

**BCHCT-131**

**ASSIGNMENT BOOKLET**

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

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

**Valid from 1<sup>st</sup> July, 2019 to 30<sup>th</sup> June, 2020**



**School of Sciences  
Indira Gandhi National Open University  
Maidan Garhi  
New Delhi-110068  
(2019-2020)**

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:

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**ROLL NO.:** .....

**NAME:** .....

**ADDRESS:** .....

.....

.....

**COURSE CODE:** .....

**COURSE TITLE:** .....

**ASSIGNMENT NO.:** .....

**STUDY CENTRE:** .....      **DATE:** .....

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**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 1<sup>st</sup> July, 2019 to 30<sup>th</sup> June, 2020**. If you have failed in this assignment or fail to submit it by June, 2020, then you need to get the assignment for the year 2020-21, 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/2019-2020

Maximum Marks: 100

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

#### PART-(A)

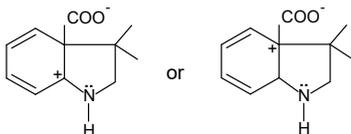
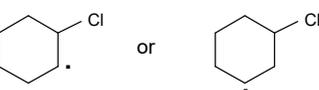
(50)

1. What are the postulates of Bohr model of atom? Why was this model proposed by Bohr? (5)
2. What are matter waves? Explain in phase and out of phase waves using suitable diagrams. (5)
3. What are observables? Give the operators and operation for the following observables: (5)
  - (i) Position ( $x$ )
  - (ii) Momentum ( $P$ )
  - (iii) Potential Energy  $U(x)$
  - (iv) Total Energy ( $E$ )
4. How are spherical polar coordinates related to the rectangular cartesian coordinates? Illustrate giving suitable relations. Also write the Schrodinger equation for hydrogen atom in spherical polar coordinates. (5)
5. State and illustrate Hund's rule and Pauli exclusion principle giving suitable examples. (5)
6. Derive the expression for the total energy of an electron in the  $n^{\text{th}}$  orbit. (5)
7. (a) The first ionisation energies of silicon and sulphur are lower than that of phosphorus. Explain. (5)  
(b) Explain the use of cation to anion radius ratio.  
(c) Arrange the following according to the increasing order of covalence:  
NaF, NaCl, NaBr, NaI
8. For the phosphite ion,  $(\text{PO}_3)^{3-}$ : (5)
  - (a) giving all the steps, write the Lewis structure.
  - (b) calculate the formal charges on O atoms and P atom.
  - (c) draw the shape of the ion.
9. Explain valence bond structures of carbon monoxide molecule. (5)
10. Draw the molecular orbitals formed by the  $s-s$  combination of atomic orbitals. Also illustrate the electron densities for these orbitals and explain them. (5)

#### PART-(B)

(50)

11. What is structural isomerism? Explain its various types giving suitable examples. (5)
12. What are racemic mixtures? Discuss their resolution involving the formation of diastereomers. (5)
13. Draw Newman and sawhorse projections of various conformations of ethane. Compare the stabilities of these conformations giving reasons. (5)
14. Compare the relative acidities of ethanoic acid, propanoic acid, fluoroethanoic acid and iodoethanoic acid. Explain your answer giving appropriate reasons. (5)

15. Which is more stable in each pair given below? Give reasons for your answer. (5)
- (a)  or
- (b)  $\text{H}_3\text{C}^-$  or  $^-\text{C}(\text{CH}_3)_3$
- (c)  or
16. (a) Explain the following: (3)
- Wurtz reaction, has limited synthetic applications.
  - Alkanes are relatively unreactive or do not react with most of the reagents.
  - Physical constants like boiling points, densities, etc. of alkanes generally increase with increase in the number of carbon atoms.
- (b) Give one example each of the following reactions: (2)
- Sabatier-Senderens Reaction
  - Decarboxylation of the carboxylic acid.
17. (a) Explain Saytzeff rule giving suitable example. (2)
- (b) Give mechanism of the following reactions: (3)
- Birch reduction
  - Wittig reaction
  - Dehydrohalogenation of alkyl halides
18. What is difference between Markownikoff's and Anti-Markownikoff's rules? Explain with suitable example. (5)
19. (a) Explain the following terms: (2)
- Vicinal dihalide
  - Geminal dihalide
  - Stereoselective reaction
  - Poisoned catalyst.
- (b) How would you prepare following compounds from an internal alkyne? Give the mechanism of the reactions. (3)
- 3-Hexanone
  - Ethanoic acid
20. (a) Give structure of the following: (2)
- 1-Bromo-2-chlorobenzene
  - Propylbenzene
- (b) What is resonance energy? Explain in your own words. (3)