



# **KIBABII UNIVERSITY**

**UNIVERSITY EXAMINATIONS  
2021/2022 ACADEMIC YEAR**

**THIRD YEAR SECOND SEMESTER  
MAIN EXAMINATIONS**

**FOR THE DEGREE OF BSC (CHEMISTRY)**

**COURSE CODE: SCH 324**

**COURSE TITLE: ALICYCLIC AND HETEROCYCLIC CHEMISTRY**

**DATE: 30/08/2022**

**TIME: 2:00PM-4:00PM**

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**INSTRUCTIONS TO CANDIDATES**

Time: 2 Hours

**Answer question ONE and any other TWO of the remaining**

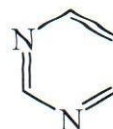
KIBU observes ZERO tolerance to examination cheating

### QUESTION ONE [30 MARKS]

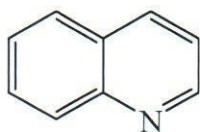
- a. Explain what you understand with the following terms [5 marks]
- i. Biosynthesis
  - ii. Heterocyclic compounds
  - iii. Homocyclic compounds
  - iv. Fusion
  - v. Ortho-and peri-fused rings
- b. Some heterocycles are fundamental to life. State the function of the following heterocycles [4 marks]
- i. Haem derivatives
  - ii. Bases found in RNA and DNA
  - iii. Dyestuff heterocycles
  - iv. Poison heterocycle detective
- c) Name the following heterocyclic compounds using **replacement nomenclature** system [4 marks]



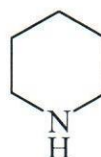
a \_\_\_\_\_



b \_\_\_\_\_



c \_\_\_\_\_

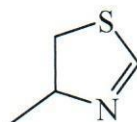


d \_\_\_\_\_

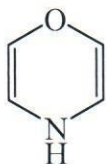
d) Name the following heterocyclic compounds using **Hantzsch-Widman** system [4 marks]



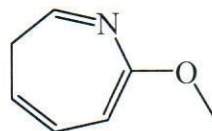
a \_\_\_\_\_



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c \_\_\_\_\_

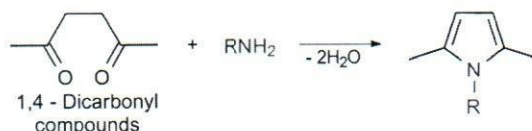


d \_\_\_\_\_

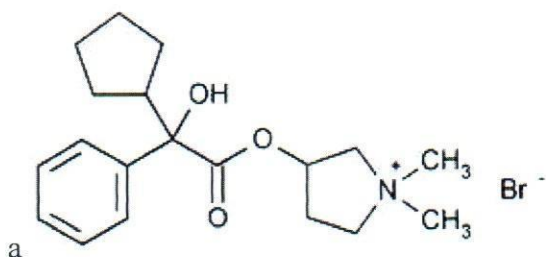
e) Consider the structure of pyrrole below, then answer questions that follows

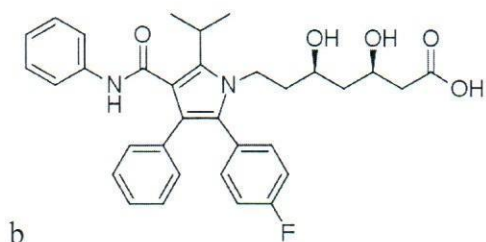


- i. Explain aromaticity of pyrrole [3 marks]
- ii. Name two properties of pyrrole [2 marks]
- iii. One way of synthesis of pyrrole is through Paal-Knorr synthesis and indicated below. Show mechanism of pyrrole synthesis using Paal-Knorr method [4 marks]



- iv. Name the following pyrrole derivative drugs and state their uses [4 marks]



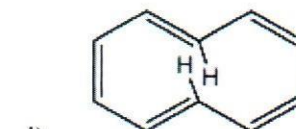
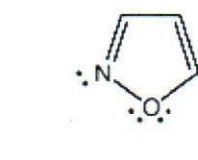
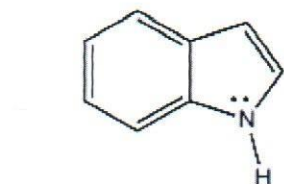
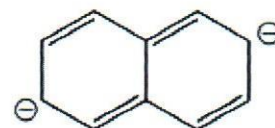
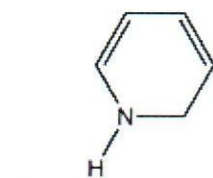
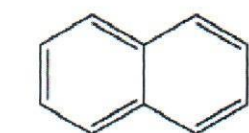


**QUESTION TWO [20 MARKS]**

a) For a compound to be aromatic it should fulfill the following four criteria. Name the four criteria **[4 marks]**

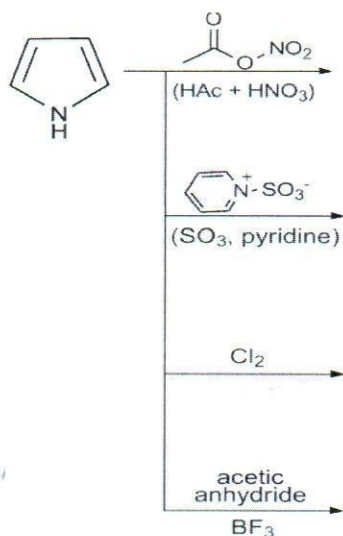
b) Classify the following molecules as aromatic, antiaromatic or nonaromatic.

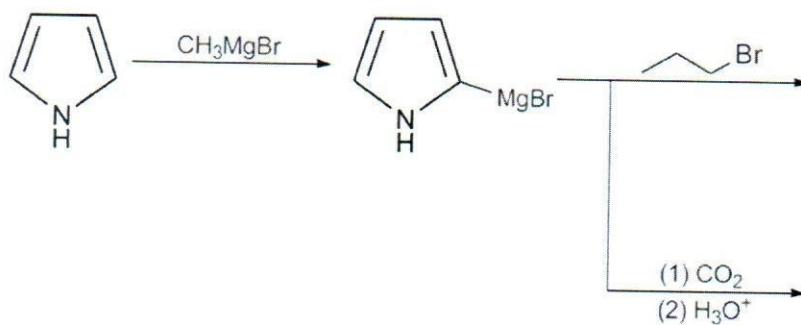
**[6 marks]**



c) Give the product in the following reactions

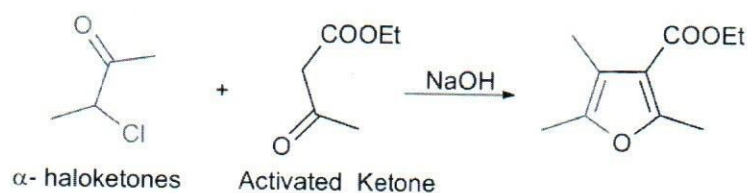
**[6 marks]**





d) Consider Feist – Benary synthesis of furan, below. Show its synthesis mechanism

[4 marks]



### QUESTION THREE [20 MARKS]

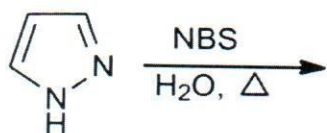
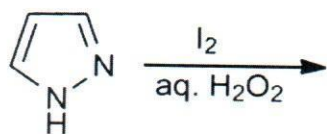
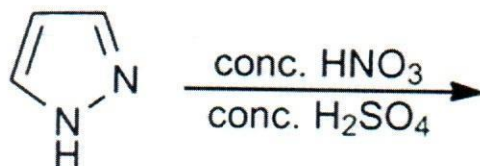
a) Draw the structures of the following compounds

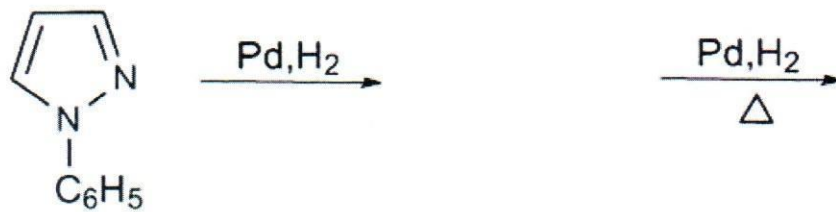
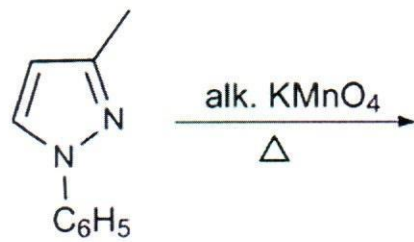
[6 marks]

- i. 2,5-Dimethylpyridine
- ii. 1,2,4-Thiadiazole
- iii. Thieno[2,3-b]furan

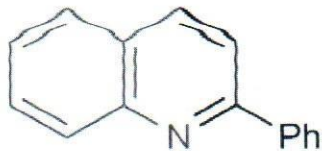
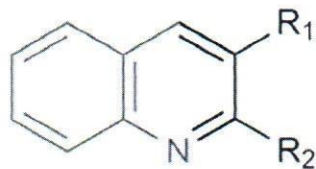
b) Complete the following equations the products of the reaction

[6 marks]





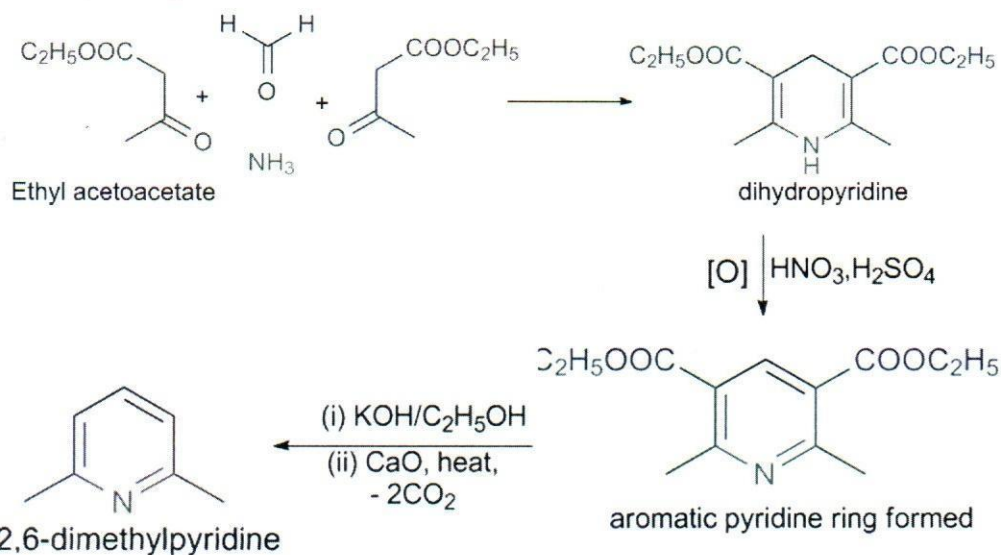
- c) Suggest possible starting materials for the synthesis of the following compounds [4 marks]



- d) Name two medicinal uses of quinoline in each case give name of one drug [4 marks]

### QUESTION FOUR [20 MARKS]

- a) Explain aromaticity of pyridine [4 marks]
- b) Pyridine is more basic than pyrrole. With reasons justify this statement [4 marks]
- c) In Hantzsch pyridine synthesis of pyridine, aldehyde is condensed with two mole of a  $\beta$ -dicarbonyl compound and ammonia as indicated below.



Provide reaction mechanism of Hantzsch pyridine synthesis shown above [8 marks]

- d) Name four medical uses of pyridine [4 marks]