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. / Industria 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 in all, three questions from each Section.

Use of scientific calculator is allowed.

Use separate answer sheets for Section A and Section B.

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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.

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(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:

$$CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$$

(f) Usually a saturated solution of KCl or NH_4NO_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°C are 184.0 torr and 59.0 torr, respectively. Calculate the partial pressures of benzene and toluene, the total vapour pressure of the

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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 91.0×10^{-4}, 426.16×10^{-4} and 126.45×10^{-4} S m^2 mol^{-1}, respectively at 25°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

$$Cd, CdCl_2.2{\cdot}5H_2O \text{ (saturated)} \parallel AgCl(s), Ag$$

in which the cell reaction

$$Cd(s) + 2AgCl(s) + aq \rightleftharpoons CdCl_2.2{\cdot}5H_2O \text{ (sat.)} + 2Ag(s)$$

is 0.6753 volt at 25°C and 0.6915 volt at 0°C. Calculate the free energy change (ΔG), enthalpy change (ΔH) and entropy change (ΔS) of the cell reaction at 25°C.

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(c) How is the pH of a solution determined using (i) hydro 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 or of reactivity towards nucleophilic substitution and g reason:

$(CH_3CO)_2O$, CH_3COCl, $CH_3COOC_2H_5$, CH_3CONH_2

(b) Explain the following:

(i) Acetyl chloride is hydrolysed more readily than benz chloride.

(ii) Benzoic acid is stronger acid than acetic acid.

(iii) *p*-hydroxy benzoic acid is weaker acid than *m*-hydro benzoic acid.

(c) Discuss Hell-Volhard-Zelinsky reaction with mechanis

(d) Complete the following reactions:

(i) $C_6H_5CHO + (CH_3CO)_2O \xrightarrow{\text{Base}} A + B$

(ii) $BrCH_2COOC_2H_5 + CH_3COCH_3 \xrightarrow[(ii)\ H_2O]{(i)\ Zn,\ ether} C$

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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:

(i) $ArNH_2 + CHCl_3 + 3KOH \rightarrow A$

(ii) $ArNH_2 + Br_2 \xrightarrow{CS_2} B$

(iii) $ArN_2^+Cl^- + H_2O/H^+ \xrightarrow{\Delta} C$

(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 α-D-glucopyranose and β-D-fructofuranose.

(d) Write short notes on the following:

(i) Mutarotation

(ii) Ruffs Degradation. 2½,2,2,5

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.

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) 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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