(i) Printed Pages: 3 Roll No. .....

(ii) Questions : 9 Sub. Code : 0352

Exam. Code : 0004

**B.A./B.Sc. (General) 4th Semester**

**(2042)**

**CHEMISTRY**

**(Same for B.Sc. Microbial and Food Technology)**

**(Physical Chemistry–B)**

**Paper–XV**

**Time Allowed : Three Hours]** **[Maximum Marks : 22**

**Note :—** Attempt **five** questions in all, selecting **one** question each from Units I-IV. Question No. IX (Unit–V) is compulsory.

**UNIT–I**

I. (a) Describe cooling curve method and thaw-melt method for constructing phase diagram of a two component system comprising of two solids miscible in liquid phase.

(b) Explain how $NaCl–H_2O$ system is considered to be a system with incongruent melting point. Also draw a labelled diagram of the system. 2×2

II. (a) Define consolute temperature. Show its existence with the help of a labelled diagram of water-triethylamine system.

(b) State Nernst distribution law. Explain its application in determining the hydrolysis constant of a salt. 2×2

## UNIT–II

III. (a) Discuss Ostwald's dilution law. How do you verify it ? Describe its limitations.

(b) Define transport number of an ion. Explain moving boundary method of determination of transport number of ions.

2×2

IV. (a) The specific conductance of a saturated solution of AgCl at 25°C is $1.26 \times 10^{-6}$ ohm$^{-1}$ cm$^{-1}$ higher than that of water used. The equivalent conductances of $AgNO_3$, $HNO_3$ and HCl at infinite dilution at the same temperature are 132.8, 421.6 and 426.0 ohm$^{-1}$cm$^2$g eq$^{-1}$ respectively. Calculate the solubility of AgCl at 25°C.

(b) Briefly explain the factors on which transport number of an ion depends. 2×2

## UNIT–III

V. (a) Describe how the Hydrogen Electrode is used for measuring pH of an aqueous solution. What are the advantages and disadvantages of this electrode ?

(b) A zinc electrode is placed in 0.1 M solution of zinc sulphate at 25°C. If the salt is 95% dissociated at this dilution at 298 K, calculate the electrode potential of the electrode. Given that $E^{\circ}_{Zn^{2+},Zn} = -0.76\,V$. 2×2

VI. (a) Write the half cell reactions of calomel electrode and a quinhydrone electrode.

(b) Derive Nernst equation for measuring EMF of a cell.

2×2

## UNIT–IV

VII. (a) Write short notes on over voltage, hydrogen over voltage and oxygen over voltage.

(b) Derive an expression for EMF of electrolytic concentration cells without transference. 2×2

VIII. (a) Explain the role of liquid junction in the determination of electrode potential. How can the liquid junction potential be minimised ?

(b) Calculate the EMF of the following concentration cell at 25°C :

$Cu/CuSO_4(m = 0.02, \gamma = 0.32) \parallel CuSO_4 (m = 0.2, \gamma = 0.11) |Cu.$

2×2

## UNIT–V

IX. (a) Calculate the number of components and degrees of freedom for an aqueous solution of NaCl.

(b) Write Debye-Huckel Onsager's equation for strong electrolytes and give significance of the terms involved in it.

(c) Differentiate between electrochemical cell and electrolytic cell.

(d) Give advantages of potentiometric titrations.

(e) What is the effect of impurities on consolute temperature ?

(f) Write the relationship between EMF of a cell and $\Delta G$, $\Delta H$ and $\Delta S$. 1×6