QB365 Question Bank Software Study Materials

Electro Chemistry Important 2 Marks Questions With Answers (Book Back and Creative)

12th Standard

Chemistry

Total Marks : 40

2 Marks

20 x 2 = 40

1) Define anode and cathode

Answer : **(i) Anode:** The electrode at which the oxidation occurs is called anode. (loss of electrons)

(ii) Cathode: The electrode at which the reduction occurs is called cathode. (gain of electrons)

2) Why does conductivity of a solution decrease on dilution of the solution.

Answer : On dilution the concentration decreases. Conductivity decreases with decrease in concentration (or dilution) as the number of ions per unit volume that carry the current in a solution decrease on dilution.

3) Reduction potential of two metals M_1 and M_2 are $E^0_{M_1^{2+}|M_1} = -2.3V$ and $E^0_{M_1^{2+}|M_1} = 0.2V$ Predict which one is better for coating the surface of iron. Given : $E^\circ_{Fe^{2+}|Fe} = -0.44\ V$

Answer : The oxidation potential of M_1 is more +ve than the oxidation potential of Fe which indicates that it will prevent iron from rusting.

4) Write a note on sacrificial protection.

Answer : **Cathodic protection:**

In this technique, unlike galvanising the entire surface of the metal to be protected need not be covered with a protecting metal. Instead, metals such as Mg or zinc which is corroded more easily than iron can be used as a sacrificial anode and the iron material acts as a cathode. So iron is protected, but Mg or Zn is corroded.This known as sacrificial protection. (or) Cathodic protection.

5) A solution of silver nitrate is electrolysed for 20 minutes with a current of 2 amperes. Calculate the mass of silver deposited at the cathode.

Answer : Electrochemical reaction at cathode is $Ag^+ + e^- \rightarrow Ag$ (reduction)

m = ZIT

$Z = \frac{\text{molarmass of Ag}}{(96500)} = \frac{108}{1\times 96500}$

I = 2A

t = 20 x 60S = 1200 S

It = 2A x 1200S = 2400C

$m = \frac{108 gmol^{-1}}{96500 Cmol^{-1}} \times$ 2400C

m = 2.68g

6) A conductivity cell has two platinum electrodes separated by a distance 1.5 cm and the cross sectional area of each electrode is 4.5 sq cm. Using this cell, the resistance of 0.5 N electrolytic solution was measured as 15 Ω. Find the specific conductance of the solution.

Answer : $l = 1.5\ cm = 1.5 \times 10^{-2} m$

$A = 4.5\ cm^2 = 4.5 \times (10^{-4}) m^2$

$R = 15\Omega$

$\kappa = \frac{1}{R}\left(\frac{l}{A}\right)$

$\kappa = \frac{1}{15\Omega} \times \frac{1.5\times 10^{-2} m}{4.5\times 10^{-4} m^2}$

$= 2.22\ ohm^{-1}\ m^{-1}$

$= 2.22\ Sm^{-1}$

7) The resistance of a conductivity cell is measured as 190 Ω using 0.1M KCl solution (specific conductance of 0.1M KCl is 1.3 Sm^{-1}). When the same cell is filled with 0.003 M sodium chloride solution, the measured resistance is 6.3KΩ. Both these measurements are made at a particular temperature. Calculate the specific and molar conductance of NaCl solution.

Answer : Given that

κ = 1.3 Sm^{-1} (for 0.1M KCl solution)

R = 190 Ω

$\kappa = \frac{1}{R}\left(\frac{l}{A}\right)$

κ . R = $\left(\frac{l}{A}\right)$ = (1.3 Sm^{-1}) (190Ω)

= 247 m^{-1}

$\kappa_{(NaCl)} = \frac{1}{R_{(NaCl)}}\left(\frac{l}{A}\right)$

$= \frac{1}{6.3K\Omega}(247m^{-1})$ (6.3KΩ = 6.3 x 10^3Ω)

= 39.2 x 10^{-3} Sm^{-1}

$\Lambda_m = \frac{\kappa \times 10^{-3} mol^{-1} m^3}{M}$

$= \frac{39.2\times10^{-3}(Sm^{-1})10^{-}3(mol^{-1}m^3)}{0.003}$

Λ_m = 13.04 × 10^{-3} Sm^2 mol^{-1}

8) Calculate the molar conductance of 0.01M aqueous KCl solution at 25°C . The specific conductance of KCl at 25°C is 14.114 ×10^{-2} Sm^{-1} .

Answer : $\Lambda_m = \frac{K\times10^{-3}}{M}$

$= \frac{(14.114\times10^{-2})\times10^{-3}}{0.01}$

= 14.114 x 10^{-3}

= 14.114 ×10^{-2} Sm^{-1} .

9) Write the overall redox reaction which takes place in the galvanic cell,

Pt(s) | Fe^{2+}(aq),Fe3+(aq) || MnO^{-}_4 (aq), H^+ (aq),Mn^{2+} (aq) | Pt(s)

Answer : $5Fe^{2+}_{(aq)} + MnO^{-}_{4\,(aq)} + 8H^{+}_{\,(aq)}$

↓

$5Fe^{2+}_{(aq)} + Mn^{2+}_{(aq)} + 4H_2O_{\,(l)}$

10) A solution of a salt of metal was electrolysed for 15 minutes with a current of 0.15 amperes. The mass of the metal deposited at the cathode is 0.783g. calculate the equivalent mass of the metal.

Answer : m = Zlt

⇒ m = E/F lt

$E = \frac{mF}{It} = \frac{0.783\times96500}{0.15\times15\times60}$

= 559.7g eq^{-1}

11) Define conductance. Give its unit

Answer : The reciprocal of the resistance $\left(\frac{l}{R}\right)$ gives the conductance of an electrolytic solution. The SI unit of conductance is Siemen (S).

12) On dilution of 0.1 M of Na_2SO_4, what will happen to its

(a) Conductance (C)

(b) Conductivity K

(c) Molar conductance Λ_m

(d) Equivalent conductance Λ

Answer : Conductivity, molar conductance and equivalent conductance increases with dilution whereas Conductance (C) decreases.

13) Express Kohlraush's law for molar conductance of a uni - univalent electrolyte NaCl

Answer : For a uni - univalent electrolyte such as NaCl, the Kohlraush's law is expressed as

$(\Lambda^o_m)_{NaCl} = (\lambda^o_m)_{Na^+} + (\lambda^o_m)_{Cl^-}$

14) What type of cell is a Daniel cell?

Answer : It is an Galvanic cell.

15) What are the two types of batteries?

Answer : The two types of batteries are primary batteries (non - rechargeable) and secondary batteries (rechargeable).

16) What is the principle used in secondary batteries to regenerate the original reactants?

Answer : Electrochemical reactions which take place in a galvanic cell may be reversed by applying potential slightly greater than the emf generated by the cell. This principle is used in secondary batteries to regenerate the original reactants.

17) Give an example of secondary cell.

Answer : Lead storage battery.

18) Define: cell constant

Answer : (i) Cell constant $= \left(\frac{l}{\mathrm{A}}\right)$
(ii) It is the ratio of the length of a conductor to its cross sectional area.

19) Define: Molar conductivity $\left(\Lambda_{\mathrm{m}}\right)$

Answer : (i) Molar conductivity (Conductance) is defined as the conductance of V m^3 of an electrolytic solution contains 1 mole of the electrolyte.
(ii) $\Lambda_{\mathrm{m}} = \frac{\kappa \times 10^{-3}}{\mathrm{M}} \mathrm{Sm}^2\ \mathrm{mol}^{-1}$

20) Define: Equivalent Conductance (Λ)

Answer : (i) Equivalent conductance is defined as the conductance of 'V' m^3 of electrolytic solution containing one gram equivalent of the electrolyte in a conductivity cell in which the electrodes are one meter apart
(ii) $\Lambda = \frac{\kappa \times 10^{-3}}{N} \mathrm{Sm}^2\ \mathrm{geq}^{-1}$