ALUPE UNIVERSITY COLLEGE
...Bastion of Knowledge...
P. O.Box 845-50400 Busia(K)
principal@auc.ac.ke
Tel: +254 741 217 185
+254 736 044 469
off Busia-Malaba road

OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2021/2022 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER REGULAR EXAMINATION

FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE

COURSE CODE: **CHE 403**

COURSE TITLE: **HETEROCYCLIC AND STEREOCHEMISTRY**

DATE: 8TH JUNE, 2022 **TIME: 1400 – 1700 HRS**

INSTRUCTION TO CANDIDATES

- SEE INSIDE

THIS PAPER CONSISTS OF PRINTED PAGES 3 **PLEASE TURN OVER**

REGULAR – MAIN EXAM

CHE 403: HETEROCYCLIC AND STEREOCHEMISTRY

STREAM: BED (Scie) **DURATION: 3 Hours**

INSTRUCTIONS TO CANDIDATES

i. *Answer **ALL** questions.*

ii. *Diagrams may be used whenever they serve to illustrate the answer.*

iii. *Do not write on the question paper.*

Question One

a) What is stereochemistry (2 Marks)

b) Differentiate between the stereochemical terms

i. A chiral molecule and an achiral molecule (2 Marks)

ii. A chirality and a chiral center (2 Marks)

iii. Enantiomer and diastereomer (2 Marks)

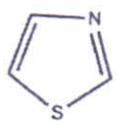
iv. Why is stereochemistry important to the pharmaceutical industry (2 Marks)

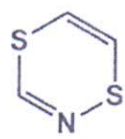
v. Explain why stereochemistry has extremely important implications in life (2 Marks)

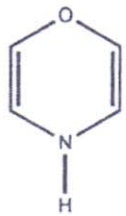
Question Two

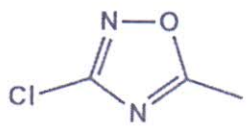
a) Name **four** heterocyclic based pharmaceutical drugs in local markets. (2 Marks)

b) Name the following heterocyclic compounds. (5 Marks)









c) Explain why heterocycles undergo substitution reactions much faster than benzene under similar conditions (4 Marks)

d) Describe the commercial importance of furan (1 Mark)

Question Three

a) Heterocycles are named by following set nomenclature. Explain in detail **Three** IUPAC ways of naming. (6 Marks)

b) Explain why six membered heterocycles are generally electron deficient compared to benzene (3 Marks)

c) Describe three key differences between the structure of pyridine and benzene. (3 Marks)

Question Four

a) Using relevant equations and examples, explain Feist-Benary synthesis of furans, pyrroles and thiopenes (3 Marks)

b) Draw the structures of the following compounds: (9 Marks)

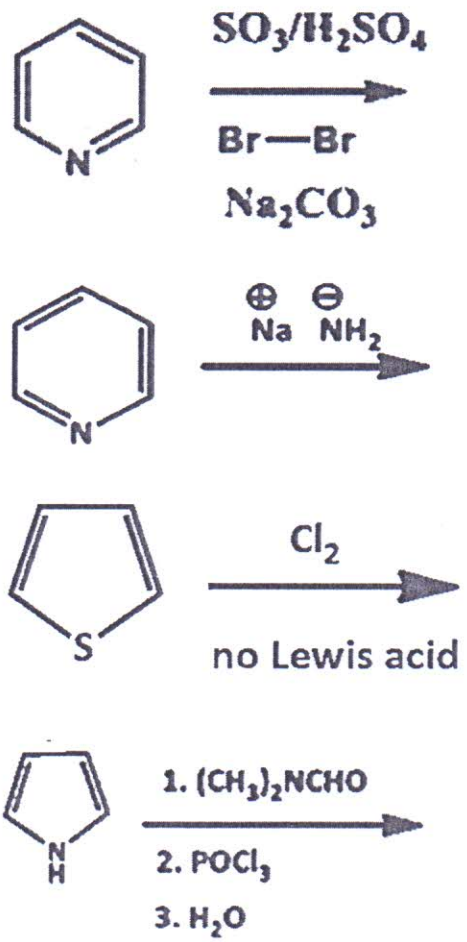
i. Oxirane
ii. Thiirane
iii. Aziridine
iv. Oxetane
v. Thietane
vi. Azetidine
vii. Oxolane
viii. Thiolane
ix. Azolidine

Question Five

a) Using relevant equations and examples, explain Knorr-pyrrole synthesis of furans, pyrroles and thiopenes (3 Marks)

b) Explain, giving reasons, the preferred electrophilic and nucleophilic substitution positions in five membered aromatic heterocycles (5 Marks)

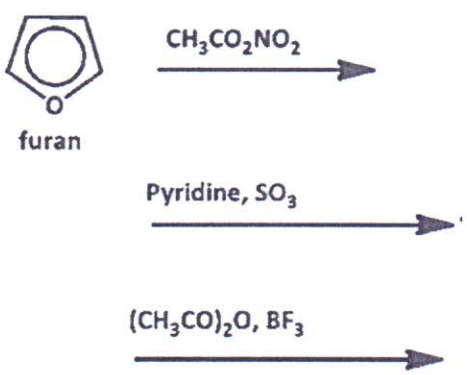
c) Determine the product for the reactions below? (4 Marks)



Question Six

a) Discuss some reactions that can be predicted for pyridines on the basis of their electronic structure (5 Marks)

b) Complete the following reactions of furans. For each, state the type of reaction (3 Marks)



c) Using relevant equations and examples, explain Fiesselmann synthesis of furans, pyrroles and thiopenes (5 Marks)

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