B.Sc. (Bio Technology) 4th Semester
PHYSICAL CHEMISTRY-B
Paper—BT-1

Time Allowed—2 Hours]   [Maximum Marks—40

Note :— There are *eight* questions of equal marks. Candidates are required to attempt any *four* questions.

I. (a) Describe the construction and working of the following electrodes :

   (i)   Hydrogen electrode

   (ii) Calomel electrode

   Give an example where a metal chloride behaves reversibly with respect to an ion.

   (b) Consider the cell :

   Ag | 0.005 M $AgNO_3$ ‖ KNO_3(Satd.) ‖ AgCl (Satd.)|Ag salt bridge.

   If the EMF of this cell at 25°C is 0.1585 Volt, Calculate the solubility of AgCl at this temperature.

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

(b) What is the basic principle of potentiometric titrations ? Give at least two applications of potentiometric titrations.

III. (a) Differentiate between rate of the reaction and rate constant.

(b) Enumerate different methods used for the determination of order of reaction. Discuss any three methods in detail.

IV. (a) Discuss briefly the Collision theory of bimolecular reactions.

(b) Explain the Michaelis Menden equation for enzyme catalysis.

V. (a) State and explain Kohlrausch's law. Why is it called law of independent migration of ions ? How it help in the calculation of degree of dissociation of a weak electrolyte ?

(b) If the equivalent conductance at infinite dilution of NaCl, HCl and CH_3COONa are 126.4, 426.1 and 91.0 Ohm^{-1} cm^2 g eq^{-1} respectively, what will be that of acetic acid ?

VI. (a) What are the limitations of Arrhenius theory ? How does Debye Huckel theory explain the anomalous behaviour of strong electrolytes ?

(b) How do specific conductivity and equivalent conductivity vary with dilution and why ?

VII. (a) What is the basic principle of Conductometric titrations ? Discuss in detail at least three types of conductometric titrations.

(b) Define buffer solution. What is buffer action of a buffer ?

VIII.(a) Define buffer capacity. Discuss buffer action of acidic buffer. Show that $pH = pKa + \log \frac{[Salt]}{[Acid]}$. Under what conditions pH = pKa ?

(b) Calculate the pH of a solution obtained by mixing 6.0g of acetic acid and 12.3g of sodium acetate and making the volume to 500mL. Dissociation constant of acetic acid is 1.8×10^{-5}.