilibrium and its significance in the ion exchange process.
3. What are synthetic ion-exchange resins
4. Explain the concept of selectivity in ion-exchange systems.
5. What are the main differences between ion-exchange chromatography and other types of chromatography techniques

UNIT–II

1. What is the main principle behind gel chromatography?
2. Name two types of gels used in gel chromatography and briefly describe each.
3. In affinity chromatography, what is the purpose of the ligand?
4. How is the ligand attached to the stationary phase in affinity chromatography?
5. What is one common application of gel chromatography in laboratories

UNIT-III

1. What is the role of the carrier gas in gas chromatography?
2. Name two common types of detectors used in gas chromatography.
3. What is the function of the column in gas chromatography?

UNIT-IV

1. What is electro-osmosis, and how does it affect electrophoresis?
2. List the factors that affect the mobility of particles during electrophoresis.
3. What is the principle behind capillary electrophoresis?
4. Explain the concept of zone electrophoresis and its main application.

UNIT-V

1. What are the key differences between nitrocellulose and fiberglass filters in laboratory applications?
2. What is relative centrifugal force (RCF), and how is it calculated?
3. Explain the purpose of using density gradients in centrifugation.
4. What are the common applications of membrane filtration in scientific research?

PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA

II B.SC ANALYTICAL CHEMISTRY SEMESTER-IV

COURSE-11 SEPARATION METHODS-II

PRACTICALS - ORGANIC PREPARATIONS

1. Preparation of acetanilide from aniline by conventional method
2. Preparation of acetanilide using green synthetic approach
3. Preparation of benzanilide from aniline using conventional method
4. Preparation of p- nitro acetanilide from acetanilide using conventional method
5. Preparation of 1,1 – bis -2-naphthol