



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF APPLIED CHEMISTRY

FIRST SEMESTER EXAMINATIONS – APRIL/MAY 2009

ORGANIC CHEMISTRY – SCH 1116

FOR SBB, ESH, EFW AND TXT STUDENTS

TIME - THREE (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.

GRAPH PAPER WILL BE PROVIDED ON REQUEST

2. SHOW MECHANISM, CHEMICAL STEPS OR SYNTHESIS BY MEANS OF CURVED ARROWS.

TOTAL MARKS = 100

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

SECTION A :

1. (a) Draw the structural formulae for the following compounds.

(i) 3-propyl-4,7-dimethyl nonane

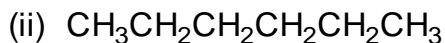
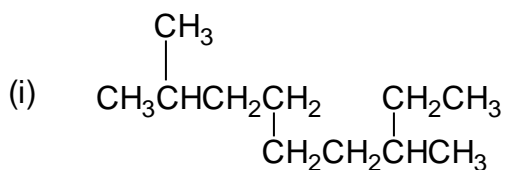
(ii) cis-1,2-dimethylcyclopentane

(2 Marks)

(b) What is plane-polarised light?

(4 Marks)

(c) Give IUPAC names of the following compounds.



(2 Marks)

(d) From the list given below, select the substituents, which are

(i) ortho/para - directing (ii) meta – directing

-Br, -CHO, -OCH₃, -F, -NO₂, -COOH, -NH₂, -N(CH₃)₃

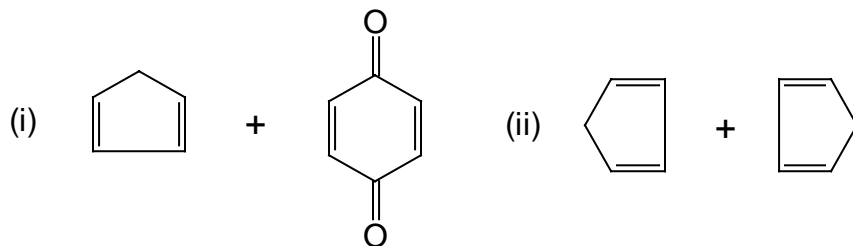
(4 Marks)

(e) Draw E and Z configuration for the following alkene and indicates priority on the structure.



(6 Marks)

(f) Draw the structures of the products arising from the following pericyclic reactions.



(2 Marks)

(g) The following names are incorrect. Draw the structures and provide proper IUPAC names.

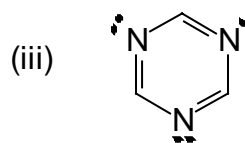
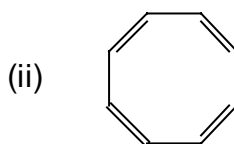
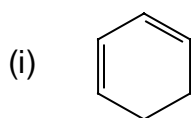
- (i) 4-ethyl-5-heptene
- (ii) 1,1-dimethyl pentane

(4 Marks)

(h) Describe Huckel's rule in your own words.

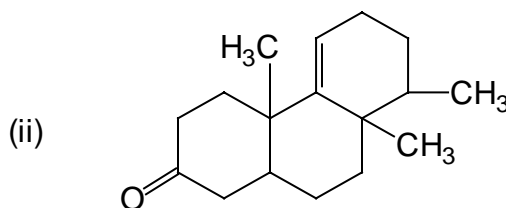
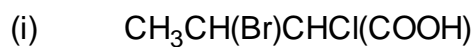
(4 Marks)

(i) State whether the following compounds are aromatic or non-aromatic and state the number of pi electrons present in each compound.



(6 Marks)

(j) Mark with an asterix (*) all chiral centers present in the following compounds. (Marks will be deducted for the wrong marking).



(6 Marks)

SECTION B

2. (a) Dehydrohalogenation of 2-chlorobutane (alkyl halide) with sodium hydroxide in ethanol solvent yields a mixture of products.

(i) Write reaction mechanism for the reaction.

(6 Marks)

(ii) State with good reason which product you would expect to be the major product.

(3 Marks)

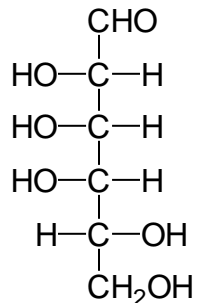
(b) Draw (i) the most stable and (ii) the least stable Newman projections for the compound 1,2-dihydroxy ethane and any interesting Newman projection for the compound. Give names of the projections.

(3 Marks)

(c) Explain in detail with an appropriate example of your choice the sp hybridisation.

(8 Marks)

3. (a) The structure of D-talose is as follows.



D - TALOSE

Draw Fischer projection and then Haworth projection for D-talose.

(4 Marks)

(b) Draw all possible isomers of a compound with molecular formula $\text{C}_4\text{H}_{10}\text{O}$ and give IUPAC name for each isomer.

(12 Marks)

(c) Give starting materials which would react under basic conditions to give following ethers.

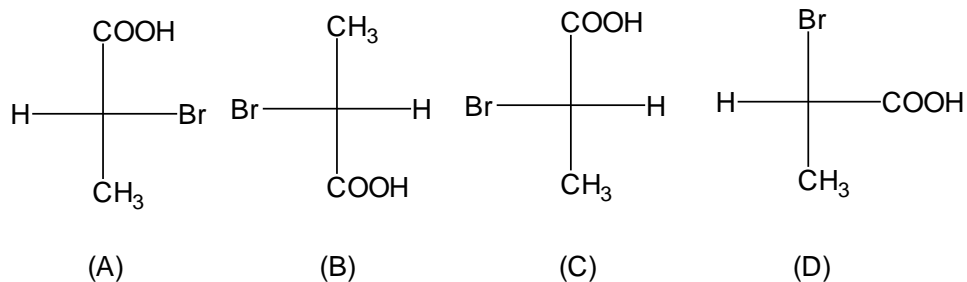
(i) Ethyl phenyl ether (ii) Diethyl ether

(4 marks)

4. (a) Write the reaction mechanism for the reaction between 2-butene and bromine (Br_2). The product is optically active. Draw all possible Fischer projections for stereoisomers. Indicate the relationship between them such as enantiomers, diastereoisomers and meso compounds.

(12 Marks)

(b) Assign R or S designation to the following Fischer projections (show your workings) and comment on the relationship between them.



(8 Marks)

5. (a) Predict the product(s) and give IUPAC names for the following reactions. (No Reaction mechanism required).

- (i) Reaction of benzene with 1-chlorobutane in presence of aluminium chloride. (The main or major product will be considered first then other products).
- (ii) Reaction of benzene with nitronium ion followed by reduction with tin and hydrochloric acid. The product is then treated with nitrous acid in hydrochloric acid below 10°C. The final product is then treated with phenol.
- (iii) reduction of $\text{CH}_3\text{C}=\text{CCH}_2\text{CH}_3$ with Lindler catalyst.

(12 Marks)

(b) With an appropriate example write reaction mechanism for S_{N}^2 reaction.

(6 Marks)

(c) What Grignard reagents and what carbonyl compounds might you start with to synthesise butan-2-ol. (Draw the chemical structures of the compounds).

(2 Marks)

END OF QUESTION PAPER!!!