UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 4th Semester Examination, 2021

CC10-CHEMISTRY

PHYSICAL CHEMISTRY

Full Marks: 40

ASSIGNMENT

The figures in the margin indicate full marks.
All symbols are of usual significance.

Answer any *four* questions 10×4 = 40

1. (a) State the Principle of Conductometric Titration. 2

   (b) Draw and explain the titration curves for: 6

   (i) Strong acid vs Strong Base

   (ii) Weak acid vs Strong Base

   (iii)Weak Acid vs Weak Base

   (c) Define Cell Constant. 2

2. (a) Derive Nernst Equation. 4

   (b) Discuss the working Principle of Glass Electrode. How is pH of a solution determined using this electrode? What are the advantages and disadvantages of using this electrode? 2+2+2

3. (a) What do you mean by Concentration Cells? 2

   (b) Derive an expression for emf of an electrolyte concentration cell with transport. What is the value of $E°_{cell}$ in these cases? 3+2

   (c) Calculate the EMF of the Electrode – Concentration Cell: 3

   Pt, $H_2(p_1)$, HCl, $H_2(p_2)$, Pt

   at 25°C if p_1 = 600 Torr and p_2 = 400 Torr.

4. (a) Define Standard Electrode Potential. 2

   (b) How is Equilibrium Constant determined from Standard Electrode Potential? 2

   (c) What is Liquid Junction Potential? How can it be minimized? 2+1

   (d) Calculate the Liquid Junction Potential associated with the following Cell: 3

   Ag(s), AgCl(s), HCl(m_1=1.0; γ_1=0.809) : HCl (m_2=0.05; γ_2=0.830), AgCl(s), Ag

   Provided the transference number of H^+ is 0.83.

5. (a) What is the Clausius Mosotti Equation? 4

   (b) Explain why: Molar Polarizability of CCl_4 is independent of temperature whereas that of $CHCl_3$ changes with temperature. 3

   (c) Calculate the dipole moment of m-dichlorobenzene, provided the dipole moment of chloro benzene is 1.55 D. 3

6. Explain why:

   (a) Specific conductance decreases while Equivalent Conductance increases with dilution. 3

   (b) H^+ and OH^- in aqueous media have exceptionally high ionic conductance. 3

   (c) A DC current cannot be used in Conductometric Measurements. 2

   (d) Molar Conductance values for alkali metal cations are in the order of: 2

$$Rb^+ > K^+ > Na^+ > Li^+$$

7. (a) What is Transport Number? 2

   (b) Under what conditions an aqueous solution of CdI_2 shows negative transport Number of Cd^{2+} ions? 2

   (c) State and explain Kohlrausch's Law of independent Migration of ions. 3

   (d) The Molar Conductance of aqueous Sodium Acetate, Hydrochloric acid and Sodium Chloride at infinite dilution are 0.0091 Sm^2/mol, 0.0425 Sm^2/mol, 0.01281 Sm^2/mol respectively. Calculate the Molar Conductance of Acetic acid at infinite dilution. 3

8. (a) Write short notes on: Asymmetry Effect and Electrophoretic Effect 6

   (b) What is Walden's Rule? 4

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