QP – 164

V Semester B.Sc. Examination, March/April 2022
(2016 – 17 and Onwards) (CBCS) (F + R)
CHEMISTRY
Paper – VI : Physical Chemistry

Time : 3 Hours Max. Marks : 70

Instructions : *i) The question paper has **two** Parts, answer **both** the Parts.*
*ii) **Draw** the diagram and chemical equation **wherever** necessary.*

PART – A

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

1) State Kohlrausch law of independent migration of ions.
2) Mention any two advantages of glass electrode.
3) Molar conductance of 0.01M acetic acid at 25°C is 16.3×10^{-4} Sm^2mol^{-1}. Molar conductance at infinite dilution at 25°C is 30.7×10^{-4} Sm^2mol^{-1}. Calculate degree of dissociation.
4) What is cell constant ?
5) What is salt bridge ? What is its function in galvanic cell ?
6) What is the effect of temperature on degree of hydrolysis ?
7) What is Peltier effect ?
8) State Born–Oppenheimer's approximation.
9) Which region of IR spectrum is called as finger print region ? Why ?
10) State Hooke's law.
11) Which of the following molecules are IR active ? Why ?
    H_2, HCl, CH_4, H_2O.
12) Give any two applications of polarigraphy.

P.T.O.

PART – B

II. Answer **any nine** of the following. **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^{-3} 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.

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

15) a) How do you determine EMF of cell potentiometrically ?

b) Calculate the potential of zinc electrode, where in a zinc rod is dipped in 0.05 M $ZnSO_4$ solution at 298 K.

$E^{\circ}_{Zn^{2+}/Zn} = -0.76V$. **(4+2)**

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

b) What are reference electrodes ? Give an example. **(4+2)**

17) a) Show that the sum of transport numbers of cation and anion is unity.

b) Calculate the EMF of the concentration cell

$Pt.H_2/HCl\ (C_1 = 0.2\ M)\ //\ HCl(C_2 = 3\ M)/H_2.Pt$ **(4+2)**

18) a) Derive the relationship between K_h, K_w, K_a and K_b.

b) Mention the limitations of Ostwald's law. **(4+2)**

19) a) Define

i) Seeback effect

ii) Pyroelectricity.

b) Mention any two applications of semiconductors. **(4+2)**

20) a) Write a note on :
   i) Thomson effect
   ii) Induced polarization.

   b) What are inelastic collision ? **(4+2)**

21) a) The pure rotational spectrum of CO has lines spaced at 385.5 m^{-1} apart. Calculate its moment of inertia and bond length.
   Given $\mu = 1.139 \times 10^{-26}$ kg, $h = 6.627 \times 10^{-34}$ Js and $c = 3 \times 10^{8}$ ms^{-1}.

   b) Write vibrational energy expression for diatomic molecule at zero level. **(4+2)**

22) a) Give the relationship between vibrational frequency with force constant and reduced mass. Give the significance of force constant.

   b) Which of the following molecules are IR active and why ?
   H_2, HCl, CH_4, H_2O **(4+2)**

23) a) Write any four advantages of Raman spectroscopy over IR spectroscopy.

   b) What are overtones and combination bands ? **(4+2)**

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

   b) Name the region of electromagnetic spectrum in which rotational spectrum and vibrational spectrum occur. **(4+2)**

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

   b) What is the principle of cyclic voltametry ? **(4+2)**
