



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF APPLIED CHEMISTRY

BACHELOR OF SCIENCE HONOURS DEGREE

END OF FIRST SEMESTER EXAMINATIONS – FEBRUARY 2010

**ORGANIC CHEMISTRY – SCH 1116 (FOR SBB, ESH, EFW AND
TXT STUDENTS)**

TIME – 3 HOURS

INSTRUCTIONS TO CANDIDATES

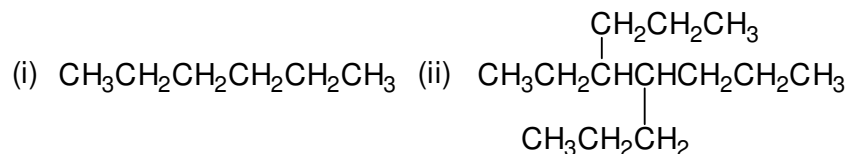
1. ANSWER **ALL** QUESTIONS FROM SECTION A AND **ANY THREE** FROM SECTION B. SECTION A CARRIES 40 MARKS AND EACH QUESTION IN SECTION B CARRIES 20 MARKS.
2. START NEW QUESTION ON A NEW PAGE. (NOT EACH PART OF A QUESTION.)
3. SHOW MECHANISM, CHEMICAL STEPS OR SYNTHESIS BY MEANS OF CURVED ARROWS.

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) Give IUPAC names for the following compounds.



(2 Marks)

(b) Draw the structural formulae for the following compounds.

- (i) cis-1,2-dimethylcyclopentane.
(ii) 3-propyl-4,7-dimethyl nonane

(2 Marks)

(c) Draw E and Z configuration for the following alkenes and indicate priority on the structures.



(4 Marks)

(d) Show the steps to assign either R and/or S designation to each chiral centres in the following compound.



(6 Marks)

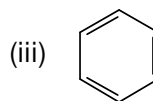
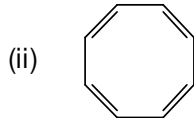
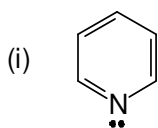
(e) With good explanation draw the most stable chair conformation for 1-bromo-2-methyl cyclohexane.

(4 Marks)

(f) Explain Huckel's rule in your own words.

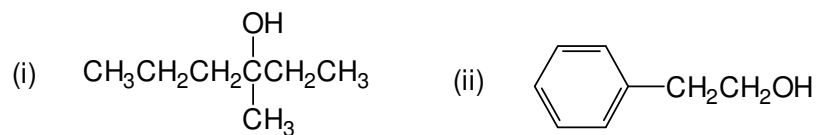
(4 Marks)

(g) State whether the following compounds are aromatic or non-aromatic and also indicate the number of pi electrons which support your answer. Marks will not be given if one of the answers is not correct.



(6 Marks)

(h) What Grignard reagents and what carbonyl compounds might you start with to prepare the following alcohols?



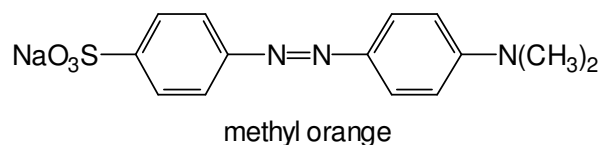
(4 Marks)

(i) Draw the structures for the starting materials which would react under basic condition to give the following ethers.



(2 Marks)

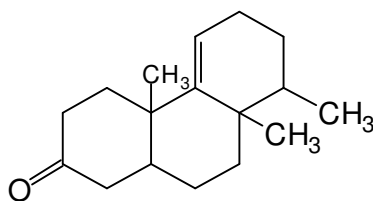
(j) Methyl orange is an azo dye and its structure is as follows:



Draw two structures which couple together and also indicates the reaction conditions needed for the reaction.

(3 Marks)

(k) Mark with an asterisk (*) all chiral centres present in the following compound. (Marks will be deducted for the wrong marking).



(3 Marks)

SECTION B:

2. (a) From the list given below, select the substituents, which are (i) ortho/para directing and (ii) meta-directing. (Mark will be deducted for the wrong answer.)

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

-CN, -CH₃, -CHO, OCH₃, -F, -NO₂, -COOH, -NH₂, .

(4 Marks)

- (b) Draw the structures of the products and give IUPAC names for the following reactions. Indicate also if there is a major product. (No reaction mechanism required.)

(i) reaction of $\text{CH}_3\text{CH}_2\text{CH}_2\text{C}=\text{CCH}_2\text{CH}_3$ with Lindler catalyst.

(ii) reaction of $\text{CH}_3\text{CH}_2\text{CH}_2\text{C}=\text{CCH}_2\text{CH}_3$ with Li/NH₃ and H₂O.

(iii) reaction of $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$ with HCl in presence of peroxide.

(8 Marks)

- (c) Dehydrohalogenation of 2-chlorobutane with potassium hydroxide in ethanol yields a mixture of two products.

(i) Write reaction mechanism for the reaction.

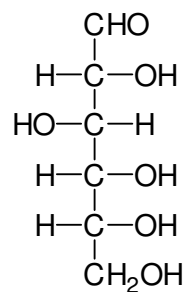
(ii) State with good reason which product you would expect to be predominant.

(8 Marks)

3. (a) What are anomers?

(4 Marks)

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



D - GLUCOSE

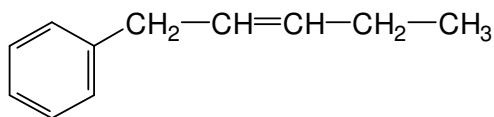
Draw reaction mechanism for Haworth projection from D-glucose. Indicate the name of the chemical reaction that has taken place

(4 Marks)

(ii) Draw α and β anomers of D-glucopyranose.

(4 Marks)

- (c) What carbonyl compound and what phosphorus ylide might you use to prepare the following alkenes? What is the importance of the reaction?



(3 Marks)

- (d) Draw all the possible isomers of a compound with molecular formula C_4H_9OH . Write IUPAC names for the compounds.

(5 Marks)

4. (a) Discuss sp^2 hybridisation with an appropriate organic compound of your choice. Draw orbital as well as bonded structures and indicate the shape of the molecule.

(8 Marks)

- (b) Starting with benzene as your only source of aromatic compound, how would you synthesise the following compounds? Assume that you can separate isomers if necessary.

(i) *m*-bromonitrobenzene

(4 Marks)

(ii) *o*-chloronitrobenzene

(4 Marks)

(iii) Propylbenzene

(4 Marks)

5. (a) Write reaction mechanism for S_N^1 and S_N^2 reactions. Use starting material of your choice.

(10 Marks)

- (b) Write reaction mechanism for the acid catalysed dehydration of 3,3-dimethylbutan-2-ol. Explain with good reason if there is a major product.

(6 marks)

- (c) Write the chemical reaction between alkene and ozone and then with Zn/CH_3COOH . Indicate the importance of the reaction. Use alkene of your choice (No mechanism required).

(4 Marks)

END OF QUESTION PAPER!!!