PITHAPUR RAJAH'S GOVERNMENTCOLLEGE (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

*Convened on 30 April 2024*AY 2024-25

DEPARTMENT OF CHEMISTRY

PITHAPUR RAJAH'S GOVERNMENTCOLLEGE (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 normsof 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	K.Umamaheswari	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 Paper Setters & Examiners to the academic council for appointment of Paper Setters & 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 throughoffline/ 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. OrganicChemistry (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 academicyear 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, Cos, POs, & PSOs mappingfor I, II, III, IV, V, VII and VIII Semesters.
7. Teaching-learning methodology by 50:50 (External: Internal) ratio I, II, I I I & 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 itshall be approved in the BOS.

9. Minimum of 50% integration of ICT into a transaction of curriculum.
10. Remedial coaching and assignments for slow learners, project works, research, Conferences, Industrial /academic tours & PG Entrance Coaching 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.
16. Proposal to start new UG honours course i.e, BSc., Pharmaceutical Chemistry for the AY 24-25

Signature of the members who attended the board of studies in B.sc Honors Chemistry and B.sc Three major system 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.	9849324968
2	Dr. K. Jhansi Lakshmi	K. Jhansi Lakshmi	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 Rao	9885165588
13	U.S.N. Prasad	USNP	6300882584
14	K.N.S. Swamy	KNS Swamy	9908900962
15	S. Vijaya Lakshmi	S. Vijaya Lakshmi	9133941966
16	D.Bhavyasri	D. Bhavyasri	
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 COURSESCHEMISTRY

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	Added Green synthesis of pyrimidine	Green synthesis of Adipic acid
III	V & VIIA	NIL	NIL
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** answerquestions with five marks each out of four questions and five objective questionswith 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 paperis 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

CIA structure for 3 Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will beconsidered
  .
- I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at 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
- The remaining 25 marks for CIA are allocated as per the following structure.

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

CIA structure for 3 Major system for Honors programmes
(2020-21AB)

- Out of 40 marks for CIA, 20 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.
- I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.
- I mid examination to be conducted in offline mode in which the student should attempt **Two essay** questions for ten marks each out of three questions, **four short** answer questions with five marks each out of six questions.

- The remaining 20 marks for CIA are allocated as per the following structure.

Assignment- 10M	**Seminar- 5M**	**Quiz -5M**

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	**Culturalactivity**	*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*

	PITHAPUR RAJAH'S GOVERNMENT COLEGE(A) Kakinada DEPARTMENT OF CHEMISTRY	Program & Semester			
Course Code CHE-6A	TITLEOFTHECOURSE **SYNTHETIC ORGANIC CHEMISTRY**	III B.Sc. (V Semester)			
Teaching	HoursAllocated:60 (**Theory**)	L	T	P	C
Pre-requisites	Symmetry and Photochemistry, Oxidation, Reduction and Named synthetic reactions	60	10	30	4+2

Course Objectives:

1. Pericyclic Reactions
2. Organic Photochemistry
3. Retro synthesis
4. C-C bond formation, Oxidation and Reduction Reactions.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Student will acquire knowledge on basic concepts in different types of pericyclic reactions
CO2	Student will get the knowledge in understanding the fundamental concepts involved in the organic photochemistry and gets acquainted with new kind of reactions
CO3	Student shall have opportunity to understand the importance of retrosynthesis in organic chemistry which is a key analysis in recent research trends.
CO4	Students shall Comprehend the applications of different novel reagents and reactions in synthetic organic chemistry.

Course with focus on Skill Development/Employability/Entrepreneurship modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT-I Pericyclic reactions: 15 h

A brief introduction to synthetic organic chemistry – Features and classification of pericyclic reactions: Phases, nodes and symmetry properties of molecular orbitals in ethylene,1,3-butadiene,1,3,5-hexatriene, Thermal and photochemical reactions. Introduction of Frontier Molecular Orbitals –

Electro cyclic reactions: Definition and examples, definitions of con and dis rotation, Woodward-Hoffmann selection rules. (Correlation diagrams are not required) Cycloaddition reactions: Definition and examples, definitions of suprafacial and antrafacial addition, Woodward-Hoffmann selection rules. (Correlation diagrams are not required)

UNIT-II Organic photochemistry: 9h

Jablonski diagram-singlet and triplet states -Photochemistry of Carbonyl compounds- π–π* and *n*–π* transitions, Norrish type-1and type-2 reactions - Paterno– Buchi reaction - Photo Fries Rearrangement.

UNIT-III Retrosynthesis 12 h

Important terms in Retrosynthesis with Examples-Disconnection, Target molecule, FGI, Synthon, Retrosynthetic analysis, chemo selectivity, regio selectivity & stereo selectivity. Importance of Order of events in organic synthesis – Retrosynthetic analysis of the compounds: a. Aspirin, b. 4-Nitro toluene, c. Paracetamol.

Unit-4: Synthetic Reactions 12 h

Shapiro reaction, Stork - Enamine reaction (only alkylation), Wittig reaction, Robinson annulation, Bailys-Hillman reaction, Heck reaction, Suzuki coupling. Concept of Umpolung – Synthesis of aldehydes and ketones using1,3-Dithiane. Barton reaction

Unit-5: Reagents in Organic Chemistry 12h

Oxidizing agents: PCC, OsO_4, SeO_2 (Riley oxidation), mCPBA.

Reducing agents: LiAlH4 (with mechanism), NaBH4(with mechanism), Metal-solvent reduction (Birchreduction), Introduction Catalytic reduction (Heterogeneous catalysis).

Additions and Deletions

Unit No	Additions	Deletions	Expected levels of learning as per Blooms taxonomy for assessment of CO	Percentage added/deleted
1	--------	-------	----	- -
2	---------	-----	------	-
3	Retrosynthesis of Aspirin	Retrosynthesis of cyclohexene	K6	5 %
4	Barton reaction	---	K2, K3	5 %
5	$NaBH_4$(Mechanism), mCPBA	DDQ	K2, K3	5 %

K_1 = Remembering, K_2= Understanding, K_3= Applying, K_4 = Analyzing,
K_5 = Evaluating, K_6 = Create

Textbooks:

S.NO	AUTHOR	TITLE	PUBLISHER
1	S.M. Mukherjee and S.P. Singh	Reaction Mechanism in Organic Chemistry	Trinity Press
2	Jonathan Clayden, Nick Greeves and Stuart Warren	Organic Chemistry	Oxford University Press

Reference books

S.NO	AUTHOR	TITLE	PUBLISHER
1	Ian Fleming	Pericyclic Reactions	Oxford University Press
2	Sankararaman	Pericyclic Reactions-A Textbook: Reactions, Applications and Theory	WILEY-VCH
3	S.M. Mukherjee,	Pericyclic reactions-A Mechanistic study	Macmillan India
4	Stuart Warren	Organic synthesis: The disconnection approach	John Wiley&Sons.
	S.N. Sanyal	Reactions, Reagents and Rearrangements	Bharati Bhawan Publishers

WebLinks:

1. https://youtu.be/c9-h83KDiAk
2. https://youtu.be/NDHQ7W2TKIY
3. https://youtu.be/mdWsJWybUcA
4. https://youtu.be/CyYUGaSWihE

Course outcome & Program outcome mapping

On Completion of the course, the students will be able to	
CO1	Student will acquire knowledge on basic concepts in different types of pericyclic reactions
CO2	Student will get the knowledge in understanding the fundamental concepts involved in the organic photochemistry and gets acquainted with novel reactions
CO3	Student shall have opportunity to understand the importance of retro synthesis in organic chemistry which is a key analysis in recent research trends.
CO4	Students shall Comprehend the applications of different novel reagents and reactions in synthetic organic chemistry.

CO-PO Mapping:

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

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

PROGRAMME OUTCOMES

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

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

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

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

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

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

(PO6): Life-long Learning: Demonstrate scholarly attitude to pursue a career in the field of chemical education and research and have the zeal and vision to engage in independent and life-long learning in the broadest context of technological and social change.

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

PROGRAM SPECIFIC OUTCOMES (PSO's)

At the time of graduation, our under graduates would be able to:
PSO 1- Evaluate, analyze, interpret and effectively apply the basic laws, principles, phenomena, processes and mechanisms involved in the domain of organic, inorganic, physical and analytical Chemistry
PSO2 - Demonstrate the knowledge of Chemistry in the domain of research, education and perspective entrepreneurship.

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

Weightage to content

Semester -V

Paper-6A

SYNTHETIC ORGANIC CHEMISTRY

S.No	Course Content	Long Answer	Short Answer	Total marks	As per Blooms Taxonomy
1	Pericyclic reactions	1	1	15	Understanding, Application
2	Organic Photo Chemistry	1	2	20	Remembering, Understanding
3	Retrosynthesis	1	1	15	Analyzing & Creation
4	Synthetic Reactions	2	1	25	Evaluation, Understanding
5	Reagents in Organic Chemistry	1	2	20	Application & Creation
	TOTAL	**6**	**7**	**95**	

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III YEAR B.Sc (Examination at the end of V semester)
(Synthetic Organic Chemistry)
Paper-6A
MODELPAPER

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

SECTION-I

Answer any THREE of the following questions. And attempt one question from Each section part Each question carries TEN marks **3X10=30Marks**

PART-A

1. Discuss Electro cyclic reactions by taking anyone example with any one method.
2. Elaborate Paterno–Buchi reaction and Norrish type– II reaction with an example.
3. Devise ways for retrosynthetic analysis of Aspirin and Paracetamol.

PART- B

4. Suggest the acceptable mechanism for reduction with LiAlH4 and give any two synthetic applications of LiAlH4.
5. How can you describe the mechanisms of Suzuki coupling and Robinson annulation?
6. Elaborate the mechanism of Heck reaction and Shapiro reaction.

SECTION-II

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

7. Draw the Molecular orbital diagram of 1,3-butadiene.
8. How would you generalize Norrish Type–I reaction.
9. What is Photo Fries rearrangement?
10. What can you infer Target molecule and synthon with an example?
11. Suggest the mechanism of Stork– Enamine alkylation reaction.
12. How would you explain Birch reduction with mechanism?
13. How would you present SeO_2 as oxidizing agent.

LABORATORY COURSE

Practical Paper – 6A :: Synthetic Organic Chemistry

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

Learning Out comes:

On successful completion of this practical course, student shall be able to:

1. Prepare acetanilide using the green synthesis.
2. Demonstrate the preparation of an azodye.

Practical (Laboratory) Syllabus

1. Identification of various equipment in the laboratory.
2. Acetylating of 10amine by green method: Preparation of acetanilide
3. Rearrangement reaction in green conditions: Benzil-Benzilic acid rearrangement
4. Radical coupling reaction: Preparation of1,1-bis-2-naphthol
5. Green oxidation reaction: Synthesis of adipic acid
6. Photo reduction of Benzophenone to Benzopinacol in the presence of sunlight.

Lab References:

S.NO	AUTHOR	TITLE	PUBLISHER
1	Vogel A.I	Practical Organic Chemistry	Longman Group Ltd.
2	Bansal R.K	Laboratory Manual of Organic Chemistry	Wiley-Eastern
3	Ahluwalia & Aggarwal R	Comprehensive Practical Organic Chemistry	Universitypress. Delhi
4	Mann F.G and Saunders B.C	Practical Organic Chemistry	Pearson Education

Co-Curricular Activities:

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

For Teacher: Training of students by teacher in laboratory and field for not lessthan15 hourson 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.

For Student: Student shall visit a related industry/chemistry laboratory in universities/research organizations/private sector facility and observe the techniques used for theseparation of organic compounds. Write their observations and submit a hand written fieldwork/project work report not exceeding10 pages in the given format to the teacher.

Max marks for Fieldwork/project work Report:05.

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

Unit tests (IE).

a) Suggested Co-Curricular Activities

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

SCHEME OF VALUATION

Practical Paper – 6A :: Synthetic Organic Chemistry
(at the end of semester V)

a.	Correct Equation withMechanism	10 marks
b.	Procedure	10 marks
c.	Recrystallization with M. P	10 marks
d.	Yield	10 marks
e.	Record	05 marks
f.	Viva voce	05 marks
	TOTAL	**50 marks**

	PITHAPUR RAJH'S GOVERNMENT COLLEGE(A) KAKINADA	Program & Semester			
CourseCode CHE-7A	TITLE OF THE COURSE **ANALYSIS OF ORGANIC COMPOUNDS**	III B.Sc. (V Semester)			
Teaching	Hours Allocated:60 (**Theory**)	L	T	P	C
Pre-requisites	Symmetry and Photochemistry, Oxidation, Condensation and Reduction reactions	60	10	30	4+2

Course Objectives:

1. Gains knowledge in Mass spectrometry
2. Structural elucidation by IR, NMR and Mass spectroscopic techniques
3. Applications of Paper and Thin layer chromatographic techniques
4. Problem solving approach to elucidation of the structure and separation of organic compounds.

CourseOutcomes:

On Completion of the course, the students will be able to	
CO1	Identify the importance of mass spectrometry in the structural elucidation of organic compounds
CO2	Acquire the knowledge on structural elucidation of organic compounds
CO3	Understand various chromatography methods in the separation and identification of organic compounds.
CO4	Demonstrate the knowledge gained in solvent extraction for the separation of organic compounds

Coursewithfocusonemployability/entrepreneurship/SkillDevelopment modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

Unit-1: Mass Spectrometry **10h**

A brief introduction to analysis of organic compounds

Basic principles, Instrumentation - Mass spectrometer, Electron Ionization (Electron Impact, EI), Molecular ions, Nitrogen rule, McLafferty rearrangement, Metastable ions, Isotopic abundance.Basic fragmentation types. Fragmentation patterns in Butane, Toluene, 2- Butanol, Pentanamine.

Unit-2: Structural elucidation of organic compounds using IR, NMR, mass spectral data- **8h**

2,2,3,3-Tetramethylbutane, Phenylacetylene, Butane-2,3-dione, Propionic acid, Methylpropionate and N,N- dimethyl amine.

Unit-3: Structural elucidation of organic compounds using IR, NMR, Mass spectral data- 8h

Butyraldehyde, acetophenone, benzoic acid, propane nitrile and p-nitroaniline

Unit-4: Separation techniques-1 12h

Solvent extraction-Principle and theory, Types of solvent extraction-Batch extraction, Continuous extraction and Counter current extraction techniques.

Chromatography- Principle and theory, classification, types of adsorbents, eluents, Rf values and factors affecting Rfvalues. Thin layer chromatography -principle, experimental procedure, advantages and applications.

Unit-5: Separation techniques-2 12h

Paper chromatography-Principle, experimental procedure, ascending, descending, radial and two dimensional, applications.

Column chromatography- Principle, classification, experimental procedure, advantages and applications.

Textbooks:

1. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition Pearson
2. Fundamentals of Analytical Chemistry by F.James Holler, Stanley R Crouch, Donald M. West and Douglas A.Skoog, Ninth edition, Cengage.
3. Organic Spectroscopy by William Kemp, Third Edition, Palgrave USA

Referencebooks

1. Introduction to Spectroscopy by Pavia, Lampman, Kriz and Vyvyan, Fifth edition, Cengage
2. Organic Spectroscopy: Principles and Applications by Jag Mohan, Second edition, Alpha Science
3. Spectroscopy of Organic Compounds by P.S. Kalsi, Seventh edition, New Age International.
4. Spectroscopic Methods in Organic Chemistry by Ian Fleming and Dudley Williams, Seventh edition, Springer.
5. Analytical Chemistry by Gary D. Christian, Purnendu K. Dasgupta and Kevin A. Schug, Seventh edition, Wiley.
6. Quantitative analysis by R.A.Day Jr. and A.L. Underwood, Sixth edition, Pearson

WebLinks:

1. https://youtu.be/rzF-dW08UIw
2. https://youtu.be/bPsXkPYexJY
3. https://youtu.be/inbiTYI5Nlw
4. https://www.youtube.com/watch?v=qpZhc2Zn_TI

Course outcome & Program outcome mapping

On Completion of the course, the students will be able to	
CO1	Identify the importance of mass spectrometry in the structural elucidation of organic compounds
CO2	Acquire the knowledge on structural elucidation of organic compounds
CO3	Understand various chromatography methods in the separation and identification of organic compounds.
CO4	Demonstrate the knowledge gained in solvent extraction for the separation of organic compounds

CO-POMapping:

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

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

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 analysing specific problems both qualitatively and quantitatively in laboratories and in industries.

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

(PO5) :Communication: Develop Skills to evaluate, analyze and interpret the chemical information and data and to communicate effectively within the chemical community and with society at large, such

as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

(PO6): Life-long Learning : Demonstrate scholarly attitude to pursue a career in the field of chemical education and research and have the zeal and vision to engage in independent and life-long learning in the broadest context of technological and social change.

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

PROGRAM SPECIFIC OUTCOMES (PSO's)

At the time of graduation, our under graduates would be able to:
PSO 1- Evaluate, analyze, interpret and effectively apply the basic laws, principles, phenomena, processes and mechanisms involved in the domain of organic, inorganic, physical and analytical Chemistry

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

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

Weightage
to content
Semester -V
Paper-7A

S.No	Course Content	Long Answer	Short Answer	Total marks	As per Blooms Taxonomy
1	Mass Spectrometry	1	2	20	Understanding, Evaluating
2	Structural elucidation of organic compounds using IR, NMR, mass spectral data	1	1	15	Analyzing, Applying
3	Structural elucidation of organic compounds using IR, NMR, mass spectral data	1	1	15	Analyzing, Applying
4	Separation techniques-1	2	1	25	Remembering, Applying
5	Separation techniques-2	1	2	20	Evaluating, Creation
	TOTAL	**6**	**7**	**95**	

P.R. GOVERNMENT COLLEGE(A),KAKINADA

III YEAR B.Sc (Examination at the end of V semester)
Paper-7A :: Analysis of Organic Compounds
MODELPAPER

Duration: 2hrs.30Min **Max.Marks:50**

Section -I

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

Part – A

1. i) What is the significance of Isotopic abundance in Mass Spectrometry.
   ii) What are metastable ions. How can you describe their characteristics.

2. Write the IR, NMR and Mass spectral analysis for 2,2,3,3- tetramethyl butane and methylPropionate.

3. Write the IR, NMR and Mass spectral analysis of Propane nitrile and Butyraldehyde.

Part – B

4. Explain Continuous extraction techniques.

5. Explain the Principle, experimental procedure and advantages of Thin Layer Chromatography?

6. How would you elaborate ascending, descending, radial and two dimensional paper chromatography. Suggest any of its applications.

Section -II

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

7. How can you describe Electron Impact ionization.
8. Elaborate on McLafferty rearrangement.
9. What is the IR spectral data analysis for Propionic acid.
10. How would you explain NMR spectral data for acetophenone and P-Nitro Aniline?
11. What do you remember about the principle and theory involved in solvent extraction.
12. How could you explain the principle and experimental procedure involved in Paper chromatography.
13. Point out the experimental procedure involved in Column chromatography.

Unit No	Additions	Deletions	Expected levels of learning as per Blooms Taxonomy for assessment of CO	Percentage of Syllabus Added/deleted
1	Fragmentation patterns in Butane and Pentanamine	----	Understanding, Applying	2 %
2	----	----	Understanding	2 %
3	Butyraldehyde, Propanenitrile	Coumarin	Applying, Analyzing	2 %
4	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& neutral.	Understanding	2 %

LABORATORY COURSE

Practical Paper – 7A:: Analysis of Organic Compounds

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

Learning Outcomes:

On successful completion of this practical course, student shall be able to:

- Perform the organic qualitative analysis for the detection of N, S and halogens usingthe green procedure.
- Acquire skills in these parathion of organic compounds in the given mixture usingsolvent extraction.
- Learn the procedure for the separation of mixture of amine acids using PaperChromatography.
- Prepare the TLC plates for TLC chromatography.
- Acquire skills in conducting column chromatography for the separation of dyes in thegiven mixture.

Practical (Laboratory) Syllabus:

- Green procedure for organic qualitative analysis: Detection of N, S and halogens
- Separation of organic compounds in a mixture (acidic compound + neutral compound) using separation technique.
- Separation of organic compounds in a mixture (basic compound + neutral compound) using separation technique.
- Separation of given mixture of amino acids (glycine and phenylalanine) using ascending paper chromatography.
- Separation of a given dye mixture (methyl orange and methylene blue) using TLC(using alumina adsorbent).
- Separation of Chlorophyll and Xanthophyll from the leaves of spinach or tekoma using ascending paper chromatography.
- Separation of mixture of methyl orange and methylene blue by Paper Chromatography

SCHEME OF VALUATION

Practical Paper – 7 A:: Analysis of Organic Compounds

(at the end of semester V)

a. Nature of the mixture	5 marks
b. Separation of the mixture into two components	10 marks
Systematic analysis of each component which involves following	
c. Preliminary Tests (Ignition, M.P/B.P, Unsaturation)	03 + 03 marks
d. Detection of extra elements	04 + 04 marks
e. Detection of the functional group (Preliminary & Confirmation)	04+ 04 marks
f. Report	01 + 01 marks
g. Viva voce	06
h. Record	05
TOTAL	**50 marks**

References:

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 Aggarwal R. Comprehensive Practical Organic Chemistry, University press.
4. Mann F. G and Saunders B.C, Practical Organic Chemistry, Pearson Education.

Co-CurricularActivities

a) Mandatory:*(Lab/fieldtrainingofstudentsbyteacher:(lab:10+field:05*):

1. **For Teacher**: Training of students by the teacher in laboratory and field for not lessthan15 hours on the field techniques/skills of detection of N, Sand halogens using the green procedure, preparation of TLC plates, detection of organic compounds using R_f values in TLC/ paper chromatography, loading of column, selection of solvent system for column chromatography, separation of aminoa cids and dye mixture using chromatographic techniques.

2. **For Students**: Student shall visit a related industry/chemistry laboratory in universities/research organizations/private sector facility and observes the synthetic reactions. 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 Field work/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 relevant videos and material.
3. Visits of abilities, firms, research organizations etc.
4. Invited lectures and presentations on related topics by field/industrial experts