

B.Sc.- III (CBCS Pattern) Semester-V
USCCHT10 - Chemistry-II - Physical Chemistry

P. Pages : 3

Time : Three Hours



GUG/W/24/13090(S)

Max. Marks : 50

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1. a) Define the terms specific conductance and equivalent conductance. Explain the effect of dilution on the above terms. 5
- b) Describe postulate of Debye-Huckel theory of strong electrolyte. 5

OR

- c) Explain application of conductometric titration for precipitation reaction. 2½
- d) Describe Arrhenius Theory with its limitation. 2½
- e) How to determine λ_{∞} of weak electrolyte by Kohlrausch Law. 2½
- f) Specific conductance of BaSO_4 solution is $3.20 \times 10^{-4} \text{ Sm}^{-1}$ and that of pure water is $1.12 \times 10^{-4} \text{ Sm}^{-1}$.
The ionic conductivities of Ba^{2+} and SO_4^{2-} at infinite dilution are 120.18×10^{-4} and $98 \times 10^{-4} \text{ Sm}^{-2} \text{ mol}^{-1}$ respectively. Calculate solubility and solubility product of BaSO_4 . 2½
2. a) Explain construction and working of Daniel cell. 5
- b) Explain Hittorf method for the determination of transport number of ions. 5

OR

- c) The E.M.F. of the cell $\text{Pt} / \text{H}_2 (1\text{atm}), \text{HCl} \parallel \text{KCl}, \text{Hg}_2 \text{Cl}_2 (\text{s}) | \text{Hg}$ is 0.2264 volts at 25°C and its temperature coefficient is 0.000216 volts per degree. Calculate thermodynamics terms ΔH , ΔS and ΔG . 2½
- d) Describe Faradays Second law of electrolysis. 2½
- e) Explain the relation between transport number and ionic conductance. 2½
- f) Discuss about the migration of ion when electrode are not attackable. 2½
3. a) Explain the potentiometric titration. 5
- i) Redox titration.
- ii) Precipitation titration.
- for emf measurement.

- b) Explain Electrolyte concentration cell with transference. 5
 Calculate emf of the following cell at 25°C

$$\text{Zn(Hg)} \mid \text{ZnSO}_4 \mid \text{Zn(Hg)}$$

$$(0.01\text{m}) \quad 1\text{m} \quad (0.01\text{m})$$

OR

- c) What is salt bridge? Give the function of salt bridge. 2½
 d) Explain construction and working of calomel electrode. 2½
 e) What do you mean by reversible and irreversible cell? 2½
 f) How to measure EMF by using quinhydrone electrode. 2½

4. a) Explain the phenomenon 5

- (i) Black body radiation.
 (ii) Photoelectric effect.

Which could not be explained on the basis of classical mechanics.

- b) Derive Schrodinger wave equation on the basis of postulates of quantum mechanics. 5

OR

- c) What is de Broglie's hypothesis? Draw only diagram of experimental verification of de Broglie's concept. 2½
 d) A particle having mass equal to 10^{-3}g has to be located within distance of 1.2 nm. 2½
 Determine the uncertainty involved in velocity and momentum ($h = 6.626 \times 10^{-34}\text{JS}$).
 e) Normalize the wave function for particle in one dimensional box. 2½
 f) When electron is in first excited state in one dimensional box of width 1.2\AA . 2½
 Calculate energy of electron. (mass of electron = $9.1 \times 10^{-31}\text{kg}$) ($h = 6.26 \times 10^{-34}\text{JS}$)

5. Attempt **any ten**. 1x10
=10
- 1) Write Onsager equation
 2) What is unit of specific resistance and molar conductance?
 3) Give any two advantage of conductometric titration over visual titration.

- 4) Write Nernst equation.
- 5) What are faradaic processes?
- 6) Write two factor which affect the transport number.
- 7) What is reference electrode?
- 8) Define liquid junction potential.
- 9) For glass electrode,
 $E_G(\text{oxid}^n \text{ potential}) = 0.2315V$ $E^\circ_G(\text{oxid}^n \text{ potential}) = -0.698V$
determine pH of the solution.
- 10) Give any two limitation of Bohr's theory?
- 11) Write Heisenberg's uncertainty principal in mathematically form.
- 12) Define
 - i) Eigenvalues.
 - ii) Eigenfunction.
