SN – 339

V Semester B.Sc. Examination, November/December 2017
(Semester Scheme) (CBCS) (F + R) (2016-17 and Onwards)
CHEMISTRY
Physical Chemistry (Paper – VI)

Time : 3 Hours Max. Marks : 70

Instructions : *1) The question paper has* ***two*** *Parts. Answer* ***both*** *the Parts.*

2) ***Draw*** *diagrams and write chemical equation* ***wherever*** *necessary.*

PART – A

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

1. Define ionic mobility.
2. State Kohlrausch law of independent migration of ions.
3. Give any two limitations of Arrhenius theory .
4. How is the cell constant of a given conductivity cell determined ?
5. The standard electrode potentials of zinc and copper electrodes in their salt solutions are – 0.76 V and +0.34 V respectively. Calculate e.m.f. of the Daniel cell.
6. Name a primary and secondary reference electrode.
7. Explain induced dipole moment with an example.
8. Define zero point energy of a vibrating molecule. Give its equation.
9. Mention any two advantages of Dropping Mercury Electrode (D.M.E.).
10. State Franck-Condon principle.
11. Give any two applications of Raman Spectroscopy.
12. What is the selection rule for pure vibration and pure rotational transitions ?

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 verses strong base graphically.

    b) The molar conductances at infinite dilution for NaCl, NH_4Cl and NaOH are 12.6×10^{-3}, 15.0×10^{-3} and 24.81×10^{-3} $S.m^2\ mol^{-1}$ respectively. Calculate the λ_∞ of NH_4OH. **(4+2)**

14. a) Explain the determination of transport number of H^+ and Cl^- ions in hydrochloric acid by moving boundary method.

    b) Write Debye-Huckel Onsanger equation and indicate the terms involved. **(4+2)**

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

    b) The Standard reduction potentials of $Ag^+|Ag$ and $Cu^{+2}|Cu$ electrodes are 0.8 V and 0.34 V respectively. Represent the cell symbolically and calculate the emf of the cell. **(4+2)**

16. a) Explain the construction of glass electrode and represent it symbolically.

    b) A hydrogen electrode was immersed in the solution and coupled with a colomel electrode, the emf of the cell was found to be 0.4 V. Calculate pH of the solution, given E^0_{Cal} = 0.2415 volts. **(4+2)**

17. a) How is the EMF of a cell experimentally determined by Pogendroff's compensation method ?

    b) Differentiate between single electrode and standard electrode potential. **(4+2)**

18. a) Derive Henderson's equation for calculating pH of an acidic buffer.

    b) Give any two analytical applications of buffer solutions. **(4+2)**

19. a) What is Seebeck effect ? Explain why carbon dioxide has a zero dipole moment and sulphur dioxide has a positive dipole moment.

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

20. a) i) Write Clausius-Mossotti equation and indicate the terms involved in it.

ii) What are semiconductors ? Give an example.

b) Chlorine is microwave inactive, where as hydrogen chloride is active. Why ?

(4+2)

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

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

22. a) Give any four differences between Raman Spectra and IR Spectra.

b) Calculate the number of modes of vibrations for carbondioxide and water molecules.

(4+2)

23. a) Explain in brief : Stokes and anti Stoke's lines.

b) State Hooke's law.

(4+2)

24. a) How is rotational spectral data of a diatomic molecule used to determine the moment of inertia and bond length of the molecule ?

b) The force constant for HF molecule is 870 N/m. Calculate the fundamental vibrational frequency. Given $C = 3 \times 10^8$ m.s^{-1} and reduced mass of HF; $\mu = 0.1566 \times 10^{-26}$ kg.

(3+3)

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

b) Give any two applications of polarography.

(3+3)
