SN – 243

V Semester B.Sc. Examination, November/December 2014
(NS) (2013-14 and Onwards)
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 the term specific conductance of an electrolyte solution. How does it vary with dilution ?
2. What are concentration cells ?
3. Write the Nernst equation for single electrode potential and explain the terms in it.
4. Mention two advantages of potentiometric titrations.
5. Explain the term common ion effect taking an example.
6. What is the effect of concentration and temperature on the degree of hydrolysis of a salt of weak acid and weak base ?
7. State Franck-Condon principle.
8. Distinguish between photochemical and photophysical processes.
9. What are Stoke's and antistokes lines in Raman spectra ?
10. Chloroform has a permanent dipole moment while carbon tetrachloride does not have. Explain.
11. Mention the selection rules for rotational transitions and vibrational transitions of a molecule AB.
12. Define the term force constant for a diatomic molecule and mention its significance.

PART – B

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

a) How is molar conductance of 0.1 M solution of potassium nitrate determined experimentally ?
b) What is meant by cell constant of a conductivity cell ? **(4+2)**

14. a) Explain Debye-Huckel theory of strong electrolytes.
    b) Name the primary reference electrode used in electrochemical measurements. Represent it symbolically.

15. a) Describe the construction of calomel electrode. Write the half-cell reaction.
    b) The standard reduction potentials of Ag/Ag^+ and Cu^{2+}/Cu electrodes are +0.8 and +0.34V respectively. Write the cell reaction and calculate emf of the cell.

16. a) Molar conductances of HCl, NaCl and CH_3COONa at infinite dilution are 425×10^{-4} sm^2mol^{-1}, 125×10^{-4} sm^2mol^{-1} and 91×10^{-4} sm^2mol^{-1} respectively. Calculate the degree of dissociation of 0.01 M acetic acid solution. Molar conductance of 0.01 M acetic acid is 16.3×10^{-4} $sm^2\ mol^{-1}$.
    b) Transport number of Cl^- ion is not the same in 0.1 M KCl and 0.1 M HCl at the same temperature. Explain.

17. a) Describe the determination of transport number of H^+ and Cl^- ions in hydrochloric acid by moving boundary method.
    b) Why is Weston cadmium cell used as a standard cell?

18. a) Derive Henderson's equation for pH of an acidic buffer.
    b) During the detection of basic radicals of third group in inorganic qualitative analysis NH_4OH is added to a salt solution saturated with NH_4Cl. Why ?

19. a) What are semi-conductors ? Give examples.
    b) What is the effect of temperature on paramagnetic property of a substance ?

20. a) State Beer-Lambert's Law. Write the equation for calculation of absorbance of a solution. Mention limitations of the law.
    b) State Grotthus-Draper Law of photochemistry.

21. a) Explain the terms fluorescence and phosphorescence taking suitable examples.
    b) What is meant by photostationary equilibrium ?

22. a) Mention the advantages of Raman spectra over infrared spectra.
    b) In rotational spectrum of a diatomic molecule the lines are equi-spaced. Explain.

23. a) Force constant for HF molecule is 870 Nm^{-1}. Calculate the fundamental vibrational frequency and zero point energy. [$h=6.627\times10^{-34}$ JS ; $\mu = 0.1566\times10^{-26}$kg]
    b) H_2 does not give rotation spectrum whereas HBr gives. Why ?

24. a) Sketch the normal modes of vibrational of CO_2 and H_2O molecules.
    b) Define the terms : i) fundamental and ii) overtone bands.

25. a) Using a suitable diagram indicate Raman transitions. Write the characteristics of Raman lines.
    b) State Born-Oppenheimer approximation.