

BCHCT-131

ASSIGNMENT BOOKLET

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

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

Valid from 1st January, 2023 to 31st December, 2023



**School of Sciences
Indira Gandhi National Open University
Maidan Garhi
New Delhi-110068
(2023)**

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, 2023 to 31st December, 2023**. If you have failed in this assignment or fail to submit it by 31st December, 2023, then you need to get the assignment for the year 2024, 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/2023
Maximum Marks: 100

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

PART-(A) (50)

- Derive the following expression for the energy of electron in the n^{th} orbit. (5)
$$E_n = \frac{-Z^2 e^2 m}{8 \epsilon_0 h^2 n^2}$$
- What is a black body? Discuss the important features of black body radiation giving a suitable diagram. (5)
- Derive the time independent Schrodinger equation for a particle. (5)
- Draw the shapes of $5d$ orbitals. Also indicate the signs of wave functions and nodal planes in the diagram. (5)
- Write the electronic configurations for the following elements. (5)
 - Cr
 - Mo
 - AgAlso explain your answer.
- (a) Write down Born-Haber cycle for CaCl_2 formation. $\left(2\frac{1}{2}\right)$
(b) Discuss the factors which affect the solubilities of ionic solids in water. $\left(2\frac{1}{2}\right)$
- Write the assumptions of calculating the formal charge in a molecule. Calculate the formal charge in $\text{CH}_3\text{-C=O-CH}_3$. (5)
- Draw the resonance structures of HCl . Out of them which one has little importance as a resonance structure and why? (5)
- (a) Calculate the percentage ionic character in HBr gas. $\left(2\frac{1}{2}\right)$
Use following data:
The dipole moment of $\text{HBr} = 2.635 \times 10^{-30} \text{ C m}$
Bond length of $\text{HBr} = 141 \text{ pm}$.
(b) An anion will be more easily polarized, if it is large and highly negatively charged. Explain using suitable examples. $\left(2\frac{1}{2}\right)$
- Draw and explain the molecular orbitals formed by the linear combination of following atomic orbitals. (5)
 - p_x and p_x orbitals
 - p_y and p_y orbitals

PART-(B)**(50)**

11. Explain the following giving suitable examples: (5)
- (i) Position isomerism
 - (ii) Functional group isomerism
 - (iii) Chiral centre
12. (a) Write two more Fischer projection formulas for the following compound: (2)
- $$\begin{array}{c} \text{Cl} \\ | \\ \text{I} - \text{C} - \text{Br} \\ | \\ \text{OH} \end{array}$$
- (b) Write the enantiomer of the following compound and assign their configurations as *R* or *S* (3)
- $$\begin{array}{c} \text{CH}_3 \\ | \\ \text{H} - \text{C} - \text{OH} \\ | \\ \text{COOH} \end{array}$$
13. Draw the possible conformations of cyclohexane and explain their relative stability. (5)
14. (a) Arrange the following compounds in the increasing order of their acidities and give reason in support of your answer. (3)
- 3-chlorobutanoic acid, butanoic acid, 4-chlorobutanoic acid and 2-chlorobutanoic.
- (b) Write acid the resonance structures of propanoate ion. (2)
15. What is pK_a ? How does it help in explaining the basicity of different nucleophiles? Write a nucleophilic reaction indicating the nucleophile and its conjugate acid. (5)
16. (a) How would you prepare cyclopentane starting from barium adipate? Write the reactions involved. (3)
- (b) Explain the term pyrolysis and cracking giving suitable examples. (2)
17. (a) Explain Saytzeff rule giving a suitable example. (3)
- (b) Explain the mechanism of Birch reduction. (2)
18. (a) How would you prepare 2-propanol from propene? Write the steps involved in the conversion. (3)
- (b) Write the products of ozonolysis of 2-methyl-2-butene. (2)
19. Give the mechanism of hydration of ethyne and the product form. (5)
20. Giving suitable diagrams, explain the structure of benzene. (5)