



GAYATRI VIDYA PARISHAD
COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
Affiliated to Andhra University || Accredited by NAAC and NBA
VISAKHAPATNAM

DEPARTMENT OF ORGANIC CHEMISTRY

M.Sc. (Final) CHEMISTRY
SEMESTER-IV SYLLABUS

PAPER – 1: MODERN SYNTHETIC METHODOLOGY IN ORGANIC CHEMISTRY
(Effective from the admitted batch of 2022-2023)

Credits: 4		Theory: 4 Hours
Max Marks: 100	External: 80	Internal: 20

Course Outcomes (COs)/Course Specific Outcomes (CSOs):

- CO 1: Acquire the knowledge of modern synthetic methods,
- CO 2: Understands various multicomponent reactions
- CO 3: Develop knowledge on various Oxidizing reagents used in organic synthesis
- CO 4: Develop knowledge on various reducing reagents used in organic synthesis
- CO 5: Acquire and understand various new methods in organic synthesis

Course learning outcome (LOs):

Upon completion of the course the students should be able to:

- LO 1: Explain and apply modern synthetic methods in preparing new molecules
- LO 2: Analyze various multicomponent reactions
- LO 3: Apply different oxidizing reagents in organic synthesis
- LO 4: Apply different reducing reagents in organic synthesis
- LO 5: Solve and analyze new green chemistry methods in organic synthesis.
- LO 6: Compare various modern synthetic methods, multicomponent reactions, oxidation, reduction and green chemistry related reactions

UNIT – I: Modern Synthetic Methods **[12 Hours]**

Baylis-Hillman reaction, Henry reaction, Nef reaction, Kulinkovich reaction, Ritter reaction, Sakurai reaction, Tishchenko reaction and Ugi reaction. Brook rearrangement; Tebbeolefination. Nozaki-Hiyama, Buchwald-Hartwig, Ullmann coupling reaction.

UNIT-II: Multi component Reactions: **[12 Hours]**

Passerini reaction, Biginelli reaction, Hantzsch reaction and Mannich reaction. Metathesis: Grubb's 1st generation and 2nd generation catalyst, Olefin Cross coupling Metathesis (OCM), Ring Closing Metathesis (RCM), Ring Opening Metathesis (ROM) and applications.

UNIT-III: Oxidation **[12 Hours]**

Oxidation: Metal based and non-metal based oxidations of (a) alcohols to carbonyls (Chromium, Manganese, aluminium, silver, ruthenium, DMSO, and TEMPO based reagents). (c) alkenes to epoxides (peroxides/per acids based), Sharpless asymmetric epoxidation, Jacobsen epoxidation, Shi epoxidation. (d) alkenes to diols (Manganese, Osmium based), Sharpless asymmetric dihydroxylation, Prevost reaction and Woodward modification, (e) alkenes to carbonyls with bond cleavage (Manganese, Osmium, and ozonolysis) (f) alkenes to alcohols/carbonyls without bond cleavage (selenium, chromium based allylic oxidation)

UNIT-IV: Reduction **[12 Hours]**



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Reduction: (a) Catalytic hydrogenation (Heterogeneous: Palladium/Platinum/Rhodium/Nickel etc; Homogeneous: Wilkinson). Noyori asymmetric hydrogenation. (b) Metal based reductions using Li/Na/Ca in liquid ammonia, Sodium, Magnesium, Zinc, Titanium and (Birch, Pinacol formation, McMurry, Acyloin formation, dehalogenation and deoxygenations) (c) Hydride transfer reagents-NaBH₄ triacetoxyborohydride, L-selectride, K-selectride; LiAlH₄, DIBAL-H, and Red-Al.

UNIT-V: newer methods in organic synthesis:

[12 Hours]

Green Chemistry: Introduction, principles, atom economy and scope (illustrate with two examples) **Microwave induced reactions:** Principle conditions, advantages over conventional heating methods-applications **Ionic liquids:** Introduction and applications in organic synthesis (illustrate with two examples). **Nanomaterials:** Introduction, methods of preparation, applications in organic synthesis **Phase-transfer catalysis:** solid-solid, solid-liquid systems-mechanism of catalytic action, type of catalysts, application in few important reactions

Text Books:

1. Some Modern Methods of Organic Synthesis W. Carothers, Third Edition, Cambridge University Press, Cambridge, 1988.
2. F. A. Cary and R. I. Sundberg, Advanced Organic Chemistry, Part A and B, 5th Edition, Springer, 2009.
3. M. B. Smith, Organic Synthesis, 2nd Edition, 2005
4. J. Tsuji, Palladium Reagents and Catalysts, New Perspectives for the 21st Century, John Wiley & Sons, 2003.
5. I. Ojima, Catalytic Asymmetric Synthesis, 2nd edition, Wiley-VCH, New York, 2000.
6. J. Clayden, N. Greeves, S. Warren and P. Wothers, Organic Chemistry, Oxford University Press, 2001.
7. R. Noyori, Asymmetric Catalysis in Organic Synthesis, John Wiley & Sons, 1994.
8. L. Kuerti and B. Czako, Strategic Applications of named Reactions in Organic Synthesis Elsevier Academic Press, 2005.
9. Green chemistry, Theory and Practical, Paul T. Anastas and John C. Warner.
10. New trends in green chemistry By V.K. Ahluwalia and M. Kidwai.
11. Organic Synthesis: Special techniques. V.K. Ahluwalia and Renu Agarwal

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