NS – 295

V Semester B.Sc. Examination, November/December 2016
(Semester Scheme) (CBCS) (Fresh)
(2016-17 and Onwards)
CHEMISTRY – VI
Physical Chemistry

Time : 3 Hours Max. Marks : 70

Instructions: *i) The question paper has **two** Parts. Answer **both** Parts.*
*ii) Draw diagrams and chemical equations **wherever** necessary.*

PART – A

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

1. Define the term molar conductance.
2. Name any two factors that influence the transport number of an ion.
3. Calculate the specific conductance of the solution of an electrolyte having the resistance of 210 ohms at 298 K.
   (Given : Cell constant = 88 m^{-1})
4. Give two limitations of standard hydrogen electrode.
5. What is Redox electrode ? Give an example.
6. Define force constant. Mention its significance.
7. What is Peltier effect ?
8. State Born-Oppenheimer's approximation.
9. Write the expression for the rotational constant (B) of a diatomic molecule. Indicate the terms involved.
10. Give an example each for an acidic and basic buffer.
11. Give any two advantages of Dropping Mercury Electrode (DME).
12. What are stokes and anti-stokes lines ?

P.T.O.

PART – B

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

13. a) Describe the principle involved in the conductometric titration of a strong acid Vs strong base graphically.

    b) λ_∞ values of NaCl, NH_4Cl and NaOH are 12.6×10^{-3}, 15.1×10^{-3} and 24.81×10^{-3} $S.m^2mol^{-1}$ respectively. Calculate the λ_∞ of NH_4OH.

14. a) Derive Nernst equation for the electrode potential of an electrode system thermodynamically.

    b) Define Ionic mobility.

15. a) Describe the determination of transport number of H^+ ion by moving boundary method.

    b) A hydrogen electrode was immersed in a solution and coupled with a Calomel electrode, the emf of the cell was found to be 0.40 volt. Calculate the pH of the solution. (Given $E^0_{Cal} = 0.2442V$)

16. a) Describe the construction and working of Weston-Cadmium cell with neat labelled diagram.

    b) What are reference electrode ? Give an example.

17. a) Explain :

        i) Asymmetric effect

        ii) Electrophoretic effect in strong electrolytes.

    b) Calculate the emf of the cell

    $Zn \mid Zn^{2+}_{(0.05\,M)} \parallel Zn^{2+}_{(0.025M)} \mid Zn$ at 298 K.

18. a) Derive the relationship between K_h, K_w, K_a and K_b for hydrolysis of the salt of a weak acid and a weak base.

    b) Mention any two analytical applications of buffer solutions.

19. a) Define dipole moment. Chloroform ($CHCl_3$) has a permanent dipole moment while carbon tetrachloride (CCl_4) does not. Why ?

    b) Write Clausius-Mossotti equation and indicate the terms.

20. a) What are paramagnetic and diamagnetic substances ? Give two examples for each type.

    b) Nitrogen (N_2) molecule fails to exhibit rotational spectra but carbon monoxide (CO) exhibits. Why ? **(4+2)**

21. a) Mention the regions of electromagnetic spectrum where rotational and vibrational spectra are observed.

    b) The rotational spectrum of gaseous HCl containing a series of equally spaced lines separated by 2080 m^{-1}. Calculate the internuclear distance, given that atomic mass of Hydrogen is 1.67×10^{-27} Kg, Chlorine is 58.06×10^{-27} Kg; $h = 6.626 \times 10^{-34}$ Js; $C = 3 \times 10^8$ $m.s^{-1}$. **(2+4)**

22. a) Sketch the different modes of vibrations of CO_2 and H_2O molecules.

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

23. a) What are the allowed transitions that occur in molecules during electronic spectra ?

    b) What is zero point energy ? Give its mathematical expression. **(4+2)**

24. a) Bringout the differences between Raman spectra and IR spectra.

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

25. a) Mention the different types of currents obtained at the Dropping Mercury Electrode (DME).

    b) Give any three applications of polarography. **(3+3)**
