

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF APPLIED CHEMISTRY

END OF SECOND SEMESTER EXAMINATIONS – APRIL/MAY 1999

ORGANIC CHEMISTRY II – SCH 1202

TIME: THREE HOURS

INSTRUCTIONS TO CANDIDATES

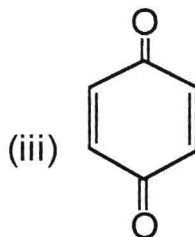
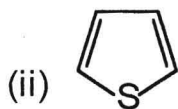
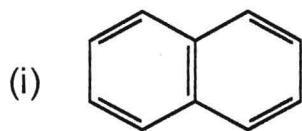
1. Answer *ALL* questions from Section A and *ANY THREE* from Section B. Section A carries 40 marks and each question in Section B carries 20 marks.
2. Show mechanism, chemical steps or synthesis by means of curved arrows.

TOTAL MARKS: 100

This question paper consists of five (5) printed pages (on one side) including the top page with the instructions.

SECTION A

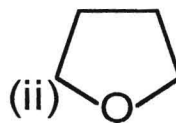
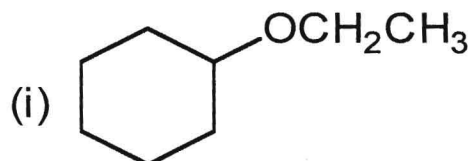
1. (a) Explain whether the following compounds are aromatic or non-aromatic



(6 marks)

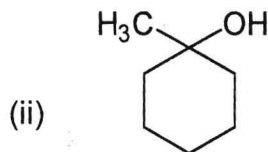
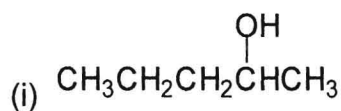
- (b) With an example, define tautomers. (4 marks)

- (c) How would you prepare the following ethers? Use whichever method you think is most appropriate, the Williamson synthesis or alkoxy mercuration reaction. (no reaction mechanism required).



(6 marks)

- (d) What carbonyl compound would react with what Grignard reagent to yield the following compounds?



(6 marks)

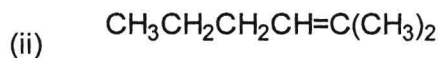
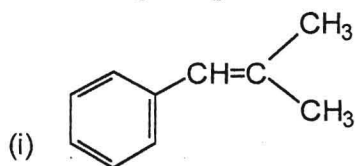
- (e) p-aminobenzoic acid (PABA) is widely used as a sunscreen agent. Propose a synthesis of PABA starting from benzene, chloromethane, aluminium chloride and any other reagents needed. (6 marks)

- (f) Draw the structure of 15-crown-5 ether. Na^+ complex. (2 marks)

- (g) Rank the following compounds in order of ascending basicity. Briefly explain your answer.

p-chloroaniline, p-aminoacetophenone, p-methylaniline. (4 marks)

- (h) What carbonyl compound and what phosphorus ylides might you use to prepare the following compounds?



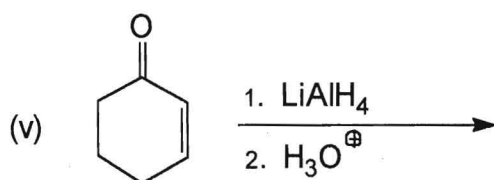
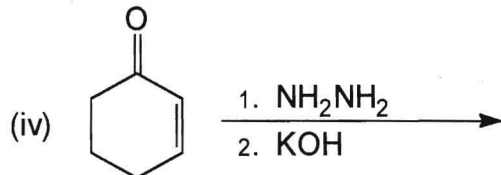
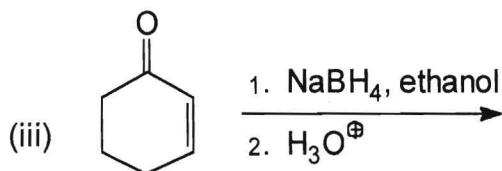
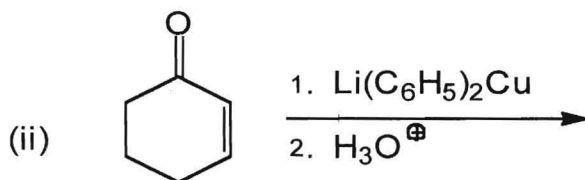
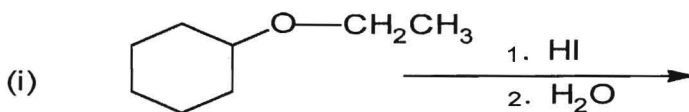
(4 marks)

(i) Why is pyridine more basic than pyrrole?

(4 marks)

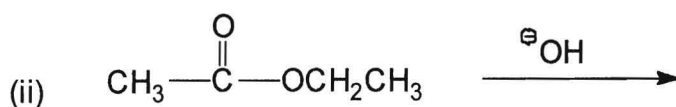
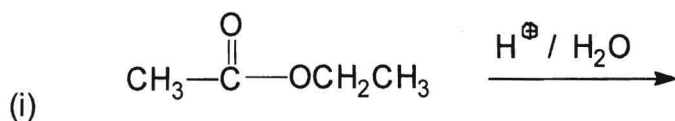
SECTION B

2. (a) Predict the products for the following reactions.



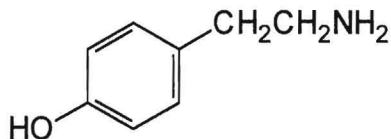
(10 marks)

(b) Complete the following reactions showing the mechanisms in each case.



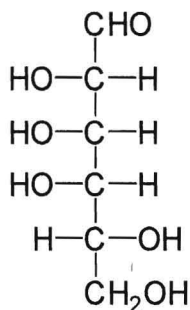
(10 marks)

3. (a) Tyramine is an alkaloid found, among other places, in mistletoe and ripe cheese. How would you synthesize tyramine from benzene?



(12 marks)

- (b) Draw Fischer projection and then Haworth projection for the compound D-Talose.. Comment on the stability of the anomers.

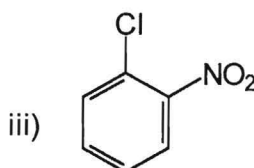
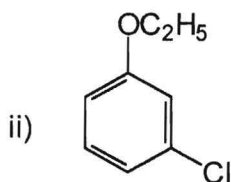
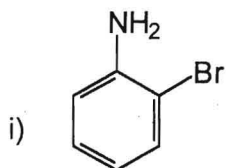


(8 marks)

4. (a) When 4-chloro-1-butanol is treated with a strong base such as sodium hydride, NaH, tetrahydrofuran is produced. Suggest a mechanism for this reaction. (5 marks)
- (b) Write as many resonance forms as you can for the carbocation intermediate resulting from the bromination of methyl-benzene (toluene) at the ortho, para and meta positions. At what position(s) does reaction appear most favourable? Which position(s) are least favourable? Give reasons. (10 marks)
- (c) What is the major monosubstitution product that you would expect to obtain from the Friedel – Crafts reaction of benzene and chloropropane in the presence of aluminium chloride? Show all the necessary steps involved in the reaction. (5 marks)

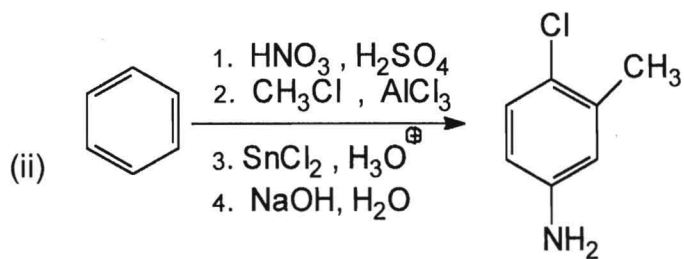
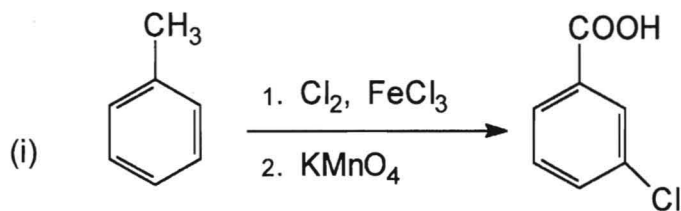
5. (a) Predict the product(s) of base treatment of a mixture of ethanal and propanal. (6 marks)

- (b) Where would you expect electrophilic substitution to occur in the following substances? Give your reason.



(6 marks)

(c) The following synthetic routes are incorrect. Explain what is wrong with each and how you would correct the route(s) to obtain the given product.



(8 marks)

END OF QUESTION PAPER!!!