[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 6810 **D** **Your Roll No.....**

Unique Paper Code : 217361

Name of the Course : **B.Sc. Programme (Physical Sc., Life Sc., Applied Sc.)**

Name of the Paper : CHPT-303 : CHEMISTRY III

Semester : 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.

SECTION A

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

1. Answer any **five** in brief :

   (a) Give one example of solution where solute is a liquid and solvent is solid.

   (b) What is the significance of triple point in water system?

   (c) Eutectic mixture, although it has a definite melting point, is not regarded as compound. Why ?

   (d) The process of extraction is more efficient if the solvent is used in a number of small portions rather than in one whole lot.

   (e) What is cell constant and what is its unit ?

   (f) Differentiate between molar and molal solution. (2½×5=12½)

2. (a) What is meant by the transport number of an ion ? Describe the Hittorf method for determination of transport number of Ag^+.

P.T.O.

(b) Discuss the titration curve obtained in the conductometric titration of CH_3COOH and NaOH.

(c) An aqueous solution of succinic acid at 15°C, containing 0.07g in 10 mL is in equilibrium with an ethereal solution which has 0.013g in 10 mL. The acid has its normal molecular weight in both the solvents. What is the concentration of the ethereal solution which is in equilibrium with an aqueous solution containing 0.024g in 10 mL ? (5,3½,4)

3. (a) State and explain the Phase Rule. Explain that sulphur system at any of its triple pointy is a non-variant system.

(b) State Nernst Distribution Law. How is it used in the process of extraction of solutes ?

(c) The molar conductance at infinite dilution of KCl is 130.1. The Hittorf number, t- of Cl^- in very dilute solution is 0.505. Calculate the mobilities cm sec^{-1} of K^+ and Cl^- ions. (6,3,3½)

4. (a) Explain the reversible and irreversible cells with examples.

(b) Calculate the emf of the cell

$Zn \mid Zn^{+2}(0.001M) \mid\mid Ag^+(0.1M) \mid Ag$

The standard electrode potential of $Ag \mid Ag^+$ half cell is +0.80V and that of $Zn \mid Zn^{+2}$ is –0.76 V.

(c) Deduce the Nernst equation for the emf of a cell. (4,4½,4)

5. Explain in brief the following :

(a) Determination of pH of a solution using the glass electrode.

(b) Explain monovariant, bivariant and non-variant points in the phase diagrams.

(c) Effect of impurities on the partial miscibility of liquids. (4,4,4½)

SECTION B

Attempt any **three** *questions*

1. (a) What is a condensation reaction ? Write a mechanism to show how Claisen condensation is used in the preparation of Ethyl acetoacetate.

   (b) Arrange the following acid derivatives in decreasing order of reactivity towards hydroxide ion (^-OH) and give reasons for your choice :

   ethanoic anhydride, ethanoyl chloride, ethyl ethanoate

   (c) How can the following compounds be obtained from ethyl acetoacetate ?

   (i) Adipic acid (ii) 3-Methyl-2-butanone (3½,3,6)

2. (a) How will you convert :

   (i) Aniline to p-Nitroaniline

   (ii) D-Arabinose to D-Glucose

   (b) An amide X, on treatment with Br_2-NaOH gives Y. With HNO_2, Y evolves N_2 gas and gives Z. Without loss of carbon atoms, Z can be oxidized to a carboxylic acid, A. Compound A is obtainable from acid hydrolysis of ethyl acetoacetate. Identify X, Y, Z and A and outline the sequence of reactions.

   (c) Draw the Haworth structure of maltose and write its systematic name. (6,4½,2)

3. (a) Give brief description, reaction and example of **(any two)** :

   (i) Gabriel's Phthalimide Synthesis

   (ii) Schotten - Baumann Reaction

   (iii) Perkin Condensation

   (b) What is mutarotation ? Explain the phenomenon using (+)-Glucose as an example.

(c) Formulate reactions to show the products formed when

(i) D-Glucose reacts with excess phenyl hydrazine, and

(ii) Trimethylamine reacts with HNO_2 (6,3½,3)

4. (a) How will you chemically distinguish between the following pairs of compounds :

(i) HCOOH and CH_3COOH

(ii) Aniline and N-Methylaniline

(iii) Sucrose and Lactose

(b) Predict the product(s) of following reactions **(any Two)** :

(i) D-Glucose $\xrightarrow[0°C]{\text{Acetic anhydride/Pyridine}}$?

(ii) $Br\text{-}CH_2\text{-}CO_2Et + CH_3COCH_3 \xrightarrow[\text{ii) } H_2O]{\text{i) Zn}}$?

(iii) Benzene diazonium chloride $\xrightarrow{\text{alkaline } \beta\text{-Naphthol}}$?

(c) Outline the chemistry of Hinsberg test. (6,4,2½)