

QUESTION BANK

TOPIC: ELECTROCHEMISTRY GRADE:12

1. Arrange the following metals in order of their increasing reducing power.

K+/K = - 2.93V, Ag+/Ag = 0.80V, Hg2+/Hg = 0.79 V, Mg2+/Mg = - 2.37 V

Cr3+/Cr = - 0.74V.

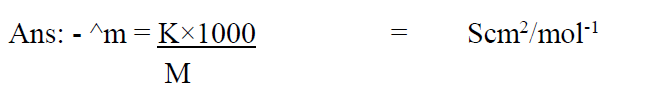
Ans: Lower the reduction potential, easily if gets oxidized hence greater is the reducing power, therefore the increasing order of reducing power is Ag <Hg<Cr<mg<K.

2. Define conductivity and molar conductivity.

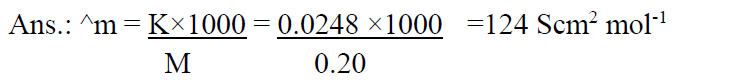
Ans: The conductance of a solution of 1 cm length and area of cross section equal to 1cm2 is known as conductivity. The conductivity of electrolytic solution containing 1 mole of electrolyte between 2 large electrodes at one cm apart is known as molar conductivity.

3. What is limiting molar conductivity?

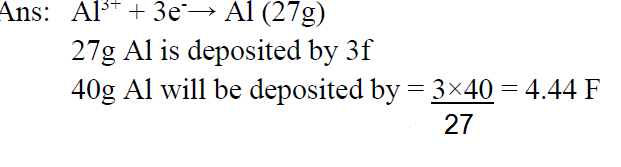
Ans: The molar conductivity of an electrolyte at zero concentration is known as Limiting molar conductivity.

4. What is unit of molar conductivity?

5. The conductivity of 0.20m solution of KCl at 298 K is 0.0248 Scm-1. Calculate its molar conductivity.



6. How much faraday is required to produce 40gm Al from Al2O3?



7. Predict the products of electrolysis of AgNO3 with Silver electrodes.

Ans. AgNO3→Ag+ + NO3-

Reaction at cathode Ag+ +ē→Ag

Reaction at cathode Ag → Ag+ + e-

8. Predict if the reaction between the following is feasible? Fe3+ and Br-.

Ans : Fe3+ + Br- →Fe2+ + ½Br2

E°cell = 0.77V – 1.09V = -0.32V not feasible

9. Explain Kohlrausch’s law.

Ans: The Limiting molar conductivity of an electrolyte can be represented as sum of individual contribution of cation and onion of the Electrolytic

⋀º m =V⋀º+ + V⋀º-

10. Calculate emf of the following cell Cd/Cd2+ (.10 M)//H+ (.20 M)/H2 (0.5 atm)/Pt

[Given E° for Cd2+ /Cd = -0.403 v]

Ans: Ecell = E°cell – 0.0591/n log [Cd2+]/ [H+]2

E°cell= 0 – (–.403V) =0.403V

=0.0403 – 0.0591/2 Log (0.10) X 0.5/(0.2)2 = 0.400V

Important questions

1. How much electricity in terms of Coulomb is required to reduce 1 mol of Cr2O72- to Cr3+.

Ans:- 2Cr2O7-2🡪2Cr+3, 2Cr+6+6e🡪2Cr3+

Therefore the coulomb of electricity required =6F,

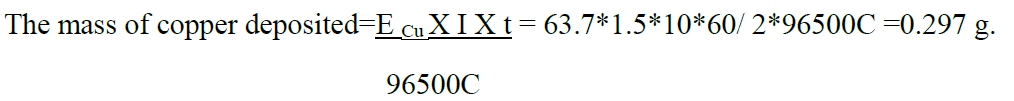
=6x96500 C= 579000 C

Q2. What is Fuel Cell?

Ans:- Fuel cell is a device which produce the energy during the combustion of fuels like Hydrogen , Methane, Methanol.

Q3. A solution of CuSO4 is electrolysed using a current of 1.5 amperes for 10 minutes. What mass of Cu is deposited at the cathode? (Atomic mass of Cu=63.7)

Ans:- The reaction is Cu+2(aq.) + 2e -> Cu (s)



4. Calculate the equilibrium constant for the reaction Cu (s) + 2Ag+ -> Cu2+/Cu = +0.34V, EoAg+/Ag = + 0.80V.

Q5. Write the Nernst equation and emf of the following cells at 298K:

Sn/Sn2+(0.050M)//H+(0.020M)/H2(g) /Pt(s) EoSn2+/Sn= - 0.13V

Q6. Calculate the standard free energy change for the following reaction at250C, Au(s) +Ca+2 ->Au3+(1M) + Ca (s) ,The electrode values are

Ca2+ /Ca = –2.87V, Au3+ / Au = +1.50V. Predict whether the reaction will be spontaneous or not at 250C

Q7. How do you account for conductivity of strong and weak electrolyte with concentration? Plot the graphs also.

Q8. State Kohlrausch law . Calculate Limiting molar conductivity of NaCl, HCl and NaAc are 126.4, 425.9 & 91 SCm2 mol-1. Calculate Limiting molar conductivity of HAc.

Ans:- According to this law, Molar conductivity of an electrolyte, at infinite dilution can be expressed as the sum of contributions from its individual ions. It the molar conductivity of the cation is denoted by Λo+ and that of the anions by Λo- then the law of independent migration of ions is

Λom=v+ Λo+ + v- Λo-.

9. Resistance of conductivity cell filled with 0.1molL-1 KCl solution is 100 ohm.

If the resistance of the same cell when filled with 0.02molL-1 KCl solution is 520 ohm. Calculate the conductivity & molar conductivity of 0.02molL-1 KCl solution. The conductivity of 0.1 molL-1 solution of KCl is 1.29Sm-1.

10. A Copper –silver is set up. The copper ion concentration in its is 0.10M.The concentration of silver is not known. The cell potential measured 0.422V.Determine the concentration of silver ion in the cell. Eo (Ag+/Ag) = +0.80V, Eo (Cu2+/Cu)= +0.34V.

11. A voltaic cell is set up at 250C with the following half cells:

Al(s)/Al3+(0.001M) and Ni2+(0.50)/Ni(s) ,Write the equation for the cell reaction that occurs when the cell generates an electric current and determine the cell potential (given

Eo Ni2+/Ni = -0.25V, Eo Al(s)/Al3+=-1.66V)

12. Write the reaction involved in the following cells: (a) Fuel Cell (b) Lead Storage Battery.

13. Three electrolytic cells A,B,C containing solutions ZnSO4,AgNO3,and CuSO4 respectively are connected in series .a Steady current of 1.5 amperes was respectively are connected in series .A steady current of 1.5 amperes was passed through them until 1.45g of silver deposited at the cathode of cell B. How long did the current flow? What mass of copper and zinc were deposited?

14. Conductivity of 0.00241M acetic acid is 7.896 X 10-6 S cm-1. Calculate its molar conductivity. If Λ0 for acetic acid is 390.5 S cm2 mol-1.What is its dissociation constant?

15. (a) Two half-cell reactions of an electrochemical cell are given below:

MnO4- + 8 H+ + 5 e- -> Mn2+ + 4 H2O Eo =+1.51V

Sn2+ ->Sn4++ 2e- Eo = +0.15V.

Construct the redox reaction from the two half-cell reaction and predict if the reaction favours formation of reactants or product shown in the reaction

(b). How much electricity in terms of Faraday is required to produce (i)20g of Ca from molten CaCl2 (ii) 40g of Al from molten AlCl3