UN – 343-R

V Semester B.Sc. Examination, November/December 2015
(NS) (2013-14 and Onwards Scheme)
CHEMISTRY – VI
Physical Chemistry

Time : 3 Hours

Max. Marks : 70

Instructions: *i) The question paper has* ***two*** *Parts.*
ii) Answer ***both*** *the Parts.*

PART – A

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

1. Define cell constant. Give its SI unit.
2. Why is transport number of cadmium ion in cadmium iodide abnormal at high concentration ?
3. State Kohlrausch's law.
4. Give any two limitations of Arrhenius theory.
5. What is the effect of concentration and temperature on the hydrolysis of ammonium acetate ?
6. Define dipole moment.
7. The dipole moment of HF, HCl, HBr, HI are 2.0, 1.03, 0.80 and 0.40 Debye. Arrange them in the increasing order of polar character.
8. HCl exhibit rotational spectrum but Cl_2 does not. Why ?
9. Define quantum efficiency.
10. What is meant by zero point energy ? Give its equation.
11. What is Raman shift ?
12. What are chemical sensors ? Give example.

P.T.O.

PART – B

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

13. a) The resistance of 0.01 μ solution of an electrolyte was found to be 200 Ω. The cell constant of the cell was 87.8 m^{-1}. Calculate the specific conductance and molar conductance.

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

14. a) How is EMF of a cell experimentally determined by compensation method ?

    b) Draw a labelled diagram of a western cadmium cell. (4+2)

15. a) How is solubility of sparingly soluble salt AgCl determined by constructing a concentration cell ?

    b) The molar conductance at infinite dilution for NaCl, NH_4Cl and NaOH are 12.6×10^{-3}, 15.0×10^{-3} and 24.81×10^{-3} $Sm^2\ mol^{-1}$ respectively. Calculate $\lambda\infty$ of NH_4OH. (4+2)

16. a) Explain :
    i) Asymmetry effect
    ii) Electrophoretic effect.

    b) What is liquid junction potential ? How can it be minimised ? (4+2)

17. a) Describe the construction of glass electrode represent it symbolically.

    b) A hydrogen electrode was immersed in the solution and coupled with a calomel electrode. The emf of the cell was found to be 0.40 V. Calculate the pH of a solution. (Given $E^{\circ}_{calomel} = 0.2422V$) (4+2)

18. a) Give an example of an acidic buffer and basic buffer.

b) What is common ion effect ? Explain why NH_4Cl is added before adding NH_4OH in the analysis of IV group basic radicals. **(2+4)**

19. a) What is meant by induced dipole moment ? Explain why CO_2 has a zero dipole moment and SO_2 has a positive dipole moment.

b) What are paramagnetic and diamagnetic substances ? **(4+2)**

20. a) The force constant of HBr is 410 Nm^{-1}. Calculate the fundamental vibrational wave number.

(Given reduced mass of HBr = 1.64×10^{-27} kg and C = 3×10^8 ms^{-1})

b) Write Clasius – Mosotti equation and explain the terms involved. **(4+2)**

21. a) Explain briefly Stoke's and Antistoke's lines.

b) State Hooke's law. **(4+2)**

22. a) Represent a Daniel cell. Give the cell reactions and calculate the emf of the cell.

(Give $E^{\circ}_{cu^{2+}/cu} = +0.34\,V$, $E^{\circ}_{zn^{2+}/zn} = -0.76\,V$)

b) Give any two advantages of Raman spectra over IR spectra. **(4+2)**

23. a) Name the different types of molecular spectra. Mention the regions of the electromagnetic spectrum in which they appear.

b) Give the selection rule for Raman rotation spectrum. **(4+2)**

24. a) Discuss briefly the quantum efficiency of dimerisation of anthracene.

b) Define a singlet and a triplet state. (4+2)

25. a) The intensity of a monochromatic radiation on a solution of 0.02 molar is reduced to $\frac{1}{5}$ of its initial value after passing through 6 cm length of the solution. Calculate the molar extinction coefficient and molar absorption coefficient.

b) State Grotthus Draper's law. (4+2)