



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF  
SCIENCE AND TECHNOLOGY  
(MMUST)**

**MAIN CAMPUS**

**UNIVERSITY EXAMINATIONS**

**2021/2022 ACADEMIC YEAR**

**THIRD YEAR FIRST SEMESTER EXAMINATIONS**

**FOR THE DEGREE**

**OF**

**BACHELOR OF SCIENCE (CHEMISTRY)**

**SUPPLIMENTARY/SPECIAL EXAMINATIONS**

**COURSE CODE: SCH 331**

**COURSE TITLE: ALICYCLIC & HETEROCYCLIC CHEMISTRY**

**DATE: 26-07-2022**

**TIME: 8-10am**

---

**INSTRUCTIONS TO CANDIDATES**

**Answer all the Questions**

**TIME: 2 Hours**

MMUST observes ZERO tolerance to examination cheating

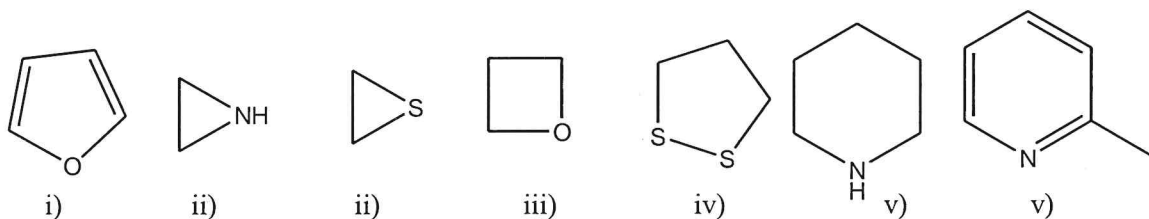
This Paper Consists of 6 Printed Pages. Please Turn Over. ▶

## QUESTION ONE

a) With an example, explain the following as used in alicyclic and heterocyclic Chemistry (4 marks)

- i) Cycloalkyl halides
- ii) Angle strain
- iii) Cyclic conformers
- iv) Aliphatic heterocyclic compounds

b) Name the following alicyclic and heterocyclic compounds using IUPAC nomenclature (7 marks)

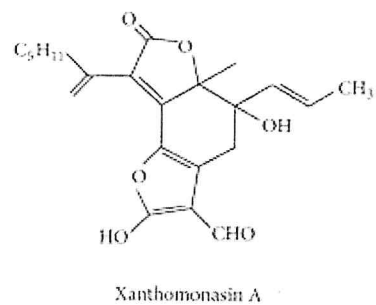
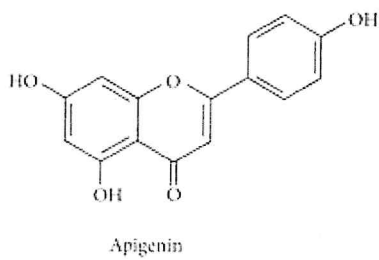
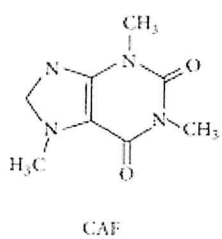
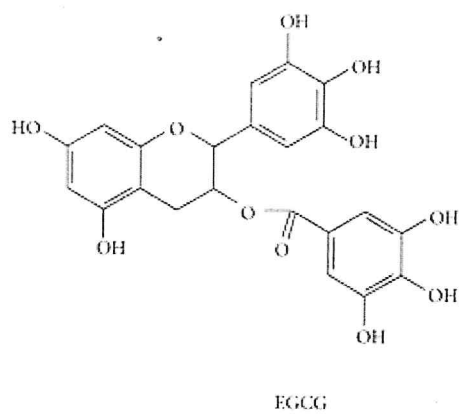
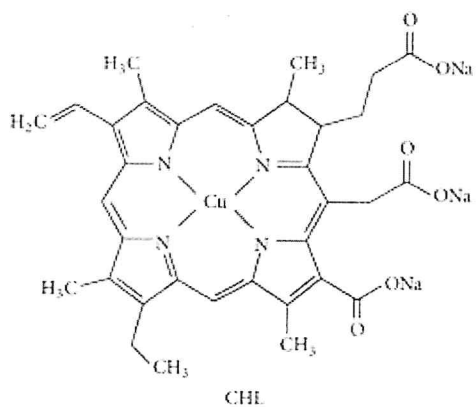


c) Draw the structure of each of the heterocyclic compounds below (6 marks)

- i) bicyclo[2.2.2] nonane
- ii) bicyclo[4.1.0] heptane
- iii) bicyclo[2.2.1] octane

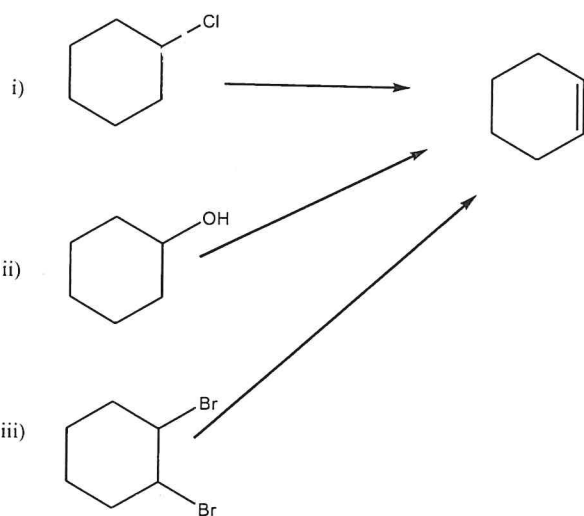
d) The following are examples of biologically active aromatic compounds (BACs) chemical structures. CHL: chlorophyllin; EGCG: (-)-epigallocatechin gallate; CAF: caffeine.

- i) Classify the compounds as alicyclic or heterocyclic (4 marks)
- ii) Indicate the part of the molecule that has aliphatic heteroatom and/or aromatic heteroatoms (4 marks)
- iii) What general class of compound does each moiety of heterocyclic compound in b(ii) belong (4 marks)

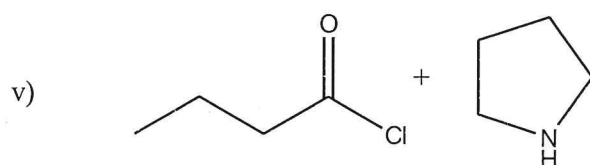
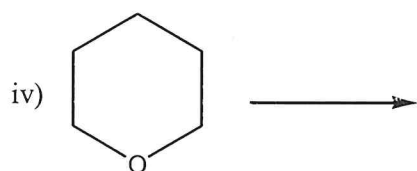
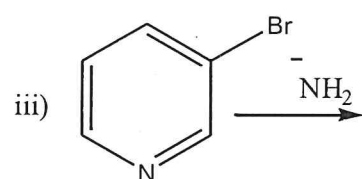
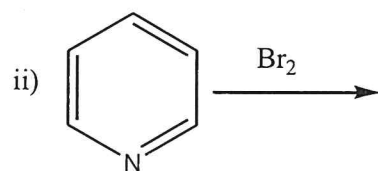
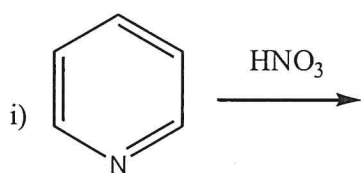


## QUESTION TWO (18)

a) Provide the reagents for the chemical reactions below for alicyclic compounds (4 marks)

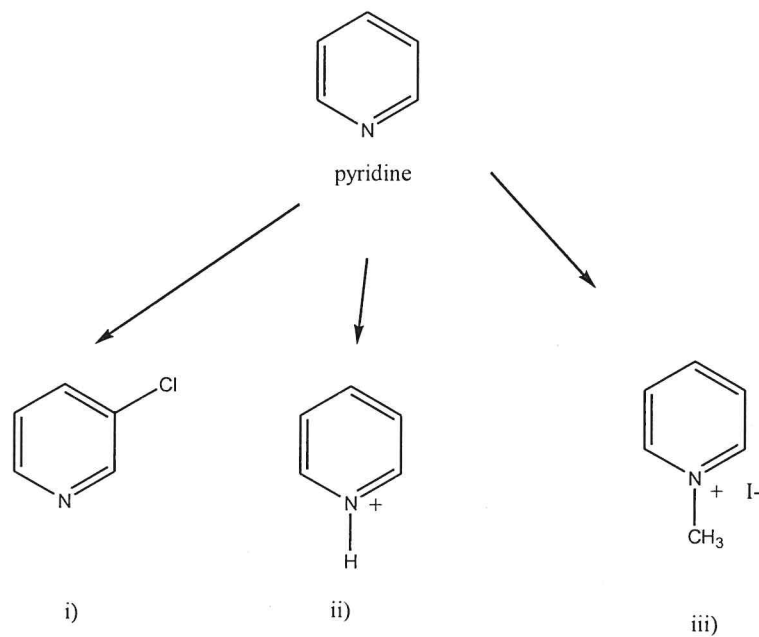


b) An organic chemist is given the following compounds in the laboratory. Establish the products of the chemical reactions shown below. (10 marks)



### QUESTION THREE

- Differentiate nucleophilic and electrophilic aromatic substitution using one example (3 marks)
- Using reaction equations, show how the following heterocyclic compounds are synthesized from pyridine (6 marks)



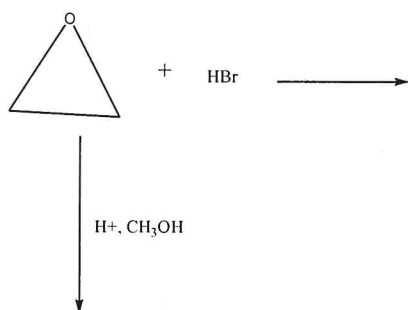
#### QUESTION FOUR

a) Explain the following;

- i) Pyridine is less reactive than benzene in electrophilic substitution. (3 marks)
- ii) Oxiranes are more reactive than ethers, and react with hydrogen halides (3 marks).

b) Use the following equation to establish a mechanism for these reactions (9 marks)

c) provide the product (s) (4 marks)



END