



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF BIOLOGICAL, PHYSICAL, MATHEMATICS & ACTUARIAL
SCIENCES
UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF EDUCATION
(SCIENCE) WITH IT
4TH YEAR 1ST SEMESTER RESIT
MAIN CAMPUS

COURSE CODE: SPB 9312

COURSE TITLE: ALICYCLIC AND HETEROCYCLIC CHEMISTRY

DATE:

TIME:

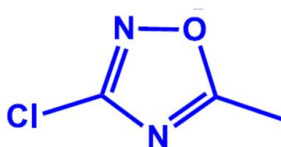
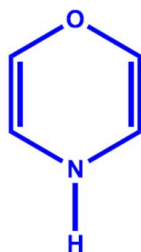
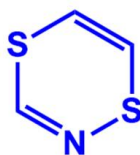
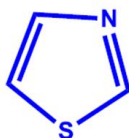
TIME: 2 HOURS

Instructions:

- 1. Answer ALL questions in Section A and B and ANY other TWO questions in Section C**

Section A - Compulsory
QUESTION ONE (30 marks)

- a) Explain why heterocycles undergo substitution reactions much faster than benzene under similar conditions [4 marks]
- b) Pyrazole is a 5-membered heterocycle. Is it aromatic or non-aromatic? Explain. [2 marks]
- c) Name the following heterocyclic compounds. [5 marks]



- d) State any **THREE** five membered unsaturated heterocycles. [3 marks]
- e) Describe the commercial importance of furan [2 marks]
- f) Heterocycles are named by following set nomenclature. Explain in detail **Three** IUPAC ways of naming. [9 marks]
- g) Name **five** heterocyclic based pharmaceutical drugs in local markets. [5 marks]

SECTION B

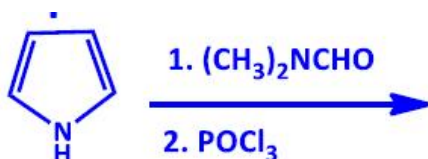
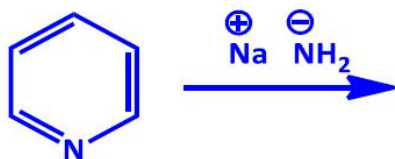
QUESTION TWO (20 marks)

- a. Explain why six membered heterocycles are generally electron deficient compared to benzene [3 marks]
- b. Draw the structures of the following compounds shown below: [9 marks]
- Oxirane
 - Thiirane
 - Aziridine
 - Oxetane

- v. Thietane
- vi. Azetidane
- vii. Oxolane
- viii. Thiolane
- ix. Azolidane

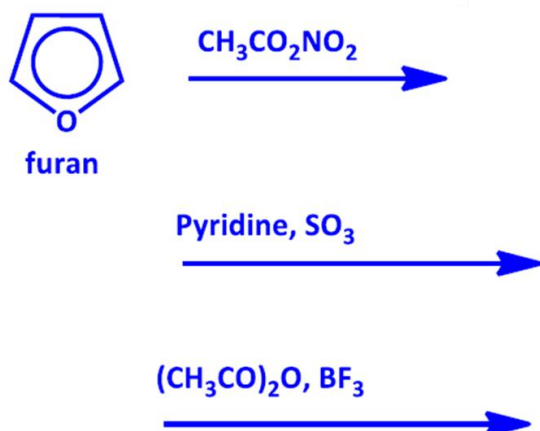
c* Determine the product for the reactions below?

[8 marks]



QUESTION THREE (20 marks)

- a. Complete the following reactions of furans. For each, state the type of reaction [6 marks]



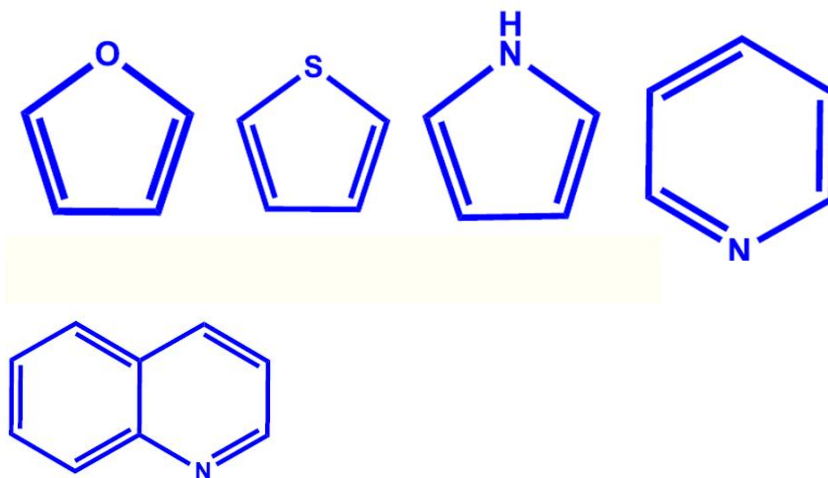
- b. Describe three key differences between the structure of pyridine and benzene. [3marks]
- c. Discuss some reactions that can be predicted for pyridines on the basis of their electronic structure [9 marks]
- d. Briefly discuss the order of aromaticity of pyrrole, furan and thiophene. [2 marks]

QUESTION FOUR (20 marks)

a. Using relevant equations and examples, explain;

- Feist-Benary synthesis of furans, pyrroles and thiophenes [5 marks]
- Knorr-pyrrole synthesis of furans, pyrroles and thiophenes [5 marks]
- Fiesselmann synthesis of furans, pyrroles and thiophenes [5 marks]

b. What are the common names for the following compounds [5 marks]



QUESTION FIVE (20 marks)

- a. Explain, giving reasons, the preferred electrophilic and nucleophilic substitution positions in five membered aromatic heterocycles [5 marks]
- b. Discuss the synthesis of pyridine [15 marks]