



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR**

**THIRD YEAR SECOND SEMESTER EXAMINATIONS
SUPPLEMENTARY EXAM**

**FOR THE DEGREE
OF
BACHELOR OF SCIENCE (CHEMISTRY)**

COURSE CODE: SCH 333

COURSE TITLE: STEREOCHEMISTRY, CONFORMATIONAL STUDIES AND REACTION

DATE: 03 AUGUST 2022

TIME: 8.00 TO 10 AM

INSTRUCTIONS TO CANDIDATES

1. Answer all questions

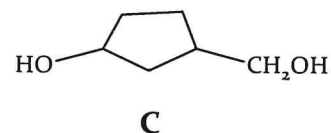
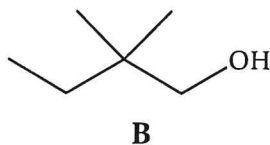
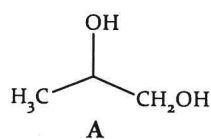
TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

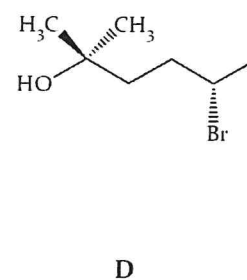
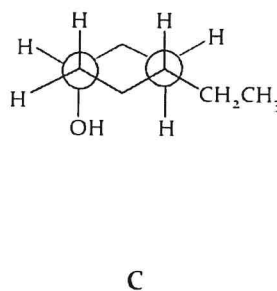
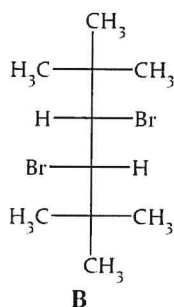
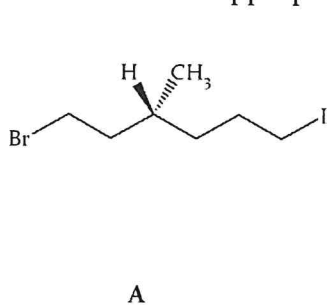
This Paper Consists of 5 Printed Pages. Please Turn Over.

QUESTION 1 (21 Marks)

- a) Determine whether or not a stereogenic centre exists in the molecules given below and draw all possible stereoisomers associated with the molecule where appropriate in perspective formula. 6 Marks



- b) Provide an unambiguous name for each of the molecules given. Note you should use the R and S notations where appropriate. 4 Marks

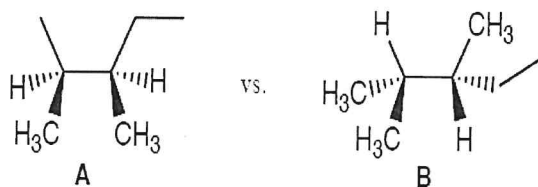


- c) Define the following terms used in stereochemistry 3 Marks

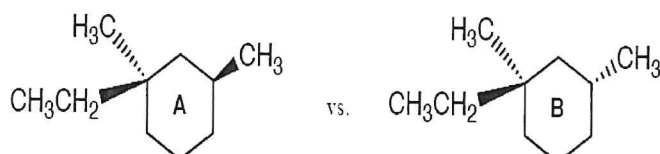
- i) Prochiral center
- ii) Dextrorotatory
- iii) Enantiomeric excess (ee)

- d) Giving clear reasons and using drawings, where appropriate, select the structure that best fits the descriptions for each pair of molecules shown below.

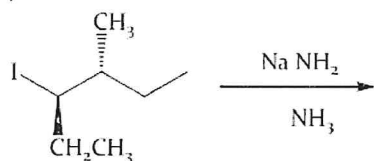
- i) More stable conformer 2 Marks



- ii) More stable diastereomer 2 Marks

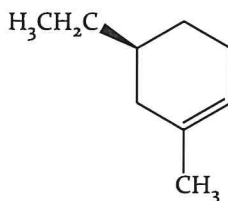


v) E2 reaction



b) Answer the following question related to reactions in question 2, a) above

i) Consider reaction iii). Compound **10** below is a possible product in the reaction. Comment on this. **2 Marks**



Compound 10

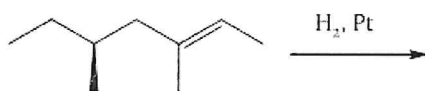
ii) Give a reaction mechanism leading to the major product in vi) above. **4 Marks**

iii) Give a plausible mechanism for reaction v) **2 Marks**

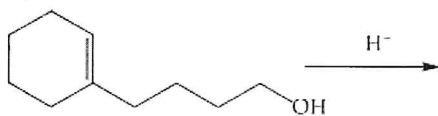
QUESTION 3 (13 Marks)

a) Draw both the **major** and **minor** products, where applicable of each of the following addition reactions. *Be sure to include stereochemistry in your answers where appropriate.* **10 Marks**

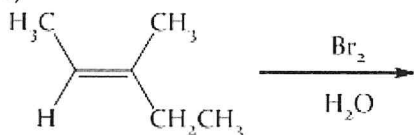
i)



ii)



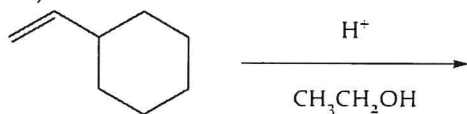
i)



ii)

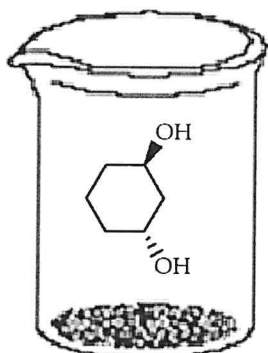


iii)

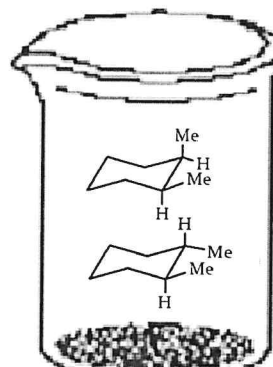


b) Give a reaction mechanism for reaction in question 3, a) iii) above. **3 Marks**

- e) Predict whether the contents of each beaker rotate plane polarized light and provide a brief reason for your decision. 4 Marks



A

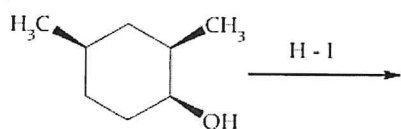


B

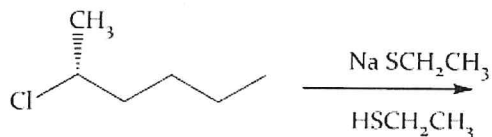
QUESTION 2 (20 Marks)

- a) Draw the **major product** of each of the following reactions. *Be sure to include stereochemistry in your answers where appropriate.* 12 Marks

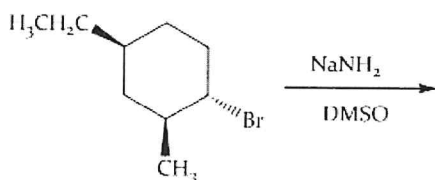
i) S_N reaction



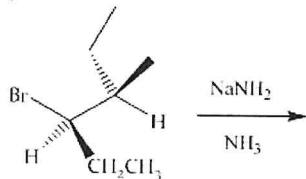
ii) S_N2 reaction



iii) E2 reaction

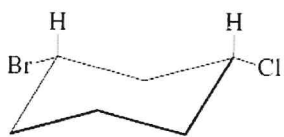


iv) S_N reaction

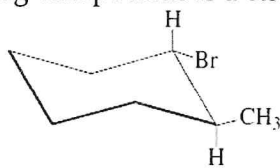


QUESTION 4 (16 Marks)

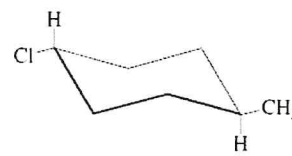
a) Determine whether each of the following compounds is a *cis* isomer or a *trans* isomer. **3 Marks**



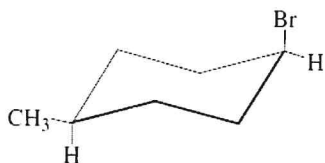
A



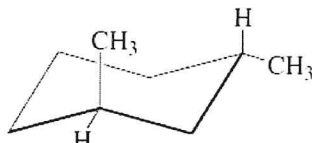
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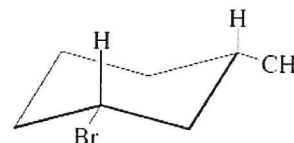
C



D

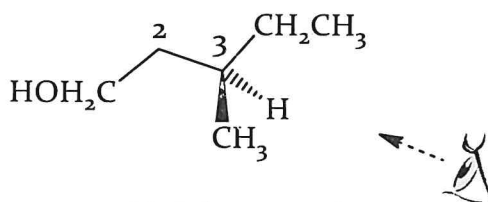


E



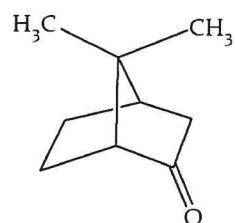
F

b) Consider the compound 3-methylpentane given below. Carefully read question i) to iv) below before answering this question.



3-Methylpentan-1-ol

- Draw the Newman projection of this compound from the indicated direction about C₃-C₂ as indicated (place it in the leftmost circle below). **1 Mark**
 - Perform a conformational analysis of the molecule by **rotating the groups behind in the clockwise direction** and drawing its other eclipsed and staggered conformers. **5 Marks**
 - Indicate their relative energies by completing the energy diagram above your drawings **3 Marks**
- c) Reduction of 7,7-dimethylbicyclo[2.2.1]heptan-2-one whose structure given below using sodium borohydride is gives two products with one being preferred (80%). Give structures of both products and explain the reason for the major product. **4 Marks**



7,7-dimethylbicyclo[2.2.1]heptan -2-one

