UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER
SUPPLEMENTARY EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE

COURSE CODE: SCH 124

COURSE TITLE: ORGANIC CHEMISTRY I

DURATION: 2 HOURS

DATE: 11/8/2023 **TIME: 11 – 1PM**

INSTRUCTIONS TO CANDIDATES

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

Question 1

a) Explain the following terms; [5mks]

i. Stereochemistry-

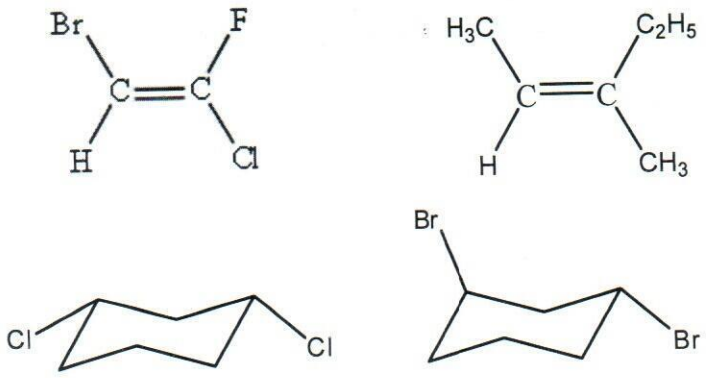
ii. Optical activity-

iii. Racemic mixture

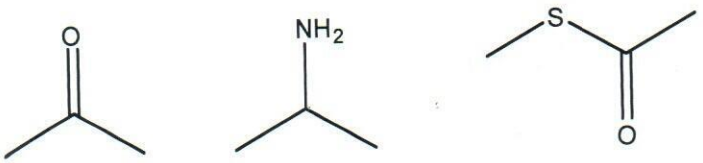
iv. Enantiomers

v. Chiral centre

b) Using Trans- and cis- system of nomenclature, give the IUPAC name of the following; **[4mks]**



c) Using δ- and δ+, indicate polarity patterns in the following functional groups. **[4mks]**

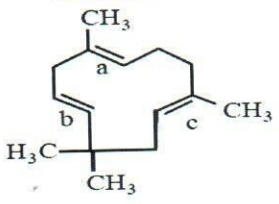


d) Calculate the specific rotation of the sample, if solution of the sample containing 0.75 g/10 mL is placed in 10 m polarimeter tube and its observed rotation at 25°C (D-line) is +1.2°. What would be the specific rotation and percentage optical purity of its enantiomer? **[4mks]**

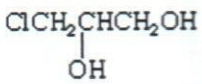
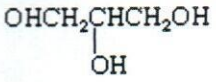
e) Give the other three names for a stereogenic centre **[3 mks]**

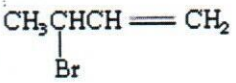
f) Humulene is a triene found in hops. Label bonds a, b, and c by E and Z rules. **[3mks]**

humulene



g) In each of the following pairs, Identify each compound as chiral or achiral, as appropriate [4 marks]

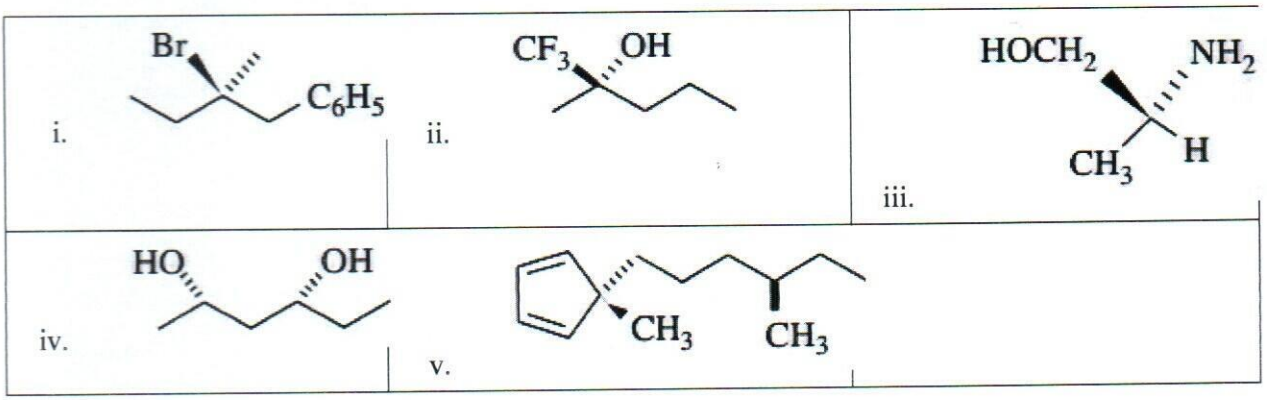
(i)  and 

(ii)  and 

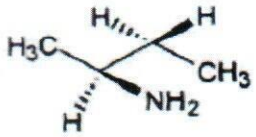
h) State three differences between E1 and E2 reaction mechanisms **[3mks]**

Question 2

a) Indicate the chiral centers by placing an asterisk (*) in the following molecules and give the relative configuration (R,S) of each: **[10mks]**



b) Consider the chemical structure of 2-aminobutane shown below. Citing down the C2-C3 bond, draw a Newman projection specifically for this structure. **[3mks]**



c) 2-*aminopropanoic(alanine)* acid can be found as a racemic mixture which has no effect on the plane of polarisation. 2-aminopropanoic acid has the structure:

i. Draw the structures of the two enantiomers. Use your diagram to explain what is meant by the term *non-superimposable mirror image*. **[5mks]**

ii. Why doesn't a racemic mixture have any effect on the plane of polarisation of plane polarized light? **[2mks]**

Question 3

a) Discuss three methods for the resolution of enantiomers from their racemic mixture . **[10mks]**

b) Draw the conformational isomers of *cis*-1,2-dimethylcyclohexane and *cis*-3,4-dimethylcyclohexanone. While the cyclohexane conformers are of equal energy, the cyclohexanone conformers are not. Indicate which con-former is favored and explain why. **[10mks]**

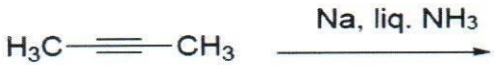
Question 4

a) Using a molecule of 1,2-Dichloroethane

i. Draw Newman projection for all conformations formed by rotation from 0° to 360°. **[6mks]**

ii. Sketch a curve of potential energy versus dihedral angle for 1,2-Dichloroethane **[6mks]**

b) Complete and Provide a detailed, step-by-step mechanism for the reaction below. **[8mks]**



Question 5

a) Distinguish between the Nucleophile and electrophile **[2mks]**

b) Explain the factors affecting elimination Reactions **[8mks]**

c) Give any four properties of enantiomers. **[4mks]**

*d)*Show the plausible reaction mechanism for the addition of Br_2 to But-2-ene leading to the formation of ;

i. Racemic-2,3- dibromo butane **[3 mks]**

ii. Meso-dibromo butane **[3 mks]**