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May 2026

B.SC. (CHEMISTRY) IV SEMESTER

Organic Chemistry III (BCHT–DS–402)

Time : 3 Hours] [Maximum Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART–A

1. (a) Write one example of a medicinal alkaloid used as a painkiller. (1.5)

   (b) Distinguish between nitriles and isonitriles in one line. (1.5)

   (c) What is isoprene rule? (1.5)

   (d) Give one example of electrophilic substitution reaction of Anthracene. (1.5)

   (e) Describe the carbylamine reaction. (1.5)

   (f) Write the reaction of Doebner-Miller synthesis of Quinoline. (1.5)

(g) What is Mannich reaction? (1.5)

(h) Write the reaction involved in the synthesis of isoquinoline. (1.5)

(i) What type of substitution does pyridine undergo easily? (1.5)

(j) What is the product formed when secondary amines react with nitrous acid? (1.5)

PART–B

2. (a) Discuss how Hinsberg's test can be used for the identification and differentiation of 1°, 2°, and 3° amines. Include the reaction mechanism and characteristic observations for each type of amine. (10)

(b) Discuss the Fischer indole synthesis and its step wise mechanism. (5)

3. (a) Explain Emde degradation (Emde modification). Write the reaction involved and discuss its importance in the structure elucidation of amines and alkaloids. (5)

(b) Explain the Hofmann elimination reaction in detail. Describe the mechanism of the reaction and significance of Hoffmann rule with suitable examples. (10)

4. Describe the synthesis, important reactions, and mechanisms of substitution reactions of furan, pyrrole (including Paal-Knorr and Knorr syntheses) and thiophene. Explain the key difference between the reactivity of three heterocycles. (15)

5. (a) What is Hofmann exhaustive methylation? Explain its mechanism. (5)

(b) Discuss the structure elucidation of nicotine, highlighting the key experimental evidences that led to the determination of its molecular structure. Also outline the synthetic route for the preparation of nicotine. (10)

6. (a) Explain the structure elucidation of naphthalene. Discuss the experimental evidences based on molecular formula, oxidation reactions, hydrogenation studies, and electrophilic substitution reactions that led to the determination of its fused ring structure. (10)

(b) Describe Gabriel phthalimide method of synthesis of aliphatic primary amines. Why is it preferred over other methods? (5)

7. Explain the following reactions: (15)

(a) Synthesis of Citral.

(b) Skraup synthesis.

(c) Diazonium salts : Azo coupling.
