BINDURA UNIVERSITY OF SCIENCE EDUCATION

CHEMISTRY DEPARTMENT

COURSE: CH103 ORGANIC CHEMISTRY 1

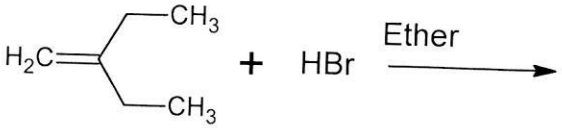
2 HOURS

ANSWER QUESTION ONE AND FOUR OTHER QUESTIONS TWO FROM EACH OF THE SECTIONS A AND B. EACH QUESTION CARRIES 20 MARKS

1. a) Define the following terms as used in organic chemistry:
   (i) Reaction mechanism
   (ii) Conformer
   (iii) Enantiomer

(3x2 marks)

b) Using mechanisms, show the product of the following reaction.

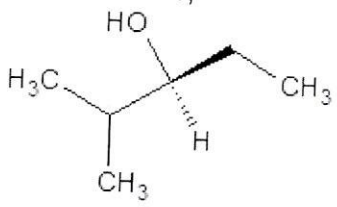


(5 marks)

c) Give the structure corresponding to the following IUPAC name: 6-isopropyl-3,3,7-trimethyldecane..

(4 marks)

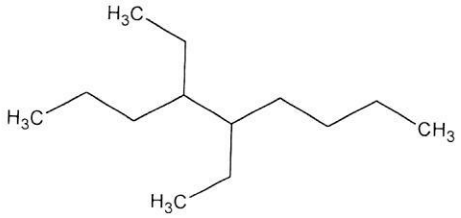
d) Name the molecule below;



(5 marks)

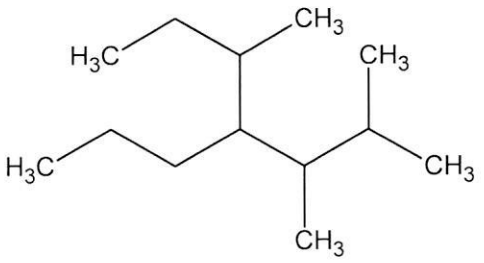
SECTION A: ANSWER TWO QUESTIONS

2. (a) Give the IUPAC names of the following compounds:
   (i)



(ii)

(2 marks)



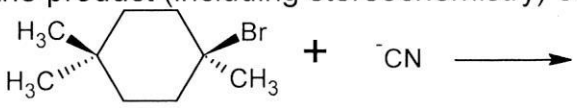
(2 marks)

(b) Draw the two chair conformations of ethylcyclohexane. Which one is more stable? (4 marks)

(c) Draw the other isomer of the molecule shown below;

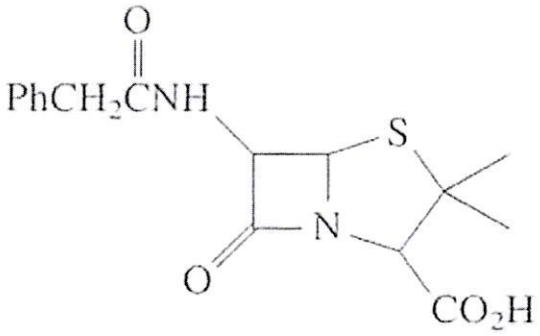
(3 marks)

(d) Draw the product (including stereochemistry) of the following SN_2 reaction.



(5 marks)

(e) Draw and name all functional groups present in Penicillin G below:



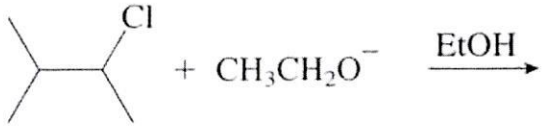
Penicillin G

(4 marks)

3. (a). State Zaitsev's rule. (2 marks)

(b) Use Zaitsev's rule to predict the major and minor products of the following reactions:

(i)



(4 marks)

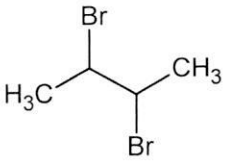
(ii)

(4 marks)

(iii) Show the reaction mechanism for the monochlorination of propene.
(4 marks)

(c) Draw the staggered Newman projection of the following compounds:

(i)

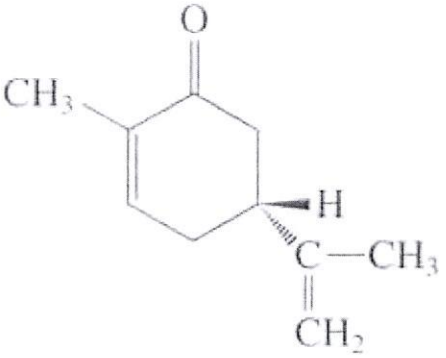


(3 marks)

(ii)

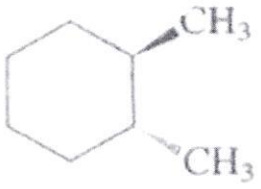
(3 marks)

4. (a) Assign R/S to each of the chiral centers in the molecules below:
(i)



(3 marks)

(ii)

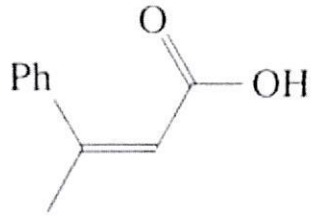


(6 marks)

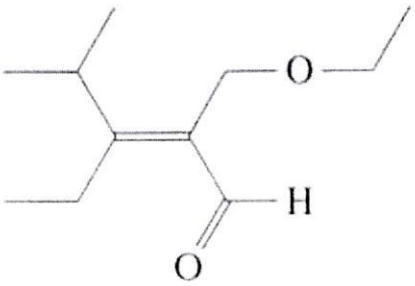
(b) Draw the structure of (S)-1-methyl-2-cyclohexenol. (5 marks)

(c) Assign the configurations of following compounds as E or Z:

(i)



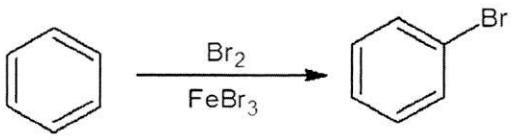
(ii)



(3+3 marks)

SECTION B: ANSWER TWO QUESTIONS

5. (a) Illustrate the mechanism of the following reaction:



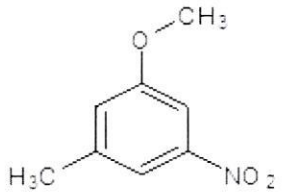
(6 marks)

(b) Predict the major products of the following reactions:
(i) Mononitration of *o*-bromoaniline
(ii) Monobromination of *p*-nitromethylbenzene
(i) Monochlorination of phenylamine
(ii) Monobromination of 1,2-methylbezene (4x2 marks)

(c) When benzene reacts with 1-chloro-2,2-dimethylpropane (neopentyl chloride) in the presence of aluminum chloride, the major product is 2-methyl-2-phenylbutane, not 2,2-dimethyl-1-phenylpropane (neopentylbenzene). Explain this result. (6 marks)

6. How would you synthesize the following compound starting from benzene? Assume that ortho and para isomers can be separated.

(a)

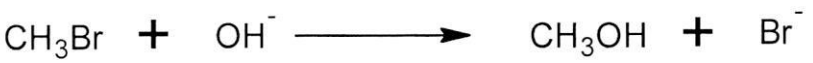


(9 marks)

(b) Alkylhalides/halogenoalkanes undergo S_N2 reactions. Four factors influence the rate of S_N2 reactions.

(i) What do you understand by S_N2 reactions? (2 marks)

(ii) Use the following reaction to illustrate the mechanism of an S_N2 reaction:

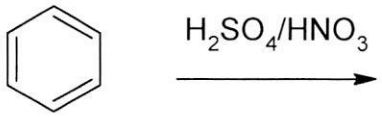


(5 marks)

(iii) State and explain any one factor that influence the rate of S_N2 reactions of alkylhalides (1+3 marks)

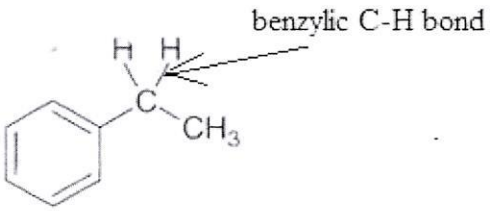
7. Show with mechanisms the products of the following reaction:

(a)



(10 marks)

(b) Using the compound below, explain why benzylic C-H bond is weaker than most other sp^3 hybridised C-H bonds



(10 marks)

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