

Syllabus

M.Sc. (Chemistry) Programme

(SEMESTER – IV)

Chemistry of Natural Products & Heterocyclic Compounds ((Elective)
Programme Code- (MSCCH -21)
Course Code – (MSCCH -607)

Block I Chemistry of Natural Products

Unit 1 Terpenoids and Carotenoids

Classification, nomenclature, occurrence, isolation, general methods of structure determination, isoprene rule. Structure determination, stereochemistry, biosynthesis and synthesis of the following representative molecules: Menthol, Santonin and β -Carotene.

Unit 2 Alkaloids

Definition, nomenclature and physiological action, occurrence, isolation, general methods of structure elucidation, classification, role of alkaloids in plants. Structure, stereochemistry, synthesis and biosynthesis of Morphine and Reserpine .

Unit 3 Steroids

Occurrence, nomenclature, basic skeleton, Diel's Hydrocarbon and stereochemistry. Isolation, structure determination synthesis and biosynthesis of Cholesterol , Testosterone and Estrone.

Unit 4 Plant Pigments / Porphyrins

Occurrence, extraction, classification, chemical characterization and functions of anthocyanins, flavonoids, xanthophylls and porphyrins. Chemistry and structure of cyanins, flavones, flavonol, quercetin. Biosynthesis of flavonoids: Acetate and Shikimic acid pathway. Structure and synthesis of porphyrin skeleton, haemin and chlorophyll.

Unit 5 Prostaglandins/ Pyrethroids and Rotenones

Occurrence, nomenclature, classification, biogenesis and physiological effects. Synthesis of PGE₂ and PGE₂ α . Synthesis and reactions of Pyrethroids and Rotenones. Note: In structure elucidation, emphasis is to be laid on the use of spectral parameters, wherever possible.

Block II Heterocyclic Chemistry

Unit 6 Nomenclature of Heterocycles / Aromatic and Non-aromatic Heterocycles

Systematic nomenclature (Hantzsch-Widman System) for monocyclic, fused and bridged heterocycles. Tautomerism in aromatic heterocycles. Strain-bond angle, torsional strains and their consequences in small ring heterocycles. Conformation of six-membered heterocycles with reference to molecular geometry, barrier to ring inversion, pyramidal inversion and 1,3- diaxial interaction.

Unit 7 Heterocyclic Synthesis

Three membered and four-membered heterocycles-synthesis and reactions of aziridines, oxiranes, thiranes, azetidines , oxetanes and thietanes. Benzo-Fused Five-membered Heterocycles Synthesis and reactions including medicinal applications of benzopyrroles, benzofurans and benzothiophenes.

Unit 8 Small Ring Heterocycles

Heterocyclic Systems Containing Phosphorus Heterocyclic rings containing phosphorus: Introduction, nomenclature, synthesis and characteristics of 5- and 6-membered ring systems-phosphorinanes , phospholanes and phospholes.

Books Suggested:

1. I. L. Finar Vol. I & II, ELBS. Stereoselective Synthesis:
2. A Practical Approach, M. Norgradi, VCH.
3. Introduction to Flavonoids, B.A. Bhom, Harwood Academic Publishers.
4. New Trends in Natural Product Chemistry, Attu-ur-Rahman and M.I. Choudhary, Harwood Academic Publishers.
5. Insecticides of Natural Origin, Suk Dev, Harwood Academic Publishers.
6. Heterocyclic Chemistry Vol. 1-3, R.R. Gupta, M. Kumar and V. Gupta, Springer Verlag.
7. Chemistry of Heterocycles, T. Eicher and S. Hauptmann, Thieme.
8. Contemporary Heterocyclic Chemistry, G.R. Newkome and W.W. Paudler, Wiley-Inter Science.
9. An Introduction to the Heterocyclic Compounds, R.M. Acheson, John Wiley.
10. Comprehensive Heterocyclic Chemistry, A.R. Katritzky and C.W. Rees, eds. Pergamon press. Chemistry of Natural Products: A unified Approach, N.R. Krishnaswamy, Universities Press, Hyderabad.