

B. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2024**SEMESTER 6 : CHEMISTRY****COURSE : 19U6CRCHE12 - PHYSICAL CHEMISTRY – IV***(For Regular 2021 Admission and Supplementary 2020/2019 Admissions)*

Time : Three Hours

Max. Marks: 60

PART A**Answer All (1 mark each)**

1. Define the degree of dissociation of an electrolyte in solution. What happens to the degree of dissociation of a weak electrolyte on dilution? of a weak electrolyte
2. Calculate the degree of ionization of NH_4OH in 0.02 M solution. Given: the ionization constant of NH_4OH is $1.8 \times 10^{-5} \text{ mol L}^{-1}$ at 25°C .
3. Calculate the ionic strength of a 0.015 molal BaCl_2 solution.
4. What is the ionic product of water at 298K?
5. What is the advantage of measuring pH of the solution using quinhydrone electrode?
6. What is a Galvanic cell?
7. The relative lowering of vapour pressure is represented by the expression
8. The vapour pressure of a dilute aqueous solution of glucose is 740 mm of mercury at 373 K. The mole fraction of the solute is

(1 x 8 = 8)**PART B****Answer any 6 (2 marks each)**

9. 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
10. Explain why an aqueous solution of potassium acetate is basic while that of ammonium nitrate is acidic.
11. Write down the expression for free energy change, enthalpy change and entropy change of a cell reaction.
12. What do you mean by critical solution temperature? What happened to the miscibility of phenol-water system and triethyl amine-water system when temperature increases ?
13. What are the major requirements of a reference electrode?
14. The molar conductivities of sodium acetate, HCl and NaCl at infinite dilution are 91.0, 426.16 and $126.45 \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$ respectively at 298 K. Calculate the limiting molar conductivity of acetic acid.
15. The solubility product of AgBr is 3.3×10^{-13} at 298 K. What is its solubility?
16. What are strong and weak electrolytes? Give examples.

(2 x 6 = 12)**PART C****Answer any 4 (5 marks each)**

17. The cell constant of a cell is 0.5 cm. The resistance of an electrolyte solution taken in a cell is 50 ohms. Calculate the conductivity of the solution.
18. Explain lever rule and its application in finding the relative abundance of two phases in a partially miscible liquid mixture.

19. Derive Nernst equation for a cell reaction.
20. Calculate the ebullioscopic constant for water if ΔH (vaporisation) = $0.7171 \text{ kcal mole}^{-1}$ at 373.5 K . What is the boiling point of solution of urea with its mole fraction 0.100 ?
21. How does a glass electrode measure pH?
22. What is a buffer solution. Give the mechanism of buffer action.

(5 x 4 = 20)

PART D

Answer any 2 (10 marks each)

23. What is corrosion? Discuss the electrochemical theory of corrosion. Briefly explain how corrosion can be prevented.
24. a) Define molar conductivity and explain its variation with dilution b) 100 mL of 0.6 N CuSO_4 , which is electrolysed between two Pt electrodes till the concentration in the residual liquid is 0.1 N when a steady current of 5.0 amperes is used. How long should the current be passed to get the said change?
25. Why depression in freezing point of a solution is considered as a colligative property. Use thermodynamic derivation to prove depression in freezing point as a colligative property. Find the expression to calculate the molecular weight of the solute in this case.
26. What are acid-base indicators? Explain the action of phenolphthalein as an acid base indicator on the basis of Ostwald's theory.

(10 x 2 = 20)