

This question paper contains 6 printed pages.

Your Roll No. ....

Sl. No. of Ques. Paper : 5065 H  
Unique Paper Code : 217361  
Name of Paper : CHPT-303 (Solutions,  
Conductance, Electrochemistry  
and Functional Group Organic  
Chemistry - II)  
Name of Course : B.Sc. Life Sc. / Phy Sc. / Industrial  
Chem. / Analytical Chem.  
Semester : III  
Duration : 3 hours  
Maximum Marks : 75

(Write your Roll No. on the top immediately  
on receipt of this question paper.)

Answer six questions of all, three questions from each Section.

Use of scientific calculator is allowed.

Use separate answer sheets for Section A and Section B.

#### SECTION A

Attempt **three** questions in all.

Question No. 1 is compulsory.

All questions carry equal marks.

1. Attempt any five questions:

- (a) Explain why a eutectic mixture has a definite composition and sharp melting point yet it is not a compound.

- (b) What are the electrochemical reactions that take place at calomel electrode?
- (c) The ionic molar conductivity of hydrogen ion is much greater than any other ion. Give reason.
- (d) How will you explain the presence of both lower and upper CST for certain systems?
- (e) Give and justify the number of components in the system:



- (f) Usually a saturated solution of KCl or  $\text{NH}_4\text{NO}_3$  is used in the salt bridge. Explain.
- (g) Explain why enthalpy and volume of mixing for the formation of ideal binary solution is zero.
- (h) State and explain Kohlrausch's law of independent migration of ions.
- $2\frac{1}{2} \times 5 = 12\frac{1}{2}$
2. (a) What is meant by the process-solvent extraction? Explain why the process of extraction is more efficient if the solvent is used in a number of small portions rather than in one whole lot.
- (b) Why do binary solutions deviate from ideality? The vapour pressure of pure benzene and toluene at  $40^\circ\text{C}$  are 184.0 torr and 59.0 torr, respectively. Calculate the partial pressures of benzene and toluene, the total vapour pressure of the



solution and the mole fraction of benzene in the vapour above the solution that has 0.40 mol fraction of benzene. Assume that the solution is ideal.

- (c) Differentiate between congruent and incongruent melting points. 4,6,2½

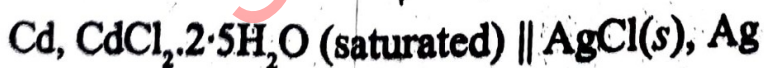
3. (a) Define specific conductance, molar conductance and equivalent conductance. What are their S.I. units?

(b) The molar conductances of sodium acetate, hydrochloric acid and sodium chloride at infinite dilution are  $91.0 \times 10^{-4}$ ,  $426.16 \times 10^{-4}$  and  $126.45 \times 10^{-4} \text{ S m}^2 \text{ mol}^{-1}$ , respectively at  $25^\circ\text{C}$ . Calculate the molar conductance at infinite dilution for acetic acid. Is transport number of ions related to molar conductivity at infinite dilution? Give reason for your answer.

(c) Draw and explain the conductometric titration of a weak acid with a strong base. 4½,4,4

4. (a) Differentiate between concentration cell with and without transference.

(b) The emf of the cell



in which the cell reaction



is 0.6753 volt at  $25^\circ\text{C}$  and 0.6915 volt at  $0^\circ\text{C}$ . Calculate the free energy change ( $\Delta G$ ), enthalpy change ( $\Delta H$ ) and entropy change ( $\Delta S$ ) of the cell reaction at  $25^\circ\text{C}$ .

- (c) How is the pH of a solution determined using (i) hydroxide electrode and (ii) quinhydrone electrode? 4,4

5. Write short notes on:

- (a) Moving Boundary Method
- (b) Phase Diagram of Sulphur
- (c) Lever Rule or Glass Electrode. 4½

### SECTION B

*Attempt three questions in all.*

*All questions carry equal marks.*

6. (a) Arrange the following acid derivatives in decreasing order of reactivity towards nucleophilic substitution and give reason:

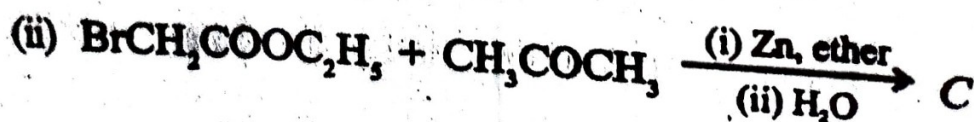
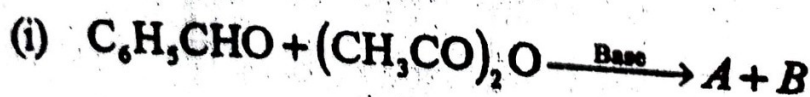


- (b) Explain the following:

- (i) Acetyl chloride is hydrolysed more readily than benzoyl chloride.
- (ii) Benzoic acid is stronger acid than acetic acid.
- (iii) *p*-hydroxy benzoic acid is weaker acid than *m*-hydroxy benzoic acid.

- (c) Discuss Hell-Volhard-Zelinsky reaction with mechanism.

- (d) Complete the following reactions:





7. (a) Write short notes on the following (any two):

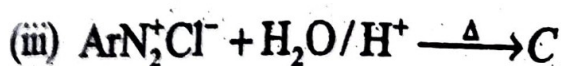
(i) Gabriel's Phthalimide Synthesis

(ii) Hofmann Bromamide Reaction

(iii) Schotten-Baumann Reaction.

(b) How will you chemically differentiate between aniline and N-methyl aniline?

(c) Complete the reactions:



(d) Give a detailed account of Hofmann elimination and compare it with Saytzeff elimination. 5,2,2,3½

8. (a) How will you convert D-arabinose to D-glucose and D-mannose by Killiani-Fischer synthesis?

(b) How will you convert D-glucose to D-fructose?

(c) Draw the Haworth projection for  $\alpha$ -D-glucopyranose and  $\beta$ -D-fructofuranose.

(d) Write short notes on the following:

(i) Mutarotation

(ii) Ruffs Degradation. 2½, 1, 2, 5

9. (a) Give the name and mechanism of the reaction involved in the synthesis of ethyl acetoacetate from ethyl acetate.

(b) What is tautomerism? Give the structures of keto and enol form of ethyl acetoacetate.

How can the following compounds be obtained from ethyl acetoacetate:

- (i) 2-Pentanone
- (ii) Butanoic acid
- (iii) Succinic acid?

5,3,4½

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