PHYSICAL CHEMISTRY– III

(Common for B.Sc. Bio. Tech. Semester-IV)

Time Allowed : Three Hours **Maximum Marks : 26**

Note : Attempt five questions, selecting two questions each from Section A and B. Section C is compulsory.

SECTION-A

I. (a) Derive the Gibbs phase rule thermodynamically. 2

(b) State the degrees of freedom of the following systems :
(i) A pure gas. (ii) A mixture of gases. 2

II. What is phase diagram ? Draw the phase diagram of the water system and explain the term triple point. 4

III. State and explain Nernst Distribution Law. Derive the law thermodynamically. 4

IV. (a) Define Ostwald's dilution law. Briefly describe its limitations. 2

(b) What are the main postulates of Arrhenius theory of electrolyte dissociation ? 2

SECTION–B

V. (a) Explain the principle of conductometric titrations taking the example of titration of HCl versus NaOH. 2

(b) Describe the method of calculation of transport number by Hittorf's method. 2

VI. What is electrochemical series ? Describe its important applications. 4

VII. (a) What is corrosion ? Briefly describe any two methods of preventing corrosion. 2

(b) What is meant by liquid junction potential ? How can it be minimised ? 2

VIII. (a) Calculate the electrode potential of a copper wire dipped in 0.1 M copper sulphate solution at 25°C. At this temperature, the standard electrode potential of copper is 0.34 V. Assume copper sulphate to be completely ionized and take the activity of copper ions equal to the molar concentration. Given F = 96500 coulombs, R = 8.314 J $degree^{-1}$ mol^{-1}. 2

(b) Determine the pH of a solution obtained by mixing equal volumes of 0.10 N ammonium nitrate and 0.02 N ammonium hydroxide solutions, K_b for ammonium hydroxide being 1.8×10^{-5}. 2

SECTION–C

IX. (a) State and explain what is meant by the terms-phase ?
(b) What do you mean by transport number ?
(c) Define Kohlrausch's law.
(d) Differentiate between electrolytic and galvanic cell.
(e) What is a buffer solution ? Give example. (2×5=10)