

ORGANIC CHEMISTRY
(Syllabus for Autonomous w.e.f 2019-20)
II/IV CHEMICAL ENGINEERING (I-SEM)

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CHE-214

Sessional marks: 40

End-Exam marks: 60

Course Objectives

- To impart knowledge on the basic concepts of organic chemistry.
- To create awareness on Stereo chemical approach of organic reactions.
- To impart knowledge on differences between primary, secondary and tertiary alcoholic compounds, and reactions of alcohols, phenol and carbonyl compounds with mechanisms.
- To give knowledge on preparation methods of acetic acids, Benzene diazonium salts and reactions of acid derivatives, amide, amines, diazonium salts with mechanisms.
- To create awareness on five membered and six membered hetero cyclic compounds and biological activity of sulpha drugs.

CO No.	Statement	Marks Allotted				
		Mid-1	Assign-1	CT-1A	CT-1B	Total Marks
CO-1	Name the organic compounds systematically based on IUPAC rules, apply the polar effects in predicting the relative strength of organic acids, bases and also predict chemical reactivity & stability of reaction intermediates	20	5	5	5	35
CO-2	Draw possible configurational and conformational isomers of organic molecules and apply sequence rules in identifying the stereochemistry of compounds	20	5	5	5	35
		Marks Allotted				
		Mid-2	Assign-2	CT-2A	CT-2B	Total Marks
CO-3	Differentiate primary, secondary and tertiary alcohols by using specific chemical reagents and also analyze chemical reactions of aldehyde and ketone and preferential reaction product formation with suitable reaction mechanisms.	15	5	5		25
CO-4	Select suitable chemical reagents for preparation of acids and diazonium salts.	15	5	5		25
CO-5	Apply the knowledge of properties of five membered and six membered hetero cyclic compounds and biological activity of sulpha drugs in industrial pharmaceutical preparations.	10	5		10	25

CO-PO Mapping

SUBJECT NAME:ORGANIC CHEMISTRY

YEAR/BRANCH: II/IV CHEMICAL

Pos	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO-1	3					1					1	1		
CO-2	3					1					1	1		
CO-3	3					1	1				1	1		
CO-4	3					1	1				1	1		
CO-5	3					1					1	1		

SYLLABUS:

UNIT-1

12 periods

FUNDAMENTALS OF ORGANIC CHEMISTRY.

Introduction to organic functional groups- IUPAC Nomenclature.

Polar effects – Inductive effect, Mesomeric effect, Electromeric effect and Hyperconjugation with examples; Reaction intermediates & hybridisation- carbocation, carbanion, free-radical, examples. Types of reagents- electrophile, nucleophile. Types of Organic Reactions-Addition, Elimination, Substitution, Rearrangement reactions.

Learning Outcomes :

At the end of this unit the student will be able to

- **Identify** the different function groups and also name them according to IUPAC system (L1)
- **Explain** the reactivity and stability of the organic species based on polar effects (L2)
- **Distinguish** the type of organic reactions the reactants undergo with formation of products (L3)

UNIT-2

10 periods

STEREOCHEMISTRY OF ORGANIC COMPOUNDS:

Stereoisomerism- definition-types. Representation of compounds – Sawhorse projection, Newmann projection, Fisher projection, Wedge formula- examples.

Conformational isomerism- examples of ethane, n-butane, cyclohexane & potential energy diagrams. Axial & Equatorial bonds in Cyclohexane.

Geometrical isomerism- Cis-trans & E-Z isomerism-sequence rules and examples. R & S configuration-sequence rules-examples.

Optical activity- Chirality, Enantiomers, diastereomers, mesomers, racemic mixture, Resolution of racemic mixture.

Learning Outcomes :

At the end of this unit the student will be able to

- **Apply** sequential rules to identify or name the Stereoisomer (L3)
- **Explain** the axial and equatorial bonds in cyclohexane (L2)
- **Identify** the asymmetric centre, enantiomers and diastereomers (L2)
- **Construct or draw** different canonical structures of Ethane and n -Butane(L3)

UNIT-3

12 periods

CHEMISTRY OF ALCOHOLS, PHENOLS & CARBONYL COMPOUNDS:

Industrial preparations of Ethyl alcohol (Molasses), Differences between alcohols- Oxidation, Lucas Test, Catalytic dehydrogenation, Victor-Meyer test. Chemical reactions of phenols- Fries rearrangement, Reimer-Tiemann reaction.

Carbonyl compounds: Chemical reactions-Cannizaro, Aldol, Reformatsky and Wittig reactions, Perkin Reaction, Differences between Aldehyde and Ketone.

- **Apply** The knowledge of Lucas test and Victor mayer test to identify the alcohol whether it is primary, secondary or tertiary alcohol (L3)
- **Explain** the Fries rearrangement, Reimer-Tiemann reaction with mechanism. (L2)
- **Describe** with possible reaction mechanism the chemical nature of carbonyl compounds in Cannizaro and aldol condensation(L2)
- **Distinguish** whether the carbonyl compound is aldehyde or ketone by doing chemical tests (L3)

UNIT-4**12 periods****CHEMISTRY OF CARBOXYLIC ACIDS & DERIVATIVES & AMINES:**

Industrial preparations of Acetic acid, chemical reactions (Hell-Volhard-Zelinsky reaction). Functional derivatives of carboxylic acids- Esters (acid & base catalyzed hydrolysis of Ester, Claisen condensation), amides (Hoffmann Bromamide reaction) and Acid halides (Rosenmunds reduction).

Amines: differences between amines and chemical reactions - Hoffmann elimination, Hinsberg test, Mustard oil test, Carbyl amine reaction. Benzene Diazonium salts and its synthetic applications- Coupling reactions, Schiemann reaction, Sandmayer reaction.

Learning Outcome :**At the end of this unit the student will be able to**

- **Explain** the Hoffmann Bromamide reaction and Claisen condensation with mechanism (L2)
- **Enumerate** the synthetic applications of diazonium salts in industrial sector (L2)
- **Describe** with reaction mechanism the Hoffmann elimination (L2)
- **Identify** the nature of amine using Hinsberg test, Mustard oil test (L2)

UNIT-5**10****periods****HETEROCYCLIC COMPOUNDS & SYNTHETIC APPLICATIONS OF SOME ORGANIC REAGENTS:**

Preparation, Properties and uses of – Five membered heterocyclic compounds- Pyrrole, Furan, Thiophene. Six membered heterocyclic compounds- Pyridine, Quinoline.

Biological activity of Sulpha drugs (Sulphanilamide, Sulphapyridine)

Learning Outcomes :**At the end of this unit the student will be able to**

- **Classify** heterocyclic compounds (L1)
- **Explain** Biological activity of Sulpha drugs (L2)
- **Explain** the physical and chemical nature of pyridine (L2)
- **Identify** the uses of heterocyclic compounds in industrial process (L2)

Recommended Text Books:

1. Text Book of Organic Chemistry by Arun Bahl & B.S.Bahl, VI Edition, 2015, S.Chand
2. Text Book of Organic Chemistry by Morrison & Boyd, VII Edition, 2010, Pearson

Reference books:

1. Organic chemistry by Jerry March, Wiley.
2. Text Book of Organic Chemistry by I.L.Finar (Vols.1&2), Pears