

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF APPLIED CHEMISTRY

BACHELOR OF SCIENCE HONOURS DEGREE

END OF SECOND SEMESTER EXAMINATIONS – JUNE 2010

ORGANIC CHEMISTRY II –SCH 1202

TIME: 3 HOURS

INSTRUCTIONS TO CANDIDATES:

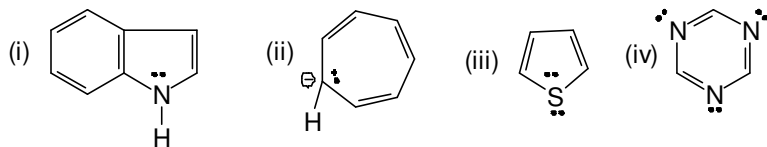
- 1. ANSWER ALL QUESTIONS FROM SECTION A AND ANY THREE FROM SECTION B. SECTION A CARRIES 40 MARKS AND EACH QUESTION IN SECTION B CARRIES 20 MARKS. MARKS ARE ALLOCATED IS INDICATED IN BRACKET.**
- 2. START EACH QUESTION ON A NEW PAGE (NOT EACH PART OF THE QUESTION).**
- 3. SHOW MECHANISM, CHEMICAL STEPS OR SYNTHESIS BY MEANS OF CURVED ARROWS.**

TOTAL MARKS = 100

THIS QUESTION PAPER CONSISTS OF FOUR PRINTED PAGES (ON ONE SIDE ONLY) INCLUDING THE TOP PAGE WITH THE INSTRUCTIONS.

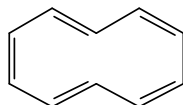
SECTION A:

1. (a) Name four criteria which indicate that benzene is a stable compound. (4 marks)
- (a) Explain Huckel's rule in your own words. (4 Marks)
- (b) State whether the following compounds are aromatic or non-aromatic and also indicate the number of pi electrons present in the compounds. (Marks will be deducted if one of the answers is not correct).



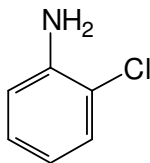
(4 Marks)

- (d) Draw chair configuration of α - D- glucopyranose and β -D-glucopyranose. (4 Marks)
- (e) trans-(e,e)-1,4-dimethyl cyclohexane is more stable than its cis-(e,a)-isomer. Explain this observation with appropriate chair conformations. (5 Marks)
- (f) Draw structures for all the isomeric dimethylbenzene. (3 Marks)
- (g) Explain why the following compound is not aromatic.



(3 Marks)

- (h) Indicate with the arrow, where would you expect electrophilic substitution to occur in the following compound? Give your reasons.

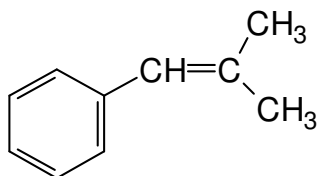


(3 Marks)

- (i) Explain with the aid of chemical equations, phenyl amine is less basic than ethylamine.. (6 Marks)
- (j) Outline the synthesis of p-nitrobenzoic acid from benzene. Use reagents of your choice. (No mechanism required). (4 Marks)

SECTION B:

2. (a) Draw the structures of an ylide and a carbonyl compound from which the following compound can be prepared.



Outline the possible synthesis of ylide starting from triphenylphosphine, suitable alkyl halide and the reaction mechanism for the product.

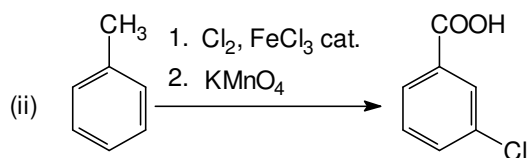
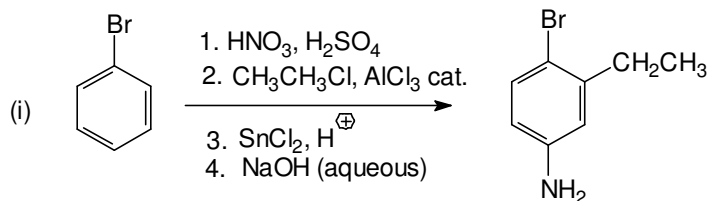
(10 Marks)

- (b) Bromination of phenyl amine is an extremely rapid process that yields 2,4,6-tribromophenylamine and not the monosubstituted product. How does one overcome this problem to produce monosubstituted phenyl amine.

With specific reason state the reactants and steps involved to synthesise monobromophenylamine.

(10 Marks)

3. (a) In the following reactions, the synthetic routes are not correct. Give your reasons and how would you correct the routes to obtain the given products? Write reaction step by step for the given products. (No mechanism required).

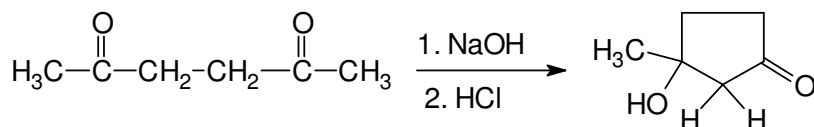


(10 Marks)

- (b) Explain why phenol is more acidic than ethanol.

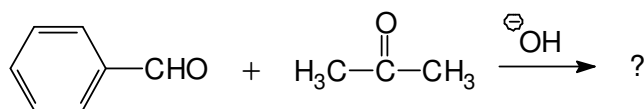
(5 Marks)

- (c) Write reaction mechanism for the following reaction. Suggest the type reaction involve.



(5 Marks)

4. (a) Aspirin is an analgesic drug. It is widely used for pain and fever. It is synthesised from phenol. Write reaction mechanism for aspirin from phenol. Use reagents of your choice. Give the name of one of the steps that take place during the reaction. (10 Marks)
- (b) The following reaction produces four different products. Draw structures of the products. Write reaction mechanism for any one of the products and indicate the type of reaction that has taken place.



(10 Marks)

5. (a) You are given the following list of substituents:
 -OH; -CHO; -Cl; -NO₂; -OCH₃; -COCH₃
 -COOH; -NHCOCH₃; -C₆H₅; -Br;

Indicate the substituents which are

- (i) *o/p* directing with activation
- (ii) *o/p* directing with deactivation
- (iii) *m*-directing with deactivation

with respect to electrophilic substitution reactions in benzene derivatives. (Marks will be deducted for the wrong answers).

(10 Marks)

- (b) With the aid of chemical reactions explain the limitations of Friedel-Crafts alkylation. (No mechanism required).

(10 Marks)

END OF QUESTION PAPER!!!!