PITHAPUR RAJAH'S GOVERNMENT COLLEGE(AUTONOMOUS)
KAKINADA - 533 001, EAST GODAVARI, A.P.

Affiliated to Adikavi Nannaya University

NAAC Accredited with "A" Grade (3.17 CGPA)

BOARD OF STUDIES OF CHEMISTRY

B.Sc. Chemistry Under CBCS

Meeting Minutes/Resolutions

Convened on 03 November 2022

DEPARTMENT OF CHEMISTRY
P. R. GOVT. COLLEGE (Autonomous)
Opp. Mc Laurin High School, Raja Ram Mohan Roy Road, Kakinada

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	P R Govt College (A) Kakinada	Program &Semester			
CourseCode CHE-6A	TITLEOFTHECOURSE **SYNTHETIC ORGANIC CHEMISTRY**	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

CourseObjectives:

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

CourseOutcomes:

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

SkillDevelopment		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-IIOrganicphotochemistry: **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. cyclohexene, 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.

Unit-5: Reagents in Organic Chemistry **12h**

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

Reducing agents: $LiAlH_4$ (with mechanism), $NaBH_4$, Metal-solvent reduction (Birch reduction), Introduction Catalytic reduction (Heterogeneous catalysis).

Text books:

1. Reaction Mechanism in Organic Chemistry by S.M. Mukherji and S.P. Singh, Revised edition, Trinity Press.
2. Organic Chemistry by Jonathan Clayden, Nick Greeves and Stuart Warren, Second Edition, Oxford University Press

Reference books

1. Pericyclic reactions by Ian Fleming, Second edition, Oxford University press.
2. Pericyclic Reactions-A Textbook: Reactions, Applications and Theory by Sankararaman, WILEY-V CH.
3. Pericyclic reactions-A Mechanistic study by S.M. Mukherji, Macmillan India.
4. Organic synthesis: The disconnection approach by Stuart Warren, John Wiley & Sons.
5. Reactions, Reagents and Rearrangements by S.N. Sanyal, Bharati Bhawan Publishers & Distributors

WebLinks:

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

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 Syllabus

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

References:

1. Vogel A.I. Practical Organic Chemistry, Longman GroupLtd.

2. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley-Eastern.

3. Ahluwalia. And Aggarwal R. Comprehensive Practical Organic Chemistry, University press.

4. Mann F.G and Saunders B.C, Practical Organic Chemistry, Pearson Education.

Co-Curricular Activities:

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

5. For Teacher: Training of students by teacher in laboratory and field for not lessthan15 hours on the field techniques/skills of preparation of acetanilide, preparation of azodye, use of separating funnel for solvent extraction, separation of organic compounds in a mixture.

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

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

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

9. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Training of students' by related industrial experts.

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

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

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

SCHEME OF VALUATION

Practical Paper – 6A:: Synthetic Organic Chemistry

(at the end of semester V)

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

	P R Govt 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

CourseObjectives:

1. Gains knowledge in Mass spectroscopy
2. Structural elucidation by IR, NMR and Mass spectroscopic techniques
3. Applications of Paper and Thinlayer 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 Impactionization, EI), Molecular ions, Nitrogen rule, metastable ions, Isotope abundance. Basic fragmentation types. - McLafferty rearrangement Fragmentation patterns inToluene,2-Butanol, Butyraldehyde,Propionicacid.

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

2,2,3,3-Tetramethylbutane,Butane-2,3-dione,Propionicacid, methylpropionateand N,N-dimethyl amine

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

Phenylacetylene, acetophenone, benzoic acid, p-nitroaniline and Coumarin

Unit-4: Separation techniques-1 12h

Solvent extraction-Principle and theory, Batch extraction technique, application of batch extraction in the separation of organic compounds from mixture- acid & neutral, base& neutral.

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

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:

1. Perform the organic qualitative analysis for the detection of N, S and halogens using the green procedure.
2. Acquire skills in these parathion of organic compounds in the given mixture using solvent extraction.
3. Learn the procedure for the separation of mixture of amine acids using Paper Chromatography.
4. Prepare the TLC plates for TLC chromatography.
5. Acquire skills in conducting column chromatography for the separation of dyes in the given mixture.

Practical(Laboratory)Syllabus:

1. Green procedure for organic qualitative analysis: Detection of N, S and halogens
2. Separation of organic compounds in a mixture (acidic compound + neutral compound) using solvent extraction.
3. Separation of organic compounds in a mixture (basic compound + neutral compound) using solvent extraction.
4. Separation of given mixture of amino acids (glycine and phenylalanine) using ascending paper chromatography.
5. Separation of a given dye mixture (methyl orange and methylene blue) using TLC (using alumina adsorbent).
6. Separation of triglycerides using TLC
7. Separation of mixture of methyl orange and methylene blue by column chromatography
8. Separation of food dyes using Column 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 Rf values in TLC/ paper chromatography, loading of column, selection of solvent system for column chromatography, separation of aminoacids and dye mixture using chromatographic techniques.
2. **For Students**: Student shall visit are lated 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. Unittests(IE).

b) SuggestedCo-CurricularActivities

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