

UNIVERSITY OF SWAZILAND
SUPPLEMENTARY EXAMINATION – 2018

TITLE OF PAPER : Advanced Organic Chemistry

COURSE NUMBER : C 403

TIME : Three Hours

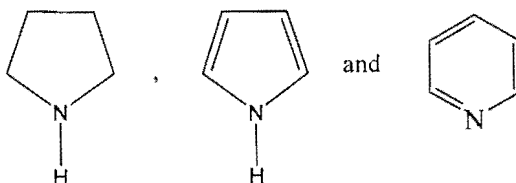
INSTRUCTIONS:

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.

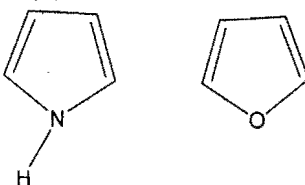
Answer any four (4) of the six (6) questions and all questions have 25 marks each.

Question 1

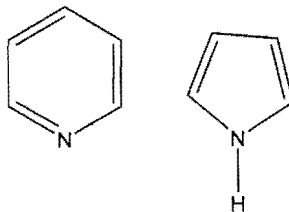
- A) Compare order and discuss the reactivity of the following heterocyclic compounds and explain your choice. (5)



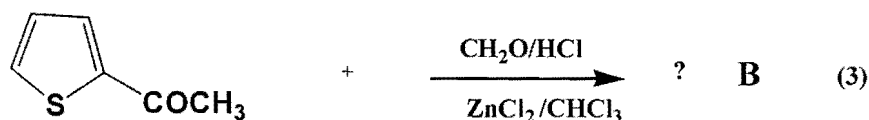
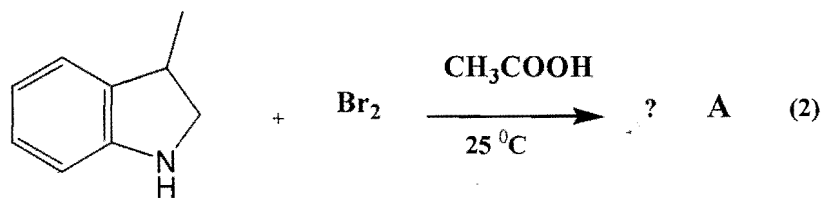
- B) How would you compare the stability of 3 and 4 as well as 5 and 6 membered heterocyclic rings in nature and their ease of formation in the laboratory? Explain the reasons for your answer and elaborate with an example.(5)
- C) Briefly describe the structure and bonding characteristics in Pyrrole and Furan in terms of orbital hybridization. What is the impact in reactivity of these two heterocyclic compounds? and which one is more aromatic. (5)



- D) Explain why pyridine is more basic than pyrrole even though both the nitrogen heteroatoms have lone pair electrons that can be protonated in an acid base reaction.(5)

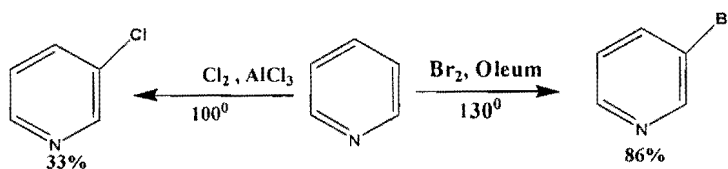


- E) Predict the major reaction products expected from each of the following reactions of the heterocyclic compounds.(5)

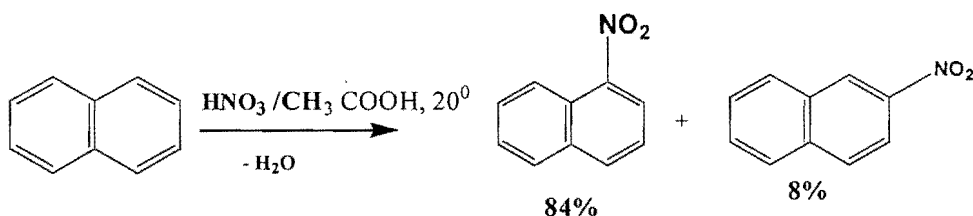


Question 2

A) Discuss the reduction in yield of the two halogenation products of pyridine. (6)



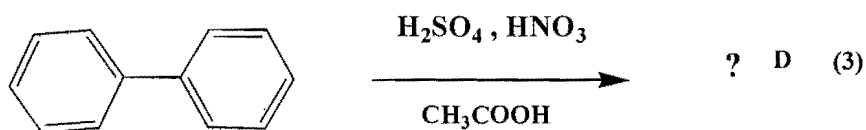
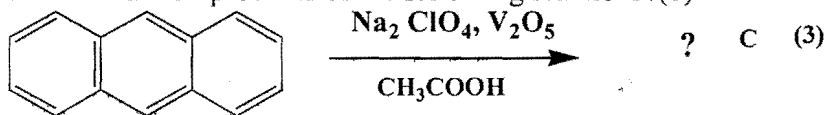
B) Explain the difference in yield between the two nitration products? (4)



C) Benzene, polycyclic benzenoids and cyclic conjugated polyenes can be aromatic when they have a set of π electrons. Relate the class of compounds and show which ones are aromatic and which not. (5)

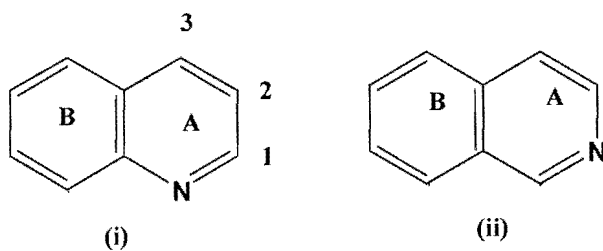
D) Explain why electrophilic substitution occurs in naphthalene preferentially at C-1 rather than C-2. (4)

E) What are the reaction products of the following reactions?(6)

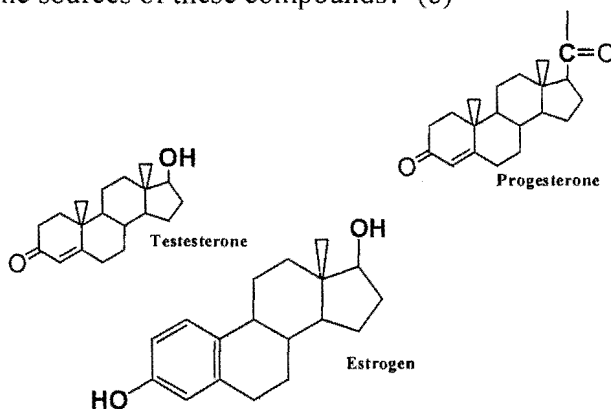


Question 3

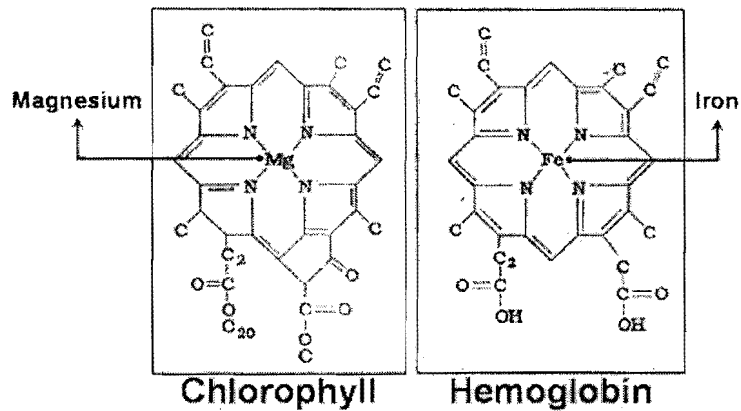
- A) Friedel-Crafts reactions are not usually possible on free pyridines, why? Can that be modified? (5)
- B) Where does nucleophilic attack take place ring A or ring B? Indicate the site of nucleophilic substitution in (i) and in (ii). (5)



- C) What is the precursor of the following physiologically active compounds and what could be said about the structure of the carbon polycyclic compounds? What are the sources of these compounds? (8)



- D) What are the roles of these heterocyclic compounds in life and what similarities do you see in their chemical composition and action? (7)

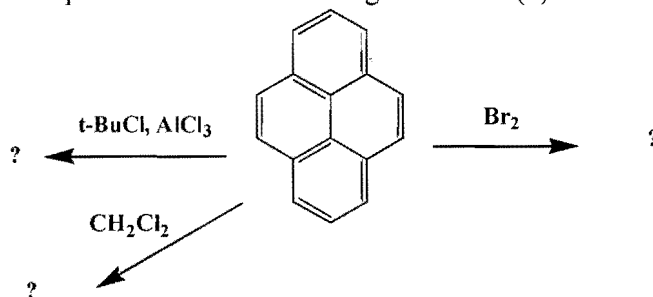


Question 4

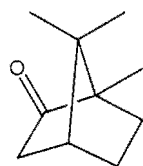
- A) Write a short essay on natural alkaloids, carbohydrates and flavonoids with specific focus on the following general aspects. (20)
- i) Definition
 - ii) Occurrence and distribution
 - iii) Properties
 - iv) Importance in human health care
- B) Discuss the biosynthesis of proteins, and terpenoids. (5)

Question 5

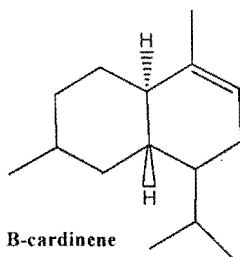
- A) Complete the reaction products of the following reactions. (6)



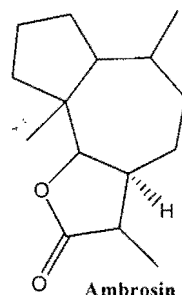
- B) The following Terpenes are made up of more than one isoprene units. Draw the compounds and with dotted lines identify the five carbon units corresponding to the isoprene units in each compound. (6)



Camphor



B-cardinene



Ambrosin

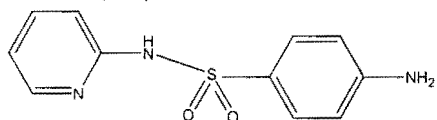
- C) Order the following aromatic structures in their energy of resonance magnitude and give your reasons for that. (13)

Order these structures in increasing resonance Energy

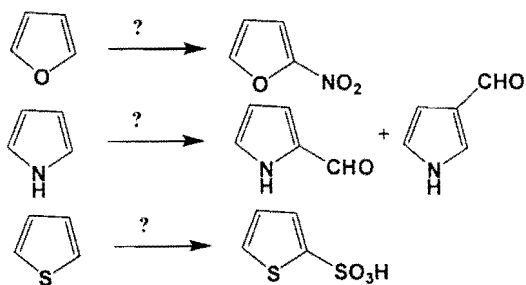


Question 6

- A) What is interesting about this molecule? Discuss it. By the way it is one of the oldest antibiotics. (4.5)



- B) Fill the missing reagents in the following reaction scheme. (4.5)



- C) Differentiate between Primary, secondary, tertiary and quaternary structures of proteins. (7)

D) Determine the structure of the organic molecule with molecular formula $C_8H_8O_2$ from the ^{13}C NMR DEPT spectrum below.

