SOUTH EASTERN KENYA UNIVERSITY

UNIVERSITY EXAMINATIONS 2016/2017

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE (CHEMISTRY) AND BACHELOR OF EDUCATION (SCIENCE)

SCH 402: HETEROCYCLIC CHEMISTRY

DATE: 21TH APRIL, 2017 **TIME: 4.00-6.00 P.M**

INSTRUCTIONS TO CANDIDATES

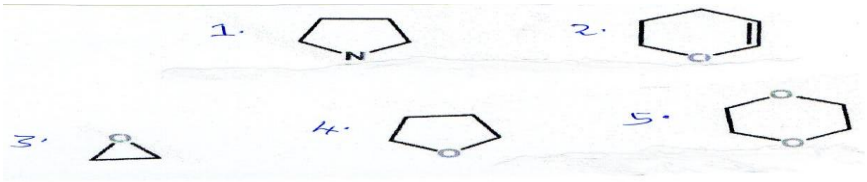
(a) Answer question One and any other Two questions

(b) Question 1 carries 30 marks while the other questions carry 20 marks each

(c) Illustrate your answers with well label diagrams where applicable

QUESTION ONE (30 MARKS)

a) i Name the following heterocycles. (2.5 marks)



b) i. State and explain two methods used to separate thiophenes from benzene during extraction (4 mark)

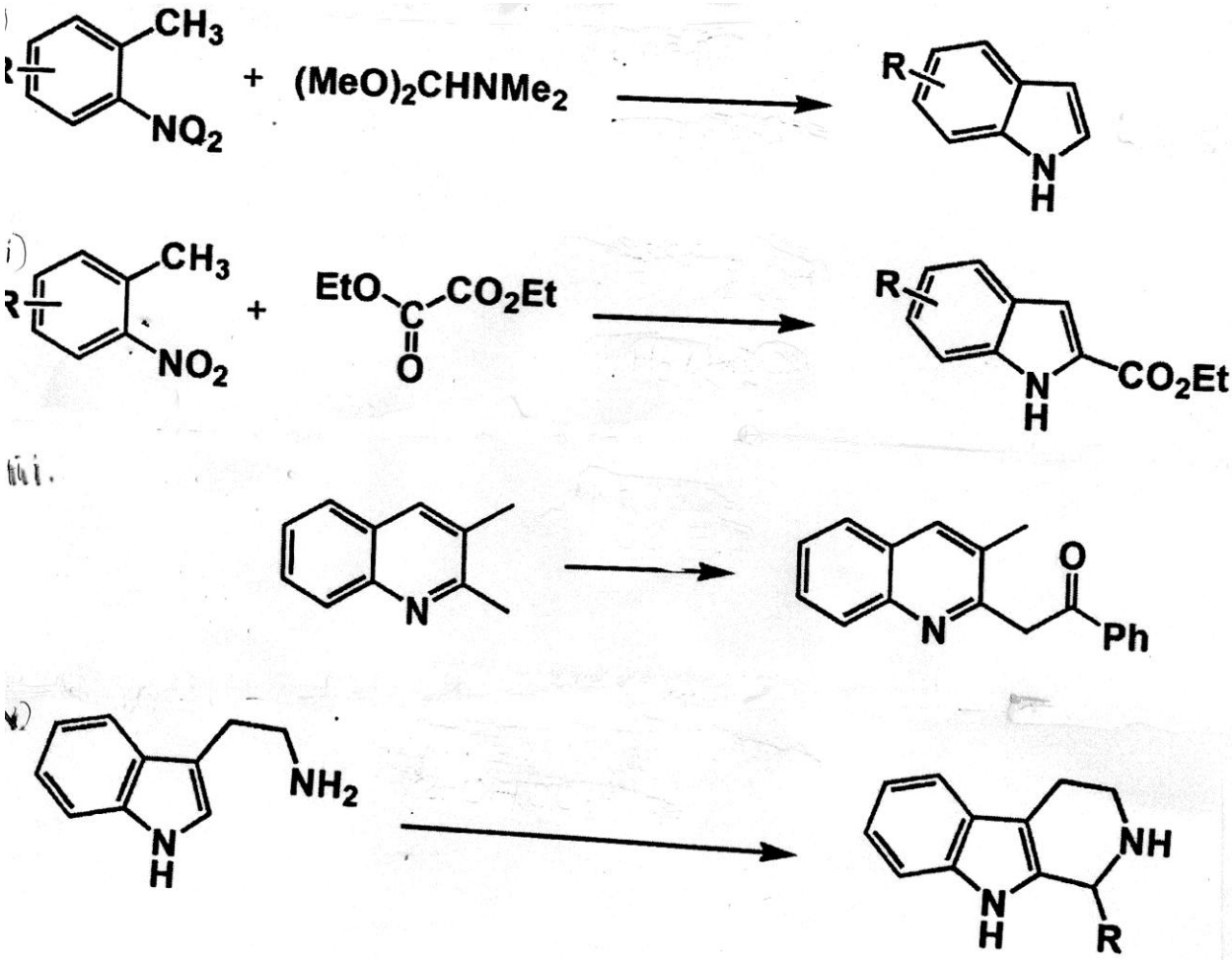
ii. How can the presence of thiophene in benzene be detected. (3 marks)

c) Give the structure of the compound formed when pyrole polymerizes in dilute acids (1 mark)

d) Name three factors which drive the equilibrium towards the product side during heterocycles synthesis (3 marks)

e) Pyrrole is a very weak base. Explain (2 marks)

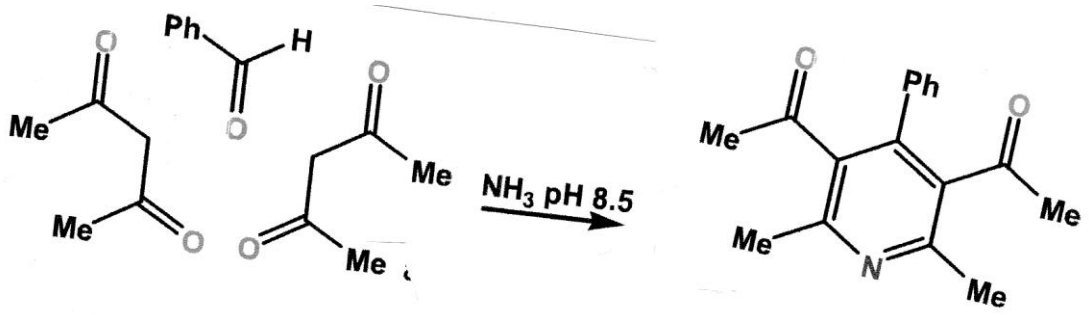
f) Give the most suitable reagents and conditions in the reactions below (8.5 marks)



QUESTION TWO (20 MARKS)

a. Explain using canonical structures why furan is less aromatic than benzene (8 marks)

b. Suggest a plausible mechanism in the following reaction (5 marks)



c. Draw the shapes cyclohexane is likely to assume during conformational analysis. (4 marks)

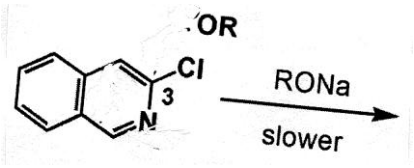
d. Explain three uses of furan (3 marks)

QUESTION THREE (20 MARKS)

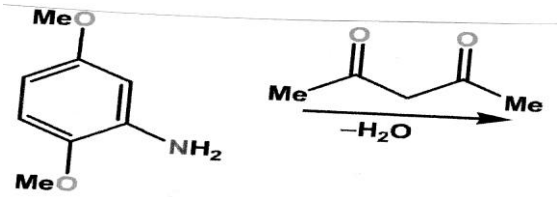
a) Suggest a plausible mechanism and predict the products for each of the following reactions.

(12 marks)

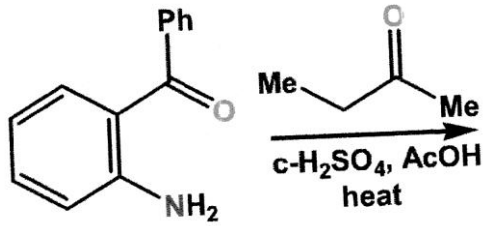
i.



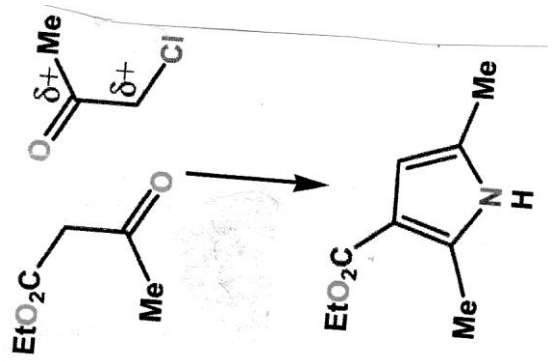
ii.



iii.



b) Study the scheme below



(i) Give the reagents needed. (2 marks)

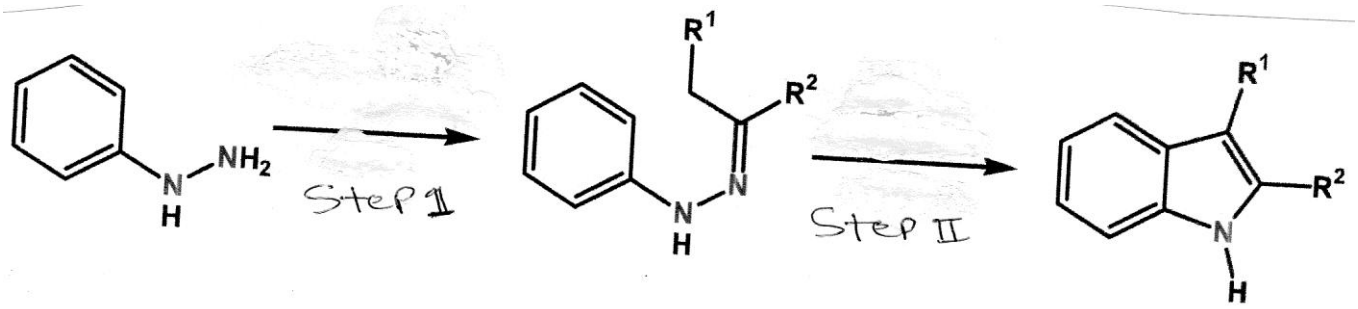
(ii) Show the mechanism. (6 marks)

QUESTION FOUR (20 MARKS)

a. i. Explain why thiophene has more canonical forms than furan and pyrrole. (3 marks)

ii. Show the canonical forms of thiophene and identify the position where electrophilic substitution occurs (5 marks)

b. Below is a reaction of indole synthesis.

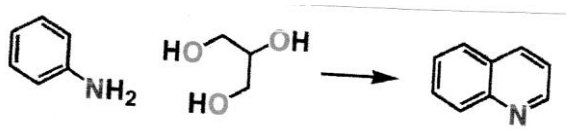


(i) Give the reactants and reagent needed in step 1 and step 11. (3 marks)

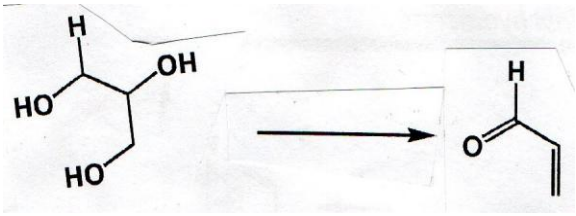
(ii) Show the mechanism. (9 marks)

QUESTION FIVE (20 MARKS)

a. Study the reaction below



i. Give the reagents and conditions needed for the reaction to occur. (3 marks)
ii. Show the mechanism (9 marks)
b. Give the mechanism for the conversion of the reaction below (6 marks)



c. Explain why epoxides are more reactive than ethers. (2 marks)