



**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**  
**4<sup>TH</sup> YEAR 1<sup>ST</sup> SEMESTER 2022/2023 ACADEMIC YEAR**  
**MAIN CAMPUS**

---

**COURSE CODE: SPB 9312**

**COURSE TITLE: ALICYCLIC AND HETEROCYCLIC CHEMISTRY**

**DATE:**

**TIME:**

**TIME: 2 HOURS**

---

**Instructions:**

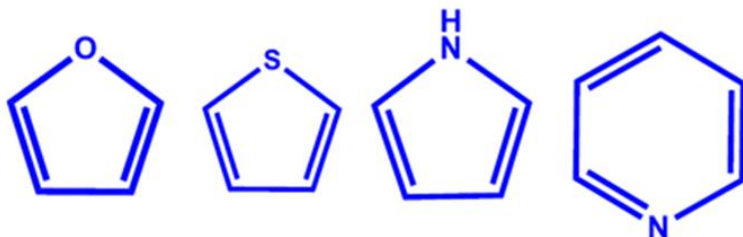
- 1. Answer ALL questions in Section A and B and ANY other TWO questions in Section C**

### QUESTION ONE (30 marks)

- a. Using the replacement nomenclature system, name the following heterocycles (5 marks)



- b. What are the non-systematic/common names for the following heterocycles (4 marks)

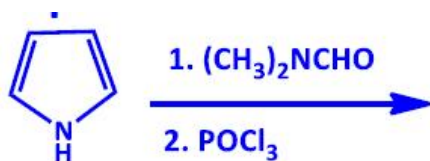
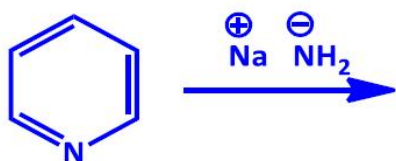


- c. Draw the structures of the following heterocycles (7 marks)

- i. 3-ethyl-5-methylpyrazole
- ii. 1-Methylindazole
- iii. Oxaziridine
- iv. 1,3 Thiazole
- v. 1,4,2-Dithiazine
- vi. 1,4-oxazine
- vii. 3-chloro-5-methyl-1,2,4-oxadiazole

- d. Describe the commercial importance of furan [2 marks]

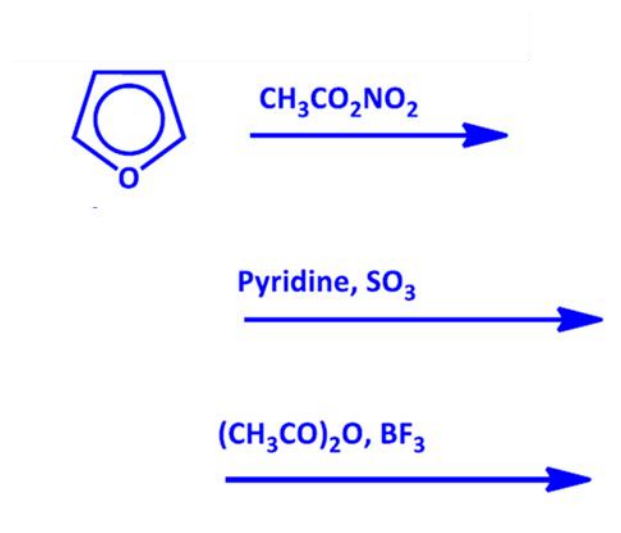
- e. Explain why six membered heterocycles are generally electron deficient compared to benzene [3 marks]
- f. Determine the product for the reactions below. Give the name for each type of reaction? [8 marks]



## SECTION B

### QUESTION TWO (20 marks)

- a. Name **four** heterocyclic based pharmaceutical drugs in local markets. [5 marks]
- b. Complete the following reactions. For each, state the type of reaction [6 marks]



c. Using relevant examples, discuss the common strategies for the synthesis of five membered unsaturated and aromatic heterocycles (12 marks)

### QUESTION THREE (20 marks)

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

### QUESTION FOUR (20 marks)

- Using relevant examples, discuss the common strategies to the synthesis of five membered saturated heterocycles (12 marks)
- Describe three key differences between the structure of pyridine and benzene. [3marks]
- Discuss some reactions that can be predicted for pyridines on the basis of their electronic structure [9 marks]

### QUESTION FIVE (20 marks)

Propose a mechanism for each of the following reactions (20 marks)

