



THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

A. M. E. C. E. A

MAIN EXAMINATION

AUGUST - DECEMBER 2016 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF CHEMISTRY

REGULAR PROGRAMME

CHEM 410: CHEMISTRY OF HETEROCYCLIC COMPOUNDS

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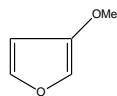
Date: DECEMBER 2016

Duration: 2 Hours

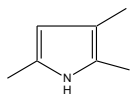
INSTRUCTIONS: Answer Question ONE and ANY OTHER TWO Questions

Q1 a) Give the IUPAC names of the following compounds

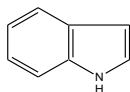
i)



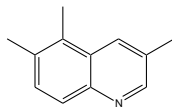
ii)



iii)



iv)



v)



(5 marks)

b) Draw the structures of the following compounds

i) 1,3-oxazole

ii) 1,2-pyran

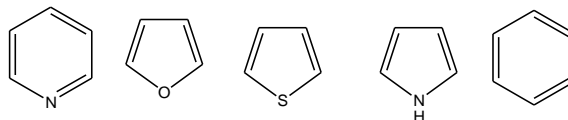
iii) 5-ethyl-4-methyl-1,2-oxazole

iv) 1H-benzo[e]indole

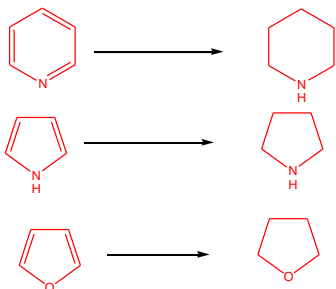
(5 marks)

c) Arrange the following compounds in decreasing order of aromaticity

(5 marks)



d) Give the products formed when pyridine, pyrrole and furan are catalytically hydrogenated



(5 marks)

e) Explain the following:

i) Pyrrole is less basic than aliphatic amines

(5 marks)

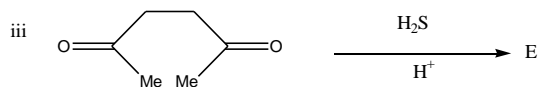
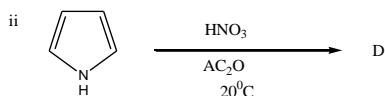
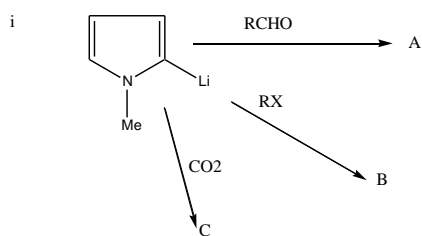
ii) Pyridine reacts with protic acid without destroying its aromaticity.

(5 marks).

Q2 a) Explain how pyrrole is synthesized through the Paal-Knorr method

(10 marks)

b) Give the products of each of the following equation

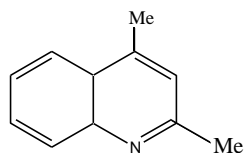


(5 marks)

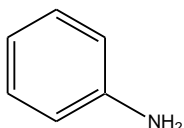
c) Explain why Pyridine undergoes nucleophilic substitution easily

(5 marks)

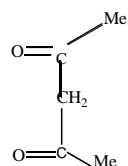
Q3 a) Show how Compound **R** a quinoline can be prepared from a reaction of compound **S** and compound **T** using the Combes synthesis.



Compound R



Compound S

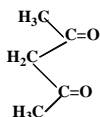


Compound T

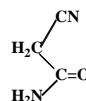
(10 marks)

b) Isoquinoline is synthesized by Bisschler-Napieralski. Starting with compound **U** show how the compound is formed. (10 marks)

Q4 a) Explain how pyridine is synthesized using compound **V** and compound **W**



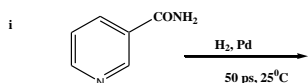
Compound V

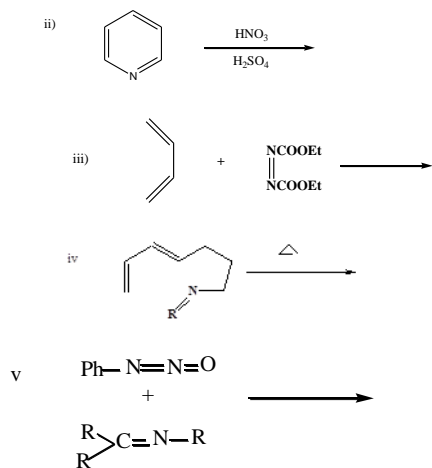


Compound W

(10 marks)

b) Provide the products for the following transformations





(5marks)

c) Explain why 5-member ring are referred to as pi-excessive ring systems.
Use pyrrole as an example **(5 marks)**

Q5 a) Explain how indole is synthesized by the Fischer indole synthesis method.

(10 marks)

b) Explain why pyridine and other 6-membered are referred to pi- electron deficient compounds. **(5 marks)**

c) Explain why pyran is not aromatic. **(5 marks)**

END