

PAPER IV (B)
CHEMISTRY OF HETEROCYCLIC AND
NATURAL PRODUCTS

Time: 3 Hrs.

M.M. 100

Note: The paper will be divided into THREE sections.

Section-A : Ten questions (short type answer) two from each Unit will be asked. Each question will be of one mark and the candidates are required to attempt all questions. **Total 10 marks**

Section-B : Five questions (answer not exceeding 250 words) one from each Unit with internal choice will be asked and the candidates are required to attempt all questions. Each question will be of 10 marks. **Total 50 marks**

Section-C : Four questions may be in parts covering all the five Units (answer not exceeding 500 words) will be asked. The candidates are required to attempt any TWO questions. Each question will be of 20 marks. **Total 40 marks**

UNIT-I

Nomenclature of heterocycles - Replacement and systematic nomenclature (Hantzsch-Widman system) for monocyclic, fused and bridged heterocycles.

Small ring heterocycles - Three membered heterocycles with one and two hetero atoms-synthetic methods, physical, spectroscopic and chemical

properties of aziridines, oxiranes, thiiranes, diaziridines, diazirines, oxaziridines, four membered heterocyclic compounds - Synthetic methods, physical, spectroscopic and chemical properties of azetines, azetidines, oxetanes, thietanes and their carbonyl derivatives.

UNIT-II

Benzo-fused five membered heterocycles - Synthetic methods, physical and chemical properties of benzopyrroles, benzofuranes and benzothiophenes.

Six-membered heterocycles - Synthetic methods, physical and chemical properties of pyrilium salts, pyrones, quinolizinium salts, pyridazines, pyrimidines, pyrazines, acridines and phenanthridines

Seven membered heterocycles - Synthetic methods, physical and chemical properties of azepines, oxepines, thiepinines and diazepines.

Meso-ionic heterocycles - Synthetic methods, properties of 1,3-oxazolium-4-olates, 1,3-oxathiolium-4-olates, 1,3-diazolium-4-olates, 1,2,3-oxadiazolium-5-olates and 1,2-diathiolium-4-olates

UNIT-III

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 - Citral, Geraniol, α -Terpineol, Menthol, Farnesol, Zingiberene, Santonin, Phytol, Abietic acid and β -Carotene

Porphyrins - Structure and synthesis of haemoglobin and chlorophyll.

UNIT-IV

Alkaloids - Definition, nomenclature and physiological action, occurrence, isolation, general methods of structure elucidation, degradation, classification based on nitrogen heterocyclic ring, role of alkaloids in plants, structure, stereochemistry, synthesis and biosynthesis of following - Ephedrine, (+) - Coniine, Nicotine, Atropine, Quinine and Morphine.

Plant pigments - Occurrence, nomenclature and general methods of structure determination, isolation and synthesis of Apigenin, Luteolin, Quercetin, Myrcetin, Quercetin-3-glucoside, Vitexin, Diadzein, Butein, Aureusin, Cyanidin-7, arabinoside, Cyanidin and Hirsutidin.

Biosynthesis of flavonoids - acetate pathway and shikimic acid.

UNIT-V

Steroids - Occurrence, nomenclature, basic skeleton, Diel's hydrocarbon and stereochemistry, isolation, structure determination and synthesis of Cholesterol, Bile acids, Androsterone, Testosterone, Estrone, Progesterone, Aldosterone, biosynthesis of steroids.

Prostaglandins - Occurrence, nomenclature, classification, biogenesis and physiological effects, synthesis of PGE₂ and PGF₂ α .

Pyrethroids and Rotenones - Synthesis and reactions of pyrethroids and rotenones.

Books Recommended-

1. Heterocyclic Chemistry, R.R Gupta, M. Kumar and V. Gupta, Springer Verlag.
2. The Chemistry of Heterocycles, T. Eicher and S. Hauptmann, Thieme.
3. Heterocyclic Chemistry, J.A Joule, K. Mills and G.F. Smith, Chapman and Hall
4. Heterocyclic Chemistry, T.L. Gilchrist, Longman Scientific Technical
5. An Introduction to the Heterocyclic Compounds, R. M. Acheson, John Wiley.
6. Comprehensive Heterocyclic Chemistry, A.R Kartritzky and C.W Rees.
7. Stereoselective Synthesis: A Practical Approach, M. Nogradi.
8. New Trends in Natural Products Chemistry, Attaur-Rahman and M.I. Choudhary.
9. Chemistry of Natural Products, S.N. Bhat