BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, MARCH 2024
2021 ADMISSIONS REGULAR
SEMESTER VI - CORE COURSE (CHEMISTRY)
CH6B12B18 - Physical Chemistry – IV

Time : 3 Hours   Maximum Marks : 60

Part A

I. Answer any Ten questions. Each question carries 1 mark   **(10x1=10)**

1. Binary mixtures of n-hexane and n-heptane obey .... law over the entire range of concentration.

2. Identify the nature of azeotropic mixture formed by Water and HCl.

3. Recall the definition of Conductance.

4. Outline a reversible cell. Give example.

5. Relate EMF and equilibrium constant (K) of a reaction.

6. List any two advantages of NHE.

7. Identify the primary and secondary process in Hydrogen- Chlorine reaction.

8. State Stark-Einstein law.

9. Identify the use of chemiluminescence

10. Define symmetry operation.

11. Point group of ammonia molecule is————.

12. List different proper axis of symmetry present in a square planar molecule.

Part B

II. Answer any Six questions. Each question carries 5 marks   **(6x5=30)**

13. Benzoic acid associates in Benzene to form dimer. 3.355g of Benzoic acid when dissolved in 100g of Benzene lowered the freezing point of Benzene by 0.75K. Calculate the van't Hoff factor and the degree of association of the solute in benzene. K_f of Benzene=5.12Kkg/mol

14. State and prove Konowaloff's rule. Sketch the liquid composition curve and vapour composition curve for an ideal binary solution.

15. 0.0989g of a metal was deposited by a current of 0.2 ampere in 25 minutes from its salt solution . Calculate the electrochemical equivalent and equivalent weight of the metal.

16. Calculate the volume of gas liberated at the anode at STP by the electrolysis of copper sulphate solution by a current of strength 2 amperes for 10 minutes.

17. Discuss reference electrode. Give an example each for (i) a metal-metal ion electrode (ii) a gas electrode (iii) a metal- metal insoluble metal salt electrode (iv) an oxidation-reduction electrode.

18. Derive an expression for EMF of electrode concentration cell. Calculate the EMF of the following concentration cell at 25°C.
    $Cu/CuSO_4(0.05M)//CuSO_4(0.5M)/Cu$

19. What are Photochemical reactions? Explain the different types with suitable examples

20. Determine point group of NH_3 using systematic procedure.

21. Illustrate combination of symmetry elements in C_{2v} point group.

Part C

III. Answer any Two questions. Each question carries 10 marks (2x10=20)

22. Explain conductometric titration with its application.

23. State and discuss Nernst distribution law. Enumerate its limitations and applications.

24. Derive the relationship between ΔG, ΔH, ΔS and electrical energy using Gibbs Helmhlotz equation.

25. A cell is constructed from Zn^{2+} /Zn [$E^0_{Zn^{2+}/Zn}$ = -0.76V] and Ag^+/Ag [$E^0_{Ag^+/Ag}$ = 0.80V] half cells.

    i. Represent the cell.

    ii. Represent oxidation and reduction half reaction.

    iii. Write the cell reaction.

    iv. Represent Nernst equation for the above cell.

    v. Calculate the standard EMF.

    vi. Identify the ion which is the more powerful oxidizing agent.

    vii. If the concentration of Zn^{2+} and Ag^+ ions are 0.1M , Calculate the EMF of the cell at 25^0C.