

**BCHCT-135**

**ASSIGNMENT BOOKLET**

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

**SOLUTIONS, PHASE EQUILIBRIUM, CONDUCTANCE,  
ELECTROCHEMISTRY & FUNCTIONAL GROUP ORGANIC  
CHEMISTRY-II**

**Valid from 1<sup>st</sup> July, 2020 to 30<sup>th</sup> June, 2021**



**School of Sciences  
Indira Gandhi National Open University  
Maidan Garhi  
New Delhi-110068  
(2020-2021)**

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 1<sup>st</sup> July, 2020 to 30<sup>th</sup> June, 2021**. If you have failed in this assignment or fail to submit it by June, 2021, then you need to get the assignment for the year 2021-22, 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

### Solutions, Phase Equilibrium, Conductance, Electrochemistry & Functional Group Organic Chemistry-II Core Course in Chemistry

Course Code: BCHCT-135  
Assignment Code: BCHCT-135/TMA/2020-2021  
Maximum Marks: 100

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

#### PART-(A) (50)

- Define the following terms (10)
  - Molarity
  - Ideal solutions
  - Conjugate solutions
  - Metastable equilibrium
  - Condensed systems
  - Congruent melting point
  - Ionic mobility
  - Conductivity water
  - Standard electrode potential
  - Concentration cells
- How is the solubility of a gas affected by different factors? Explain. (5)
- What is the critical solution temperature? Draw and explain the variation of mutual solubility of two liquids which exhibit upper CST. (5)
- What is a phase? What is the maximum number of phases possible for a one-component system? (2)
  - Solid ammonium chloride undergoes sublimation on heating. In the vapour phase ammonium chloride decomposes to give  $\text{NH}_3(\text{g})$  and  $\text{HCl}(\text{g})$ . The following equilibrium is established.  
$$\text{NH}_4\text{Cl}(\text{s}) \rightleftharpoons \text{NH}_3(\text{g}) + \text{HCl}(\text{g})$$
  
What is the number of
    - phases in the system,
    - components in the system, and
    - degrees of freedom of the system?
- Give the significance of critical point in the phase diagram of water. (2)
  - Draw the phase diagram for water system and label the one, two and three phase equilibria on it. (3)
- Differentiate between conductivity and molar conductivity of a solution. (2)
  - A conductivity cell having a cell constant of  $0.5 \text{ cm}^{-1}$  filled with  $0.02 \text{ M}$  solution of  $\text{KCl}$  at  $298 \text{ K}$  gave a resistance of  $20.2 \Omega$ . The water used for preparing the solution had a conductivity of  $7.1 \times 10^{-6} \text{ S cm}^{-1}$ . Calculate the molar conductivity of  $0.02 \text{ M}$   $\text{KCl}$  solution. (3)
- What are transference numbers and how are they related to ionic mobilities? (2)
  - In the determination of transference numbers of  $\text{HCl}$  by moving boundary method a  $0.10 \text{ M}$  solution of  $\text{HCl}$  was taken in a cell having uniform area of cross section of  $1.6 \text{ cm}^2$ . At the end of experiment the boundary moved by  $11.7 \text{ cm}$  and  $0.22 \text{ g}$  of silver was deposited on the cathode of silver coulometer. Calculate the transference numbers of ions of  $\text{HCl}$ . (3)
- Differentiate between voltaic and electrolytic cells. (2)

- b) The cell reaction for a galvanic cell is given below: (3)
- $$\text{Zn(s)} + 2\text{Ag}^+(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + 2\text{Ag(s)}$$
- i) Write the half-cell reactions at the anode and the cathode.  
 ii) Calculate the value of cell emf under standard conditions; use data from Table 7.1.  
 iii) Will the reaction be spontaneous as written?
9. a) Calculate the amount of chlorine gas evolved during the electrolysis of molten potassium chloride on passing a current of 0.5 A for two hours through it. (2)
- b) Define a potentiometric titration and draw a schematic graph of a redox potentiometric titration. (3)

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

10. Explain the acidic and basic behavior of carboxylic acids. (5)
11. How will you carry out the following conversions? (5)
- i) 2- Chlorobutane to 2-Methylbutanoic acid.  
 ii) 1- Bromobutane to Pentanoic acid.
12. How can a carboxylic acid be converted to a carboxylic acid chloride using different reagents? How will you convert the acid chlorides to (5)
- i) other halides, and  
 ii) the starting carboxylic acid?
13. Explain the reduction of nitrobenzene using different reagents. (5)
14. What is diazo coupling? Write the reaction for the preparation of Congo red dye using this reaction. (5)
15. Explain the following for an amino acid: (5)
- i) Zwitterionic nature  
 ii) Isoelectric point
16. Discuss the protection and deprotection of amino group of an amino acid by Cbz and Boc groups. (5)
17. Explain the Sanger method of identification of N-terminal of a peptide. (5)
18. Describe the formation of osazones by glucose and mannose. How are there two carbohydrates related to each to each other? (5)
19. Write the structures for the sucrose and products of hydrolysis. Also write their names. (5)