

B.Sc. (CBCS Pattern) Sem-V  
**USCCHT10 - Chemistry Paper-II : Physical Chemistry**

P. Pages : 2

Time : Three Hours



**GUG/W/22/13090**

Max. Marks : 50

- Notes :
1. All questions are compulsory & carry equal marks.
  2. Draw diagram wherever necessary.
  3. Use of calculator is permitted.

1. a) Explain the nature of curves obtained in conductometric titration of 5  
i) Mixture of strong acid and weak acid against strong base  
ii) Precipitation titrations.
- b) Describe Debye – Huckel theory of strong electrolytes 5
- OR**
- c) A 0.5 N solution of a salt placed between two platinum electrodes 2.0 cm apart and area of cross section 4.0 sq. cm has a resistance of 25 ohms. Calculate the equivalent conductivity of a solution. 2½
- d) What are the postulates of Arrhenius theory of electrolytic dissociation 2½
- e) State and explain Kohlrausch’s law of independent mobility of ions with suitable examples. 2½
- f) What are the effect of dilution on specific conductance and molar conductance of a solution. 2½
2. a) The emf of a cell, 5  
 $\text{Cd} | \text{CdCl}_2 \cdot 2\text{H}_2\text{O}(\text{sat.}), \text{AgCl}(\text{s}) | \text{Ag}$  is found to be 0.6753 V at 25° C and 0.6915 V at 0° C. Calculate  $\Delta G, \Delta H$  and  $\Delta S$  of the cell at 25°C.
- b) What is transport number? Explain Hittorf’s method for determination of transport number of ions when electrodes are non attackable. 5
- OR**
- c) State and explain Faraday’s second law of electrolysis 2½
- d) Distinguish between irreversible and reversible cells. 2½
- e) Obtain the relation between ionic conductance and transport number of ions. 2½
- f) Explain effect of 2½  
i) Hydration of ions and  
ii) Temperature on transport number of ions.
3. a) Describe construction and working of calomel electrode. Standard emf of cell 5  
 $\text{Mg} / \text{Mg}^{2+} (0.01\text{M}) || \text{Sn}^{2+} (0.1\text{M}) | \text{Sn}$  is 2.204 V. Calculate the emf of cell at 25°C.

- b) What are concentration cell? Derive an expression for the emf of a concentration cell with transference. **5**
- OR**
- c) Explain the use of hydrogen gas electrode in determination of pH of the solution. **2½**
- d) What is liquid junction potential. How it can be eliminated. **2½**
- e) Discuss the potentiometric method used for redox titration. **2½**
- f) Derive Nernst's equation for emf of a cell. **2½**
- 4.** a) Explain how classical mechanics fails when applied to **5**  
 i) Photoelectric effect and  
 ii) Black body radiations.
- b) Obtain an expression for energy of particle in one-dimensional box. Obtain an expression for normalized wave function. **5**
- OR**
- c) What is Heisenberg's uncertainty principle. Give its physical interpretation. **2½**
- d) Explain Davisson and Germer's experiment for verification of dual nature of matter. **2½**
- e) What are well behaved wave functions. Give physical significance of  $\Psi$  and  $\Psi^2$ . **2½**
- f) Explain Bohr's Theory of hydrogen atom. **2½**
- 5.** Attempt **any ten**. **10**
- i) Define cell constant. Write its SI unit
- ii) What is meant by electronic conductors
- iii) Write any two limitations of Arrhenius theory
- iv) State faraday's first law of electrolysis
- v) What is electrochemical cell.
- vi) Speed ratio of  $\text{Ag}^+$  &  $\text{NO}_3^-$  ions is 0.98 calculate transport number of these ions.
- vii) Why KCl is not used in the salt bridge in case of Cu- Ag cell.
- viii) What is Amalgam Electrodes?
- ix) What are the advantages of potentiometric titrations over ordinary titrations.
- x) What is orthogonal wave function
- xi) What is an operator
- xii) Write the net cell reaction for  $\text{Zn} | \text{Zn}^{2+} || \text{Ag}^+ | \text{Ag}$

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