UNIVERSITY OF ESWATINI

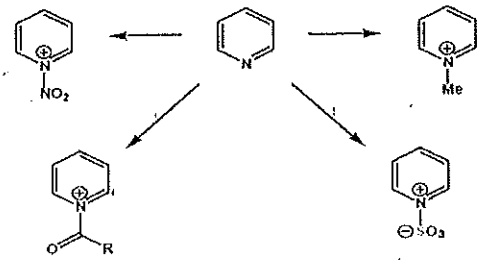
Final Examination– 2021

TITLE OF PAPER:	Heterocyclic Chemistry
COURSE NUMBER:	CHE 431
TIME ALLOWED:	3 Hours

Answer any four (4) questions of the six (6) questions and every question holds 25 marks.
NB: all questions are to be answered in a separate answer sheet.

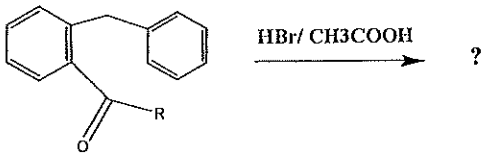
Question I

1) Provide the missing reagents in the following reaction scheme? (10)

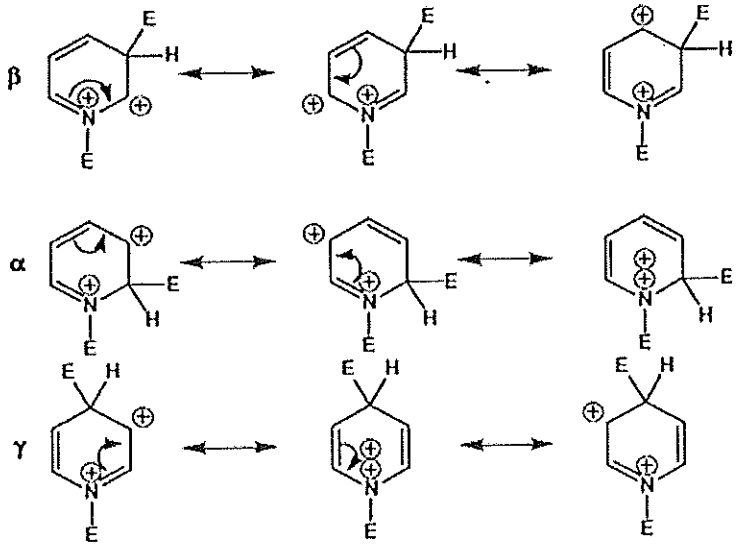


2) How would you compare the structures of cyclohexane and benzene? (6)

3) Which is the most probable main product of the following reaction? (4)

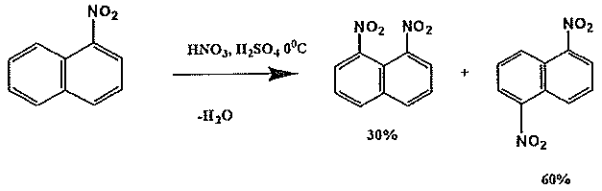


4) Which electrophilic substitution of pyridinium ions is preferred? Why? (5)

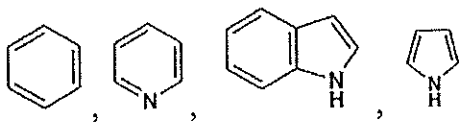


Question II

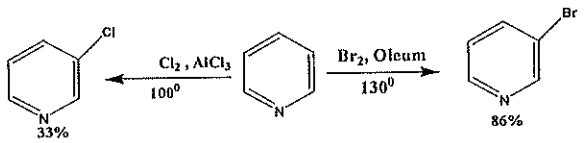
1. What brings the difference in yield? Explain? (5)



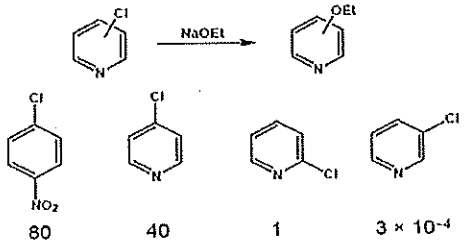
2. Which is most reactive towards an electrophile? Explain and put them in order. (8)



3. Discuss the reduction in yield of the two Halogenation products of Pyridine. (5)

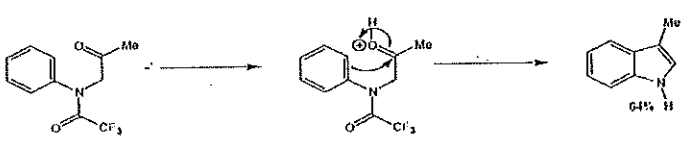


4. Explain the following reaction rates. What causes the rate difference? (7)

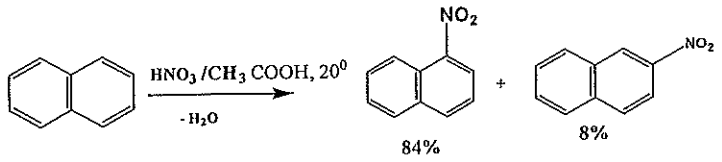


Question III

1. Give the missing reagents of Bischler Synthesis reaction. (6)



2. Explain why the difference in yield between the two nitration products? (5)

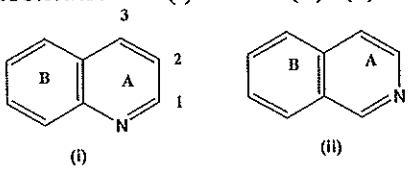


3. Benzene, polycyclic benzenoids and cyclic conjugated polyenes can be aromatic when they have a set of conditions. Put the relation and indicate the requirements for aromaticity. (6)

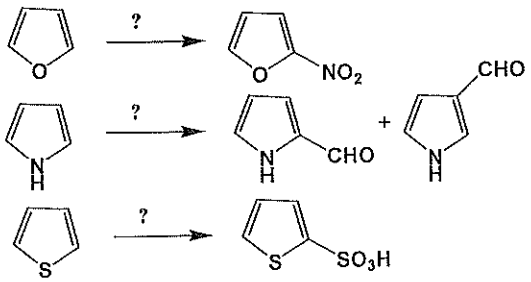
4. Friedel-Crafts reactions are not usually possible on free pyridines, why? Can that be modified? (8)

Question IV

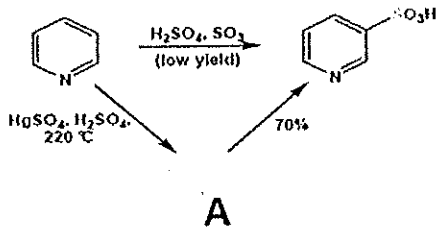
1. Where does nucleophilic attack take place ring A or ring B? Indicate the site of nucleophilic substitution in (i) and in (ii). (8)



2) Fill the missing reagents and reaction conditions in the following reaction scheme. (6)

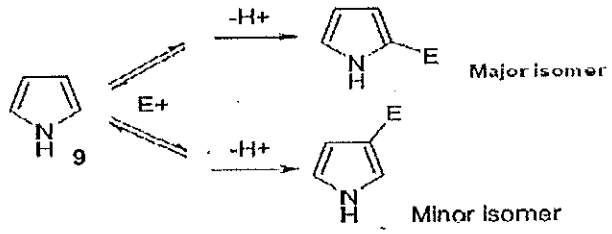


3) What is the identity of the intermediate A in the following reaction? Give reasons for the low yield in the reaction? (6)



A

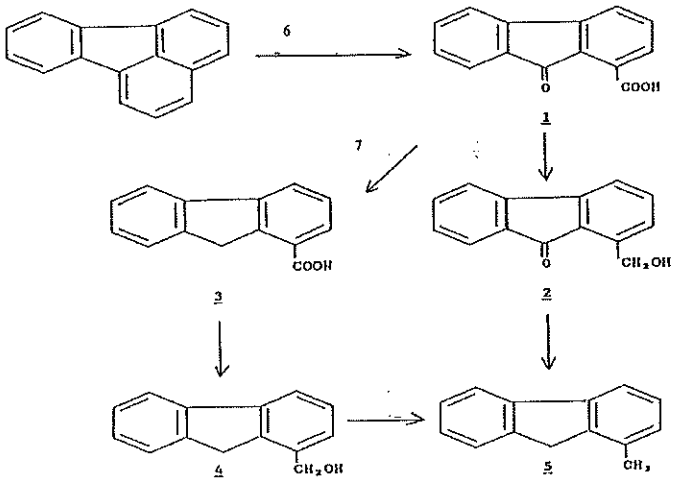
4) Explain the following equilibrium reaction? (5)



Electrophilic attack on pyrrole

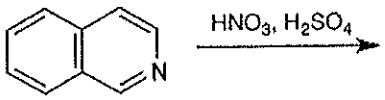
Question V

1) Complete the reactions scheme of polycyclic aromatic hydrocarbons. (14)



2) Synthesize furans using Paal Knorr Synthesis. (6)

3) Which is the most probable main product of the following reaction? Why? (5)



Question VI

1) What are the effects of electron donating and withdrawing groups in pyridine and pyridinium salt heterocyclic hydroxylation?(6)
2) What is interesting about allylic and benzylic carbon reaction sites and show an example of each? (6)
3) Discuss "4+1" synthesis strategies in heterocyclic synthesis giving oxygen nitrogen heterocyclic as examples. (6)
4) Electrophilic aromatic substitution of pyridines and pyridinium salts occur on the hetero atom and the aromatic ring. Which one predominates and on what does the substitution pattern depend. (7)