B.Sc. - III CBCS Pattern Semester-V

USCCHT10 - Chemistry-II (Physical Chemistry)

P. Pages : 2 **GUG/W/23/13090 (S)**

Time : Three Hours * 8 3 5 2 * Max. Marks : 50

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1. a) State and explain Kohlrausch's law of independent migration of ions. A 0.5 normal solution of salt placed between two platinum electrodes 2.0 cm. apart and of $4.0\,cm^2$ area of cross section has a resistance of 25 ohm. Calculate equivalent conductivity of solution. **5**

b) Define specific, equivalent and molar conductance. How they are related? How does specific and equivalent conductance of a electrolyte vary with dilution? **5**

OR

c) Explain relaxation effect. **2½**

d) Equivalent conductivity of CH_3COONa, HCl and NaCl are $91\times10^{-4}, 426.16\times10^{-4}$ and $125.45\times10^{-4}\,s.m^2.equi^{-1}$ respectively. Calculate equivalent conductance of CH_3COOH at infinite dilution. **2½**

e) How is solubility of sparingly soluble salt determined by conductance measurement. **2½**

f) Explain conductometric titration of a mixture of HCl and CH_3COOH with NaOH. **2½**

2. a) What are Galvanic Cells? Derive the relation between emf of a cell and change in enthalpy in cell reaction. Write the cell reaction of the following cell **5**

$Cd(s)\,|\,Cd^{2+}(0.1m)\,||\,H+(0.01m)|H_2(g)\,|\,pt$

b) What is transport Number? Discuss Hittorf's method for the determination of transport numbers of ions. **5**

OR

c) What are the factors affecting transport number. Obtain the relation between transport number and ionic conductance. **2½**

d) Write a note on migration of ions. **2½**

e) Write cell reaction and calculate standard EMF of following cell **2½**

$Zn(s)\,|\,Zn^{2+}(1M)\,||Cd^{2+}(1M)|Cd$

Given standard oxidation potential of electrode are $E^0{}_{Zn} = 0.86V; E^0{}_{Cd} = 0.50V$

f) Explain Reversible and Irreversible cells with suitable examples. **2½**

3. a) Obtain the expression for EMF of concentration cell without transference. **5**

b) What are the types of reversible electrodes? Derive Nernst's equation for the EMF of the cell. **5**

OR

c) Define 'Liquid junction potential'. How it can be eliminated? **2½**

d) Discuss the application of EMF measurement in determination of pH of solution by using Hydrogen electrode. **2½**

e) What are the potentiometric titrations. Explain the acid-base titration carried out potentiometrically. **2½**

f) Write construction and working of gas electrode. **2½**

4. a) Derive an expression for energy of a particle in one dimensional box. What is zero-point energy? **5**

b) Derive de-Broglie relation. Calculate the de-Broglie wave length of a body of mass 0.1 kg moving with a velocity of 2000 MS^{-1} ($h = 6.626 \times 10^{-34}$ js) **5**

OR

c) State the postulates of quantum mechanics. **2½**

d) Explain photoelectric effect. **2½**

e) Define Normalized and orthogonal wave functions. What are the properties of well behaved wave function? **2½**

f) Explain Heisenberg uncertainty principle. **2½**

5. Solve **any ten** questions.

a) The resistance of a 0.1 m KCl solution in a conductance cell is 325 ohm and the specific conductance of the same solution is $1.29 SM^{-1}$. Calculate the cell constant. **1**

b) What are advantages of conductometric titration? **1**

c) What are the limitations of Arrhenius theory? **1**

d) What is emf of cell? **1**

e) Write Farachy's I^{st} law of electrolysis. **1**

f) Give the relation between EMF of cell and Free energy change. **1**

g) Write two advantages of potentiometric titration over simple titrations? **1**

h) What is indicator electrode? **1**

i) What do you mean by reference electrode? **1**

j) What do you mean by dual nature of electron. **1**

k) Define operator. Write the Hamiltonian (time independent) operator. **1**

l) Write Stefam-Boltzmann law. **1**

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