

ACHARYA NAGARJUNA UNIVERSITY

DEPARTMENT OF CHEMISTRY

M.Sc. CHEMISTRY :: SEMESTER-II

PAPER-II: ORGANIC CHEMISTRY-II (R22CH22)

(For the students admitted from the A.Y. 2022-2023 onwards)

Max. Marks: 100

(Internal-30M & External-70M)

SYLLABUS

Learning Objectives:

- ✓ To know the general methods of synthesis involving carbon-carbon multiple bonds.
- ✓ To know various mechanisms involved in aliphatic and aromatic Nucleophilic/electrophilic substitution reactions.
- ✓ To know about various elimination mechanisms in different types of substrates.
- ✓ To know the importance of functional group protection in organic synthesis.
- ✓ To know the mechanisms involved in various types of named reactions and their applications in organic synthesis.

UNIT-I

12H

General Methods for Synthesis: Addition reactions involving electrophiles (Br_2 , HBr , HOBr , and $\text{H}_2\text{O}/\text{H}_2\text{SO}_4$); nucleophilic additions (Michael addition, Mannich, and Grignard reactions); Addition to C-C multiple bonds-stereo chemistry of addition, formation and reactions of epoxides, syn and anti hydroxylation; hydrogenation (catalytic and Non catalytic).

UNIT-II

12H

Aliphatic Nucleophilic Substitutions: The $\text{S}_{\text{N}}2$, and $\text{S}_{\text{N}}1$: Mechanisms, energy profile diagram and stereochemistry; $\text{S}_{\text{N}}i$, mixed $\text{S}_{\text{N}}1$ & $\text{S}_{\text{N}}2$, and SET mechanisms; Factors influencing nucleophilic substitution reactions: Effect of structure, nucleophile, solvent, and leaving group.

The neighbouring group mechanism: Neighbouring group participation by O, N, S, halogens, in nucleophilic substitution reactions..Concept of classical and Non-classical carbocations-Participation of Pi and Sigma bonds as neighbouring groups. Anchimeric assistance-steric requirement.

UNIT-III

12H

Aromatic Nucleophilic Substitutions: The $\text{S}_{\text{N}}\text{Ar}$, $\text{S}_{\text{N}}1$ mechanisms and benzyne mechanism. Reactivity-effect of substrate structure, leaving group and attacking nucleophile. The Von-Richter, Sommelet-Hauser and Smiles rearrangements.

Aromatic Electrophilic Substitution reactions -Friedel Crafts Alkylation, Acylation, Halogenations.

UNIT-IV

12H

Elimination and Protecting Groups:

- a) Types of elimination ($\text{E}1$, $\text{E}1\text{CB}$, $\text{E}2$) reactions, mechanisms, stereochemistry and orientation, Hofmann and Saytzeff's rules, Syn elimination versus anti elimination. Competitions between elimination and substitution.

- b) Dehydration, dehydrogenation, decarboxylative elimination, pyrolytic elimination, molecular rearrangement during elimination.
- c) *Importance of functional group protection in organic Synthesis*: Protecting agents for the protection of functional groups- Hydroxyl group, Amino group, Carbonyl group and Carboxylic acid group.

UNIT-V

12H


Familiar Named Reactions: Benzoin, Perkin, Cannizzaro, Dieckmann and Stobbe condensations; Hofmann, Schmidt, Lossen, Curtius, Claisen, Beckmann and Fries rearrangements; Reformatsky, Favoursky, Wittig reaction, Baeyer Villiger reaction and Chichibabin reaction, Oppenauer oxidation, Clemmensen, Wolff-Kishner, Meerwein-Ponndorf-Verley and Birch reductions..

Reference Books:

- 1) Advanced organic chemistry – reaction, mechanism and structure, Jerry March, John Wiley.
- 2) Advanced organic chemistry, F.A.Carey and R.J.Sundberg, Plenum.
- 3) A guide book to Mechanism in organic chemistry, Peter Sykes, Longman.
- 4) Organic chemistry, I.L.Finlar, Vol. I & II, Fifth ed. ELBS, 1975.
- 5) Organic chemistry, Hendrickson, Cram and Hammond (Mc Graw – Hill).
- 6) Stereo Chemistry of carbon compounds – E.L. Eliel.
- 7) Modern organic Reactions, H.O.House, Benjamin.
- 8) An introduction to chemistry of Heterocyclic compounds, R.M.Acheson.
- 9) Structure and mechanism in organic chemistry, C.K.Ingold, Cornell University Press.
- 10) Principles of organic synthesis, R.O.C.Norman and J.M.Coxon, Blakie Academic & Professional.
- 11) Reaction Mechanism in organic chemistry, S.M.Mukherji and S.P.Singh, Macmillan.

Learning Outcomes:

- ✓ Students understand the mode of addition reactions involving addition by electrophile and nucleophiles over unsaturated bonds between carbons
- ✓ Students understand and apply the substitution and elimination reaction mechanisms at aliphatic and aromatic substrates for various reactions leading to research
- ✓ Understand how to protect various functional groups in organic synthesis and can apply the same to novel molecules useful for research also.
- ✓ Students understand the mechanisms of studied named reactions and their applications in organic synthesis.
- ✓ To learn the molecular rearrangements.


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