

BCHCT-135

ASSIGNMENT BOOKLET

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

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

Valid from 1st January, 2025 to 31st December, 2025



**School of Sciences
Indira Gandhi National Open University
Maidan Garhi
New Delhi-110068
(2025)**

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, 2025 to 31st December, 2025**. If you have failed in this assignment or fail to submit it by December, 2024, then you need to get the assignment for the year 2025, 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/2025

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

Maximum Marks: 100

PART-(A)

(50)

1. Discuss the effect of pressure on the solubility of gases. How is Henry's law constant determined? (5)
2. Draw and explain the mutual solubility curve of nicotine-water system. Which other system exhibits the similar curve? (2)
3. (a) What are conjugate solutions? Give one example. (2)
(b) Define metastable equilibrium and differentiate it from true equilibrium (3)
4. Define any five of the following terms : (5)
 - (i) A component
 - (ii) Mole fraction
 - (iii) Incongruent melting compounds
 - (iv) Liquid junction potential
 - (v) Ionic mobility
 - (vi) Conductometric titration
5. (a) Give the mathematical expression for Gibbs' phase rule and calculate the maximum number of phases that can coexist for a one-component system. (2)
(b) Draw the phase diagram for sulphur system and label the sublimation and fusion curves for monoclinic sulphur on it. (3)
6. (a) How does μ vs. T curves for a pure substance get affected by an increase in pressure? Draw a schematic diagram indicating the same? (2)
(b) Two substances, X and Y form a simple eutectic system. The melting point of X is more than that of Y and a mixture of X and Y having 40% of X form the eutectic mixture having a melting point of 512 K. Based on this information, draw a schematic suitably labelled phase diagram for the system. (3)
7. (a) Explain the concentration dependence of molar conductivity for a strong electrolyte (2)
(b) The conductivity of a saturated solution of AgCl at 298 K was found to be $3.41 \times 10^{-6} \text{ S cm}^{-1}$. The water used for dissolving AgCl had a conductivity of $1.6 \times 10^{-6} \text{ S cm}^{-1}$. If the molar conductivity at infinite dilution for AgCl at 298 K is given as $138.2 \text{ S cm}^{-1} \text{ mol}^{-1}$, calculate the solubility product of AgCl at 298 K. (3)
8. (a) Describe the moving boundary method for the determination of transference numbers. (2)
(b) In the determination of transference numbers of HCl by moving boundary method a 0.10 M solution of HCl was taken in a cell having uniform area of cross section of 1.0 cm^2 . At the end of experiment the boundary moved by 10.3 cm and 0.132 g of silver was deposited on the cathode of silver coulometer. Calculate the transference numbers of ions of HCl. (3)

9. (a) Outline the requirements for the construction of concentration cells without transference. (2)
- (b) The cell reaction for a galvanic cell is given below:

$$\text{Cu(s)} + 2\text{Ag}^+(\text{aq}) \rightarrow \text{Cu}^{2+}(\text{aq}) + 2\text{Ag(s)}$$
- (i) Write the half-cell reactions at the anode and the cathode.
- (ii) Calculate the value of cell emf under standard conditions by using the data from Table 7.1.
- (iii) Will the reaction be spontaneous as written?
10. (a) Define electrolysis and discuss any one application of electrolysis. (2)
- (b) Calculate the time required to get 5 g of magnesium by passing a current of 0.6 A through molten magnesium chloride. (Given: $M_m(\text{Mg}) = 24.25 \text{ g mol}^{-1}$). (3)
11. How will you prepare 2-methylpentanoic acid starting from a suitable alkyl halide? Write the sequence of reactions involved. (5)
12. (a) Which alkyl halide will you use if pentanoic acid is to be obtained? Give the scheme of synthesis involved. (3)
- (b) Write the mechanism of amide formation using ethanoic acid and ammonia. (2)
13. (a) What is transesterification? Briefly explain using a suitable example. (2)
- (b) Give the products formed when propyl butanoate is reduced using Bouveault-Blanc reduction. Which other reagent can be used to obtain the same products? (3)
14. (a) Using suitable diagram, explain the interconversion of enantiomers of *N*-methylethanamine. (2)
- (b) Explain why C-N bond in benzenamine is shorter than that in aliphatic amines. (3)
15. (a) Which one is more stable-alkyl diazonium salt or an aryl diazonium salt? Explain. (3)
- (b) How can you obtain 4-methylbiphenyl from 4-methylbenzenamine? Write the reactions involved. (2)
16. (a) Explain the Zwitter ionic nature and isoelectric point of a 2-amino acid. (3)
- (b) Discuss the chemistry of ninhydrin reaction of 2-amino acids and its importance (2)
17. Discuss the N-protection and deprotection of amino acids using phthaloyl group. (5)
18. Explain sanger method for the N-terminal identification of peptides giving suitable reactions. (5)
19. What are reducing sugars? Which tests are exhibited by them? Give the chemistry of these tests. (5)
20. How was structure of lactose arrived at? Explain. Also write the structure of its α -anomer. (5)