

**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**DEPARTMENT OF APPLIED CHEMISTRY**

**SUPPLEMENTARY EXAMINATIONS – AUGUST 2004**

**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.

GRAPH PAPER WILL BE PROVIDED ON REQUEST.

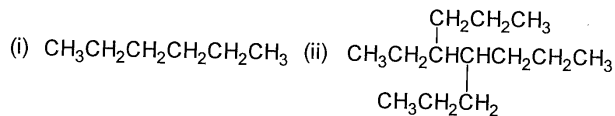
2. SHOW MECHANISM, CHEMICAL STEPS OR SYNTHESIS BY MEANS OF CURVED ARROWS.

**TOTAL MARKS = 100**

THIS QUESTION PAPER CONSISTS OF **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.



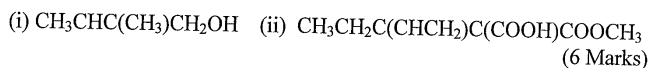
(2 Marks)

(b) The following names are incorrect. Draw structures and provide correct IUPAC names.

- (i) 2,2-Dimethyl-6-ethyl heptane
- (ii) 1-Ethyl-5-methyl pentane
- (iii) 3-ethyl-5,5-dimethyl pentane

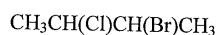
(6 Marks)

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



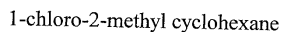
(6 Marks)

(d) Show the steps to assign either R or S designation to each chiral centre in the following compounds.



(5 Marks)

(e) Draw the chair conformations of the following compound and indicate with appropriate reason, which one of them is the most stable conformation.

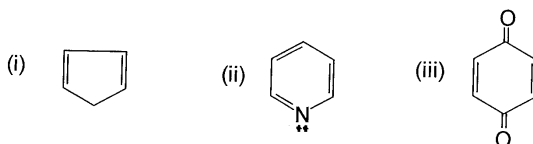


(6 Marks)

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

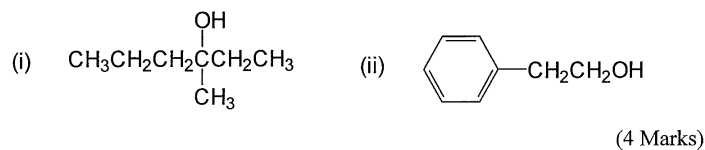
(4 Marks)

(h) State whether the following compounds are aromatic or non-aromatic.

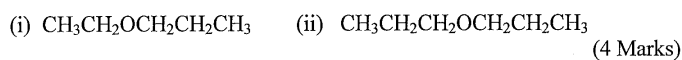


(3 Marks)

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



- (j) Give starting materials and reagents, which would react under basic conditions to give the following ethers.



**SECTION B:**

2. (a) Sketch a potential energy diagram for rotations about the carbon-carbon bond of  $\text{BrCH}_2\text{CH}_2\text{Br}$ .

Use Newman projections to indicate locations of the various conformations.

(12 Marks)

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

(i) Write reaction mechanism for the reaction.

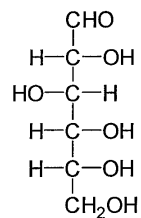
(ii) State with good reason which product you would expect to be predominant.

(8 Marks)

3. (a) What are anomers?

(4 Marks)

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



D - GLUCOSE

- (i) State reaction mechanism for Haworth projection from D – glucose. Indicate the name of the chemical reaction that has taken place

(4 Marks)

- (ii) Draw  $\alpha$  and  $\beta$  anomers of D-glucopyranose. (4 Marks)
- (c) Name the six possible isomeric tripeptides that contain valine, tyrosine and glycine. Use the three-letter shorthand notation for each amino acid. (3 Marks)
- (d) Draw all the possible isomers of a compound with molecular formula  $C_4H_9O$ . (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. (9 Marks)
- (b) Write reaction mechanism for the acid catalysed dehydration of 3,3-dimethylbutan-2-ol. Explain with a good reason if there is a major product. (6 marks)
- (c) Write the reaction mechanism between 2-butene and hydrogen bromide. Comment on the product. (5 Marks)

\*\*\*\*\* END OF QUESTION PAPER \*\*\*\*\*