## **ORGANIC CHEMISTRY - I**

Semester	Subject Code	Category	Lecture Hours		Theory Hours		Practical hours		Credits
			Per week	Per sem.	Per week	Per sem.	Per week	Per sem.	
V	21CCH5B	Core-VI	5	75	5	75	-	-	5

## **COURSE OBJECTIVES:**

The students will be able to

• Gain knowledge about the various aspects of organic chemistry such as molecular rearrangements, stereoisomerism, conformational analysis, heterocyclic compounds and organic synthetic reagents.

## **COURSE OUTCOMES:**

On the successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	Understand about Molecular rearrangement reactions, mechanisms and their synthetic applications.	K4
CO2	Know about stereochemistry, symmetry elements, asymmetric synthesis, resolution, racemisation, Walden inversion, optical and geometrical isomerisms.	K4
CO3	Understand the conformational analyses of some organic compounds and the concepts behind it.	K4
CO4	Study about the concepts, characteristic features, preparation and reactions of heterocyclic compounds.	K3
CO5	Know about the applications of some important synthetic organic compounds such as Acetoacetic ester, Grignard reagents, Benzene diazonium chloride and Diazomethane.	K4

\*CO – Course Outcomes

Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze.

## MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	М	S	S	S	S
CO2	S	S	S	S	S	S
CO3	М	М	S	S	S	S
CO4	S	S	S	S	S	S
CO5	S	S	S	S	S	S

(S - Strong; M - Medium; L - Low)

#### **UNIT –I: Molecular Rearrangements**

- 1.1 Molecular rearrangements Classification Anionotropic and cationotropic rearrangement intermolecular and intramolecular rearrangement 1, 2-shift Mechanisms, evidences for Rearrangement to electron deficient carbon: Pinacol-pinacolone rearrangement Migratory aptitude Benzil-benzilic acid rearrangement.
- 1.2 Rearrangement to electron-deficient nitrogen: Beckmann, Hofmann, Curtius –
  Rearrangement to electron-deficient oxygen: Baeyer-Villiger oxidation, Dakin reaction –
  Aromatic rearrangements: Claisen (sigmatropic), para-Claisen and Fries rearrangements.

### **UNIT-II: Stereochemistry**

#### **15 Hours**

- 2.1 Stereoisomerism Definition Classification into optical and geometrical isomerism Optical isomerism Optical activity Optical and specific rotations Conditions for optical activity Configuration Asymmetric centre Chirality Achiral molecules Meaning of (+) and (-) notation D and L- notation Representation of molecules in Flying-wedge, Fischer, Saw horse, and Newman projection formulae and their interconversions using ethane and propane Elements of symmetry axis of symmetry, Plane of symmetry, center of symmetry and alternating axis of symmetry Enantiomers and diastereomers Cahn-Ingold-Prelog rules R, S- notation of optical isomers.
- 2.2 Optical activity of lactic acid and tartaric acid Meso form and Racemic mixture Racemisation Methods of racemisation Resolution Methods of resolution Asymmetric synthesis Walden inversion Optical activity of allenes, spiranes and biphenyls Stereoselective and stereospecific reactions (elementary idea only) Geometrical isomerism cis-trans, syn- anti and E, Z- notations Geometrical isomerism in maleic and fumaric acids Difference between the geometrical isomers.

### **UNIT – III: Conformational Analysis**

### **15 Hours**

3.1 Conformational analysis – Conformations – Conformational nomenclature: eclipsed – staggered – Gauche and anti conformations – Dihedral angle – Torsion angle – conformer
 – Energy barrier of rotation – Potential energy diagram – Differences between conformational isomers and configurational isomers – Conformational analysis of ethane and n-butane.

#### **15 Hours**

3.2 Conformational analysis of cyclohexane – Chair, boat and twist-boat conformations – Axial and equatorial bonds – Ring inversion – Conformations and stability of methylcyclohexane and dimethylcyclohexane.

## **UNIT – IV: Heterocyclic Compounds**

- 4.1 Heterocyclic compounds: Introduction Aromaticity of heterocyclic compounds Huckel's rule – Electrophilic substitution reactions in heterocyclic compounds – mechanism – Preparation, properties and structure of furan, pyrrole, thiophene and pyridine – Piperidine – Hofmann's exhaustive methylation – Comparative study of basicity of pyrrole, pyridine and piperidine with aliphatic amines.
- 4.2 Condensed five and six membered Heterocyclic compounds Quinoline, isoquinoline and indole: Preparation Skraup quinoline synthesis, Bischler-Napieralski synthesis and Fischer-indole synthesis Properties: oxidation, reduction and electrophilic substitution reactions Nucleophilic substitution reactions.

## **UNIT – V: Synthetic Organic Compounds**

- 5.1 Acetoacetic ester: Preparation by Claisen ester condensation Compounds containing active methylene group Synthetic applications of acetoacetic ester Organometallic compounds Examples Grignard reagents: Preparation Synthetic applications of Grignard reagents Benzene diazonium chloride: preparation Diazotization mechanism Synthetic applications Diazomethane: Preparation Von Pechmann method Synthetic applications Structure.
- 5.2 Mechanisms and Applications: H<sub>2</sub>/Ni H<sub>2</sub>-Pd-C Sodium borohydride Lithium aluminium hydride Clemmensen reduction Wolff-Kishner reduction MPV reduction.

S.	Authors	Title	Publishers	Year of
No.				publication
1.	P. L. Soni and	Text Book of Organic	Sultan Chand and Sons	1994
	H. M. Chawla	Chemistry		
2.	K. S. Tewari,	Text Book of Organic	Vikas Publishing	2006
	N. K. Vishal	Chemistry	House	
	and S. N.			
	Mehrotra			
3.	M. K. Jain and	Modern Organic	Vishal Publishing Co.	2017
	S. C. Sharma	Chemistry		

## **TEXT BOOKS:**

# **15 Hours**

# 15 Hours

## **REFERENCE BOOKS:**

S. No.	Authors	Title	Publishers	Year of
				publication
1.	B. S. Bahl and Arun	Advanced Organic	S. Chand and Private	1987
	Bahl	Chemistry	Ltd.	
2.	P. S. Kalsi	Stereochemistry,	New Age	2015
		Conformations and	International	
		Mechanisms	Publishers	
3.	O. P. Agarwal	Reactions and	Goel Publishing	2005
		Reagents	House	
4.	Gurdeep R. Chatwal	Organic Reaction	Himalaya Publishing	2008
		Mechanisms	House	
5.	Ernest L. Eliel	Stereochemistry of	Tata McGraw Hill	1990
		Carbon Compounds	publishing Ltd	
6.	I. L. Finar	Organic Chemistry	Pearson Education	2004
		Volume I and II		
7.	Gurdeep R. Chatwal	Chemistry of Natural	Himalaya Publishing	2003
		Products	House	
8.	Jerry March	Reaction, Mechanism	John Wiley and Sons	1992
		and Structure		
9.	V. K. Ahluwalia and	Organic Reaction	Narosa Publishing	2009
	Rakesh Kumar	Mechanisms	House	
	Parashar			

# **TEACHING METHODOLOGY:**

- Chalk and Board
- Power Point Presentations
- Assignments
- Animated videos
- Seminars
- Models
- Quizzes

## **SYLLABUS DESIGNER:**

• Dr. S. Santha Lakshmi, Assistant Professor of Chemistry