



# UNIVERSITY EXAMINATIONS

**SECOND SEMESTER 2023/2024 ACADEMIC YEAR**

**SECOND YEAR EXAMINATION FOR THE DEGREES  
OF BACHELOR OF SCIENCE (GENERAL), BACHELOR  
OF EDUCATION (SCIENCE), BACHELOR OF SCIENCE  
(BIOMED)**

**CHEM 222: ORGANIC CHEMISTRY II**

***STREAM: R***

***TIME: 2 HRS***

***DAY: WEDNESDAY [2. 30P.M - 4.30P.M] DATE: 17/04/2024***

**THIS QUESTION PAPER CONSISTS OF FOUR (4) PAGES**

**PLEASE DO NOT OPEN UNTIL THE INVIGILATOR SAYS SO.**

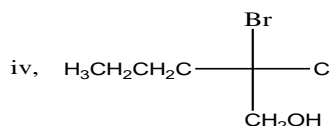
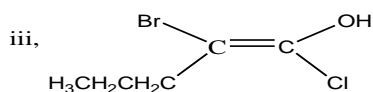
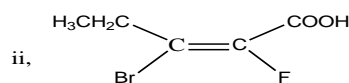
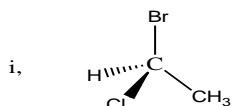


**INSTRUCTIONS: Attempt ALL questions****QUESTION ONE (30 MARKS)**

a) Define the term Epimer and give one Example (1.5 Marks)

b) Give the IUPAC name of the following compounds designating them as R, S, E or Z.

(4 Marks)



c) Draw the structures of the following compounds (7.5 Marks)

i) (S)-2-Chloro-2-fluoropentane (in both Fischer and 3 dimension)

ii) Trans-3-methoxycyclobutan-1-ol

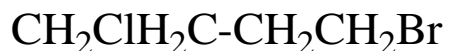
iii) (Z)-2-Bromo-3-chloro-2-hexene

iv) (R)-2-Chloro-2-fluoropropanol (in both Fischer and 3 dimension)

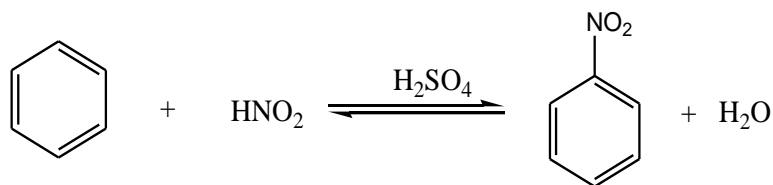
v) Ethoxyhexane

d) i, Define the term Conformational isomers. (1 Mark)

ii, Draw the conformers of the following compound and sketch a Potential Energy diagram for rotation around a C-C bond. Clearly identify maximum and minimum PE. Assume PE max = 25KJ/mol (6.1Kcal/mol). (8 Marks)

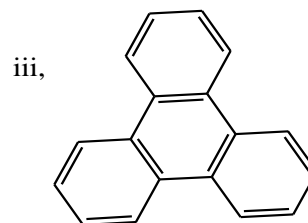
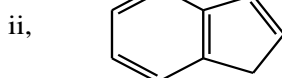
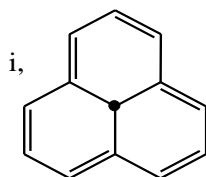


e) Write the mechanism of the following reaction (8 Marks)



### QUESTION TWO (20 MARKS)

a) Classify each molecule as Aromatic, Anti-aromatic or Non-aromatic. (3 Marks)



b) Use 3,4-Dibromo-2,5-Dichlorohexane to differentiate between Enantiomers, Diastereomers and Meso compounds. Name and assign all the **Chiral Centers** as either R or S (11 Marks)

c) i, Using E1 reactions to write the mechanism for the reaction between 2-Chloro-3-methylbutane and Ethanol as a solvent to give rearrangement. (5 Marks)

ii, Give the IUPAC names of the products. (1 mark)

### QUESTION THREE (20 MARKS)

a) Give the structure of an ester that will yield a mixture of 1-Pentanol and Ethanol on reduction with  $LiAlH_4$ . (2 Marks)

b) i, Write  $S_N1$  mechanism for 2-Bromo-3-methylpentane in Ethanol to give both rearranged and non-rearranged products (8 Marks)

ii, Write the IUPAC names of the products (1 Mark)

c) Propose the  $S_N2$  mechanism for 1-Bromopentane with Sodium ethoxide and give the IUPAC name of the product. (5 Marks)

d) Give the products (A-D) in the following reactions.

(4 Marks)

