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[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1894

C

Unique Paper Code : 32175915

Name of the Paper : GE – Solutions, Phase Equilibria, Conductance, Electrochemistry & Functional Group Organic Chemistry-II

Name of the Course : **B.Sc. (Hons.)**

Semester : I / III

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Use separate sheets for **Section A** and **Section B**.
3. **All** questions carry equal marks.
4. Attempt **six** question in all, three question from each Sections
5. Attempt all parts of a question together.
6. Use of scientific calculator and logarithmic table is allowed.

P.T.O.

SECTION A

Physical Chemistry

1. Attempt any **five** :

- (a) What are azeotropes? Give an example. Is it possible to separate the components of an azeotropic mixture using simple distillation? Explain.
- (b) Describe the use of quinhydrone electrode for the measurement of pH of a solution.
- (c) Determine the number of components, number of phases and degrees of freedom for the following system:



- (d) Draw a labeled phase diagram of water. Using this phase diagram, explain why skating is possible on ice.

(e) Derive the Clapeyron-Clausius equation in the form $dP/dT = \Delta H_{vp}/(TV_g)$. Under what conditions can this equation be integrated and how?

(f) Explain why enthalpy and volume of mixing for the formation of ideal binary solution is zero.

(5×2.5)

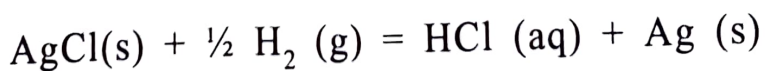
2. (a) State and explain Kohlrausch's law of independent migration of ions. Also, explain the variation of specific conductance, molar and equivalent conductance at infinite dilution of weak and strong electrolytes with suitable graph.

(b) Give the principle of potentiometric titration. Also give the advantages of potentiometric titration over volumetric titrations using indicators. Why do we prefer potentiometer for the measurement of EMF of a cell over voltmeter?

- (c) Transport number of Na^+ is 0.463 (dilute solution of NaCl in methanol). Calculate transport number for H^+ (dilute solution of HCl in methanol) if Λ^∞ for (NaCl in methanol) is $96.9 \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$ and Λ^∞ for (HCl in methanol) is $192 \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$ respectively. (4,4,4.5)

3. (a) (i) What is salt bridge? Write its functions emphasizing on its role in eliminating the liquid junction potential in an electrochemical cell.

- (ii) Construct the galvanic cell for the following reaction and write down the expression for the cell potential



- (b) Derive the expression to determine the pH value of an unknown solution by using quinhydrone electrode with well labelled diagram.

(c) Draw and discuss the well labelled phase diagram of Sulphur system. (4,4,4.5)

4. (a) In water-phenol system, determine phase, component, and degree of freedom

(i) inside the solubility curve

(ii) outside the solubility curve

(iii) at critical solution temperature

(b) Write short note on any **two** :

(i) Critical solution temperature

(ii) Moving boundary method

(iii) Nernst distribution law

(c) For the electrochemical cell: $\text{Cd}, \text{CdCl}_2, 5/2$

$\text{H}_2\text{O}_{(\text{aq})} | \text{AgCl}_{(\text{s})}, \text{Ag}$, the EMF at 0°C and 25°C is

0.6915 V and 0.6753 V, respectively. Calculate

ΔG° , ΔS° , and ΔH° at 25°C . (4,4,4.5)

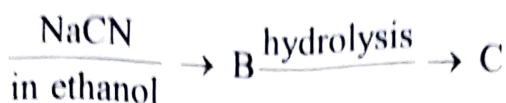
P.T.O.

SECTION - B

Attempt three questions in all.

All questions carry equal marks.

5. (a) Write short notes on any **two** of the following :
- (i) Merrifield solid phase synthesis
 - (ii) Hell-Volhard-Zelinsky reaction with mechanism
 - (iii) Perkin Condensation
- (b) Outline the synthesis of Alanine using Strecker synthesis
- (c) Give the full name of DCC and *t*-BOC and highlight their use in peptide synthesis. (6,3,3,5)
6. (a) Predict the structure of products A to E in the following reactions:



(b) Differentiate Hoffmann V/s Saytzeff elimination.

(c) Explain Mutarotation with suitable example.

(5,4,3.5)

7. (a) Name the reaction involved in the conversion of acetamide into methylamine. Explain the mechanism.

(b) Explain with structure, why sucrose is a non-reducing sugar.

(c) How will you convert D-Arabinose into D-Glucopyranose?

P.T.O.

(d) Draw the Haworth projection for α -D-glucopyranose and β -D-Fructofuranose.

(4,2.5,3,3)

8. Write short notes on the following :

(a) Reformatsky Reaction

(b) Hinsberg test

(c) Primary and Secondary structure of proteins

(4,4,4.5)