Chapter 03

Electro Chemistry

TOPIC WISE QUESTIONS

CONDUCTANCE

Q.1 Molten sodium chloride conducts electricity due to the presence of :
(1) free electrons
(2) free ions
(3) free molecules
(4) free atoms of Na and Cl

Q.2 Strong electrolyte are those which :
(1) dissolve readily in water
(2) conduct electricity
(3) dissociate into ions even at high concentration
(4) dissociate into ions at high dilution.

Q.3 Which one of the following is wrong :–
(1) Specific conductance increases on dilution
(2) Specific conductance decreases on dilution
(3) Equivalent conductance increases on dilution
(4) Molar conductance increases on dilution

Q.4 The value of molar conductivity of HCl is greater than that of NaCl at a particular temperature because :
(1) Molecular mass of HCl is less than that of NaCl.
(2) Velocity of H^+ ions is more than that of Na^+ ions
(3) HCl is strong acidic
(4) Ionisation of HCl is larger than that of NaCl

Q.5 Electrolytic conduction differs from metallic conduction from the fact that in the former
(1) The resistant increases with increasing temperature
(2) The resistance decreases with increasing temperature
(3) The resistance remains constant with increasing temperature
(4) The resistance is independent of the length of the conductor

Q.6 Which has maximum conductivity :
(1) $[Cr(NH_3)_3Cl_3]$ (2) $[Cr(NH_3)_4Cl_2]Cl$
(3) $[Cr(NH_3)_5Cl]Cl_2$ (4) $[Cr(NH_3)_6]Cl_3$

Q.7 The highest electrical conductivity of the following aqueous solution is of
(1) 0.1 M fluoroacetic acid
(2) 0.1 M difluoroacetic acid
(3) 0.1 M acetic acid
(4) 0.1 M chloroacetic acid

Q.8 Which of the following solutions of NaCl will have the highest specific condutance ?
(1) 0.001N (2) 0.1 N
(3) 0.01 N (4) 1.0 N

Q.9 The specific conductances in $ohm^{-1}\ cm^{-1}$ of four electrolytes P, Q, R and S are given in brackets:
P (5.0×10^{-5}) Q (7.0×10^{-8})
R (1.0×10^{-10}) S (9.2×10^{-3})
The one that offers highest resistance to the passage of electric current is
(1) P (2) S (3) R (4) Q

Q.10 If the specific resistance of a solution of concentration C g equivalent $litre^{-1}$ is R, then its equivalent conductance is :
(1) $\frac{100R}{C}$ (2) $\frac{RC}{1000}$
(3) $\frac{1000}{RC}$ (4) $\frac{C}{1000R}$

Q.11 If V, in the equation Λ = sp. cond. × V, is the volume in cc containing 1 eq. of the electrolyte; V for a N/10 solution will be:
(1) 10 c.c. (2) 100 c.c.
(3) 1000 c.c. (4) 10,000 c.c.

Q.12 Which of the following solutions of KCl has the lowest value of equivalent conductance ?
(1) 1 M (2) 0.1 M

(3) 0.01 M (4) 0.001 M

Q.13 The specific conductivity of N/10 KCl solution at 20^0C is 0.012 Ω^{-1} cm^{-1} and the resistance of the cell containing this solution at 20^0C is 56Ω. The cell constant is
(1) 4.616 cm^{-1} (2) 0.672 cm^{-1}
(3) 2.173 cm^{-1} (4) 3.324 cm^{-1}

Q.14 The ionization constant of a weak electrolyte is 25×10^{-6} while the equivalent conductance of its 0.01 N solution is 19.6 S cm^2eq^{-1}. The equivalent conductance of the electrolyte at infinite dilution (in S cm^2 eq^{-1}) will be
(1) 39.2 (2) 78.4 (3) 392 (4) 196

Q.15 The resistance of 1N solution of CH_3COOH is 250Ω, when measured in a cell of cell constant 1.15 cm^{-1}. The equivalent conductance will be
(1) 4.6 $\Omega^{-1}cm^2eq^{-1}$ (2) 9.2 $\Omega^{-1}cm^2eq^{-1}$
(3) 18.4 $\Omega^{-1}cm^2eq^{-1}$ (4) 0.023 $\Omega^{-1}cm^2eq^{-1}$

Q.16 The specific conductance of a 0.01 M solution of KCl is 0.0014 ohm^{-1} cm^{-1}at 25° C. Its equivalent conductance (cm^2 $ohm^{-1}equiv^{-1}$) is:–
(1) 140 (2) 14 (3) 1.4 (4) 0.14

Q.17 Specific conductance of 0.1 M Nitric acid is 6.3×10^{-2} ohm^{-1} cm^{-1}. The molar conductance of the solution is :
(1) 630 ohm^{-1} cm^2 mol^{-1}
(2) 315 ohm^{-1} cm^2 mol^{-1}
(3) 100 ohm^{-1} cm^2 mol^{-1}
(4) 6.300 ohm^{-1} cm^2 mol^{-1}

KOHLRAUSCH'S LAW

Q.18 The equivalent conductivity of 0.1 N CH_3COOH at 25 °C is 80 and at infinite dilution 400. The degree of dissociation of CH_3COOH is :
(1) 1 (2) 0.2 (3) 0.1 (4) 0.5

Q.19 At infinite dilution, the eq. conductances of CH_3COONa, HCl and CH_3COOH are 91, 426 and 391 mho cm^2 respectively at 25 °C. The eq. conductance of NaCl at infinite dilution will be :
(1) 126 (2) 209 (3) 391 (4) 908

Q.20 The limiting molar conductivities Λ^0 for NaCl, KBr and KCl are 126, 152 and 150 S cm^2 mol^{-1} respectively. The Λ^0 for NaBris :
(1) 278 S cm^2 mol^{-1} (2) 176 S cm^2 mol^{-1}
(3) 128 S cm^2 mol^{-1} (4) 302 S cm^2 mol^{-1}

Q.21 The conductivity of a saturated solution of $BaSO_4$ is 3.06×10^{-6} ohm^{-1} $cm^{-1}$and its molar conductance is 1.53 ohm^{-1} cm^2 mol^{-1}. The K_{sp} of $BaSO_4$ will be
(1) 4×10^{-12} (2) 2.5×10^{-9}
(3) 2.5×10^{-13} (4) 4×10^{-6}

Q.22 The molar conductance at infinite dilution of $AgNO_3$, AgCl and NaCl are 116.5, 121.6 and 110.3 respectively. The molar conductances of $NaNO_3$is :
(1) 111.4 (2) 105.2 (3) 130.6 (4) 150.2

Q.23 The specific conductivity of a saturated solution of AgCl is 3.40×10^{-6} ohm^{-1} cm^{-1} at 25 °C.
If λ_{Ag^+}= 62.3 ohm^{-1} cm^2 mol^{-1}& λ_{Cl^-} = 67.7 ohm^{-1} cm^2 mol^{-1}, the solubility of AgCl at 25 °C is:
(1) 2.6×10^{-5} M (2) 4.5×10^{-3} M
(3) 3.6×10^{-5} M (4) 3.6×10^{-3} M

Q.24 For HCl solution at 25^0C, equivalent conductance at infinite dilution, is 425 $ohm^{-1}cm^2equiv^{-1}$. The specific conductance of a solution of HCl is 3.825 ohm^{-1} cm^{-1}. If the apparent degree of dissociation is 90% the normality of the solution is :-
(1) 0.90 N (2) 1.0 N (3) 10 N (4) 1.2 N

Q.25 Molar conductance of $BaCl_2$, H_2SO_4 and HCl at infinite dilutions are x_1, x_2 and x_3, respectively. Equivalent conductance of $BaSO_4$ at infinite dilution will be:
(1) $\frac{[x_1+x_2-x_3]}{2}$ (2) $\frac{[x_1-x_2-x_3]}{2}$
(3) $2(x_1+x_2-2x_3)$ (4) $\frac{[x_1+x_2-2x_3]}{2}$

GALVANIC CELL

Q.26 The passage of electricity in the Daniel cell when Zn and Cu electrodes are connected is :
(1) from Cu to Zn in the cell
(2) from Cu to Zn out side the cell
(3) from Zn to Cu outside the cell
(4) in any direction in the cell

Q.27 In the galvanic cell Cu $|Cu^{2+}$ (1M)$||Ag^+$ (1M) | Ag the electrons will travel in the external circuit:
(1) from Ag to Cu
(2) from Cu to Ag

(3) electrons do not travel in the external circuit
(4) in any direction

Q.28 Which is not true for a standard hydrogen electrode ?
(1) The hydrogen ion concentration is 1 M
(2) Temperature is 25°C
(3) Pressure of hydrogen is 1 atmosphere
(4) It contains a metallic conductor which doesnot adsorb hydrogen.

Q.29 Which of the following statements is correct :–
(1) Oxidation occur at anode in both galvanic and electrolytic cell
(2) Reduction occurs at anode in both galvanic and electrolytic cell
(3) Reduction occur at anode in electrolytic cell where as oxidation occur at cathode in galvanic cell
(4) Oxidation occur at anode in electrolytic cell where as reduction occur at anode in a galvanic cell

Q.30 $Cu \mid Cu^{+2}(1M) \| Zn^{+2}(1\ M) \mid Zn$
A cell represented above should have emf.
(1) Negative (2) Positive
(3) Zero (4) Cannot be predicted

Q.31 Which of the following statements is TRUE for the electrochemical Daniel cell :
(1) Electrons flow from copper electrode to zinc electrode.
(2) Current flows from zinc electrode to copper electrode.
(3) Cations move toward copper electrode.
(4) Cations move toward zinc electrode.

Q.32 Other things being equal, the life of a daniel cell may be increased by :–
(1) Keeping low temperature
(2) Using large copper electrode
(3) Decreasing concentration of copper ions
(4) Using large zinc electrodes

Q.33 The cell emf depends on :–
(1) Size of anode (2) Volume of solution
(3) Temperature (4) All of them

ELECTROCHEMICAL SERIES

Q.34 The standard electrode potential value of the elements A, B and C are 0.68, 2.5 and 0.50 V respectively. The order of their reducing power is:
(1) A > B > C (2) A > C > B
(3) C > B > A (4) C > A > B

Q.35 The standard reduction potential at 25 °C of Li^+/Li, Ba^{2+}/Ba, Na^+/Na and Mg^{2+}/Mg are –3.05, –2.73, –2.71 and –2.34 volt respectively. Which one of the following is the strongest oxidising agent ?
(1) Na^+ (2) Li^+
(3) Ba^{2+} (4) Mg^{2+}

Q.36 The reduction potential values are given below:
$Al^{3+} / Al = –1.67$ volt, $Mg^{2+} / Mg = –2.34$ volt
$Cu^{2+} / Cu = + 0.34$ volt, $I_2 / 2I^– = + 0.53$ volt
Which one is the best reducing agent ?
(1) Al (2) Mg
(3) Cu (4) I_2

Q.37 The standard reduction potentials at 25°C for the following half reactions are given against each:
$Zn^{2+} (aq) + 2e^– \rightarrow Zn(s)$, –0.762
$Cr^{3+} (aq) + 3e^– \rightarrow Cr(s)$, –0.740
$2H^+ + 2e^- \rightarrow H_2(g)$, 0.00
$Fe^{3+} + 2e^– \rightarrow Fe^{2+}$, 0.77
Which is the strongest reducing agent ?
(1) Zn (2) Cr
(3) $H_2(g)$ (4) Fe^{2+} (aq)

Q.38 The standard electrode potential of Zn, Ag and Cu are –0.76, 0.80 and 0.34 volt respectively, then :
(1) Ag can oxidise Zn and Cu
(2) Ag can reduce Zn^{2+} and Cu^{2+}
(3) Zn can reduce Ag^+ and Cu^{2+}
(4) Cu can oxidise Zn and A

Q.39 Given $E^o_{Ag^+/Ag} = 0.80V$, $E^o_{Mg^{2+}/Mg} = -2.37V$,
. $E^o_{Cu^{2+}/Cu} = 0.34V$, $E^o_{Hg^{2+}/Hg} = 0.79V$
Which of the following statement is correct
(1) $AgNO_3$ can be stored in copper vessel
(2) $Mg(NO_3)_2$ cannot be stored in copper vessel
(3) $CuCl_2$ can be stored in silver vessel
(4) $HgCl_2$ can be stored in copper vessel

Q.40 A standard reduction electrode potentials of four elements are
A = – 0.250 V , B = – 0.140 V
C = – 0.126 V , D = – 0.402 V
The element that displaces A from its compounds aqueous solution is :–
(1) B (2) C (3) D (4) None

Q.41 Zn can not displace following ions from their aqueous solution :
(1) Ag^+ (2) Cu^{2+} (3) Fe^{2+} (4) Na^+

Q.42 Which one will liberate Br_2 from KBr ?

(1) HI (2) I_2 (3) Cl_2 (4) SO_2

Q.43 If a spoon of copper metal is placed in a solution of ferrous sulphate:
(1) Cu will precipitate out
(2) Iron will precipitate
(3) Cu and Fe will precipitate
(4) No reaction will take place

Q.44 Which of the following metals does not give the following reaction?
M + water $\longrightarrow$ oxide or hydroxide + H_2
(1) Iron (2) Sodium
(3) Mercury (4) Magnesium

Q.45 Red hot carbon will remove oxygen from the oxide XO and YO but not from ZO. Y will remove oxygen from XO. Use this evidence to deduce the order of activity of the three metals X, Y and Z putting the most active first.
(1) X > Y > Z (2) Z > Y > X
(3) Y > X > Z (4) Z > X >Y

Q.46 A gas X at 1 atm. is bubbled through a solution containing a mixture of 1M Y^- and 1M Z^- at 25°C. If the reduction potential of Z > Y > X then:
(1) Y will oxidise X and not Z
(2) Y will oxidise Z and not X
(3) Y will oxidise both X and Z
(4) Y will reduce both X and Z

Q.47 Each of the three metals x, y and z were put in turn into aqueous solution of the other two.
x + salt of y (or z) = y (or z) + salt of x
Which one of the following observation is probably incorrect ?
(1) y + salt of x = no action observed
(2) y + salt of z = z + salt of y
(3) z + salt of x = x + salt of z
(4) z + salt of y = no action observed

Q.48 Which of the following displacement does not occur?
(1) $Zn + 2H^+ \rightarrow Zn^{2+} + H_2\uparrow$
(2) $Fe + 2Ag^+ \rightarrow Fe^{2+} + Ag\downarrow$
(3) $Cu + Fe^{2+} \rightarrow Cu^{2+} + Fe\downarrow$
(4) $Zn + Pb^{2+} \rightarrow Zn^{2+} + Pb\downarrow$

Q.49 The following four colourless salt solutions are placed in separate test tubes and a strip of Cu is placed in each solution which finally turns blue: –
(1) $Zn(NO_3)_2$ (2) $Mg(NO_3)_2$
(3) KNO_3 (4) $AgNO_3$

Q.50 Adding powdered Pb and Fe to a solution containing 1.0 M in each of Pb^{+2} and Fe^{+2} ions would result into the formation of :–
(1) More of Pb and Fe^{+2} ions
(2) More of Fe and Pb^{2+} ions
(3) More of Fe and Pb
(4) More of Fe^{+2} and Pb^{2+} ions

Q.51 The following facts are available: –
$2X^- + Y_2 \rightarrow 2Y^- + X_2$
$2W^- + Y_2 \rightarrow$ NO reaction
$2Z^- + X_2 \rightarrow 2X^- + Z_2$
Which of the following statements is correct :–
(1) $E^\circ_{W^-/W_2} > E^\circ_{Y^-/Y_2} > E^\circ_{X^-/X_2} > E^\circ_{Z^-/Z_2}$
(2) $E^\circ_{W^-/W_2} < E^\circ_{Y^-/Y_2} < E^\circ_{X^-/X_2} < E^\circ_{Z^-/Z_2}$
(3) $E^\circ_{W^-/W_2} < E^\circ_{Y^-/Y_2} > E^\circ_{X^-/X_2} > E^\circ_{Z^-/Z_2}$
(4) $E^\circ_{W^-/W_2} > E^\circ_{Y^-/Y_2} < E^\circ_{X^-/X_2} < E^\circ_{Z^-/Z_2}$

Q.52 E° for the half cell $Zn^{2+} | Zn$ is –0.76 E_{cell} of the cell
$Zn | Zn^{2+} (1M) || 2H^+ (1M) | H_2$ (1 atm) is :
(1) –0.76 V (2) +0.76 V
(3) –0.38 V (4) + 0.38 V

Q.53 The standard electrode potentials for the reactions
$Ag^+ (aq.) + e^- \longrightarrow Ag(s)$,
$Sn^{2+} (aq.) + 2e^- \longrightarrow Sn (s)$
at 25 °C are 0.80 volt and –0.14 volt, respectively. The standard emf of the cell.
$Sn | Sn^{2+} (1M) || Ag^+ (1M) | Ag$ is :
(1) 0.66 volt (2) 0.80 volt
(3) 1.08 volt (4) 0.94 volt

Q.54 The standard oxidation potentials E°, for the half reaction are as :
$Zn \longrightarrow Zn^{2+} + 2e^-$ E° = + 0.76 volt
$Fe \longrightarrow Fe^{2+} + 2e^-$ E° = + 0.41 volt
The standard emf of the cell
$Fe^{2+} + Zn \rightarrow Zn^{2+} + Fe$ is –
(1) 0.35 volt (2) – 0.35 volt
(3) +1.17 volt (4) –1.17 volt

Q.55 $E^\circ(Ni^{2+}/Ni)$ = –0.25 volt,
$E^\circ (Au^{3+} / Au)$ = 1.50 volt.
The standard of the voltaic cell.
$Ni / Ni^{2+} (1.0\ M) || Au^{3+} (1.0\ M) | Au$ is :

(1) 1.25 volt (2) –1.75 volt
(3) 1.75 volt (4) 4.0 volt

Q.56 The oxidation potential of Zn, Cu, Ag, H_2 and Ni are 0.76, –0.34, –0.80, 0 and 0.55 volt respectively. Which of the following reaction will provide maximum voltage ?
(1) $Zn + Cu^{2+} \longrightarrow Cu + Zn^{2+}$
(2) $Zn + 2Ag^{+} \longrightarrow 2Ag + Zn^{2+}$
(3) $H_2 + Cu^{2+} \longrightarrow 2H^{+} + Cu$
(4) $H_2 + Ni^{2+} \longrightarrow 2H^{+} + Ni$

Q.57 From the following E° values of half cells
(i) $A^{3-} \rightarrow A^{-2} + e$; E° = 1.5 V
(ii) $B^{+} + e \rightarrow B$; E° = 0.5 V
(iii) $C^{2+} + e \rightarrow C^{+}$; E° = 0.5 V
(iv) $D \rightarrow D^{2+} + 2e$; E° = –1.15 V
What combination of two half cells would result in a cell with the largest potential ?
(1) (i) and (iii) (2) (ii) and (iv)
(3) (i) and (iv) (4) (iii) and (iv)

Q.58 Given electrode potentials :
$Fe^{3+} + e \longrightarrow Fe^{2+}$; E° = 0.771 volts
$I_2 + 2e \longrightarrow 2I^{-}$; E° = 0.536 volts
E° cell for the cell reaction
$2Fe^{3+} + 2I^{-} \rightarrow 2Fe^{2+} + I_2$ is -
(1) (2 × 0.771 – 0.536) = 1.006 volts
(2) (0.771 – 0.5 × 0.536) = 0.503 volts
(3) 0.771 – 0.536 = 0.235 volts
(4) 0.536 – 0.771 = –0.235 volts

Q.59 The standard reduction electrode potentials of Fe^{2+}/Fe and Sn^{2+}/Sn are – 0.44 V and – 0.14V respective. What will be the standard E.M.F. of the following cell reaction
$Fe^{2+} + Sn \rightarrow Fe + Sn^{2+}$
(1) 0.3 V (2) –0.58 V
(3) +0.58 V (4) –0.30 V

Q.60 The standard electrode potentials of the two half cell are given below: –
$Ni^{2+} + 2e^{-} \rightarrow Ni$; E° = – 0.25 V
$Zn^{2+} + 2e^{-} \rightarrow Zn$; E° = – 0.77 V
The standard of cell formed by combining the two half cells would be :–
(1) – 1.02 volt (2) + 0.51 volt
(3) + 1.02 volt (4) – 0.51 volt

Q.61 Aluminium displaces hydrogen from dilute HCl whereas silver does not, the E.M.F. of a cell prepared by combining Al/Al^{+3} and Ag/Ag^{+} is 2.46V. The reduction potential of silver electrode is +0.80V. The reduction potential of aluminium electrode is :
(1) – 3.26V (2) +1.66V
(3) –1.66V (4) 3.26 V

Q.62 Calculate E^{o}_{cell} of following galvanic cell at 298 K; $Ca(s)|Ca^{+2}_{(aq)}||Fe^{+2}_{(aq)}|Fe(s)$
$E^{o}_{Ca^{+2}/Ca}$ =–2.87V; $E^{o}_{Fe/Fe^{+2}}$ = 0.41V
(1) 2.46 V (2) –2.46V
(3) 3.28 V (4) – 3.28V

Q.63 The standard oxidation potential of Zn and Ag in water at 25° C are: –
$Zn(s) \rightarrow Zn^{2+}(aq.) + 2e^{-}$ E° = 0.76 V
$Ag(s) \rightarrow Ag^{+}(aq.) + e^{-}$ E° = – 0.80 V
Which one of the following reactions actually takes place :–
(1) $Zn(s) + 2Ag^{+}(aq.) \rightarrow Zn^{+2}_{(aq.)} + 2Ag(s)$
(2) $Zn^{2+}(aq.) + 2Ag(s) \rightarrow 2Ag^{+}(aq.) + Zn(s)$
(3) $Zn(s) + Ag(s) \rightarrow Zn^{2+}(aq.) + Ag^{+}(aq.)$
(4) $Zn^{2+}(aq.) + Ag^{+}(aq.) \rightarrow Zn(s) + Ag(s)$

NERNST EQUATION

Q.64 E°_{cell} of reaction $aA + bB \longrightarrow cC + dD$ is
(1) $E + RT\ln\frac{[a]^{A}[b]^{B}}{[c]^{C}[d]^{D}}$ (2) $E + \frac{RT}{nF}\ln\frac{[C]^{c}[D]^{d}}{[A]^{a}[B]^{b}}$
(3) $E + \frac{RT}{nF}\ln\frac{[C]^{C}[d]^{D}}{[A]^{A}[B]^{B}}$ (4) $E + \frac{RT}{nF}\ln\frac{[a]^{A}[B]^{B}}{[c]^{C}[d]^{D}}$

Q.65 E^{0} for the cell,
$Zn|Zn^{2+}(aq)||Cu^{2+}(aq)|Cu$ is 1.10 V at 25°C. The equilibrium constant for the cell reaction
$Zn + Cu^{2+}(aq) \rightleftharpoons Cu + Zn^{2+}(aq)$
is of the order of
(1) 10^{-37} (2) 10^{37} (3) 10^{-17} (4) 10^{17}

Q.66 What is the standard cell potential E° for an electrochemical cell in which the following reaction takes place spontaneously ?
$Cl_2(g) + 2Br^{-} \rightarrow Br_2(aq) + 2Cl^{-}$; $\Delta G°$ = – 50.6 kJ
(1) 1.2 V (2) 0.53 V (3) 0.26 V (4) –0.53 V

Q.67 The potential of hydrogen electrode (P_{H2} = 1 atm; $C_{H^{+}}$ = 0.1 M) at 25°C will be -
(1) 0.00 V (2) –0.059 V
(3) 0.118 V (4) 0.059 V

Q.68 Which of the following represents the potential of silver wire dipped in to 0.1 M $AgNO_3$ solution at 25° C ?
(1) $E°_{red}$ (2) $(E°_{red} + 0.059)$
(3) $(E°_{ox} – 0.059)$ (4) $(E°_{red} – 0.059)$

Q.69 The reduction electrode potential E, of 0.1 M solution of M^+ ions ($E°_{RP}$ = –2.36 V) is :
(1) –2.41 (2) +.241
(3) –4.82 (4) none

Q.70 Which of the following will increase the voltage of the cell with following cell reaction
$Sn_{(s)} + 2Ag^+_{(aq)} \rightarrow Sn^{+2}_{(aq)} + 2Ag_{(s)}$
(1) Increase in the size of silver rod
(2) Increase in the concentration of Sn^{+2} ions
(3) Increase in the concentration of Ag^+ ions
(4) Decrease in the concentration of Ag^+ ions

Q.71 By how much times will potential of half cellCu^{+2}/Cu change if the solution is diluted to 100 times at 298 K: –
(1) Increases by 59 mv
(2) Decrease by 59 mv
(3) Increases by 29.5 mv
(4) Decreases by 29.5 mv

Q.72 Consider the cell $Cu/Cu^{+2}||Ag^+/Ag$. If the concentration of Cu^{+2} and Ag^+ ions becomes ten times the emf of the cell :–
(1) Becomes 10 times
(2) Remains same
(3) Increase by 0.0295 V
(4) Decrease by 0.0295 V

Q.73 The hydrogen electrode is dipped in a solution of pH = 3 at 25°. The potential of the cell would be :
(1) 0.177 (2) – 0.177 V
(3) 0.087 V (4) 0.059 V

Q.74 How much will the potential of a hydrogen electrode change when its solution initially at pH = 0 is neutralised to pH = 7 ?
(1) increase by 0.059 V
(2) decrease by 0.059 V
(3) increase by 0.41 V
(4) decrease by 0.41 V

Q.75 How much will the potential of Zn / Zn^{2+} change if the solution of Zn^{2+} is diluted 10 times
(1) increase by 0.03 V
(2) decreases by 0.03 V
(3) increases by 0.059 V
(4) decreases by0.059 V

Q.76 For a spontaneous reaction the ΔG, equilibrium constant (K) and E^0_{Cell} will be respectively
(1) –ve, < 1, –ve (2) –ve, >1, –ve
(3) –ve, >1, +ve (4) +ve, >1, –ve

Q.77 On the basis of the information available from the reaction $\frac{4}{3}Al + O_2 \rightarrow \frac{2}{3}Al_2O_3$,
ΔG = –827 KJ mol^{-1} of O_2, the minimum e.m.f. required to carry out an electrolysis of $Al_2O_3$is:-
(F = 96500 C mol^{-1})
(1) 2.14 V (2) 4.28 V (3) 6.42 V (4) 8.56 V

Q.78 For the redox reaction :
$Zn(s) + Cu^{2+}$ (0.1M) $\rightarrow Zn^{2+}$ (1M) + Cu(s) taking place in a cell,
$E°_{Cell}$ is 1.10 volt. E_{Cell} for the cell will be
$\left(2.303\frac{RT}{F} = 0.0591\right)$
(1) 1.07 volt (2) 0.82 volt
(3) 2.14 volt (4) 1.80 volt

Q.79 For a reaction - $A(s) + 2B^+ \rightarrow A^{2+} + 2B$
K_C has been found to be 10^{12}. The E°cell is:
(1) 0.354 V (2) 0.708 V
(3) 0.0098 V (4) 1.36 V

Q.80 At 25°C the standard emf of cell having reactions involving two electrons change is found to be 0.295 V. The equilibrium constant of the reaction is -
(1) 29.5×10^{-2} (2) 10
(3) 10^{10} (4) 29.5×10^{10}

Q.81 E° for $F_2 + 2e^- \rightarrow 2F^-$ is 2.8 V, E° for
$\frac{1}{2}F_2 + e^- \rightarrow F^-$ is ?
(1) 2.8 V (2) 1.4 V (3) –2.8 V (4) –1.4 V

Q.82 Δ G° of the cell reaction
$AgCl(s) + \frac{1}{2}H_2(g) \rightarrow Ag(s) + H^+ + Cl^-$ is –21.52 KJ ΔG° of $2AgCl(s) + H_2(g) \rightarrow 2Ag(s) + 2H^+ + 2Cl^-$ is :
(1) –21.52 KJ (2) –10.76 KJ
(3) –43.04 KJ (4) 43.04 KJ

Q.83 What is the potential of the cell containing two hydrogen electrodes as represented below

$Pt; \frac{1}{2} H_2(g) \mid H^+(10^{-8})M \| H^+(0.001M) \mid \frac{1}{2} H_2(g).Pt;$

(1) –0.295 V (2) – 0.0591 V
(3) 0.295 V (4) 0.0591 V

Q.84 The emf of the cell
Ni/Ni^{+2} (1.0 M)|| Au^{+3} (0.1M)/Au
[E° for Ni^{+2}/Ni = - 0.25, E° for Au^{+3}/Au = 1.50V] is given as:-
(1) 1.25 V (2) – 1.75
(3) 1.75 V (4) 1.73 V

Q.85 Consider the reaction
$Cl_2(g) + 2Br^-(aq) \longrightarrow 2Cl^-(aq) + Br_2$
The emf of the cell when
$[Cl^-] = [Br_2] = [Br^-] = 0.01$ M and Cl_2 gas at 1 atm pressure will be (E° for the above reaction is = 0.29 volt)
(1) 0.54 volt (2) 0.35 volt
(3) 0.24 volt (4) –0.29 volt

Q.86 The emf of the cell in which the following reaction
$Zn(s) + Ni^{2+}(0.1M) \rightleftharpoons Zn^{2+}(1.0M) + Ni(s)$
occurs, is found to be 0.5105 V at 298 K. The standard e.m.f of the cell is :-
(1) –0.5105 V (2) 0.5400 V
(3) 0.4810 V (4) 0.5696 V

Q.87 The standard reduction potentials of Cu^{2+}/Cu and Cu^{2+}/Cu^+ are 0.337 and 0.153 V respectively. The standard electrode potential of Cu^+/Cu half cell is:
(1) 0.184 V (2) 0.827 V
(3) 0.521 V (4) 0.490 V

ELECTROLYSIS

Q.88 The amount of an ion discharged during electrolysis is not directly proportional to :
(1) resistance
(2) time
(3) current strength
(4) electrochemical equivalent of the element

Q.89 Which one is the correct equation that represents the first law of electrolysis ?
(m → mass, c → current, t → time)
(1) mz = ct (2) m = czt
(3) mc = zt (4) c = mzt

Q.90 W g of copper deposited in a copper voltameter when an electric current of 2 ampere is passed for 2 hours. If one ampere of electric current is passed for 4 hours in the same voltameter, copper doposited will be :
(1) W (2) W/2 (3) W/4 (4) 2W

Q.91 Electro chemical equivalent of a substance is 0.0006735; its eq. wt. is :
(1) 65 (2) 67.35
(3) 130 (4) cannot be calculated

Q.92 The electric charge for electrode deposition of 1 eq. of a substance is :
(1) one ampere per second
(2) 96500 coulomb per second
(3) one ampere for one hour
(4) charge on one mole of electrons

Q.93 A solution of sodium sulphate in water is electrolysed using platinum electrodes. The products at cathode and anode are respectively:
(1) H_2, O_2 (2) O_2, H_2
(3) O_2, Na (4) O_2, SO_2

Q.94 Which of the substances Na, Hg, S, Pt and graphite can be used as electrodes in electrolytic cells having aqueous solution ?
(1) Hg and Pt (2) Hg, Pt and graphite
(3) Na, S (4) Na, Hg, S

Q.95 The passage of current liberates H_2 at cathode and Cl_2 at anode the solution is: –
(1) $CuSO_4$ (aq) (2) $CuCl_2$ (aq.)
(3) NaCl(aq.) (4) Water

Q.96 Electrolysis of aq. $CuSO_4$ produces
(1) An increase in pH
(2) A decrease in pH
(3) Either decrease or increase
(4) None

Q.97 During electrolysis of fused calcium hydride, the hydrogen is produced at :
(1) Cathode
(2) Anode
(3) Hydrogen is not liberated at all
(4) H_2 produced reacts with oxygen to form water

Q.98 One Faraday of electricity will liberate one mol atomic mass of the metal from the solution of

(1) Auric chloride (2) Silver nitrate

(3) Calcium chloride (4) Copper sulphate

Q.99 On passing electricity through dil. H_2SO_4 solution the amount of substance librated at the cathode and anode are in the ratio :

(1) 1 : 8 (2) 8 : 1 (3) 16 : 1 (4) 1 : 16

Q.100 The electrochemical equivalent of silver is 0.0011180g. When an electric current of 0.5 ampere is passed through an aqueous silver nitrate solution for 200 sec., the amount of silver deposited is :

(1) 1.1180 g (2) 0.11180 g

(3) 5.590 g (4) 0.5590 g

Q.101 How many coulombs of electricity are required for the oxidation of 1 mole of H_2O to O_2?

(1) 9.65×10^4 C (2) 4.825×10^5 C

(3) 1.93×10^5 C (4) 1.93×10^4 C

Q.102 On passing one Faraday of electricity through a dilute solution of an acid, the volume of hydrogen obtained at N.T.P. is :

(1) 22400 ml. (2) 1120 ml.

(3) 2240 ml. (4) 11200 ml.

Q.103 3.17 g., of a substance was deposited by the flow of 0.1 mole of electrons. The equivalent weight of the substance is :

(1) 3.17 (2) .317 (3) 317 (4) 31.7

Q.104 If 0.224 L of H_2 gas is formed at the cathode, the volume of O_2 gas formed at the anode under identical conditions, is

(1) 0.224L (2) 0.448L (3) 0.112L (4) 1.12L

Q.105 A quantity of electric charge that brings about the deposition of 4.5 g Al from Al^{+3} at the cathode will also produce the following volume STP of $H_2(g)$ from H^+ at the cathode

(1) 44.8L (2) 22.4L (3) 11.2L (4) 5.6L

Q.106 A certain current liberates 0.5 g of hydrogen in 2 hr. How many grams of copper can be deposited by the same current flowing for the same time in a copper sulphate solution?

(1) 12.7 g (2) 15.9 g (3) 31.8 g (4) 63.5 g

Q.107 Same quantity of current is passed through molten NaCl and molten Al_2O_3. If 4.6g of Na was deposited in one cell, the mass of Al deposited in other cell is-

(1) 0.9 g (2) 1.8 g (3) 2.7 g (4) 3.6 g

Q.108 1 litre of 1 M $CuSO_4$ solution is electrolysed. After passing 2F charge, the molarity of $CuSO_4$ will be

(1) M/2 (2) M/4 (3) M (4) zero

Q.109 One Faraday of current was passed through the electrolytic cell placed in series containing solution of Ag^+, Ni^{+2} and Cr^{+3} respectively. The amounts of Ag (at. wt. = 108), Ni (at. wt. = 59) and Cr (at. wt. = 52) deposited will be :

	Ag	**Ni**	**Cr**
(1)	108 g	29.5 g	17.4 g
(2)	108 g	59.0 g	52.0 g
(3)	108 g	108.0 g	108.0 g
(4)	108 g	117.5 g	166.0 g

Q.110 The time required for a current of 3 amp. to decompose electrolytically 18 g of H_2O is:

(1) 18 hour (2) 36 hour

(3) 9 hour (4) 18 seconds

Q.111 10800 C of charge through the electrolyte deposited 2.977 g of metal with atomic mass 106.4 g mol^{-1}. The charge on the metal cation is-

(1) +4 (2) +3 (3) +2 (4) +1

Q.112 The ratio of weights of hydrogen and magnesium deposited by the same amount of electricity from aqueous H_2SO_4 and fused $MgSO_4$are :

(1) 1 : 8 (2) 1 : 12 (3) 1 : 16 (4) None

Q.113 A factory produces 40 kg. of calcium in two hours by electrolysis. How much aluminium can be produced by the same current in two hours:–

(At wt. of Ca = 40, Al = 27)

(1) 22 kgm (2) 18 kgm (3) 9 kgm (4) 27 kgm

Q.114 The same amount of electricity was passed through two separate electrolytic cells containing solutions of nickel nitrate $Ni(NO_3)_2$ and chromium nitrate $Cr(NO_3)_3$ respectively. If 0.3 g of nickel was deposited in the first cell, the amount of chromium deposited is :

(at. wt. of Ni = 59, at. wt. of Cr = 52)

(1) 0.1 g (2) 0.17 g (3) 0.3 g (4) 0.6 g

Q.115 The cost of electricity required to deposit 1 gm. of Mg is Rs. 5.00. How much would it cost to deposit 10 gm. of Al (At wt. Al = 27, Mg = 24)
(1) Rs. 10.00 (2) Rs. 27.00
(3) Rs. 44.44 (4) Rs. 66.67

Q.116 Two electrolytic cells one containing acidified ferrous chloride and another acidified ferric chloride are connected in series. The ratio of iron deposited at cathodes in the two cells when electricity is passed through the cells will be :
(1) 3 :1 (2) 2 : 1 (3) 1 : 1 (4) 3 : 2

Q.117 To produce 160 g of oxygen, the number of moles of water required to be electrolysed is :
(1) 2.5 (2) 5 (3) 10 (4) 20

Q.118 13.5 g of Al get deposited when electricity is passed through the solution of $AlCl_3$. The number of faradays used are :
(1) 0.50 (2) 1.00 (3) 1.50 (4) 2.00

Q.119 Three Faradays of electricity was passed through an aqueous solution of iron (II) bromide. The mass of iron metal (at mass 56) deposited at the cathode is :
(1) 56 g (2) 84 g (3) 112 g (4) 168 g

Q.120 The time required to remove electrolytically one fourth of Ag from 0.2 litre of 0.1 M $AgNO_3$ solution by a current of 0.1 amp. is :
(1) 320 min. (2) 160 min.
(3) 80 min. (4) 40 min.

Q.121 1 mole of Al is deposited by X coulomb of electricity passing through aluminium nitrate solution. The number of moles of silver deposited by X coulomb of electricity from silver nitrate solution is :
(1) 3 (2) 4 (3) 2 (4) 1

Q.122 The number of electrons required to deposit 1 g. atom of Al(at. wt. = 27) from a solution of $AlCl_3$ are :
(1) 1 N_A (2) 2N_A (3) 3N_A (4) 4N_A

Q.123 The mass of copper that will be deposited at cathode in electrolysis of 0.2 M solution of copper sulphate when a quantity of electricity equal to that required to liberate 2.24 L of hydrogen at STP from 0.1 M aqueous H_2SO_4 is passed (At. mass of Cu = 63.5) will be :
(1) 1.59 g (2) 3.18 g
(3) 6.35 g (4) 12.70 g

COMMERCIAL CELLS

Q.124 As lead storage battery is charged when
(1) lead dioxide dissolves
(2) sulphuric acid is regenerated
(3) lead electrode becomes coated with lead sulphate
(4) the concentration of sulphuric acid decreases

Q.125 In a hydrogen-oxygen fuel cell, combustion of hydrogen occurs to
(1) produce high pure water
(2) create potential difference between two electrodes
(3) generate heat
(4) remove adsorbed oxygen from elctrode surfaces

Q.126 Among the following cells:
(i) Leclanche cell
(ii) Nickel-Cadmium cell
(iii) Lead storage battery
(iv) Mercury cell
primary cells are
(1) (i) and (ii) (2) (i) and (iii)
(3) (ii) and (iii) (3) (i) and (iv)

Q.127 When lead accumulator is charged it is :
(1) an electrolytic cell
(2) a galvanic cell
(3) a daniel cell
(4) none of the above

Q.128 The thermodynamic efficiency of cell is given by-
(1) $\frac{\Delta H}{\Delta G}$ (2) $\frac{nFE}{\Delta G}$ (3) $-\frac{nFE}{\Delta H}$ (4) Zero

Q.129 Which of the following cells can convert combustion energy of H_2 directly into electrical energy–
(1) Mercury cell
(2) Daniel cell
(3) Lead storage battery
(4) Fuel cell

ANSWER KEY

TOPIC WISE QUESTIONS

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	2	3	1	2	2	4	2	4	3	3	4	1	2	3	1
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	1	1	2	1	3	4	2	1	3	4	2	2	4	1	1
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	3	4	3	4	4	2	1	3	3	3	4	3	4	3	2
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	1	3	3	4	1	2	2	4	1	3	2	2	3	4	2
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	3	1	1	2	2	3	2	4	1	3	2	3	2	4	1
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	3	1	1	1	3	1	3	3	4	2	2	3	1	2	1
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	1	4	1	2	3	2	2	2	1	2	3	4	4	3	4
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	2	2	4	1	1	1	4	2	2	3	4	3	3	2	3
Que.	121	122	123	124	125	126	127	128	129						
Ans.	1	3	3	2	2	4	1	3	4						