

ORGANIC CHEMISTRY
(Syllabus for Autonomous w.e.f 2020-21)
II/IV CHEMICAL ENGINEERING (I-SEM)

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End-Exam marks: 60

CHE-214

Sessional marks: 40

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