

BCHCT-133

ASSIGNMENT BOOKLET

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

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

Valid from 1st January, 2021 to 31st December, 2021



**School of Sciences
Indira Gandhi National Open University
Maidan Garhi
New Delhi-110068
(2021)**

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, 2021 to 31st December, 2021**. If you have failed in this assignment or fail to submit it by December, 2021, then you need to get the assignment for the year 2022, 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

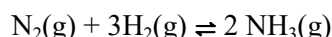
Assignment Code: BCHCT-133/TMA/2021

Maximum Marks: 100

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

PART A: CHEMICAL ENERGETICS AND EQUILIBRIA

- 192 J of heat was supplied to a thermodynamic system and its internal energy was found to decrease by 22 J. Calculate the amount of associated work and state whether the work was done by the system or done on the system? (2)
 - Derive the relationship between the temperature and volume for a reversible adiabatic process. (3)
 - Define heat capacity; molar heat capacity and specific heat capacity of a substance and give relations between them. (5)
- State Hess' law of constant heat summation and give its importance. (2)
 - The enthalpy of formation of $\text{NH}_3(\text{g})$ as per the following reaction is -46.11 kJ/mol at 298 K. (2)



- Calculate the value of enthalpy of formation of $\text{NH}_3(\text{g})$ at 100°C . The C_p° ($\text{J K}^{-1}\text{mol}^{-1}$) values are given as: $\text{N}_2(\text{g}) = 29.12$; $\text{H}_2(\text{g}) = 28.82$; $\text{NH}_3(\text{g}) = 35.06$. Assume the given heat capacity values to be temperature independent in the range. (3)
- What is residual entropy? What kind of species show residual entropy? (2)
 - What are spontaneous reactions? Give an example of a spontaneous reaction and state the criterion of spontaneity of a reaction? (3)
- What is a state function? Is work a state function? (2)
 - Give the statistical definition of entropy and calculate the entropy of a system having 6.9×10^{10} microstates. (3)
 - What is meant by the equilibrium constant K_p ? Give the relation where it is shown in terms of partial pressure. (3)
 - State Ostwald's dilution law. How can this law be experimentally verified? (2)
 - Give Bronsted and Lowry's definition of an acid and a base with a suitable example for each. (3)
 - For the equilibrium
 $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g})$ $K_c = 245$ (at 100 K)
The equilibrium concentrations are $[\text{SO}_2] = 0.204 \text{ M}$, $[\text{O}_2] = 0.0264 \text{ M}$ and $[\text{SO}_3] = 0.368 \text{ M}$. Suppose that the concentration of SO_2 is suddenly halved calculate Q_c and use it to show that the forward reaction takes place to reach a new equilibrium. (5)
 - Define a buffer solution. Explain the buffer action with the help of a suitable example. (5)

- b) Define degree of hydrolysis and hydrolysis constant, and derive a relationship between them. (5)

PART B: FUNCTIONAL GROUP ORGANIC CHEMISTRY-I

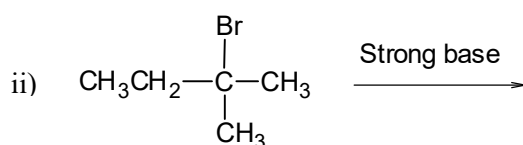
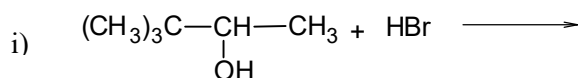
- 6 Write chemical equation(s) for following conversions : (5)

- i) Acetophenone to ethylbenzene
- ii) Benzene to ethylbenzene
- iii) Bromobenzene to ethylbenzene
- iv) Phenylmagnesium bromide to ethylbenzene
- v) *n*-Octane to ethylbenzene

- b) What are the limitations of Friedel-Crafts alkylation reactions? (5)

7. a) What do you understand by Meta-directing deactivator? Explain with the help of a suitable example. (5)

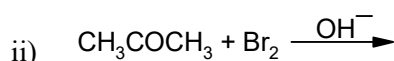
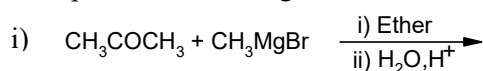
- b) What product(s) would you expect from each of the following reactions? Write the mechanism of the reactions and also mention the reason for the relative amount of products formation where necessary. (5)



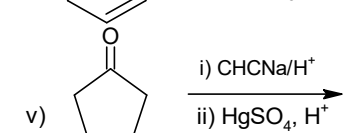
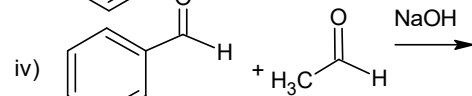
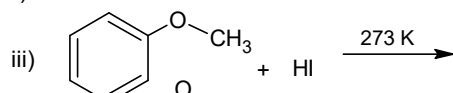
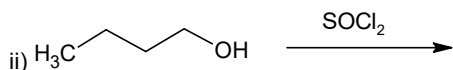
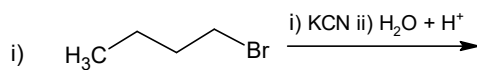
8. a) Explain following: (5)

- i) Phenols are acidic in nature, while alcohols are almost neutral
- ii) Oxiranes are more reactive than open chain ethers.

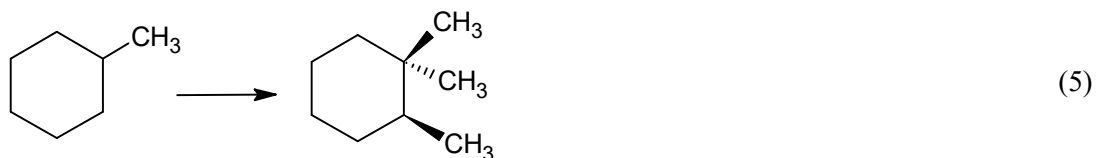
- b) Complete the following reactions and write their mechanisms: (5)



9. a) Complete following reactions: (5)



b) How will you carried out following conversion:



10. a) Write the products for the reaction of iodoethane with sodium nitrite and silver nitrite. Explain why two different types of products are formed? (5)

b) Taking suitable example write the mechanism of benzoin condensation. (5)