

**ASSIGNMENT BOOKLET**

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

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

**Valid from 1<sup>st</sup> July, 2021 to 30<sup>th</sup> June, 2022**



**School of Sciences  
Indira Gandhi National Open University  
Maidan Garhi  
New Delhi-110068  
(2021-2022)**

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> July, 2021 to 30<sup>th</sup> June, 2022.** If you have failed in this assignment or fail to submit it by June, 2022, then you need to get the assignment for the year 2022-23, 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/2021-2022

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

**Maximum Marks: 100**

#### PART-(A)

1. Draw and explain the vapour pressure curve of a solution showing positive deviation from Raoult's law. (5)
2. Explain the process of steam distillation with the help of a suitable diagram (5)
3. (a) State Nernst distribution law and write the expression for distribution constant. (2)  
(b) Differentiate between true and metastable equilibrium. (3)
4. Define any five of the following terms : (1 x 5 = 5)
  - (i) A component
  - (ii) Critical point
  - (iii) Molar conductivity
  - (iv) Transference number
  - (v) Standard hydrogen electrode
  - (vi) Electrolytic cells
5. (a) What are degrees of freedom? What is the maximum number of degrees of freedom possible for a one-component system? (2)  
(b) An aliphatic carboxylic acid reacts with an alcohol and the following equilibrium is established. (3)  
$$\text{RCOOH} + \text{R}'\text{CH}_2\text{OH} \rightleftharpoons \text{RCOOCH}_2\text{R}' + \text{H}_2\text{O}$$

What is the number of constituents and the number of components in the system?
6. (a) "A four phase equilibrium is not possible in a one component system." Justify the statement. (2)  
(b) Draw the phase diagram for sulphur system and label the sublimation and fusion curves for monoclinic sulphur on it. (3)
7. (a) Differentiate between conductance and conductivity of an electrolytic solution. (2)  
(b) The resistance of a conductivity cell filled with an electrolytic solution is observed to be 180  $\Omega$ . If the resistance of 0.1M KCl solution taken in the same cell was found to be 72  $\Omega$  calculate the conductivity of the given solution. (3)  
(Given: The conductivity of 0.1 M KCl solution = 1.29 S m<sup>-1</sup>).
8. (a) What is ionic mobility? How is it related to transference number? (2)  
(b) The cell reaction for a galvanic cell is given below (3)  
$$\text{Cu(s)} + 2\text{Ag}^+(\text{aq}) \rightarrow \text{Cu}^{2+}(\text{aq}) + 2\text{Ag(s)}$$
  - (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) Differentiate electrolyte concentration cell and electrode concentration cells. (2)
- (b) The cell reaction for a galvanic cell is given below (3)
- $$\text{Cu(s)} + 2\text{Ag}^+(\text{aq}) \rightarrow \text{Cu}^{2+}(\text{aq}) + 2\text{Ag(s)}$$
- (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?
10. (a) Calculate the time for which a current of 0.65 A be passed through molten magnesium chloride to get 5 g of magnesium. (3)  
(Given:  $M_m(\text{Mg}) = 24.25 \text{ g mol}^{-1}$ )
- (b) Draw a labelled schematic graph of a conductometric titration between a weak acid and a strong base. (2)

**PART-(B)**

- (50)**
11. Explain Fischer esterification of carboxylic acids giving its mechanism. (5)
12. How would you prepare the following?
- (i) Ethanoic anhydride using ketene (2)
- (ii) A tertiary alcohol starting from an ester (3)
13. (a) What are lactams? Write the structures of  $\gamma$ -butyrolactam and  $\delta$ -valerolactam and give their IUPAC names. (3)
- (b) Draw the enantiomers of *N*-methylethanamine. (2)
14. Explain the nitrosation reaction of secondary and tertiary amines giving suitable reactions. (5)
15. How can you prepare 1,3,5-tribromobenzene? Why it cannot be prepared by bromination of benzene? (5)
16. How will you synthesise valine using Gabriel phthalimide synthesis? Explain giving the sequence of reactions involved. (5)
17. Discuss ninhydrin test giving the reactions involved. (5)
18. Explain Edman degradation giving the reactions involved in it. Give the advantage of this method. (5)
19. (a) Explain the formation of methyl glycoside of  $\alpha$ - and  $\beta$ -D-glucose. Also give their structures. (2)
- (b) Write the reactions involved when  $\beta$ -D-glucose is treated with excess of acetic anhydride in the presence of pyridine. (3)
20. (a) Differentiate between reducing and non-reducing sugars giving one example of each type. (2)
- (b) Write the reaction of formation of maltose from its monomers giving appropriate structures with proper labeling. (3)