PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)
KAKINADA - 533 001, AP.

Affiliated to Adikavi Nannaya University

NAAC Accredited with "A" Grade (3.17 CGPA)

BOARD OF STUDIES OF CHEMISTRY

B.Sc. CHEMISTRY MAJORS & B.Sc. CHEMISTRY UNDER CBCS

Meeting Minutes/Resolutions

ORGANIC (HONS)

Convened on 30 April 2024

AY 2024-25

DEPARTMENT OF CHEMISTRY

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)

Opp. Mc Laurin High School, Raja Ram Mohan Roy Road, Kakinada

www.prgc.edu.in; e-mail: chemistry@prgc.edu.in

PROCEEDINGS OF THE PRINCIPAL, P.R. GOVERNMENT COLLEGE (A)KAKINADA- A.P

Present: Dr. B. V. Tirupanyam, M. Sc; Ph.D.

R.C.No.2/A.C./BOS/2024-25, Dated: 23.04.2024

SUB: P.R. Government College (A), Kakinada-UG Board of Studies (BOS)- B.Sc-Chemistry-Nomination of Members-Orders issued.

REF: 1. UGC Guidelines for Autonomous Colleges-2018.

ORDERS:

The Principal, P.R. Government College (A), Kakinada is pleased to constitute UG Boards of Studies in CHEMISTRY for framing the syllabi in respective Subject for all Semesters duly following the norms of the UGC Autonomous guidelines.

S. No	Name of the Person	Designation
1	V. Sanjeeva Kumar	Chairman & Lecturer In charge
2	Dr. K. Jhansi Lakshmi ASD Govt. Degree College for Women (Autonomous) Kakinada	University Nominee
3	Dr. D. Chenna Rao Lecturer in Chemistry, Govt. Degree College, Yeleswaram	Subject Expert -I
4	U. Sai Krishna Lecturer in Chemistry, Govt. College, (Autonomous) Rajamahendravaram	Subject Expert - II
5	Dr.N.Ratnakar, AARKISH PHARMACEUTICALS INS NJ,NEW JERSEY	Subject Expert - III
6	Dr. P. KARUNA RAMAN MD, IDEAL ORGANICS HYDERABAD.	Representative from Industry
7	T. V. V. Satyanarayana	Member
8	P. Vijay Kumar	Member
9	V. Ram babu	Member
10	G. Pavani	Member
11	Dr. N. Bujji Babu	Member
12	Dr. Ch. Praveen	Member
13	V. Venkateswara Rao	Member
14	U.S.N. Prasad	Member
15	K.N.S. Swamy	Member
16	S. Vijaya Lakshmi	Member
17	D.Bhavyasri	Member
18	V Ramya	Student Alumni Member
19	Deepthi Anusha II FBC	Student Member
20	BVNagendra Kumar, II MCCS	Student Member
21	J.Veera Durga I CHEMISTRY MAJORS	Student Member

The above members are requested to attend the BoS meeting on 30-04-2024 and share their valuable reviews, and suggestions on the following functionaries.

- Prepare syllabi for the subject keeping in view the objectives of the college, the interest of the stakeholders
- and National requirements for consideration and approval of the IQAC and Academic Council.
- Suggest the panel of Names to the academic council for appointment of Examiners.
- Suggested methodologies for innovative teaching and evaluation techniques.
- Coordinate research, teaching, extension and other activities in the Department of the college.

PRINCIPAL
P. R. Government College(A),
Kakinada

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A)

DEPARTMENT OF CHEMISTRY

Meeting of Board of Studies in Chemistry is convened on 30 April 2024 through offline/ online at P.R. Govt. College (A), Kakinada, at 10.00 AM.

Venue: JKC AC HALLS , Dt: 30-04-2024, Tuesday – 10.00 A.M.

The Principal Dr. B.V. Tirupanyam; Chairman V. Sanjeeva Kumar; University Nominee Dr. K. Jhansi Lakshmi, Lecturer in Chemistry, ASD Govt. Degree College for Women (Autonomous), Kakinada; Dr. P. KARUNA RAMAN MD, IDEAL ORGANICS HYDERABAD. Industrialist; Subject Experts Dr. D. Chenna Rao, Lecturer in Chemistry, Govt. Degree College, Yeleswaram and U. Sai Krishna Lecturer in Chemistry, Govt. College, (Autonomous), Rajamahendravaram all the faculty members of the Chemistry Department and student alumni attended the meeting.

Agenda:

1. To discuss the I,II,III, IV semesters of a Single major system as B.Sc. Chemistry (Hons), B.Sc. Organic Chemistry (Hons), B.Sc. Analytical Chemistry (Hons) from the academic year 2024-25. & V ,VI semesters of CBCS System
2. To discuss 4th year B.Sc. Honours to the students who were admitted in the academic year 2021-22.
3. To discuss the Semester System and revised Choice Based Credit System (CBCS) being implemented for the past 04 years, i.e., w.e.f. 2020-21.
4. To discuss and approve the Continuation/Modifications of the syllabus for the Odd& Even Semesters of I, II, III & IV Years for 2024-25.
5. Grant of Extra credits for Online SWAYAM MOOCs, edX, Coursera etc.
6. Syllabus, Model Question Papers and Model Blue Prints, POs, PSOs & COs mapping for I, II, III, IV, V, VII and VIII Semesters.
7. Teaching-learning methodology by 50:50 (External: Internal) ratio I, II, III & IV Year Students commenced w.e.f. 2021-22.
8. Minimum attendance of 75% for both I mid-term examination, and II mid- term examination under CIA component shall be the benchmark for attendance and it shall be approved in the BOS.

9. Minimum of 60% integration of ICT into transaction of curriculum.
10. Remedial coaching for slow learners and project works, research, Conferences, etc., for advanced learners.
11. Panel of paper setters and examiners.
12. Implementation of compulsory Community Service Project (CSP)/ Internships/ Apprenticeship and Extension activities for the benefit of the society.
13. Department action plan for 2024-25.
14. To discuss and resolve the minor modifications/refinement if any, in the I, II, III, IV, V, VII, & VIII Semester.
15. Any Other Proposal with the permission of the Chairman.

Signature of the members who attended the board of studies in Organic Chemistry on 30th April 2024 at 10 a.m. mode of conduct of meeting offline / online

SL.NO	NAME	SIGNATURE	CONTACT NO.
1	V. Sanjeeva Kumar	V. S.	9849324966
2	Dr. K. Jhansi Lakshmi	K. Jhansi L.	9441256409
3	Dr. P. KARUNA RAMAN MD, IDEAL ORGANICS, HYDERABAD.	Dr P Karuna Raman	9398249493
4	Dr. D. Chenna Rao		9560740108
5	U. Sai Krishna	U. Sai Krishna	9347334707
6	T. V. V. Satyanarayana	T. V. V. Satya	9490876913
7	P. Vijay Kumar	P. Vijay	9652023082
8	V. Ram babu		9948485537
9	G. Pavani		9912526493
10	Dr. N. Bujji Babu		9441394792
11	Dr. Ch. Praveen	Praveen	9491185518
12	V. Venkateswara Rao	V. Venkateswara	9885165588
13	U.S.N. Prasad	USN Prasad	6300885584
14	K.N.S. Swamy	K.N.S. Swamy	9908900962
15	S. Vijaya Lakshmi	S. Vijaya Lakshmi	9133941966
16	D.Bhavyasri	D. Bhavya	
17	Ch. Veni	Ch Veni	
18	Deepthi Anusha II FBC	P. Deepthi Anusha	7382468859
19	Syamala, II MCCS	A. Syamala	6300192780
20			

ADDITIONS/DELETIONS IN COURSES

CHEMISTRY 2024-25

Year	SEMESTER & PAPER	ADDITIONS	DELETIONS
I	I & I	Adopted the same from APSCHE	
I	I & II	Adopted the same from APSCHE	
I	II & III	Adopted the same from APSCHE	
I	II & IV	Adopted the same from APSCHE	
II	III & III	Adopted the same from APSCHE	
II	IV & IV	Adopted the same from APSCHE	
II	IV & V	Adopted the same from APSCHE	
III	V & VIA	Retrosynthesis of Aspirin , Barton reaction, $NaBH_4$(Mechanism), m CPBA	Retrosynthesis of cyclohexene , DDQ
III	V & VIIA	Fragmentation patterns in Butane and Pentanamine, Types of Solvent extraction- Continuous and Counter current extraction techniques	Application of batch extraction in the separation of organic compounds from mixture- acid & neutral, base & amp; neutral. Coumarin
III	VI	APPERENTICESHIP	
IV HONOURS	VII & VIIIA/B	Adopted the same from APSCHE	
IV HONOURS	VII & IXA/B	Adopted the same from APSCHE	
IV HONOURS	VII & XA/B	Adopted the same from APSCHE	
IV HONOURS	VII & XIA/B	Adopted the same from APSCHE	
IV HONOURS	VII & XIIA/B	Adopted the same from APSCHE	
IV HONOURS	XIII	ONLINE COURSE	
IV HONOURS	VIII & XIV A/B	Adopted the same from APSCHE	

IV HONOURS	VIII & XV A/B	Adopted the same from APSCHE
IV HONOURS	VIII & XVIA/B	Adopted the same from APSCHE
IV HONOURS	VIII & XVIIA/B	Adopted the same from APSCHE
IV HONOURS	VIII & XVIIIA/B	Adopted the same from APSCHE
IV HONOURS	XIX	ONLINE COURSE

CIA structure for Single Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid-examinations will be conducted and the average of the two is considered.
- I mid-examination is to be conducted in offline mode at the college level and II mid-examination is to be conducted in online mode at the department level.
- I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **two short** answer questions with five marks each out of four questions and five objective questions with one mark each for each paper.
- Question paper is to be given as per the following structure for the courses with **4 units**

Unit No	Long Answer Question(10M)	Short Answer Question (5 M)	Objective Questions(1M)
I	1	0	1
II	1	0	1
III	0	2	1
IV	0	2	1+ one question from any unit with more syllabus weightage

- For I mid examination to be conducted in offline mode, Question paper is to be given as per the following structure for the courses with **5 units**

S.No	Unit No	Long Answer Question(10M)	Short Answer Question (5 M)	ObjectiveQuestions (1M)
1	I	1	0	1
2	II	1	0	1
3	III	0	1	1
4	IV	0	1	1
5	V	0	1+ one question from any unit(III or IV or V) with more syllabus weightage	1

- The remaining 25 marks for CIA are allocated as per the followingstructure.

Study Project- 10M	Viva on theory- 3M	Assignment- 5M	Seminar- 5M	Clean & green and Attendance- 2M

Allotment of Extra credits guidelines

Sl.No.	Activity	Details of achievement	Credits
1	MOOC Course	*SWAYAM /NPTEL /CEC etc., (Course Completion certificate with credits should be produced for the claim of extra credits)*	*Total credits achieved will be considered*
2	NCC	*B CERTIFICATE*	*2*
		Participation in National Camp after 'B' certificate	*3*
		C CERTIFICATE	*4*
		Adventure camp/RD parade along with 'B'	*5*
		Failed in B certificate Examination	*1*
3	Sports	*Intercollegiate selection*	*2*
		South zone selection	*3*
		All India participation	*4*
		Winning medals in all India competitions	*5*
4	NSS	*40% attendance in regular NSS activities*	*1*
		50% attendance with Community Service	*2*
		Conduct of survey/Youth exchange/RD	*3*
5	JKC	*Enrollment and training*	*1*
		Campus recruitment local level	*2*
		MNCs/reputed companies	*3*
6	Community service	*Participation in community service by departments (outreach programmes)*	*2*
7	Cultural activity	*Winning medals at state level-2, District level-1*	*2* *1*
8	COP/Add on Course	*Pass in Certificate Exam-1,* *Diploma-2*	*1* *2*
9	Support services	*Lead India, Health club, RRC and Eco Club etc., participation in various programmes*	*1*

	P.R. GOVERNMENT COLLEGE(A), KAKINADA	**Program & Semester** **II B.Sc. ORGANIC CHEMISTRY(H)** **(SEMESTER – IV)**			
Course Code 09	TITLE OF THE COURSE Course -09**: 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-09: 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. ORGANIC CHEMISTRY, SEMESTER–IV 2024-25

CHEMISTRY COURSE-09: 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 (SEMESTER – IV)			
Course Code C09P	TITLE OF THE COURSE **Course 09: 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

	Pithapur Rajah's Government College (Autonomous) kakinada	Program & Semester II B.Sc. Honors in Organic Chemistry Semester-IV			
Course Code CHE-10	TITLE OF THE COURSE Course -10: **PHYSICAL CHEMISTRY**				
Teaching	Hours Allocated: 45 (**Theory**) (3 hrs. / Wk.)	L	T	P	C
Pre-requisites:	Basic knowledge about Dilute solutions, Electrochemistry, photochemical reactions and phase rule	45	10	30	3+1

Course Objectives:

1. To provide basic knowledge on Colligative Properties
2. To provide basic awareness on concepts of electrochemistry
3. To understand the basic concepts of Electrodes significance and their usage
4. To provide knowledge and understand ability on phase systems
5. To Provide the knowledge on photochemistry
6.

Course Outcomes:

On Completion of the course, the students will be able to-		Cognitive Domain
CO1	Understand the concept of Colligative Properties.	Knowledge and Application
CO2	Understand the basic concepts of electrochemistry	Knowledge
CO3	Understand the basic concepts of Electrodes and their usage	Understand and application
CO4	To understand basic concepts of phase rule	Application
CO5	Understand the laws of photochemistry and learn how to calculate the quantum yields of different photo physical processes	Knowledge

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Course outcome & Program outcome mapping

On Completion of the course, the students will be able to	
CO1	In depth understanding of theory and principles in Physical chemistry
CO2	Understand and explainvarious Redox reactions by using Nernst Equation for
CO3	Understand the importance of Phase rule and its applications applications in respect of Nitrogen based organic compounds
CO4	Comprehend the concepts and applications of Photo Chemistry and Quantum Yield

SYLLABUS

UNIT-I DILUTE SOLUTIONS

Colligative properties. Raoult's law, relative lowering of vapour pressure, its relation to molecular weight of non- volatile solute. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. osmotic pressure, experimental determination. Theory of dilute solutions. Determination of molecular weight of non-volatile solute from osmotic pressure. Abnormal Colligative properties- Van't Hoff factor.

UNIT-II ELECTROCHEMISTRY-I

Specific conductance, equivalent conductance. Variation of equivalent conductance with dilution. Migration of ions, Kohlrausch's law. Arrhenius theory of electrolyte dissociation and its limitations. Ostwald's dilution law. Debye-Huckel-Onsagar's equation for strong electrolytes (elementary treatment only). Definition of transport number, determination by Hittorfs method. Application of conductivity measurements- conductometric titrations.

UNIT-III ELECTROCHEMISTRY-II

Single electrode potential, sign convention, Reversible and irreversible cells Nernst Equation- Reference electrode, Standard Hydrogen electrode, calomel electrode, Indicator electrode, metal – metal ion electrode, Inert electrode, Determination of EMF of cell, Applications of EMF measurements- Potentiometric titrations.

UNIT-IV PHASE RULE

Concept of phase, components, degrees of freedom. Thermodynamic Derivation of Gibbs phase rule. Phase equilibrium of one component system - water system. Phase equilibrium of two- component

system, solid-liquid equilibrium. Simple eutectic diagram of Pb-Ag system, simple eutectic diagram, desilverisation of lead., NaCl-Water system, Freezing mixtures.

UNIT-V PHOTOCHEMISTRY

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, hydrogen- bromine reaction. Qualitative description of fluorescence, phosphorescence, Photosensitized

LIST OF REFERENCE BOOKS

1. Modern Electrochemistry by J.O. M. Bockris and A.K.N.Reddy
2. Advanced Physical Chemistry by Atkins
3. Introduction to Electrochemistry by S. Glasstone

CO-PO Mapping:

CO	PO1	PO 2	PO3	PO 4	PO 5	PO6	PO 7	PSO1	PSO2	PSO 3
CO 1	3	2	2	2	1	2	1	3	2	2
CO 2	3	1	2	2	1	1	1	3	1	2
CO 3	3	2	2	3	2	2	2	3	2	2
CO 4	3	1	1	1	1	1	1	2	1	1

PROGRAMME OUTCOMES (PO's)

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, 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.

Pithapur Rajah's Government College (Autonomous), kakinada

II B.Sc. ORGANIC CHEMISTRY
SEMESTER – IV

PHYSICAL CHEMISTRY-II WEIGHTAGE TO CONTENT

& BLUE PRINT

S.NO.	COURSE CONTENT	LONG ANSWER QUESTIONS	SHORT ANSWER QUESTIONS	TOTAL MARKS	AS PER BLOOMS TAXONOMY
1.	UNIT - I	1	1	15	Understanding, Application
2.	UNIT – II	1	2	20	Remembering, Understanding
3.	UNIT – III	2	1	25	Analyzing, Creation
4.	UNIT – IV	1	2	20	Evaluation, Understanding
5.	UNIT - V	1	1	15	Understanding, Application
	TOTAL	**6**	**7**	**95**	

Pithapur Rajah's Government College (Autonomous), Kakinada

II B.Sc. ORGANIC CHEMISTRY

SEMESTER-IV

MODEL PAPER

Course - 10: PHYSICAL CHEMISTRY

Time: 2 hrs. **Maximum Marks:50**

Section – 1

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

PART-A

1) What is elevation in boiling point and derive the relation between molecular weight of solute and elevation in boiling point? BT2 CO1 PO1
2) Define the transport number and determine the transport number by Hittorf's method
3) Describe the following electrodes (a) Calomel electrode (b) Indicator electrode BT2 CO3 PO3

PART-B

4) Explain phase diagram of Pb-Ag System BT3 CO4 PO4
5) Derive the quantum yield of Hydrogen chlorine photochemical reaction through mechanism
6) Elaborate Potentiometric titrations with example. [BT3, CO4]

Section-II

Answer any four of the following questions.
Each question carries FIVE marks. 4 x 5=20 Marks

7) . Explain arhenious theory of dissociation and its limitations BT2 CO2 PO2
8) Derive the Nernst equation BT2 CO3 PO3
9) Define osmotic pressure and explain their experimental determination? BT2 CO1 PO1
10) Derive the Gibbs phase rule? BT1 CO4 PO4
11) Define fluorescence and phosphorescence? BT1 CO5 PO5
12) How is the eutectic point utilized in the desilverisation process?BT2 CO4 PO5
13) Explain the Kohlrausch law BT2 CO2 PO2

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A) : KAKINADA

BOARD OF STUDIES 2024-25

DEPARTMENT OF CHEMISTRY

II B.Sc., Honors in Organic Chemistry

SEMESTER– IV

Paper: II - Physical Chemistry (Course 10)

Question Bank

UNIT-I
DILUTE SOLUTIONS

ESSAY QUESTIONS

1. What is Elevation of the Boiling point. Derive its relationship with molar mass of Non-volatile solute and write its determination by Cottrell's method.
2. What is Depression of Freezing point. Derive the relationship with molar mass of Non-Volatile solute and write its determination by Rast's Camphor method.
3. Define Osmotic pressure. Explain Berkley and Hartley's method to determine the molecular mass of non-volatile solute.

SHORT ANSWERS

4. How do you determine relative lowering of vapour pressure by Ostwald – Walker method.
5. Write about Van't Hoff factor.

UNIT-II
ELECTROCHEMISTRY-I

ESSAY QUESTIONS

1. State Kohlrausch law. And explain its applications.
2. Explain Debye-Huckel -Onsagar equation for strong electrolytes.
3. Define transport number. Describe the determination of transport number by Hittorf's method.
4. Discuss Conductometric titrations with examples.

SHORT ANSWERS

5. Define equivalent conductance and conductance.
6. Define strong and weak electrolytes with examples.

UNIT-III
ELECTROCHEMISTRY-II

ESSAY QUESTIONS

1. Explain different types of electrodes with examples.

2. Explain the determination of EMF of a cell.

3. Write about Potentiometric titrations.

SHORT ANSWERS

4. Write about galvanic cell and electrolytic cell.

5. Write about Nernst equation

UNIT-IV
PHASERULE

ESSAY QUESTIONS:

1. Explain the Concept of phase, components, degrees of freedom.
2. Derivation of Gibbs phase rule.
3. Discuss the Phase equilibrium of one component system - water system.
4. Discuss the Phase equilibrium of two- component (Pb-Ag) system,
5. Discuss the Phase equilibrium of two- component (NaCl-Water) system ,

ESSAY QUESTIONS:

6. What are Freezing mixtures.
7. Write about desilverisation of lead

UNIT-V
PHOTOCHEMISTRY

EASSY QUESTIONS

1. State and Explain Laws of Photo chemistry.
2. Give photo chemical reaction mechanism of H2-Cl2 and H2-Br2
3. Explain Jablonskis Diagram.

SHORT ANSWERS

4. Write about a) Fluorescence b) Phosphorescence c) Chemiluminescence
5. Write about Photosensitization.
6. Distinguish between thermal and photochemical process.

	PITHAPUR RAJAH'S GOVERNMENT COLLEGE KAKINADA	Program & Semester II B.Sc.HONORS (IV Semester)			
Course Code **CHE-11**	**TITLE OF THE COURSE** **COURSE 11 / MAJOR 9 : ORGANIC CHEMISTRY**				
Teaching	Hours Allocated: 45 (**Theory**)	L	T	P	C
Pre - requisites	Fundamental Knowledge in functional Groups of organic compounds and their general formulas	45	10	30	3+1

Course Outcomes:

At the end of the course , the students will be able to
1.Understand the basic concepts of Amines,Nitrocompounds
2.Understand the concept of Carbohydrates,Amino Acids.

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 Amines,Nitrocompounds
CO3	Learn and identify Amines, Nitrocompounds, Carbohydrates, Amino Acids.
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
NITRO HYDROCARBONS

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

UNIT – II
NITROGEN COMPOUNDS
ALIPHATIC AMINES:

Nomenclature, Classification into 1°, 2°, 3° Amines and Quarternary ammonium compounds. Preparative methods – 1. Ammonolysis of alkyl halides 2. Gabriel synthesis 3. Hoffman's bromamide reaction (mechanism). Reduction of Amides and Schmidt reaction. Physical properties and basic character - Comparative basic strength of Ammonia, methyl amine, dimethyl amine, trimethyl amine

UNIT-III
AROMATIC AMINES

Introdution comparative basic strength of aniline, N-methylaniline and N,N-dimethyl aniline (in aqueous and non-aqueous medium), steric effects and substituent effects. Chemical properties: a) Alkylation b) Acylation c) Carbylamine reaction d) Hinsberg separation e) Reaction with Nitrous acid of 1°, 2°, 3° (Aliphatic and aromatic amines). Electrophillic substitution of Aromatic amines – Bromination and Nitration. Oxidation of aryl and Tertiary amines, Diazotization.

UNIT-IV
CARBOHYDRATES

Monosaccharides: (+) Glucose (aldo hexose) - Evidence for cyclic structure of glucose (some negative aldehydes tests and mutarotation) - Proof for the ring size (methylation, hydrolysis and oxidation reactions) - Pyranose structure (Haworth formula and chair conformational formula).

(-) Fructose (ketohexose) - Evidence of 2 - ketohexose structure (formation of penta acetate, formation of cyanohydrin its hydrolysis and reduction by HI). Cyclic structure for fructose (Furanose structure and Haworth formula) - osazone formation from glucose and fructose – Definition of anomers with examples.

Interconversion of Monosaccharides: Aldopentose to Aldohexose (Arabinose to D- Glucose, D-Mannose) (Kiliani - Fischer method). Epimers, Epimerisation - Lobry de bruyn van Ekenstein rearrangement. Aldohexose to Aldopentose (D-Glucose to D- Arabinose) by Ruff degradation. Aldohexose to Ketohexose [(+) Glucose to (-) Fructose] and Ketohexose to Aldohexose (Fructose to Glucose)

UNIT- V
AMINO ACIDS

Introduction: Definition of Amino acids, classification of Amino acids into alpha, beta, and gamma amino acids. Natural and essential amino acids - definition and examples, classification of alpha amino acids into acidic, basic and neutral amino acids with examples.

Methods of synthesis: General methods of synthesis of alpha amino acids (specific examples - Glycine, Alanine, valine and leucine) by following methods: a) from halogenated carboxylic acid b) Malonic ester 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)

List of Reference Books

1. Organic Chemistry by G.Mare loudan, Purdue Univ
2. A Text Book of Organic Chemistry by Bahl and Arun bahl
3. A Text Book of Organic chemistry by I L Finar Vol IOrganic Chemistry by G.Mareloudan, Purdue Univ
4. A Text Book of Organic Chemistry by Bahl and Arunbahl
5. A Text Book of Organic chemistry by I L FinarVol I
6. A Text Book of Organic chemistry by I L FinarVol II

Course outcome & Program outcome mapping

On Completion of the course, the students will be able to	
CO1	In depth understanding of Structural theory in Organic chemistry
CO2	Understand and explain preparations and properties of Amines, Nitrocompounds, Carbohydrates, Amino Acid Compounds
CO3	Understand the importance of structure, preparation and chemical applications in respect of Nitrogen based organic compounds
CO4	Comprehend the concepts and applications of Carbohydrates & Amino acids

CO-PO Mapping:

CO	PO1	PO 2	PO3	PO 4	PO 5	PO6	PO 7	PSO1	PSO2	PSO 3
CO 1	3	2	2	2	1	2	1	3	2	2
CO 2	3	1	2	2	1	1	1	3	1	2
CO 3	3	2	2	3	2	2	2	3	2	2
CO 4	3	1	1	1	1	1	1	2	1	1

PROGRAMME OUTCOMES (PO's)

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 Questions	Short Answer Questions	Total Marks	As per Blooms Taxonomy
1	**Nitro hydrocarbons**	1	1	15	Understanding, Application
2	**Nitrogen compounds Aliphatic amines**	1	1	20	Remembering, Understanding
3	**Nitrogen compounds Aromatic amines:**	1	1	15	Analyzing & Creation
4	**Carbohydrates**	2	2	30	Evaluation, Understanding
5.	**Amino acids**	1	2	15	Understanding, Application
	TOTAL	**6**	**7**	**95**	

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

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

COURSE – 11 :: ORGANIC CHEMISTRY
MODEL PAPER

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

Section – 1

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

PART-A

1. Explain two Preparations of Nitro alkanes and the reaction of Nitroalkanes with HNO_2? [BT1, CO1]

2. Support the open chain structure of Glucose with relevant chemical reactions [BT1, CO2]

3. How will you inter convert Glucose to Fructose and Fructose to Glucose [BT2, CO2]

PART-B

4. Give the synthesis of Glycine and Alanine by Gabriel -Pthalimide and Strecker synthesis.[BT3, CO3]

5. Discuss the separation of mixture of Amines by using Hinsberg reagent. [BT2 CO3]

6. Elaborate Gabriel synthesis and Hoffman's bromamide reaction (mechanism). [BT3, CO4]

Section-II

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

7. Brief Tautomerism of nitroalkanes leading to aci and keto form[BT3, CO1]

8. Brief the mechanism of Hoffmann bromide reaction [BT3, CO1]

9. Define Epimers and Anomers and give an example for each [BT1, CO2]

10. Write a note on Zwitterion and Isoelectric point [BT3, CO3]

11. Brief Mutarotation.[BT3, CO1]

12. Give the mechanism of Diazotisation reaction. [BT2, CO3]

13. Write the classification of amino acids[BT1, CO1]

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A) : KAKINADA

BOARD OF STUDIES 2024-25

DEPARTMENT OF CHEMISTRY

II B.Sc., Honors in Organic Chemistry

SEMESTER– IV

Paper: III - Organic Chemistry (Course 11/Major 9)

Question Bank

UNIT- I

NITRO HYDROCARBONS

Essay Questions

1. How is nitrobenzene prepared. Give its reducing properties
2. Write on a) Mannich Reaction b) Michael addition c) Michael Reduction
3. Write the two Preparation of Nitro alkanes and discuss the reactivity of Nitroalkanes with HNO2
4. Explain reactivity of nitroalkanes -halogenation, reaction with HONO (Nitrous acid), Nef reaction

Short Answer Questions

5. Discuss the Nomenclature of nitro hydocarbons
6. Explain classification-nitro hydrocarbons
7. Write about the structure and Tautomerism of nitroalkanes

UNIT – II

NITROGEN COMPOUNDS

ALIPHATIC AMINES:

Essay Questions

1. Give the general methods of Preparation of aliphatic amines
2. Discuss about Physical properties of aliphatic amines
3. Write about the basic character of aliphatic amines

Short Answer Questions

4. Discuss the Nomenclature of aliphatic amines
5. Write about the Classification of aliphatic amines

UNIT-III

AROMATIC AMINES

Essay Questions

1. Give the general methods of Preparation of aliphatic amines

2. Explain the following Chemical properties of aromatic amines

a) Alkylation b) Acylation c) Carbylamine reaction d) Hinsberg separation

3. Write the reaction with Nitrous acid of 1°, 2°, 3° (Aliphatic and aromatic amines). 4. Discuss the following Electrophillic substitution of Aromatic amines –

a) Bromination and b) Nitration.

5. Explain the oxidation reactions of aromatic amines,

Short Answer Questions

6. Write about comparative basic strength of aniline, N-methylaniline and N,N- dimethyl aniline (in aqueous and non-aqueous medium)

7. Explain steric effects and substituent effects on the basic strength of aromatic amines

8. Discuss the nomenclature and classification of aromatic amines

9. Explain the significance of Diazotization.

UNIT-IV

CARBOHYDRATES

Essay Questions

1. Explain open and cyclic structure of glucose with evidences

2. Explain the following

a) Killiani fisher synthesis b) Ruff degradation

3. Explain Inter-conversion of

a) aldohexose to ketohexose. b) Ketohexose to aldohexose.

4. Determine the ring size of Glucose and write pyranose structure of α and β anomers of Glusose?

5. Explain open and cyclic structure of fructose with evidences

Short Answer Questions

1. Define Epimers and Anomers and give one example each.
2. Write about the classification of carbohydrates
3. Discuss the phenomenon of mutarotation in carbohydrates by taking glucose or fructose as an example
4. Explain how to determine the ring structure of glucose with relavant equations
5. Write about osazone formation and explain why it reacts only three molecules of phenyl hydrazine
6. Explain Lobry de bruyn van Ekenstein rearrangement

UNIT- V

AMINO ACIDS

Essay Questions

1. Explain the Synthesis of Glycine and Alanine using Gabriel Phthalimide synthesis and Strecker's Method
2. Explain general reactions due to amino and carboxyl groups of amino acids
3. Define Amino acids and explain the classification of Amino acids

Short Answer Questions

1. What are Essential and Non Essensital amino acids give examples?
2. Write about Zwitter ion?
3. Summarize the importance of isoelectric point.
4. Explain the solubility of amino acids and their melting points

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SEMESTER-IV
COURSE 11 : ORGANIC CHEMISTRY

Practical Credits: 1 2 hrs/week

(At the end of Semester)

(A) Give a brief introduction on

(1) Re-crystallisation

(2) sublimation

(3) distillation

(4) M.P & B.P

(B) Single step preparations

1. Preparation of P-Nitro acetanilide
2. Preparation of Aspirin

Scheme of Valuation for Practical

Physical State - 1M

Odour - 1M

Colour - 1M

MP - 1M

Report -1M

Procedure in first 10 mts - 15M

Principle in Re-crystallisation - 5M

Calculation - 5M

% of Yield - 5M

Viva-voce - 5M

Record - 10M