Ex/Che/BS/B/Chem/T/214/2023

BACHELOR OF ENGINEERING IN CHEMICAL ENGINEERING EXAMINATION, 2023

PHYSICAL CHEMISTRY

(2nd Year, 1st Semester)

Full Marks: 70 Time: 3 hours

Part –I

1. **Answer any fourteen:** **2×14 = 28**

I. Define equivalent conductance.
II. What is mean ionic activity co-efficient?
III. What is irreversible cell?
IV. What is meant by decomposition potential?
V. On what factors, does the solubility of a sparingly soluble salt depend?
VI. Define ionic mobility.
VII. What is meant by electrophoretic effect?
VIII. What is potentiometric titration?
IX. On what factors, does the overpotential of an electrochemical cell depend?
X. What is contact angle and wettability?
XI. How to reduce surface tension of water?
XII. Which type of fluids will have zero surface tension and why?
XIII. What are non-ionic surfactants? Give an example.
XIV. What is colloid? Fog is an example of which type of colloidal system?
XV. What factors can be used to classify the colloidal systems?
XVI. What are vesicle and reverse micelle?

Part –II

Answer Any Six: **7×6 = 42**

I. Explain the variation of equivalent conductance of strong and weak electrolytes with concentration. **3+4 = 7**

II. (a) The statement 'With decrease of concentration, the degree of dissociation of weak electrolyte increases' – Justify or criticize. **4**

(b) The pH of a 10^{-3} (M) aqueous solution of weak acid was found to be 4.0 at 25 °C. Find the degree of dissociation. **3**

III. Define the term 'solubility product'. Derive an expression for the activity solubility product of a sparingly soluble salt, $_{Ap}B_q$ at a particular temperature. **2+5 = 7**

IV. What is conductometric titration? Explain the conductometric titration curve of CH_3COOH solution *vs.* NaOH solution. **2+5 = 7**

V. Define electromotive force. From the thermodynamic consideration, deduce the relationship between equilibrium constant and electromotive force of a cell. **2+5 = 7**

VI. What is meant by polarization of an electrochemical cell? How concentration polarization occurs during electrolysis? **3+4 = 7**

VII. Define surface tension. Derive the relation between surface tension and surface energy of a liquid. **2+5 = 7**

VIII. Why water does not spread over the surface of oil? Small droplets of a liquid are usually more spherical in shape than larger drops of the same liquid-explain why? **3+4=7**

[Turn over

IX. A drop of water, 0.4 cm in radius, is split up into 125 tiny drops. Find the increase in surface energy. [γ_{water}= 72 dynes/cm] **7**

X. Define zeta potential. Describe the entropy change during micelle formation from surfactant monomer with diagram? **2+5=7**

XI. Write the Gibbs adsorption equation. What are electroosmosis process and sedimentation potential? **2+3+2 =7**

XII. Distinguish between emulsion and microemulsion. Define water-in-oil, oil-in-water and bi-continuous microemulsion. What are the applications of different types of microemulsions? **2+3+2 =7**