SS – 330

V Semester B.Sc. Examination, November/December 2018
(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. Give any two limitations of standard hydrogen electrode.
2. What is liquid junction potential ? How it is eliminated ?
3. What is salt bridge ? What is its function in galvanic cell ?
4. Calculate the electrode potential (half cell potential) at 298 K for a reaction $Cu^{2+} + 2e^- \rightarrow Cu$. Given $[Cu^{2+}] = 5$ moles, $E^0_{Cu} = 0.34V$.
5. Why is the transport number of cadmium ion in cadmium iodide abnormal at high concentration ?
6. What is the effect of temperature on degree of hydrolysis ?
7. Explain induced dipole moment with an example.
8. Define force constant, mention its significance.
9. State Franck-Condon principle.
10. What is halfwave potential ? Give its significance.
11. State Born-Oppenheimer approximation.
12. N_2 molecule fails to exhibit rotational spectra, but CO exhibits why ?

P.T.O.

PART – B

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

13. a) How is molar conductance of 0.1 M $NaNO_3$ determined experimentally ?

    b) The molar conductance of CH_3COONa, HCl and NaCl at infinite dilution are 9.20×10^{-3}, 4.272×10^{-2} and 12.85×10^{-3} Sm^2/mol respectively. Calculate the molar conductance of acetic acid at infinite dilution. **(4+2)**

14. a) Explain Asymmetric effect and electrophoretic effect of strong electrolytes based on Debye-Huckel theory.

    b) Write any two advantages of conductometric titration. **(4+2)**

15. a) With Neat labeled diagram, explain working of Calomel electrode.

    b) The limiting ionic conductance of Na^+ ion is 4.929×10^{-3} Sm^2/mol. Calculate the Ionic mobility of Na^+ ion. **(4+2)**

16. a) How pH of a solution is determined using glass electrode ?

    b) Calculate the specific conductance of the solution of an electrolyte having the resistance of 220 ohm at 298 K. Given cell constant = 80 m^{-1}. **(4+2)**

17. a) Derive Nernst equation for single electrode potential. (Free energy concept).

    b) Write any two limitations of quinhydrone electrode. **(4+2)**

18. a) Explain the acid-base theory of indicators by taking phenolphthalein as an example.

    b) Write two biological applications of buffer solutions. **(4+2)**

19. a) What is Seebeck effect ? Explain why CO_2 has zero dipole moment and SO_2 has positive dipole moment.

    b) Explain the term Piezoelectricity. **(4+2)**

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

    b) Pure rotational spectrum of CO has lines spaced at 384.2 m^{-1}. Calculate its moment of inertia. (Given h = 6.627×10^{-34} Js, c = 3×10^8 m/s) **(4+2)**

21. a) Derive the relationship between moment of inertia and inter nuclear distance of a diatomic molecule.

    b) Write selection rules for pure rotational and vibrational transitions of a molecule AB. (4+2)

22. a) State Hook's law. Derive an expression for frequency of simple harmonic oscillator.

    b) Force constant of HF molecule is 860 Nm^{-1}. Calculate the fundamental vibrational frequency and zero point energy. [$h = 6.627 \times 10^{-34}$ Js, $\mu = 0.1566 \times 10^{-26}$ Kg]. (4+2)

23. a) Give any four general characteristics of Raman lines.

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

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

    b) Calculate the total number of modes of vibrations for CO_2 and H_2O molecule. (4+2)

25. a) Write Ilkovic equation. Mention its applications.

    b) What is cyclic voltamogram ? (4+2)