

BCHCT-131

ASSIGNMENT BOOKLET

**Bachelor's Degree Programme
(BSCM)**

**ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY
AND ALIPHATIC HYDROCARBONS**

Valid from 1st January, 2024 to 31st December, 2024



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

Dear Student,

Please read the section on assignments in the Programme Guide for B. Sc. 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 it consists of two parts, Part A and B. It covers all blocks of the course. The total marks of all the parts are 100, of which 35% 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:

ROLL NO.:

NAME:

ADDRESS:

.....

.....

COURSE CODE:

COURSE TITLE:

ASSIGNMENT NO.:

STUDY CENTRE: **DATE:**

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

- 2) Use only foolscap size writing paper (but not of very thin variety) for writing your answers.
- 3) Leave 4 cm margin on the left, top and bottom of your answer sheet.
- 4) Your answers should be precise.
- 5) Solve Part (A) and Part (B) of this assignment, and **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 this assignment.

We wish you good luck.

ASSIGNMENT

Atomic Structure, Bonding, General Organic Chemistry and Aliphatic Hydrocarbons Core Course in Chemistry

Course Code: BCHCT-131
Assignment Code: BCHCT-131/TMA/2024
Maximum Marks: 100

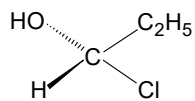
Note: Attempt all questions. The marks for each question are indicated against it.

PART-(A) (50)

- Using a suitable diagram explain the spectral transitions between different energy levels of hydrogen atom. Also name these series of lines and give the region of electromagnetic radiation in which they appear. (5)
- What was the purpose of Davisson and Germer experiment? Explain and analyse its results. (5)
- (a) What is a well-behaved wave function? Illustrate using suitable diagram. (3)
(b) Give the significance of ψ and ψ^2 . (2)
- What are different quantum numbers? Explain their significance. (5)
- Briefly explain the following: (5)
 - The *aufbau* principle
 - Hund's rule
 - Pauli exclusion principle
- a) Arrange the following compounds in order of decreasing lattice energy: LiF, MgO, KBr. Justify your answer. (3)
b) Predict coordination number of the cation in crystals of the following compounds. (2)
MgO: if ionic radii for $Mg^{2+} = 65$ pm and $O^{2-} = 140$ pm.
MgS: if ionic radii for $Mg^{2+} = 65$ pm and $O^{2-} = 184$ pm.
- Why does the bond length decrease in the case of multiple bond formation? Explain with the help of an example. Also explain why a multiple bond is stronger than a single bond. (5)
- a) The observed dipole moment of HI is 0.38 D. Calculate the percentage ionic character of the bonding HI if bond distance is 161 pm (3)
b) Melting point of aluminum fluoride is higher than the melting point of aluminum iodide. Explain (2)
- Draw the resonance structures of carbon monoxide. Also give the electronic configuration of the combining atoms (5)
- Draw the energy level diagram for carbon monoxide molecule. Write its molecular orbitals configuration and calculate its bond order. Comment on its magnetic behaviour. (5)

PART-(B) (50)

- Draw all the stereoisomers of 2-bromo-3-chlorobutane and classify them as enantiomers and diastereoisomers. (5)
- (a) What are resolving agents? Give examples of three acidic and three basic resolving agents. (4)
(b) Write the Fischer projection for the molecule. (1)



13. Draw and explain the energy profile for ring flipping of chair conformation of cyclohexane. (5)
14. Arrange the following carbocations in the increasing order of stability and explain the reason for your answer: (5)
A primary carbocation, a tertiary carbocation, a secondary carbocation.
15. Arrange the following nucleophiles in the increasing order of their strength and give reason for your answer. (5)
CH₃⁻, NH₂⁻, CN⁻, OH⁻, I⁻
16. (a) Define octane number. How does the octane number of a hydrocarbon vary with the following? (3)
(i) Branching of the hydrocarbon chain
(ii) Decrease in the chain length
(iii) Unsaturation
(b) How would you synthesise hexane using Wurtz reaction. Explain giving equation. (2)
17. How would you prepare an alkene using Wittig reaction? Explain the mechanism also. (5)
18. What is Markownikoff's rule? Explain using this rule why 2-bromopropane is the major product of bromination of propene. (5)
19. Discuss different methods of preparation of propyne. (5)
20. Explain whether the following compounds are aromatic or not? (5)

