Sl. No. of Ques. Paper : **1912**   **GC-3**

Unique Paper Code   : 42174304

Name of Paper   : C-VIII, DSC-2C- Solutions, Phase Equilibria, Conductance
                        Electrochemistry and Functional Group Organic Chemistry – II

Name of Course   : B.Sc. Industrial Chemistry / Analytical Chemistry (CBCS)

Semester   : III

Duration :   : 3 hours

Maximum Marks : 75

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

Attempt six questions in all, three questions from each Section.
Use of scientific calculator is allowed.

SECTION A

Attempt 3 questions in all.
Question No. 1 is compulsory.
All questions carry equal marks.

1. Explain (any five):

    (a) In alkali metal increasing order of conductivity is $Na^+ < K^+ < Rb^+ < Cs^+$ and not the reverse.

    (b) Azeotropic mixtures cannot be separated into pure components by simple distillation.

    (c) Role of salt bridge in an electrochemical cell.

    (d) CST is an invariant point.

    (e) Slope of sublimation curve is more than vaporization curve.

    (f) $NH_4Cl(s)$-$NH_3(g)$-$HCl(g)$ is a one component system if $p_{NH_3} = p_{HCl}$

    (g) Difference between reversible and irreversible cells

    (h) Conductivity of an electrolyte solution decreases with dilution while the molar conductivity increases.

    (2½ X 5=12½)

2. (a) Explain any four different types of half cells.

    (b) Explain briefly the principle underlying potentiometric titration and its advantages over volumetric titration. Draw the potentiometric titration curve involving a strong acid and strong base.

    (c) Given the E⁰ values for the electrodes $Fe^{2+}(aq) \mid Fe(s)$ and $Pt(s)|Fe^{3+}(aq),Fe^{2+}(aq)$ as - 0.44V and 0.77V respectively, calculate the E⁰ value for the electrode $Fe^{3+}(aq) \mid Fe(s)$.

    (4, 4, 4½)

3. (a) Derive the Clausis–Clapeyron equation for the variation of the vapour pressure of liquid with Temperature.

    (b) Draw and discuss the well labelled phase diagram of water or lead silver system.

    (c) Prove mathematically that multistage extraction is advantageous over single stage extraction.

    (4, 4, 4½)

4. (a) Define ionic mobility. Explain moving boundary method to determine the transference number.

 (b) Write short note on any two:
   (i) Kohlarusch's Law of independent migration of ion
   (ii) Conductometric titration
   (iii) Steam distillation
   (iv) Calomel electrode

 (c) The resistance of 0.5 N solution of an electrolyte in a cell was found to be 45 ohms. Calculate the equivalent conductance of the solution if the electrodes in the cell are 2.2 cm apart and have an area of 3.8 cm^2.
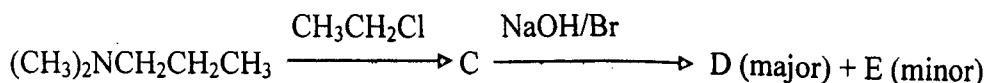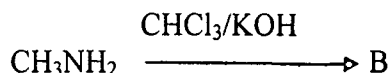
(4, 4, 4½)

SECTION B
Attempt three questions in all.
All questions carry equal marks.

5. (a) Write short note any two of the following:
   (i) Merrifield solid phase synthesis
   (ii) Electrophoresis
   (iii) Secondary structure of protein (α-helix & β-sheets)

 (b) Give the full name of "DCC" and "t-Boc" and highlight their use in peptide synthesis.

 (c) Outline the synthesis of Alanine using Strecker synthesis.

 (d) What are essential and non-essential amino acids? Give one example of each.

(5, 2, 3½, 2)

6. (a) Predict the structure of products A to E in the following reactions:

$$C_6H_5NH_2 + C_6H_5COCl \xrightarrow{\text{NaOH}} A$$

$$CH_3NH_2 \xrightarrow{\text{CHCl}_3/\text{KOH}} B$$

$$(CH_3)_2NCH_2CH_2CH_3 \xrightarrow{\text{CH}_3\text{CH}_2\text{Cl}} C \xrightarrow{\text{NaOH/Br}} D \text{ (major)} + E \text{ (minor)}$$

 (b) Write short note on any two of the following:
   (i) Gabriel's Phthalimide Synthesis
   (ii) Hofmann Bromamide reaction
   (iii) Schotten – Baumann Reaction

 (c) How will you chemically distinguish between Aniline and N-methylaniline?

(5, 5, 2½)

7. (a) How will you synthesize carboxylic acid by alkaline hydrolysis of esters and give its advantage over acidic hydrolysis?

 (b) Which of the following is a stronger acid and why?

CH₃CHBrCOOH, BrCH₂CH₂COOH

$CH_3CHBrCOOH$, $BrCH_2CH_2COOH$
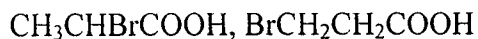
(c) Discuss HVZ reaction with mechanism.

(d) Explain the following:

(i) Acyl chloride undergoes nucleophilic attack more readily than alkyl chloride.

(ii) Esters have lower boiling point than Acids of comparable molecular weights.

(3, 2, 3½, 4)

8. (a) Sucrose and maltose both are disaccharides but sucrose is a non reducing while maltose is reducing sugar? Explain.

(b) Write the structure of the products in the following reactions:
   (i) D-Glucose + CH_3OH/HCl → A
   (ii) Fructose + Tollen's Solution → B
   (iii) Glucose + $NaBH_4$ → C

(c) What happens when an aqueous solution of D-glucose is kept for some time? Name the phenomenon and discuss the mechanism involved.

(d) How will you Convert D-glucose to D-Arabinose by Ruff's degradation?

(e) Draw the Haworth projection for: β-D-Glucopyranose and α-D-Fructofuranose.

(2, 3, 3, 2½, 2)