The relation between equivalent conductance (Λ_{eq}), concentration of solution in gram equivalents per litre (ϕ) and specific conductance (κ) is

(1) $100\,\kappa\phi$ (2) $1000\,\kappa\phi$

(3) $100\,\phi/\kappa$ (4) $1000\,\kappa/\phi$

Sol. $\Lambda_{eq} = \frac{\kappa \cdot 1000}{N}$; $N \rightarrow \phi$

$$\Lambda_{eq} = \frac{\kappa \cdot 1000}{\phi} \quad S\,cm^2\,eq^{-1}$$

Which of the following occurs to the molar conductivity of the solution, when a solution of a weak electrolyte is diluted?

(1) It decreases because the weak electrolyte becomes weaker

(2) It decreases because a given volume contains less electrolyte

(3) It increases because a large volume of solution is involved in conducting electricity

(4) It increases because a mole of the electrolyte produces more ions in a dilution

$\alpha \propto \sqrt{V}$

$V \uparrow \quad \alpha \uparrow$

no of ions $\uparrow \Rightarrow$ Conductance $\uparrow$

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The equivalent conductance of the 0.1 N solution of an electrolyte is $236\,\Omega^{-1}\,cm^{2}\,eq^{-1}$. The specific conductance of the solution in $cm^{-1}\,\Omega^{-1}$ is

(1) 0.0236 (2) 23.6

(3) 2360 (4) 2.36

Sol.

$$\lambda_{eq} = \frac{\kappa \cdot 1000}{N}$$

$$236 = \frac{\kappa \cdot 10000}{0.1}$$

$$\kappa = \frac{0236}{10{,}000}$$

$$\kappa = 0.0236\ S\,cm^{-1}$$

The specific conductance of 0.1 M HNO_3 is $5.7 \times 10^{-2}\ cm^{-1}\ \Omega^{-1}$. The molar conductance of the solution in $cm^2\ \Omega^{-1}\ mol^{-1}$ is

(1) 100
(2) 57
(3) 570
(4) 5700

Sol.

$$\lambda_m = \frac{K \cdot 1000}{M}$$

$$\lambda_m = \frac{5.7 \times 10^{-2} \times 10^{3} \times 10}{10 \times 0.1} = 570\ S\ cm^2\ mol^{-1}$$

Weak electrolytes are only partly associated in solutions. The degree of dissociation of weak electrolyte in aqueous solution

(1) is inversely proportional to the initial concentration of the electrolyte

(2) is directly proportional to the initial concentration of the electrolyte

(3) does not depend on the initial concentration of the electrolyte

(4) depends on the equilibrium concentration of the electrolyte

Sol.

$\alpha \propto \sqrt{V}$

$\because C \propto \frac{1}{V}$

$\alpha \propto \frac{1}{\sqrt{C}}$

The conductance of a solution of an electrolyte is same as that of its specific conductance. The cell used can be said to have cell constant equal to

(1) 1 (2) 0

(3) 100 (4) 10

Sol. Given $G = \kappa$

$\kappa = G \cdot G^*$

$G = G \cdot G^*$

$G^* = 1$

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The resistance of 0.01 N solution of an electrolyte was found to 210 Ω at 298, using a conductivity cell of cell constant 0.66 cm^{-1}. The specific conductance of solution is

(1) $3.14 \times 10^{-3}\ \Omega^{-1}\ cm^{-1}$

(2) $3.14 \times 10^{-3}\ \Omega^{-1}\ cm$

(3) $3.14\ \Omega\ cm^{-1}$

(4) $3.14\ \Omega\ cm^{-1}$

R

G^*

$\kappa = ?$

$\kappa = G \cdot G^*$

$\kappa = \frac{1}{R} \times G^*$

$\kappa = \frac{1}{210} \times \frac{0.66}{100} = \frac{22}{7} \times 10^{-3}$

$= 3.14 \times 10^{-3}$

The molar and equivalent conductances are same for the solution of

(1) .1 M NaCl → V.f = 1

(2) .1 M $Ba(NO_3)_2$

(3) .1 M $La(NO_3)_3$ → Salt

(4) .1 M $Th(NO_3)_4$

$$\Lambda_{eq} = \frac{\Lambda_m}{V.f.}$$

V.f. = 1

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The term infinite dilution refers when

(1) $\alpha \rightarrow 1$ for weak electrolytes

(2) an electrolyte is 100% dissociated

(3) all inter ionic effects disappears

~~(4) all~~

∞ dilution

almost 100% ionisation

$\alpha \rightarrow 1$

inter ionic forces disappears

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According to Kohlrausch law, the limiting value of equivalent conductivity of an electrolyte A_2B is given by

(1) $\lambda^{\infty}_{A^+} + \lambda^{\infty}_{B^{2-}}$ (2) $\frac{1}{2}\lambda^{\infty}_{A^+} + \lambda^{\infty}_{B^{2-}}$

(3) $\lambda^{\infty}_{A^+} + \frac{1}{2}\lambda^{\infty}_{B^{2-}}$ (4) $2\lambda^{\infty}_{A^+} + \lambda^{\infty}_{B^{2-}}$

$\lambda^{\infty}_{eq} = \frac{\lambda^{\infty}_m}{v.f.}$

$\lambda^{\infty}_{A^+} \rightarrow$ molar

$\lambda^{\infty}_{B^{2-}} \rightarrow$ molar

$\lambda^{\infty}_{eq} = \frac{\lambda^{\infty}_{A^+}}{1} + \frac{\lambda^{\infty}_{B^{2-}}}{2}$

if $\lambda^{\infty}_{A^+}$, $\lambda^{\infty}_{B^{2-}}$ $\rightarrow$ equivalent. $\Rightarrow$ $\lambda^{\infty}_{eq} = \lambda^{\infty}_{A^+} + \lambda^{\infty}_{B^{2-}}$

1	2	3	4	5	6	7	8	9	10
4	4	1	3	1	1	1	1	4	3

Limiting molar conductivity of NH_4OH $\left(\text{i. e. } \overset{o}{\Lambda}m\,(NH_4\,OH)\right)$ is equal to

$NH_4^+ + OH^-$

(A) $\Lambda_m^o\,(NH_4OH) + \Lambda_m^o(NH_4Cl) - \Lambda_m^o\,(HCl)$

(B) $\Lambda_m^o\,(NH_4Cl) + \Lambda_m^o\,(NaOH) - \Lambda_m^o\,(NaCl)$

(C) $\Lambda_m^o\,(NH_4Cl) + \Lambda_m^o(NaCl) - \Lambda_m^o\,(NaOH)$

(D) $\Lambda_m^o\,(NaOH) + \Lambda_m^o\,(NaCl) - \Lambda_m^o\,(NH_4Cl)$

Equivalent conductance of 0.1 M HA (weak acid) solution is 10 Scm^2 equivalent^{-1} and that at infinite dilution is 200 Scm^2 equivalent^{-1}. Hence pH of HA solution is :

(A) 1.3

(B) 1.7

(C) 2.3

(D) 3.7

→ weak Acid

$[H^+] = C\alpha$

Sol.

$M = 0.1 = 10^{-1}$ (c)

$\lambda_{eq} = 10\ Scm^2 eq^{-1}$

$\lambda_{eq}^{\infty} = 200$ -"-

$\alpha = \frac{\lambda_{eq}}{\lambda_{eq}^{\infty}}$

$\alpha = \frac{10}{200}$

$\alpha = \frac{1}{20}$

$[H^+] = \frac{10^{-1} \times 1}{20}$

$= \frac{1}{2} \times 10^{-2}$

$= 0.5 \times 10^{-2}$

$= 5 \times 10^{-3}$

$[H^+] = 5 \times 10^{-3}$

$pH = 3 - \log 5$

$= 3 - 0.70$

$pH = 2.30$

At 298 K, the standard reduction potentials for the following half reactions are given as

Zn^{2+} (aq) + 2e– → Zn (s); – 0.762

Cr^{3+} (aq) + 3e– → Cr (s); – 0.740

$2H^{+}$ (aq) + 2e– → H_2 (g); 0.00

Fe^{3+} (aq) + e– → Fe^{2+} (aq); + 0.770

The strongest reducing agent is -

(A) Zn(s)

(B) H_2(g)

(C) Cr(s)

(D) Fe^{2+}(aq)

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The standard reduction potentials E° of the following systems are

System	E° (volts)
(i) $MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$	1.51
(ii) $Sn^{4+} + 2e^- \rightarrow Sn^{2+}$	0.15
(iii) $Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O$	1.33
(iv) $Ce^{4+} + e^- \rightarrow Ce^{3+}$	1.61

The oxidising power of the various species decreases in the order

(A) $Ce^{4+} > Cr_2O_7^{2-} > Sn^{4+} > MnO_4^-$

(B) $Ce^{4+} > MnO_4^- > Cr_2O_7^{2-} > Sn^{4+}$

(C) $Cr_2O_7^{2-} > Sn^{4+} > Ce^{4+} > MnO_4^-$

(D) $MnO_4^- > Ce^{4+} > Sn^{4+} > Cr_2O_7^{2-}$

+7

$Ce^{4+} > MnO_4^- > Cr_2O_7^{2-} > Sn^{4+}$

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The standard reduction potential at 298K for single electrod does are given below :

Electrode	Electrode Potential (volt)
Mg^{2+}/Mg	−2.34
Zn^{+2}/Zn	−0.76
Fe^{+2}/Fe	−0.44

metal Reactivity $\propto \frac{1}{S.R.P.}$

From this we can infer that

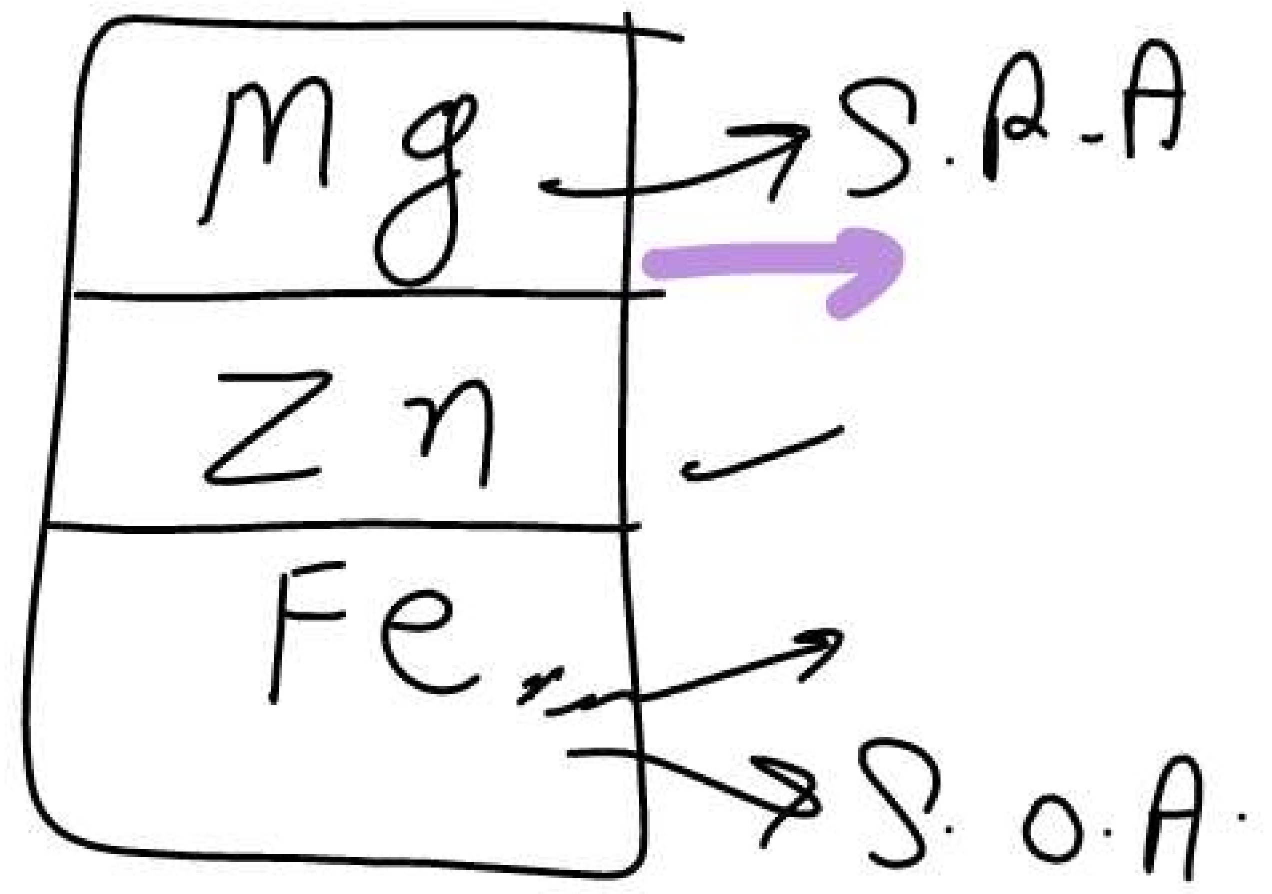
(A) Zn can reduce both Mg^{2+} and Fe^{2+}

(B) Fe can reduce both Mg^{2+} and Zn^{2+}

(C) Mg can reduce both Zn^{2+} and Fe^{2+}

(D) Mg can reduce Zn^{2+} but not Fe^{2+}

Mg^{2+}



Zn Cant reduce Mg^{2+}

E° for the half cell $Zn^{2+} || Zn$ is – 0.76
e.m.f. of the cell $Zn | Zn^{2+} (1M) || 2H^+ (1M) | H_2 (1atm)$ is

(A) – 0.76 V

(B) + 0.76 V

(C) – 0.38 V

(D) + 0.38 V

$$Zn_{(s)} + 2H^+_{(aq)}\,(1M) \longrightarrow Zn^{2+}_{(aq)}\,(1M) + H_{2(g)}\,(1\,atm)$$

$$E^\circ_{cell} = E^\circ_{Zn|Zn^{2+}} + E^\circ_{H^+/H_2}$$

$$= +0.76 + 0$$

$$E^\circ_{cell} = 0.76\,V$$

$$E_{cell} = 0.76 - \frac{0.0591}{2} \log \frac{1 \times 1}{1}$$

$$= 0.76$$

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Fe can displace which of the following ions from their aqueous solutions ?

(i) Na^+ (ii) Zn^{2+} (iii) Cu^{2+} (iv) Ag^+

(A) (i) & (ii)

(B) (ii) & (iii)

(C) (iii) & (iv)

(D) (i), (iii), (iv)

$Fe + Na_2SO_4 \rightarrow \times$

$Fe + ZnSO_4 \rightarrow \times$

$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$

$Fe + AgNO_3 \rightarrow Fe(NO_3)_2 + Ag$

Na
Zn
Fe
Cu
Ag
→ metal

7 → ① × → ③ ✓

A standard reduction eletrode potentials of four elements are

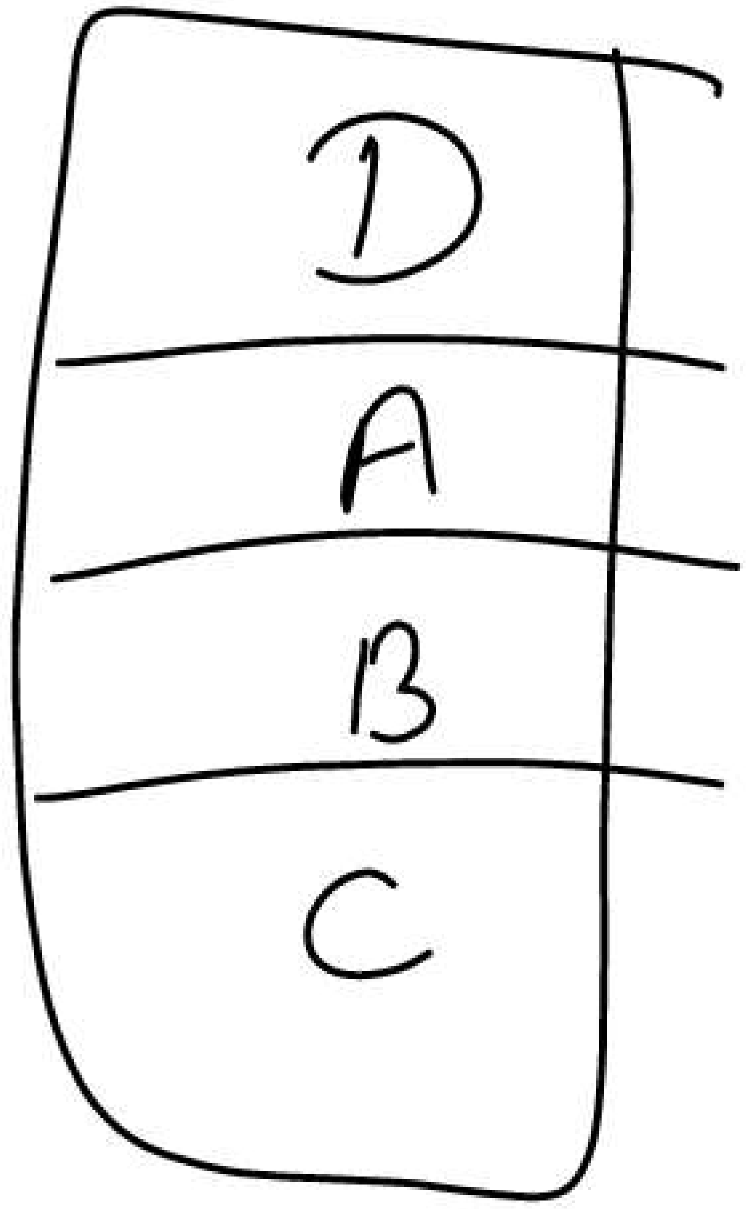
A = – 0.250 V, B = – 0.140 V

C = – 0.126 V, D = – 0.402 V

The element that displaces A from its compounds aqueous solutoin is :

(A) B (B) C

(C) D (D) None



Which of the following statements is TRUE for the electrochemical Daniel cell:

(A) Electrons flow from copper electrode to zinc electrode

(B) Current flows from zinc electrode to copper electrode

(C) Cations move toward copper electrode

(D) Cations move toward zinc electrode

Given : $E^o(Cu^{2+} | Cu) = 0.337$ V and $E^o(Sn^{2+}|Sn) = -0.136$ V. Which of the following statements is correct?

(A) Cu^{2+} ions can be reduced by $H_2(g)$

(B) Cu can be oxidized by H^+

(C) Sn^{2+} ions can be reduced by $H_2(g)$

(D) Cu can reduce Sn^{2+}

1	2	3	4	5	6	7	8	9	10
B	C	A	B	C	B	A	C	C	A