**Paper / Subject Code: 88609 / T.Y.B.Sc Chemistry: Physical Chemistry (3 & 6 Units)**

N.B.:

***(1) All questions are compulsory.***

 ***(2) Figures to the right indicate full marks.***

***(3) Use of logarithmic table/non-programmable calculator is allowed.***

***Physical Constants***:

N = 6.023 x 1023 Charge on electron = 1.66 x 10-19 C

F = 96500 coulombs Mass of an electron= 9.1 x 10-31 kg

 c = 3 x 108 m/s 2.303RT / F = 0.05916 at 298K

R = 8.314 J / K/mol π = 3.142 h = 6.626 x 10-34 J.s

**Q.1 Select whether the following statements are true or false (Any five) 5**

a. The value of activity coefficient for HCl solution is greater than one.

b. In case of chemical cell without transference, salt bridge is required for connecting two half cells.

c. The ionic strength is product of molarity and valency.

d. In electrochemistry polarization is hypothetical phenomenon.

e. For galvanic cells the value of E°cell is always zero.

f. With increase in current density the overvoltage value also increases.

g. Transport number for an electrolyte can be determined using electrolyte concentration cell with transference type of galvanic cells.

h. Debye Huckel theory deals with ionic strength and activity coefficient of the solution.

**Q.2 Fill in the blank with appropriate words given in the bracket. (Any five) 5**

a) For non-ideal solution -------------

i) γ < 1 ii) γ = 1 iii) γ > 1

b) EMF of Chemical Cell with transference is shown as

i) Ecell = E1 +E2 + Ej  ii) Ecell = E1 + Ej iii) Ecell = E1 + E2

c) No liquid junction potential will develop if both the ions of the electrolyte move with ------

i) Different speed ii) same speed iii) None of the following

d) Salt bridge

1) Keeps the two half –cells separate but still maintain the electrical contact between the two

2) Prevents development of liquid junction potential

3) Prevents diffusion of ions

i) Only 1 ii) Both 1 & 2 iii) All the 1, 2, &3.

e) The difference between the operating potential of the electrode and its equilibrium potential is called-------

i) Overvoltage ii) liquid junction potential iii) Polarization or electrode polarization

**Q.3 Match the following 5**

|  |  |
| --- | --- |
| a. Dipole Moment (μ) | i.G.N.Lewis |
| b.Activity coefficient for Uni-trivalent ion | ii. log γ$\pm $ = - A Z+.Z- $\sqrt{μ}$ |
| c.Concept of activity and activity coefficient | iii.Sodium iodide |
| d.Debye-Huckel Limiting Law | iv.1/2 ∑mizi2 |
| e.For non-aqueous Salt bridge | v.27 m4.γ$\pm $4 |

**Q.5 Attempt the following questions (Any Two) 10**

A. Find expression for activity of uni: univalent type of electrolyte in terms of molality and mean ionic activity coefficient of electrolyte. 5

B. What are chemical cells? How are they classified? Give example for each type. (Cell representation is expected) 5

C. Derive an expression for the emf of gas electrode concentration cell reversible to cation. 5

D. A solution is prepared by mixing 0.01 m NaCl and 0.005 m Na2SO4. Calculate the activity coefficient of NaCl in this solution. (Given: A = 0.509 for aqueous solution at 298 K) 5

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