

**BCHCT-133**

**ASSIGNMENT BOOKLET**

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

**CHEMICAL ENERGETICS, EQUILIBRIA AND FUNCTIONAL ORGANIC  
CHEMISTRY I**

**Valid from 1<sup>st</sup> January, 2020 to 31<sup>st</sup> December, 2020**



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

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**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> January, 2020 to 31<sup>st</sup> December, 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 2021, 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

# CHEMICAL ENERGETICS, EQUILIBRIA AND FUNCTIONAL ORGANIC CHEMISTRY I

### Core Course in Chemistry

Course Code: BCHCT-133  
Assignment Code: BCHCT-133/TMA/2020  
Maximum Marks: 100

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

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#### PART A: CHEMICAL ENERGETICS AND EQUILIBRIA

1. a) Define and explain a thermodynamically reversible process. (5)  
b) 0.25 mol of an ideal monoatomic gas undergoes isothermal expansion from a volume of 2.0 dm<sup>3</sup> to 10 dm<sup>3</sup> at 27 °C. Calculate the maximum work that can be obtained from this process. (5)
2. a) Define standard enthalpy of formation and describe a method for its direct determination with the help of an example. (5)  
b) Differentiate between enthalpy driven and entropy driven reactions with the help of suitable examples. (5)
3. a) Give the statements of Zeroth, First, Second and the Third laws of thermodynamics and outline their significance. (5)  
b) What is reaction quotient and how is it helpful in determining the direction of a given reaction? (5)
4. a) In the following equilibrium, predict the direction of shift of equilibrium for each condition listed below:  
$$\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g}) + 92 \text{ kJ}$$
  - i) Addition of H<sub>2</sub>
  - ii) increased pressure
  - iii) lowering of temperature.  
b) Define degree of ionisation of a weak electrolyte and discuss the factors affecting it. (5)
5. a) Explain the effect of common ions on the ionisation equilibria of weak acids with the help of a suitable example. (5)  
b) Define solubility product constant and derive the relationships between solubility and solubility product constants for salts of AB<sub>2</sub>, A<sub>2</sub>B types. (5)

#### PART B: FUNCTIONAL GROUP ORGANIC CHEMISTRY-I

- 6 a) List various methods of preparation of benzene and also write one chemical reaction for each case. (5)

- b) Write the mechanism of Friedel-Craft's alkylation. What are its limitations? (5)
7. a) Explain why Nitro group is meta-directing deactivator? (5)
- b) Which one of the following would undergo faster  $S_N2$  reaction? Explain (5)
- $\text{CH}_3 - \text{CH} = \text{CH} - \text{Cl}$  or  $\text{CH}_3\text{CH}_2\text{CH}_2 - \text{Cl}$
8. a) In normal reaction conditions, chlorobenzene does not react with NaOH, but 1-chloro-4-nitrobenzene reacts with NaOH in these conditions. Explain. (5)
- b) Write the chemical equation and mechanism of pinacol-pinacolone rearrangement. (5)
9. a) How will you perform following conversions? (5)
- i) Phenol to *p*-bromophenol
- ii) 1,3-dihydroxyphenol to 1-(2,4-dihydroxyphenyl)ethanal
- b) How will you prepare *tert*-butylmethyl ether? (5)
10. a) Arrange the following carbonyl compounds in the order of their favourability for formation of nitriles: (5)
- $\text{CH}_3\text{CH}_2\text{CHO}$ ,  $\text{CH}_3\text{COCH}_3$ ,  $\text{HCOH}$  and  $\text{PhCOCH}_3$
- Justify your answer.
- b) Taking suitable example write the mechanism of Mannich reaction. (5)