

MCH-012

ASSIGNMENT BOOKLET

**M.Sc. in Chemistry Programme
(MSCCHEM)**

STEREOCHEMISTRY AND REACTIVE INTERMEDIATES

(Valid from January, 2024 to December, 2024)

**It is compulsory to submit the assignment before filling in
the examination form.**



School of Sciences
Indira Gandhi National Open University
Maidan Garhi, New Delhi-110068
(2024)

Dear Learner,

Please read the Section on assignments in the Programme Guide for M.Sc. in Chemistry that we sent you after your enrolment. A weightage of 30 per cent, as you are aware, has been earmarked for continuous evaluation, which would consist of one tutor-marked assignment for this course. The assignment is in this booklet, and covers all the four blocks of the course. The total marks of all the parts are 100, of which 40% are needed to pass it.

Instructions for Formatting Your Assignments

Before attempting the assignment please read the following instructions carefully:

- 1) On top of the first page of your answer sheet, please write the details exactly in the following format:

ENROLMENT NO. :

NAME :

ADDRESS :

.....

.....

COURSE CODE :

COURSE TITLE :

ASSIGNMENT NO. :

STUDY CENTRE : **DATE** :

(NAME AND CODE)

PLEASE FOLLOW THE ABOVE FORMAT STRICTLY TO FACILITATE EVALUATION AND TO AVOID DELAY.

- 2) Use only foolscap size paper (but not of very thin variety) for writing your answers.
- 3) Leave about 4 cm margin on the left, top and bottom of your assignment response sheet.
- 4) Your answers should be precise.
- 5) Submit the complete assignment answer sheets within the due date.
- 6) The assignment answer sheets are to be submitted to your Study centre within the due date. Answer sheets received after the due date shall not be accepted.

We strongly suggest that you retain a copy of your answer sheets.

- 7) This assignment is valid from 1st January, 2024 to 31st December, 2024. If you have failed in this assignment or fail to submit it by December, 2024, then you need to get the assignment for the year 2025, and submit it as per the instructions given in the Programme Guide.
- 8) You cannot fill the examination form for this course until you have submitted the assignment.

Wishing you good luck

Tutor Marked Assignment

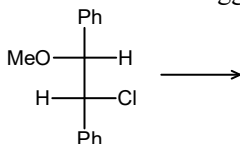
Stereochemistry and Reactive Intermediates

Course Code: MCH-012
Assignment Code: MCH-012/TMA/2024
Maximum Marks: 100

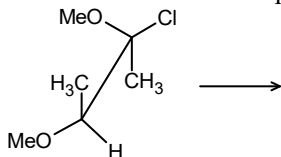
Note: Attempt all the questions. The marks for each question are indicated against it.

1. a) Name the two ways of representing the three dimensional structures of molecules in two dimensions and explain the types involved any one of these. Illustrate your answer. (5)
- b) Carry out the following conversions for the structures given indicating the projection of the molecule. (5)

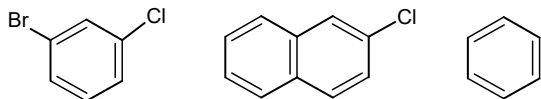
- i) Convert into the staggered Newman projection



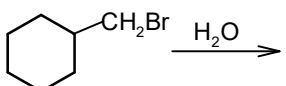
- ii) Convert into the Fischer projection



2. a) Explain the stability of methylcyclohexane with the help of chair conformations and the Newman projections. (5)
- b) Write the order of simple axis of symmetry and the plane or symmetry in the following molecules. (5)



3. a) How is the asymmetry observed in allenes or spiranes different from that observed in biphenyls? Explain giving example in both the cases. (5)
- b) Explain the method of quasi-racemates for the determination of configuration giving suitable diagrams. (5)
4. a) i) Explain the *Re* and *Si* faces in CH_3CHO using suitable diagrams. (3)
- ii) What is a stereocentre? Does the presence of stereocentres ensure chirality in a compound? (2)
- b) i) What is chirotopicity and a chirotopic atom? (2)
- ii) Explain the presence of chirotopic atoms in a chiral molecule and an achiral molecule. (3)
5. a) Illustrate Cram's rule by using open chain model by taking suitable examples. (5)
- b) Explain the octant rule using suitable diagram and give rules used for contribution of different substituents. (5)

6. a) Draw the potential energy diagrams (PED) for the following reaction indicating: (5)
 i) Step 1 as the rate determining step
 ii) Step 2 as the rate determining step
- b) How are stereochemical studies helpful in establishing the mechanism of organic reactions illustrate your answer. (5)
7. a) Which is more stable in the following pairs and why? Indicate the carbocations as primary secondary or tertiary. (5)
- i) $\text{NC}-\overset{+}{\text{C}}\text{H}-\text{CH}_2\text{CH}_2\text{CH}_3$ or $\text{NC}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2^+$
- ii) $\text{CH}_2\text{CH}_2\overset{+}{\text{C}}\text{H}-\text{CH}_2\text{CH}_2\text{CH}_3$ or $\text{CH}_3(\text{CH}_2)_4\overset{+}{\text{C}}\text{H}_2$
- b) Write the mechanism of the following reaction: (5)
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8. a) Arrange the following compounds in the increasing order of their stability. Give reason for your answer. (5)
 Allyl anion, *m*-Nitrobenzyl anion, ortho Chlorobenzyl anion, Benzyl anion
- b) Draw the structures of the two types of carbenes. Explain the stereochemistry of addition reaction on these types. (5)
9. a) Give the evidence which explains the formation of benzyne intermediate during nucleophilic substitution reactions of aromatic halides. (5)
- b) Why is bromination by free radical mechanism is more selective than chlorination? Write all the possible chlorination products of methyl cyclohexane by photolysis. (5)
10. a) Compare the nature of nitrenes to carbenes and give two methods of generation of nitrenes. (5)
- b) Describe the various redox sources of free radical generation. (5)