

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF APPLIED CHEMISTRY

ORGANIC CHEMISTRY : SCH 1116

END OF SEMESTER EXAMINATION – DECEMBER 2004

FOR SBB, ESH, EFW AND TXT STUDENTS

TIME – THREE (3) HOURS

INSTRUCTION TO CANDIDATES

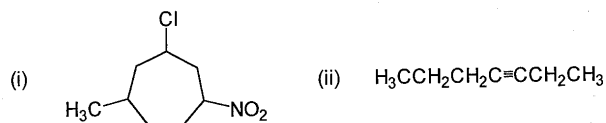
1. ANSWER ALL QUESTIONS IN SECTION A AND ANY THREE FROM SECTION B. SECTION A CARRIES 40 MARKS AND EACH QUESTION IN SECTION B CARRIES 20 MARKS.
2. SHOW MECHANISM, CHEMICAL STEPS OR SYNTHESIS BY MEANS OF CURVED ARROWS.

TOTAL MARKS = 100

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

SECTION A:

1. (a) Give IUPAC names for the following compounds.



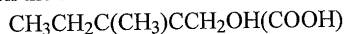
(2 Marks)

(b) The following names are incorrect. Draw the structure and provide proper IUPAC names.

- (i) 2-methyl-2,4-pentadiene
- (ii) 5-ethyl-4-octene
- (iii) 4,4-dimethyl-3-ethyl pentane

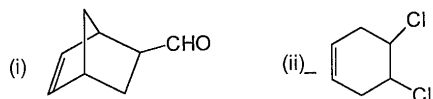
(6 Marks)

(c) Give E and Z configurations (isomers) of the following alkene. Indicate priorities on the structures.



(4 Marks)

(d) Draw the structures for dienes and dienophiles to synthesise the following products.

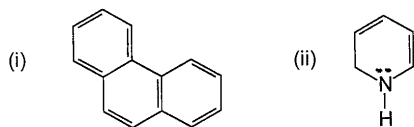


(4 Marks)

(e) Define Huckel's rule in your own words.

(4 Marks)

(f) State whether the following compounds are aromatic or non-aromatic. Indicate the number of pi electrons present in the compounds.



(4 Marks)

(g) What information does the term below give?

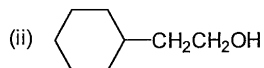
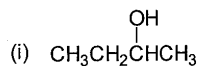
$$[\alpha] = -3.5^\circ$$

(4 Marks)

(h) With an appropriate example explain positional isomer.

(4 Marks)

- (i) What Grignard reagent and what carbonyl compound might you start with to prepare the following alcohols.



(4 Marks)

- (j) Draw and label the reaction energy diagram for one step exothermic chemical reaction.

(4 Marks)

SECTION B:

2. (a) Write a reaction mechanism of acid catalysed dehydration of 3-methyl-hexan-3-ol. Draw the structures of all possible products. With good reason explain which product will be predominant.

(12 Marks)

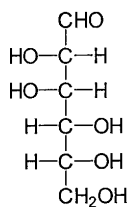
- (b) With an appropriate example write reaction mechanism for S_N^1 and S_N^2 reactions.

(8 Marks)

3. (a) The reaction between hex-3-ene and alkaline potassium permanganate produces dihydroxy hexane. This product is an optically active compound. Use Fischer projections to draw as many stereoisomers of the product as possible and label them as enantiomers, diastereoisomers and meso compound.

(10 Marks)

- (b) The structure of D-mannose is as follows.

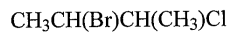


D - mannose

- (i) Draw Fischer and Haworth projections for D-mannose. (2 Marks)
(ii) Draw α and β anomers of the compounds. (4 Marks)
(iii) Draw chair conformations of both anomers and indicates the their Stability.

(4 Marks)

4. (a) Assign R and/or S configurations to the following compound. Show the necessary steps.



(4 Marks)

- (b) Starting from benzene as your only source of aromatic compound, how will you synthesise the following compounds? Use reagents of your choice.

(i) *p*-bromoaniline (ii) butylbenzene

(10 Marks)

- (c) Discuss Sp^3 hybridisation with an appropriate organic compound of your choice. Draw orbital as well as bonded structures and indicate the shape of the molecule.

(6 Marks)

5. (a) What is plane polarized light?

(4 Marks)

- (b) Predict the product(s) of the following reactions and provide IUPAC names for the product(s). (No mechanism required)

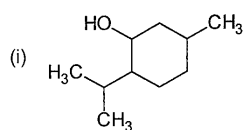
(i) Reduction of pent-2-yne with Lindler catalyst. (2 Marks)

(ii) Oxidation of hex-2-ene with ozone. (4 Marks)

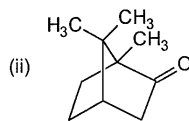
(iii) Reaction of cyclohexene with mercuric acetate $[\text{Hg}(\text{OAc})_2]$ in methyl alcohol (CH_3OH) followed by treatment with NaBH_4 .

(2 Marks)

- (c) Mark with an asterisk (*) all chiral centre(s) present in the following compounds.



Menthol



Camphor

(5 Marks)

- (d) what is α -amino acid? Give an example of it.

(3 Marks)

END OF QUESTION PAPER