KISII UNIVERSITY

UNIVERSITY EXAMINATIONS

SPECIAL EXAMINATION

THIRD YEAR EXAMINATION FOR THE AWARD OF
THE DEGREE OF BACHELOR OF EDUCATION SCIENCE
FIRST SEMESTER 2021/2022
(JULY, 2022)

CHEM 309:HETEROCYCLIC CHEMISTRY I

STREAM: Y3 S1 **TIME: 2 HOURS**

DAY: THURSDAY, 8.00 AM – 10.00 AM **DATE: 28/05/2022**

INSTRUCTIONS:

1. ***Do not write anything on this question paper.***
2. ***Answer ALL Questions in section A and any TWO Questions in Section B.***

SECTION A (40marks)

1.(a) Draw the structures represented by the following names;

(i) 3-Chloro-5-methyl-1, 2, 4-oxadiazole(ii) 2, 2′-Bipyridine

(iii) 3-Ethyl-5-methylpyrazole (iv) 4-Methyl-2*H*-oxete

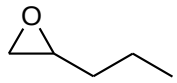
(v) 7-Methoxy-3*H*-azepine (vi) 2-Methylazacyclopentane

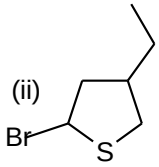
(vii) Benzo [O] furan (viii) 1, 4,2Dithiazine

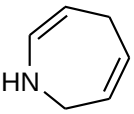
(ix) 1-Ethyl-5-methyl-2, 3, 4, 5-tetrahydroazepine (x) Thiirane (10 marks)

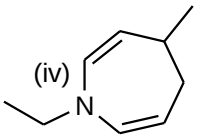
(b) Name the following organic compounds according to Hantzsch-Widman Nomenclature.

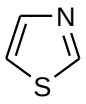
(10marks)

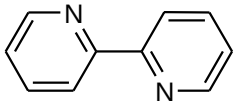
(i) 

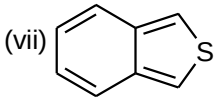
(ii) 

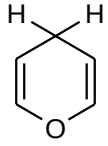
(iii) 

(iv) 

(v) 

(vi) 

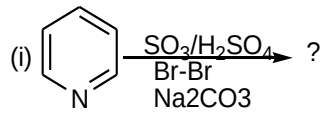
(vii) 

(viii) 

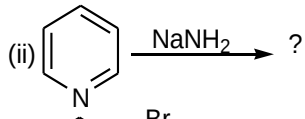
(ix) 

(x) 

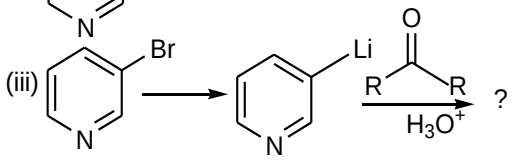
3. Provide products for the following reactions;

(i) 

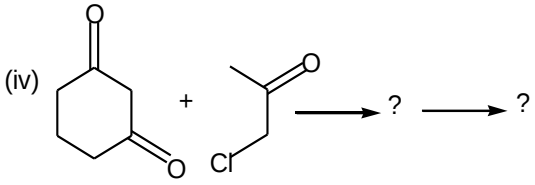
(1mk)

(ii) 

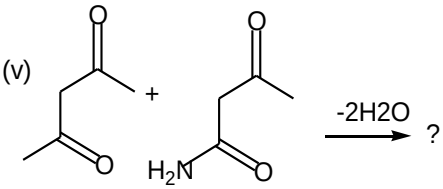
(1mk)

(iii) 

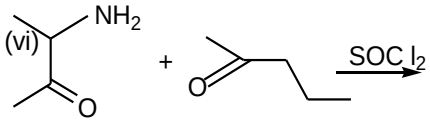
(1mk)

(iv) 

(2mks)

(v) 

(1mk)

(vi) 

(1mk)

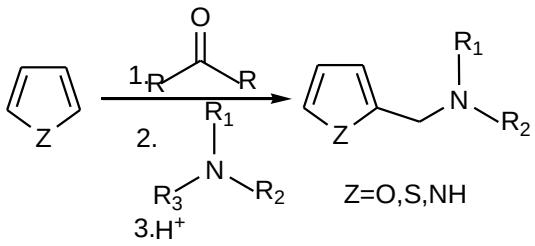
3. Citing an example, explain with reasons the statement, ‘’heterocyclic compounds undergo electrophilic aromatic substitution much faster than benzene under similar conditions. (5marks)

5. With an aid of structures explain giving the product formed when thiophene reacts with Br_2in benzene. (5marks)

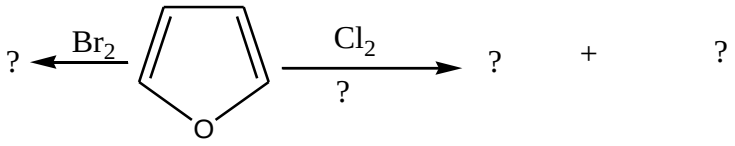
6. Predict the product formed when pyrrole reacts with Br_2 in the presence of ethanol. (3marks)

SECTION B

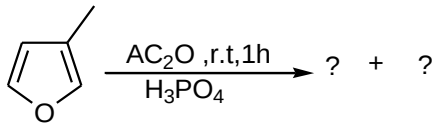
7. (a) The reaction of electron rich heterocycles with formaldehyde and primary or secondary amine forming an amino alkylated heterocyclic compound is known as Mannich reaction. Using the following transformations provide its reaction mechanism. (8marks)



(b) Complete the following transformations to show how furan is halogenated. (5marks)

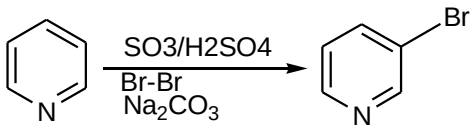


(c) Provide the viable products for the reaction below. (2marks)

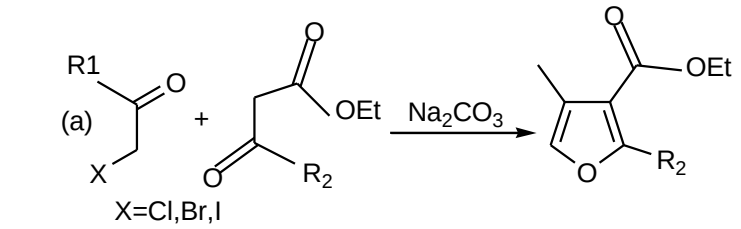


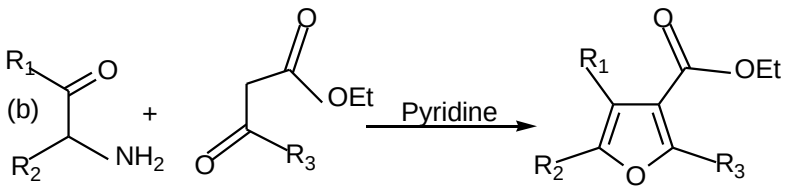
8 (a). The structure of pyridineis completely analogous to that of benzene. Give the key differences to support this statement. (5marks)

(b). Provide a reaction mechanism for the following transformation. (10marks)



9. Provide a viable reaction mechanism for each of the following reactions (15marks)


R1
O
(a)
X
+
O
OEt
O
R2
Na2CO3
O
OEt
O
R2
X=Cl,Br,I


R1
O
(b)
R2
NH2
+
O
OEt
O
R3
Pyridine
O
R1
OEt
R2
O
R3