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MCH-012

**MASTER OF SCIENCE IN
CHEMISTRY/MASTER OF SCIENCE IN
ANALYTICAL CHEMISTRY
(MSCCHEM/MSCANCHEM)**

Term-End Examination

December, 2025

**MCH-012 : STEREOCHEMISTRY AND
REACTIVE INTERMEDIATES**

Time : 2 Hours

Maximum Marks : 50

Note : Answer any ***five*** questions. All questions
carry equal marks.

C-2853/MCH-012

P. T. O.

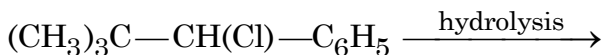
1. (a) What is meant by projection in representation of organic molecules in three dimensions ? Give examples. $2\frac{1}{2}$
- (b) Explain how to convert the Fischer projection of 2, 3-dibromobutane into its staggered sawhorse form. $2\frac{1}{2}$
- (c) Draw the *two* possible chair conformations for cis-1, 3-dimethyl cyclohexane. Explain which conformation is more stable and why. 5
2. (a) Define the term enantiomeric excess (ee). A sample of a mixture of R and S isomers of a compound is found to have a specific rotation of + 6.76. If the

specific rotation of the pure R-enantiomer is + 13.52, calculate the enantiomeric excess of the sample and explain the composition of the mixture. 5

(b) Draw the structure of (E)-1-bromo-1-chloropropene. Use the Cahn-Ingold-Prelog (CIP) rules to explain why it has E-configuration. 5

3. (a) Define a prochiral centre. Explain why the carbonyl carbon in acetophenone ($\text{C}_6\text{H}_5\text{COCH}_3$) is a prochiral centre, but the carbonyl carbon in acetone (CH_3COCH_3) is not. 5

- (b) Give the mechanism and expected product in the following reaction :



Mention whether this reaction will undergo rearrangement or not, and explain.

5

4. (a) What is the Helicity Rule ? Explain how this rule applies to conjugated dienes and α , β -unsaturated ketones, correlating the helical twist of the chromophore with the sign of the cotton effect.

5

- (b) Define carbocation. Discuss its structure, hybridization and geometry.

5

5. Give the expected product and the mechanism in the following rearrangement reactions :

(a) Reaction of 1-aminomethyl cyclohexanol with nitrous acid. 5

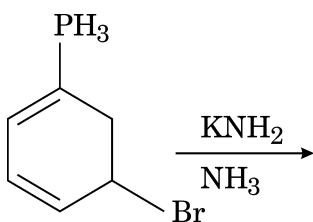
(b) Acid catalysed reaction of 2-methyl, 1, 1-diphenyl propane-1, 2-diol. 5

6. (a) Explain the mechanism of free radical addition of HBr to propene. Why is it an abnormal addition that doesn't follow Markovnikov's rule ? 5

(b) Explain the structure and stability of nitrenes. How are nitrenes generated from redox reactions ? 5

7. (a) Write the mechanism of Hofmann rearrangement and give its synthetic utility. 5

(b) Complete the following reaction and write its mechanism : 5



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