B.Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2025

SEMESTER 6 : CHEMISTRY

COURSE : **19U6CRCHE12 : PHYSICAL CHEMISTRY – IV**

(For Regular 2022 Admission and Supplementary 2021/2020/2019 Admissions)

Time : Three Hours   Max. Marks: 60

PART A
Answer All (1 mark each)

1. Calculate the pH of a mixture containing 0.01 M acetic acid and 0.03 M sodium acetatesolutions, pka of acetic acid = 4.8.

2. What is electrochemical series?

3. Give the Nernst equation for the EMF of the cell.

4. The organic liquids which are steam volatile and immiscible with water can be separated by

5. Calculate the ionic strength of 0.01 M $CuSO_4$ solution.

6. State Henry law and give the expression

7. What are the units of specific conductance and specific resistance?

8. Give an example for an acidic buffer and explain its buffer action.

$$(1 \times 8 = 8)$$

PART B
Answer any 6 (2 marks each)

9. What is concentration cell? What are the different types of it?

10. Give a rough sketch of the conductometric titration curves that would be obtained for the following titrations . a) KOH vs H_2SO_4 b) NH_4OH vs HNO_3

11. Why is it necessary to add NH4 CI prior to adding NH4OH for precipitating III group cations as their hydroxides in qualitative analysis?

12. What are strong and weak electrolytes? Give examples.

13. Derive an expression for the hydrolysis constant of a salt of weak acid and a strong base.

14. Write electrode reactions and cell reaction of the cell Zn/Zn^{2+} (1 M)// H^+ (1M)/ H_2(1 atm) / Pt.

15. A solution containing 2.44 g of a solute dissolved in 75 g of water boils at 100.413^{O}C. Calculate the molecular weight of the solute. (K_b for water = 0.56 Kkg/mol).

16. Give the Onsager equation and explain the terms involved.

$$(2 \times 6 = 12)$$

PART C
Answer any 4 (5 marks each)

17. The molar conductivities of CH_3,COONa, HCl and NaCl at infinite dilution are 91.0, 426.2 and 126.5 S cm² mol-1 at 25°C. If the percentage dissociation of acetic acid in 0.01 M solution is 4.2, calculate the molar conductivity and conductivity of this solution.

18. How will you determine ΔG, Δ H, ΔS of an electrochemical cell reaction?

19. Derive expressions for the hydrolysis constant of a salt of a strong acid and a weak base in aqueous solution, its degree of hydrolysis and the pH of the solution.

20. Explain the distillation of maximum boiling azeotropes with the help of graphical representation.

21. What is van't Hoff factor? Discuss the van't Hoff factor in the cases of abnormal molecular masses for solutes in solution.

22. How will you determine the pH using quinhydrone electrode?

(5 x 4 = 20)

PART D
Answer any 2 (10 marks each)

23. Explain the three types of partially miscible liquids with different CST's. Give examples of each type with diagrams.

24. Explain the applications of conductance measurements based on Kohlrausch's law.

25. Explain the principle behind the application of the concept of solubility product in determining the solubility of sparingly soluble salts. Give the application of it in qualitative analysis of inorganic ions?

26. What are reversible electrodes? Give a brief account of the various reversible electrodes with suitable examples.

(10 x 2 = 20)