NS – 296

V Semester B.Sc. Examination, Nov./Dec. 2016
(2013-14 and Onwards) (New Scheme) (Repeaters) (Prior to 2016-17)
CHEMISTRY (Paper – VI)
Physical Chemistry

Time : 3 Hours

Max. Marks : 70

Instructions : 1) *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 equivalent conductance. How equivalent conductance is related to specific conductance ?
2. Give two advantages of conductometric titrations.
3. Name the factors that influence the transport number of an ion.
4. Explain common ion effect with an example.
5. Write Nernst equation for single electrode potential and indicate the terms.
6. What are buffers ? Give an example.
7. How dipole moment data is used to differentiate between cis and trans isomers ?
8. What are polar molecules ? Give examples.
9. State Born-Oppenheimer approximation.
10. Which of the following molecules are microwave active ? HCl, CO, H_2, O_2.
11. What is photosensitization ?
12. State Stark-Einstein law of photochemical equivalence.

PART – B

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

13. a) Discuss the construction and working of glass electrode. Write the electrode representation.

    b) The conductance of 10 mol m^{-3} solution of an electrolyte is 0.0055. The cell constant of the cell is found to be 87.8 m^{-1}. Calculate the specific conductance of the electrolyte. (4+2)

14. a) At 25°C, the specific conductance of 10 mol m^{-3} solution of acetic acid is 1.63×10^{-2} sm^{-1}, and molar conductance at infinite dilution is 390×10^{-4} sm^2mol^{-1}. Calculate the degree of dissociation of acetic acid.

    b) Define transport number of an ion. (4+2)

15. a) Draw a neat labelled diagram of Weston Cadmium Cell and write the cell reaction.

    b) Calculate the degree of ionisation of a decinormal solution of silver nitrate from the following data.

    $\lambda_{AgNO_3} = 94.7\times10^{-4}$ sm^2mol^{-1} for 0.1N solution.

    $\lambda^{\infty}_{Ag^+} = 55.7\times10^{-4}$ sm^2mol^{-1}, $\lambda^{\infty}_{NO_3^-} = 60.8\times10^{-4}$ sm^2mol^{-1}. (3+3)

16. a) Describe how the solubility product of a sparingly soluble salt AgCl is determined by using concentration cells.

    b) How standard tree energy change is related to EMF of Galvanic cells ? Indicate the terms. (4+2)

17. a) Mention any three limitations of Arrhenius theory.

    b) The molar conductances of HCl, NaCl and CH_3COONa at infinite dilution are 425×10^{-4} sm^2, mol^{-1}, 125×10^{-4} sm^2mol^{-1} and 91×10^{-4} sm^2mol^{-1} respectively. Calculate the equivalent conductance at infinite dilution of acetic acid. (3+3)

18. a) Derive Henderson's equation for determining the pH of an acidic buffer solution.

    b) Explain solubility product principle in the precipitation of II gp basic radicals. **(3+3)**

19. a) What is induced dipole moment ?

    b) Differentiate between paramagnetic and diamagnetic substances. Give one example for each. **(2+4)**

20. a) Write Clasius-Mossotti equation. Indicate the terms.

    b) What is the effect of temperature and dilution on the degree of hydrolysis of ammonium acetate salt ? **(4+2)**

21. a) Mention any two advantages of Raman spectroscopy over IR spectroscopy.

    b) The rotational spectrum of HCl consists of equally spaced lines separated by 2080 m^{-1}. Calculate the bond length of HCl.

    [Given : $\mu = 1.626 \times 10^{-27}$ Kg, $h = 6.627 \times 10^{-34}$ Js, $c = 3 \times 10^{8} ms^{-1}$]. **(2+4)**

22. a) Derive the relationship between internuclear distance and moment of inertia.

    b) Define Zero point energy. **(4+2)**

23. a) Give any two differences between stokes lines and antistokes lines.

    b) Sketch the number of modes of vibrations of CO_2 molecule. Which of them is degenerate. **(2+4)**

24. a) Define quantum yield of a photochemical reaction. Give an example for a photochemical reaction having

        i) Low quantum yield

        ii) High quantum yield.

    b) Differentiate between fluorescence and phosphorescence. **(4+2)**

25. a) State Beer-Lambert's Law. Mention its applications.

    b) Define force constant and mention its significance. **(4+2)**