

UNIVERSITY EXAMINATIONS

FIRST SEMESTER 2025/2026 ACADEMIC YEAR

**FOURTH YEAR EXAMINATION FOR THE DEGREE OF
BACHELOR OF SCIENCE (GENERAL) AND BACHELOR OF
EDUCATION (SCIENCE)**

CHEM 412: ADVANCED STEREOCHEMISTRY

STREAMS: BEd(Sc) & BSc (Gen)

TIME: 2 HRS

DAY: WEDNESDAY [8.30 – 10.30 A.M]

DATE: 04/02/2026

THIS QUESTION PAPER CONSISTS OF THREE (3) PAGES

PLEASE DO NOT OPEN UNTIL THE INVIGILATOR SAYS SO.

Attempt ALL the Questions**QUESTION ONE (30 MARKS)**

a) Define the following term Enantiomer and give an example. (3 Marks)

b) Draw the following Fischer and 3-dimension projections of the following compounds.

(4 Marks)

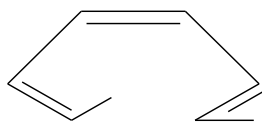
i) (R)-2-Fluoro-2-methylpentanol

ii) (S)-2-Pentanol

c) Consider 360° rotation about C-C rotation curve for 1,2-Dichloroethane: (Assume PE max = 6.1Kcal/mol.) (8 Marks)



d) i) Show the product that is formed when the following compound undergoes thermal electrocyclic and photochemical ring closure. (6 Marks)



ii) Indicate whether the process is conrotatory or disrotatory and clearly indicate the stereochemistry around the tetrahedral stereogenic centers and double bonds. (2 Marks)

iii) Name the reactants and the products. (3 Marks)

e) A sample of pure (R)-2-Butanol was placed in 1 dm Polarimeter tube, Using D line of Na Lamp, the observed rotation at 20°C was $\alpha = -10.4^\circ$. The density of this compound is 0.805 g/ml. What is the specific rotation of (R)-2-Butanol. (4 Marks)

QUESTION TWO (20 MARKS)

a) i) By use of Cyclohexane chair conformation distinguish the two sets of H atoms.

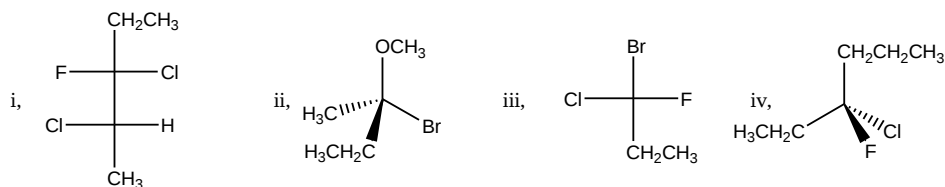
(3 Marks)

ii) Determine the percentage of Bromocyclohexane with the substitution equatorially and axillary placed at 25°C (298K). $-\Delta G^\circ = 1.59 \text{ KJ/mol}$, $R = 8.314 \text{ J/mol/K}$. (8 Marks)

- b) Consider Cycloheptatriene and Ethene. By use of arrows, draw the products formed from [2 + 2], [4 + 2] and [6 + 2] cycloadditions. (9 Marks)

QUESTION THREE (20 MARKS)

- a) Write the IUPAC names of the following compounds and assign configuration of the Chiral Carbons (4 Marks)



- b) Draw the π molecular orbitals for 2,4,6,8-Decatetraene, Show the HOMO and LUMO in both ground and excited states (9 Marks)
- c) Draw the stereochemistry of the reactants and products, include the conditions for each pair and indicate the type of cycloaddition reaction (7 Marks)

