

OC H 513: ADVANCED HETEROCYCLIC CHEMISTRY

Course Outcome

- Students will understand the various types of systematic nomenclature of simple, fused and bridged heterocyclic compounds with one or more diverse heteroatoms.
- Students will get the sound knowledge on the structure, synthesis and reactions of various three, four, five, six and seven membered simple and fused heterocyclic compounds with one or more heteroatom
- Study the use of heterocycles in functional group and ring transformations.
- Students will acquire knowledge about the synthesis and reactions of mesoionic compounds, structure and synthesis of anthocyanins, anthocyanidins, flavones, flavonols and isoflavones.

UNIT-I Heterocyclic Chemistry-I

[12 Hours]

Introduction, Biologically important heterocycles, Nomenclature of Heterocycles, Replacement and systematic nomenclature, Hantzsch-Widman system for monocyclic, fused and bridged heterocycles. Synthesis and reactions of three membered heterocycles-aziridines, oxiranes and episulfides. Synthesis and reactions of four membered heterocycles-oxetanes, azetidines and thietanes. Synthesis & reactions of five membered heterocycles-furan, pyrrole, thiophene, oxazoles, imidazoles and thiazoles.

UNIT-II Heterocyclic Chemistry-II

[12 Hours]

Structure, synthesis and reactions of six membered heterocycles-pyridine, α - and γ -Pyrones, Pyrimidines. Synthesis and reactions of seven heterocycles-Azepines, Oxepines and Thiepinines. Synthesis and reactions of fused heterocycles-benzofuran, benzothiophene & indole. Quinoline, Isoquinoline, Coumarin, Naphthyridine. **Mesoionic compounds**: Introduction, Synthesis and reactions of sydnones. **Anthocyanins and Anthocyanidins**: Introduction and general methods of synthesis.

UNIT-III Heterocyclic Chemistry-III

[12 Hours]

Flavones, Flavonols and Isoflavones: Introduction and synthesis of flavone, flavonal and quercetin. Structural elucidation and synthesis of Uric acid, Caffeine. **Heterocycles in functional group and ring transformations**: Alkanes from thiophenes, alcohols from isooxazolines, conversion of coumarin to benzofuran, sydnone to pyrazole, chromones to pyrazoles, furans to pyridines, pyrrole to pyridines, pyrimidine to pyrazole, isatins to quinolines, indoles to quinoline. Dimroth and Cornforth rearrangements.

UNIT-IV Heterocyclic Chemistry-IV

[12 Hours]

Synthesis of allo and myo inositols from furan, 5,6-dihydro-7-methyl-1,4-indandione from 2-methylfuran. Quinizarine from 2-methoxy furan, trans,trans-2,4-hexadiene from 2,5-dimethylpyrrole, γ -aryl- γ -aminobutanoic acid from pyrrole, (+)-(S)-4-methyl-3-heptanone from (S)-

1-amino-2-(methoxymethyl)pyrrolidine, 3,5-dimethyl-2-(2-methylpropyl), cyclopentan-1-one from 4-(5-*tert*-butylthiophen-3-yl)-3-methylbutan-2-one, diketone from 5-substituted –furan-2-aldehyde, δ -methyl-1-hydrindanone from 2,5-dihydro-4-methoxycarbonyl-2-thiophene acetic acid methylester, 3-butenal from oxathiolane-3,3-dioxide, dimethoxy- α -methyldopa from 4-methyl-5-ethoxy-1,3-oxazole, cis- β -amino alcohol from 3-acetyl-1,3-oxazol-2(3*H*)-one. Diastereomeric mixtures of γ -aminoalcohols from 2-methyl isoxazolidine. 3,5-dimethoxy-1,2-dimethylphthalate from 4,5-dimethoxypyrone, Barrelene from 2*H*-pyran-2-one, 3-oxohept-6-enenitrile from 2-methylisoxazole.

References

1. An Introduction to the Chemistry of Heterocyclic Compounds, Acheson, Wiley Eastern, (1997).
2. Heterocyclic Chemistry, J. Joule & G. Smith, Van Nostrand ELBS, (1978).
3. Comprehensive Heterocyclic Chemistry, Vol – I to VI, Katritzky & Rees, Pergamon, (1984).
4. Organic Chemistry, Vol I & II, I. L. Finar, Longmann ELBS, (1973).
5. Name reactions in Heterocyclic Chemistry, J. J. Li, Springer, (2014).

