SN – 340

V Semester B.Sc. Examination, November/December 2017
(Semester Scheme) (2013-2014 and Onwards)
(NS) (R) (Prior to 2016-17)
CHEMISTRY – VI
Physical Chemistry

Time : 3 Hours

Max. Marks : 70

Instructions : 1) *The question paper has* ***two*** *Parts. Answer both the Parts.*
2) *Draw diagrams and write chemical equations* ***wherever necessary.***

PART – A

Answer **any eight** of the following questions. **Each** question carries **two** marks. **(8×2=16)**

1. Define transport number of an ion. Give its relationship with the ionic mobility.
2. Give one example each for a primary reference electrode and a secondary reference electrode.
3. A solution of an electrolyte having the resistance of 75 ohms is placed in a cell, the conductivity of the solution is found to be 1.2 S/m. Calculate the cell constant.
4. Mention the significance of A and B in Debye-Huckel Onsager equation.
5. What is a salt bridge ? Mention its use.
6. Define degree of hydrolysis of salts.
7. Give any two characteristics of paramagnetic substances.
8. Hydrogen molecule is non polar, but hydrogen chloride is polar. Why ?
9. Define Quantum efficiency.
10. State Hooke's law.
11. Mention the requirement for a molecule which will be microwave active. Give an example.
12. What are stokes and antistokes lines ?

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PART – B

Answer **any nine** of the following questions. **Each** question carries **six** marks. **(9×6=54)**

13. a) How is the molar conductance of 0.1 M sodium nitrate solution determined ?

    b) In a moving boundary method 0.1 N HCl is placed in a cell having cross section of $1.12 \times 10^{-4} m^2$ area of cross section, on passing 0.0012 faradays of current, the boundary moved a distance of 0.0072 m. Calculate the transport number of cation. **(4+2)**

14. a) Describe the determination of pH of a solution using a quinhydrone electrode.

    b) Mention any two limitations of a standard hydrogen electrode. **(4+2)**

15. a) Derive Nernst equation for the electrode potential thermodynamically.

    b) Calculate the emf of the following cell at 298 K : Zn/Zn^{2+} (1M) || (1M) Ag^{+}/Ag given E° (zn) = – 0.76V, E° (Ag) = + 0.8V. **(4+2)**

16. a) State Kohlrausch law of independent migration of ions. Give any two applications of the law.

    b) Give any two limitations of Arrhenius theory. **(4+2)**

17. a) What are conductometric titrations ? Give any two of its advantages.

    b) The molar conductances of NaOH, NH_4Cl and NaCl at infinite dilution are 24.81×10^{-3}, 15×10^{-3}, 12.6×10^{-3} $S.m^2.mol^{-1}$ respectively. Calculate the molar conductance of ammonium hydroxide at infinite dilution. **(4+2)**

18. a) Derive Handerson's equation for a basic buffer.

    b) Mention the conditions for saturated and super saturated solution based on the magnitudes of ionic product and solubility products. **(4+2)**

19. a) Define the following :

    i) Induced dipole moment

    ii) Non polar molecules.

    b) Write Claussius-Mossotti equation and indicate the terms. **(4+2)**

20. a) What are diamagnetic and ferro magnetic substances ? Give an examples for each.

    b) Calculate the pOH of a buffer solution obtained by mixing 0.2M ammonium hydroxide solution and 0.1M ammonium chloride solution, given pK_b of NH_4OH is 4.76. **(4+2)**

21. a) Explain the terms fluorescence and phosphorescence with an example each.

    b) State Grothus-Draper law. **(4+2)**

22. a) Explain singlet and triplet states.

    b) Give the selection rules for pure rotational and vibrational transitions. **(4+2)**

23. a) What are fundamental and overtone bands ?

    b) Calculate the reduced mass of HCl molecule given the atomic masses of hydrogen and chlorine are 0.001 and 0.0355 respectively, given $N = 6.023 \times 10^{23}$. **(4+2)**

24. a) Give any four differences between Raman and IR spectra.

    b) State Franck-Condon principle. **(4+2)**

25. a) Describe how rotational spectral data is used to determine the moment of inertia and bond length of diatomic molecules.

    b) Calculate the number of modes of vibrations of carbondioxide molecule. **(4+2)**
