NEET REVISION SERIES

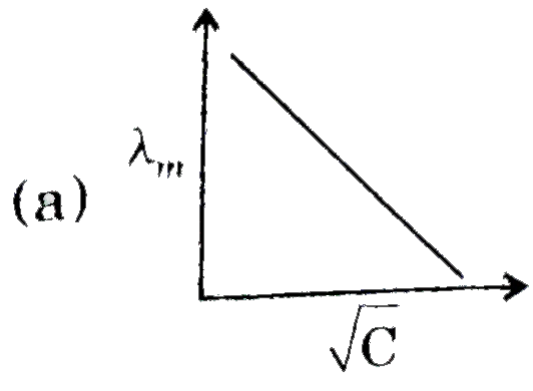
ELECTROCHEMISTRY

Revise Most Important Questions to Crack NEET 2020

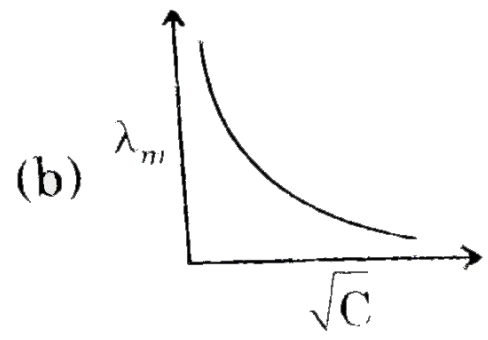
Q-1 - 17243444

Which of the following curve represents the variation of λ_m with $\sqrt{C}$ for $AgNO_3$?

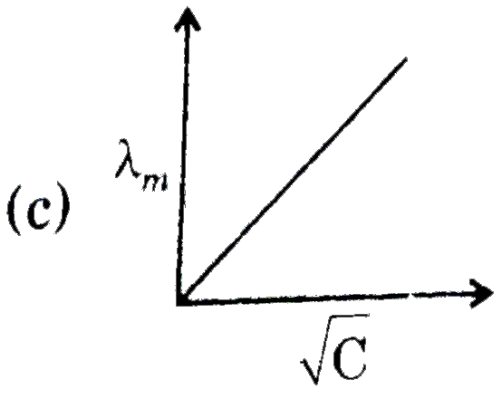
(A)

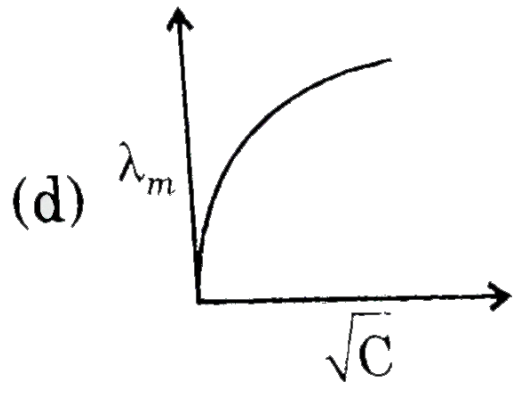


(B)



(C)



(d) 

(D)

CORRECT ANSWER: A

Q-2 - 60006351

In infinite dilutons, the equivalent conductances of Ba^{2+} and Cl^{-} are 127 and 76 $ohm^{-1}cm^{-1}eqvt^{-1}$. The equivalent conductivity of $BaCl_2$ at indefite dilution is

(A) 101.5

(B) 139.5

(C) 203.5

(D) 279.5

CORRECT ANSWER: B

SOLUTION:

$$\lambda^{\infty} BaCl_2$$
$$= \frac{1}{2}\lambda^{\infty} Ba^{2+}$$
$$+ \lambda^{\infty} Cl^{-}$$

$$= \frac{127}{2} + 76$$
$$= 139.5 ohm^{-1} cm^{-1} eq^{-1}$$

.

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Q-3 - 12659114

A conductance cell when filled with $0.5 MKCI$ solution (conductivity $= 6.67 \times 10^{-3} \Omega^{-1} cm^{-1}$) register a resistance of 243Ω. Its cell constant is .

(A) $1.62cm$

(B) $1.62cm^{-1}$

(C) $1.62dm^{-1}$

(D) $1.62m^{-1}$

CORRECT ANSWER: B

SOLUTION:

$$K = kR$$
$$= \left(6.67 \times 10^{-3}\right.$$
$$\left.\Omega^{-1}cm^{-1}\right)(243\Omega)$$
$$= 1.62cm^{-1}$$

.

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Q-4 - 16981837

Molar conductance of 0.1 M acetic acid is 7 $ohm^{-1}cm^{2}\text{mol}^{-1}$. If

the molar conductance of acetic acid at infinite dilution is 280 $ohm^{-1}cm^2\text{mol}^{-1}$, the value of dissoication constant will be:

(A) $226 \times 10^{-5} moldm^{-3}$

(B) $1.66 \times 10^{-3} moldm^{-3}$

(C) $1.66 \times 10^{-2} moldm^{-3}$

(D) $6.25 \times 10^{-5} moldm^{-3}$

CORRECT ANSWER: D

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Q-5 - 60006707

The limiting molar conductivities $\wedge$ for NaCl, KBr and KCl are 126,152 and 150 S $cm^2 mol^{-1}$ respectively. The $\wedge$ for NaBr is

(A) 278 S $cm^2 mol^{-1}$

(B) 176 S cm^2mol^{-1}

(C) 128S cm^2mol^{-1}

(D) 302 S cm^2mol^{-1}

CORRECT ANSWER: C

SOLUTION:

$\left(126s \quad cm^2\right) \wedge^o_{NaCl}$

$= \wedge^o_{Na^+} + \wedge^o_{Cl^-}$

. . .(i)

$\left(152s \quad cm^2\right) \wedge^o_{KBr} =$

$\wedge^o_{K^+} + \wedge^o_{Br^-}$

. . . (ii)

$\left(150s \quad cm^2\right) \wedge^o_{KCl} =$

$\wedge^o_{K^+} + \wedge^o_{Cl^-}$

. . .(iii)

by equation (i)+(ii)-(iii)

$\because \wedge^o_{NaBr} = \wedge^o_{Na^+}$

$+ \wedge^o_{Br^-}$

ltBrgt

$= 126 + 152 - 150$

$= 128s \quad cm^2mol^{-1}$

.

Q-6 - 12659130

The ioisation constant of a weak electroluytes is 25×10^{-6} and the equivalent conductance of its $0.01M$ solution is $19.6Scm^2eq^{-1}$. The equivalent conductance at infinited dilution of the electrolyte is Scm^2sq^{-1}. is .

(A) 50

(B) 196

(C) 392

(D) 384

CORRECT ANSWER: C

SOLUTION:

$$\begin{array}{lll} HA & \Longleftrightarrow & H^{+} + A^{-} \\ C & & 0 \quad 0 \\ C - C\alpha & & C\alpha \quad C\alpha \end{array}$$

Or $K = C\alpha^2$

Or $25 \times 10^{-6} = 10^{-2}.\alpha^2$

Or $\alpha = 5 \times 10^{-2}$

also

$$\alpha = \frac{\lambda_v}{\lambda_{\text{infty}}} = \frac{19.6}{\lambda_{\text{infty}}}$$

$$= \frac{19.6}{5 \times 10^{-2}} = 392$$

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Q-7 - 16981864

Resistance of a conductvity cell filled with a solution of an

electrolyte of concentration 0.1 M is 100 Ω. The conductivity of this solution is 1.29 Sm^{-1}. Resistance of the same cell when filled with 0.02M of the same solution is 520Ω. the molar conductivity of 0.02M solution of the electrolyte will be:

(A) $124 \times 10^{-4} Sm^2 \text{mol}^{-1}$

(B) $1250 \times 10^{-4} Sm^2 \text{mol}^{-1}$

(C) $1.24 \times 10^{-4} Sm^2 \text{mol}^{-1}$

(D) $12.4 \times 10^{-4} Sm^2 \text{mol}^{-1}$

CORRECT ANSWER: A

Q-8 - 12659135

The molar conductivities Λ_{NaOAc} and Λ_{HCI} at infinite dilution is watter at 25^{C} are 91.0 and $426.2 Scm^{/}$ mol respectively. To calculate $\Lambda^{2}_{HOAc,}$ the additional value required is:

(A) $\Lambda^{o}_{H_2O}$

(B) Λ^{o}_{KCI}

(C) $\Lambda^{o}_{N_aOH}$

(D) Λ^{o}_{NaCI}

CORRECT ANSWER: D

SOLUTION:

According to Kohlrausch 's law ,

$\Lambda^{=}_{CH_3COOH} \Lambda^{+}_{CH_3COONa}$

$\Lambda^{2}_{HCI} - \Lambda_{NaCI}$

.

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Q-9 - 60006421

The specific conductance of a 0.1 N KCl solution at $23C$ is 0.012 $ohm^{-1}cm^{-1}$. The resistance of cell containing the solution at the same temperature was found to be 55 ohm. The cell constant will be

(A) 0.142 cm^{-1}

(B) 0.66 cm^{-1}

(C) 0.918 cm^{-1}

(D) 1.12 `cm^(-1)

CORRECT ANSWER: B

SOLUTION:

$$K = \frac{1}{R} \times \text{cell constant}$$

Cell constant

$= K \times R, 0.012 \times 55$

$= 0.66 cm^{-1}$

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Q-10 - 12659148

The equivalent conductance of $NaCI$ at concentration C and at infinited dilution are λ_c and λ_{imfty} is given as.

(A) $\lambda_c = \lambda_{\text{infty}} + (B)C$

(B) $\lambda_c \lambda_{\text{infty}} - (B)C$

(C) $\lambda_c = \lambda_{\text{infty}} - (B)\sqrt{C}$

(D) $\lambda_c = \lambda_{\text{infty}} + (B)\sqrt{C}$

CORRECT ANSWER: C

SOLUTION:

Debye-Huckel Onsager equation can be written as

$\lambda_c = \lambda_\infty - (B)\sqrt{C}$

Where

$\lambda_c =$ Molar conductivity of the solution at certain concentration

$\lambda_\infty =$ Limiting molar conductivity

C=Concentration

B=Constant that depends on temperature, charges on the ions and dielectric constatnas well as viscosity of the solution.

Q-11 - 12659146

Calculate molar conductivity at infinite dilution of CH_3COOH if molar conductivity at infinite dilution of CH_3COONa, HCI and $MaCI$ are 91.6, 425.0 and 128.1$Scm^2\text{mol}^{-1}$.

(A) $390.5 Scm^2 \mathrm{mol}^{-1}$

(B) $388.5 Scm^2 \mathrm{mol}^{-1}$

(C) $490.5 Scm^2 \mathrm{mol}^{-1}$

(D) None of these

CORRECT ANSWER: B

SOLUTION:

$\Lambda_{CH_3COOH} = \Lambda_{HCI} - \Lambda_{NaCI}$

$= 9.1.6 + 425 - 128.1$

$= 388.5 Scm^2 eq^{-1}$

.

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Q-12 - 34966751

During thhe preparation of $H_2S_2O_8$ (per disulphuric acid) O_2 gas also releases at anode as byproduct. When 9.72 of H_2 releases at cathode and 2.35L O_2 at anode at STP, the weight of $H_2S_2O_8$ produced in gram is

(A) 87.12

(B) 43.56

(C) 83.42

(D) 51.74

CORRECT ANSWER: B

SOLUTION:

$$\frac{9.72}{22.4} \times 2 = \frac{2.35}{22.4} \times 4 + \frac{W}{194} \times 2$$

or $W = 43.47g$

Q-13 - 30710314

When during electrolysis of a solution of $AgNO_3$, 9650 coulombs of charge pass through the electroplating bath, the mass of silver deposited on the cathode will be :

(A) 10.0 g

(B) 21.6 g

(C) 108 g

(D) 1.08 g

CORRECT ANSWER: A

SOLUTION:

(a) No. of moles of

$$Ag = (1 \quad \text{mol}) \times \frac{(9650 \quad \text{C})}{(96500 \quad \text{C})}$$

deposited $= 0.1 \quad \text{mol.}$

Mass of Ag deposited $= 0.1 \times 108$

=10.8 g

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Q-14 - 12659159

Three faradays of electricity qas passed through an aqueous solution of iron I bromide. The mass of iron metal (atomic mass-56) deposited at thecathode is .

(A) $56g$

(B) $84g$

(C) $112g$

(D) $168g$

CORRECT ANSWER: B

SOLUTION:

Mole of Fe deposited $= \frac{1}{2} \times 3 = 1.5$ mole

$W_{Fe} = \frac{1}{5} \times 56 = 84g.$

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Q-15 - 12659168

The sam quantity of electricity is passed through H_2SO_4 and HCI solutins of same concentration. The amount of hudrogen liberated from H_2SO_4 as cmpared to that from HCI is.

(A) the same

(B) twice as such

(C) one half as such

(D) dependent on concentration.

CORRECT ANSWER: B

SOLUTION:

For

$H_2S_2 \Leftrightarrow 2H^+ + SO_4^{2-}$

$2 \times 96500C$ liberates 1 mole of H_2

For $HCI \rightarrow H^+ + CI^-$

$96500C$ liberates $/12$ mole of H_2 and therefore

$2 \times 96500C$.

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Q-16 - 12659169

When a molten ionic hydride is electrolysed.

(A) Hydrogen is liberted at the cathode

(B) H-ions produced migrate to the cathode

(C) There is no reasction

(D) Hydrogen is liberted at the anode

CORRECT ANSWER: D

SOLUTION:

On elctrolysis molten ionic hydride liberates H_2 at the anlde.

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Q-17 - 12659176

A solution of $CuSO_4$ is electrolysed for 7 minutes with a current of $0.6A$. The amount of electrictiy passed is equal to.

(A) $4.2C$

(B) $2.6 \times 10^{-3}F$

(C) $126C$

(D) $36C$

CORRECT ANSWER: B

SOLUTION:

The amout of elctricity passed $= It$ (in sec.)

$$= 0.6A \times 760\,\text{sec}$$

$$= 252C \times \frac{1F}{96500C}$$

$$= 2.6 \times 10^{-3}F$$

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Q-18 - 12659179

If $3F$ of electrictiy is passed through the solutions of

$AgNO_3, CuSO_4$ and $Auc = CL_3$, the molar ration of the cations deposited at the cathode is .

(A) $1:1:1$

(B) $1:2:3$

(C) $3:2:1$

(D) $6:3:2$

CORRECT ANSWER: D

SOLUTION:

Since

$Ag^+ + e^- \rightarrow Ag,$
$Cu^{2+} + 2e^- \rightarrow Cu,$
$Au^{3+} + 3e^- \rightarrow Au$

,

$3F$ of electricity will depostit 3 moles of Ag, 1.5 moles of coppre, and 1 mole of gole. Therefpre, the molar ration

is $3:1.5:1$ or $6:3:2$.

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Q-19 - 60006723

A solution containing one mole per litre of each

$Cu(NO_3)_2, AgNO_3,$

$Hg_2(NO_3)_2$ and $Mg(NO_3)_2$

is being electrolysed by using inert electrodes. The values of

standard electrode potentials in volts (reduction potentials) are

$Ag/Ag^+ = +0.80, 2Hg$

$/Hg_2^{2+} = +0.79, Cu$

$/Cu^{2+} = 0.34, Mg$

$/Mg^{2+} = -2.37$

with increasing voltage, the sequence of deposition of metals on the

cathode will be

(A) Ag,Hg,Cu,Mg

(B) Mg,Cu,Hg,Ag

(C) Ag,Hg,Cu

(D) Cu,Hg,Ag

CORRECT ANSWER: C

SOLUTION:

A cation havig highest reduction potential will be reduced first and so on. However, Mg^{2+} in aqueous solution will not be reduced

$$\left(E^{o}_{Mg^{2+}/Mg} < E_{H_2\,\frac{\emptyset}{1}\,/\,(2)\,H_2+OH^-}\right)$$

Instead water would be reduced in preference.

Aluminium oxide may be electorlysed at 1000^{C} to furnish aluminim metal (Atomic Mass $= 27$ amu, $1F = 96,500C$). The cathode reaction is

$Al^{3} + 3d^{-} \rightarrow Al$

To prepare $5.12kg$ of aluminimu metal by this method woold require .

(A) $5.49 \times 10^{4}C$ electricity

(B) $1.83 \times 10^{7}C$ of elctricity

(C) $5.94 \times 10^{7}C$ of electricity

(D) $5.49 \times 10^{1}C$ of electricity

CORRECT ANSWER: C

SOLUTION:

$27g$ of Al is obtained by passing a current of $3 \times 96500C$.

$\therefore 1g$ og Al is obtained by passing a current of

$$3 \times \frac{96500}{27} \times 4.12$$

$$\times 1000$$

$$= 1.83 \times 10^7 C \times 3$$

$$= 5.49 \times 10^7 C$$

.

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Q-21 - 12659216

The density of Cu is $8.94 gcm^{-3}$. The quantity of electricity neede to plate an area $10cm \times 10cm$ to a thickenss of $10^{-2} cm$ using $CuSO_4$ solution qould be .

(A) $13586C$

(B) $27172C$

(C) $40758C$

(D) $20348C$

CORRECT ANSWER: B

SOLUTION:

$$(a \times b \times c) \times \rho = \frac{Eit}{96500}$$

$$(10 \times 10 \times 10^{-2}) \times (8.94) = \frac{63.5}{2} \times \frac{It}{96500}$$

$$(\mathrm{It}) = 27172C.$$

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Q-22 - 11044136

Iron can be prevented from rusting by

(A) Connecting iron to more electropositive metal — a case of cathodic protection

(B) Connecting iron to more electropositive metal — a case of anodic protection.

(C) Connecting iron to less electropositive metal — a case of anodic protection

(D) Connecting iron to less electropositive metal — a case of cathodic protection.

CORRECT ANSWER: A,C

SOLUTION:

Cathodic protection ： A techniquie to control corrosion of a metal surface by making it work as a cathode of an electrochemical cell by placing in contact with a the metal to be protected another more easily corroded

matal to act as the anode of the electrochemical cell.

Most commonly used to protect steel, water pipelines, and storage tanks.

Anodic protection : A technique to control corrosion of a matal by making it work as anode developing a passive film on the metal.

it used in extremely corrosive conditions and most extensively used to store and hangle sulphuric acid container.

Q-23 - 11044415

Assertion(A): The rusting on the surface of iron involves following reaction :

$a.\ Fe(s) \rightarrow Fe^{2+}(aq) + 2e^{-}$

(at anodic site)

$b.\ O_2(g) + 4H^{\oplus}(aq) + 4e^-$
$\rightarrow 2H_2O(l)$

(at cathodic site)

$c.\ 4Fe^{2+}(aq) + O_2(g)$
$+ 4H_2O(l) \rightarrow 2Fe_2O_3(s)$
$+ 8H^{\oplus}$

$d.\ Fe_2O_3(aq) + xH_2O(l)$
$\rightarrow Fe_2O_3.xH_2O$

Reason (R): Rusting is accelerated in the presence of $NaCl$ and CO_2

(A) If both (A) and (R) are correct, and (R) is the correct explanation of (A).

(B) If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

(C) If (A) is correct, but (R) is incorrect.

(D) If (A) is incorrect, (R) is correct.

CORRECT ANSWER: B

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Q-24 - 12659231

The standard potentials at 25^C for the following half reactions are

given against them

$Zn^{2+} + 2e^- \rightarrow Zn, E^0 =$
$-0.762V$

$Mg^{2+} + 2e^- \rightarrow Mg, =$
$-2.37V$

.

When zinc dust is added to a solution of magnesium chloride .`

(A) No reaction will take plae

(B) Zinc chloride is formed

(C) Zinc dissolve in solution

(D) Magnesium is preciptiated

CORRECT ANSWER: A

SOLUTION:

$$Zn + MgCl_2$$
$$\rightarrow ZnCl_2 + Mg$$

$$\therefore E^{=}_{\text{cell}} E^{+}_{Zn\,/\,Zn^{+2}} E^{=}_{Mg^{+2}\,/\,Mg}$$
$$+ 0.762 - 2.37$$

$$\equiv 1.608V.$$

Here, E_{cell} is negative so no reaction will take place.

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Q-25 - 30684734

The $E_{M^{3+}/M^{2+}}$ values for Cr, Mn, Fe and Co are

-0.41,+1.57,+0.7and +1.97V respectively. For which one of these metals the change in oxidation state from +2 to +3 is easiest?

(A) Cr

(B) Co

(C) Fe

(D) Mn.

CORRECT ANSWER: A

SOLUTION:

Change in O.S. from +2 to +3i.e. Oxidation will be easy for M^{2+} with highest O.P. or lowest R.P. Thus change in oxidation state of Cr^{2+} to Cr^{3+} is easiest out of the given four metal ions.

Q-26 - 12659247

Civen E for $Cu^{2+} \rightarrow Cu^{+}$ is $+0.15V$ and $Cu^{+} \rightarrow Cu$ is $+0.05V$

Calculate E for $Cu^{2+} \rightarrow Cu$.

(A) $+0.325V$

(B) $+0.125V$

(C) $+0.250V$

(D) $+0.\ 160V$

CORRECT ANSWER: A

SOLUTION:

$Cu^{2} + \ \leq^{-\rightarrow} \ Cu^{+} E_{1}$
$= 0.15$
(i)
$Cu + \ \leq^{-\rightarrow} \ CuE_{2}$
$= 0.50$

(ii)

$$Cu^{2}+\ \leq^{-\rightarrow}\ CuE_{3}$$

$$=\ ?$$

(iii)

Clearly (iii) = (i) + (ii)

$$-\Delta G_{3}^{0}+\left(-\Delta G_{2}^{0}\right)$$

$$2\times F\times E_{3}=1$$

$$\times FE_{1}+1\times F\times E_{2}$$

$$E_{3}=\frac{0.65}{2}=0.324V.$$

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Q-27 - 19293604

Consider the following E_0 values,

$$E^{0}_{Fe^{3+}\ /\ F^{2+}}\ =\ +0.77V,$$

$$E^{0}_{Sn^{2+}\ /\ Sn}\ =\ -0.14V$$

, the E^{0}_{cell} for the reaction,

$$Sn_{(s)}+2Fe^{3+}_{(aq.)}$$

$$\rightarrow 2F^{2+}_{(aq.)}+Sn^{2+}_{(aq.)}$$

is:

(A) $0.63V$

(B) $1.40V$

(C) $0.91V$

(D) $1.68V$

CORRECT ANSWER: C

SOLUTION:

$$E^0_{cell} = E^0_{OP_{Sn/Sn^{2+}}}$$

$$+ E^0_{RP_{Fe^{3+}/FE^{2+}}}$$

$$= 0.14 + 0.77$$

$$= 0.91V$$

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Q-28 - 60006498

The position of some metals in the electrochemical series in decreasing electropositive character is given as $Mg > Al > Zn > Cu > Ag$. What will happen, if a copper spoon is used to stir a solution of aluminium nitrate

(A) The spoon will get coated with Al

(B) An alloy of Cu and Al is formed

(C) The solution becomes blue

(D) There is no reaction

CORRECT ANSWER: D

SOLUTION:

The metal placed below in electrochemical series does not react with that metal salt solution which metal is placed above in series.

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Q-29 - 14158117

For $Zn^{2+} / Zn, E = -0.76$, for $Ag^{+} / Ag, E = -0.799V$.

The correct statement is

(A) the reaction Zn getting reduced Ag getting oxidized is spontaneous

(B) Zn undergoes reduction and Ag is oxidized

(C) Zn undergoes oxidation and Ag^{+} gets reduced

(D) No suitable answer

CORRECT ANSWER: C

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Q-30 - 16981449

A gas Cl^2 at atm is bubbled through a solution containing a mixture of $1MBr^-$ and $1MF^-$ at 25C. If the reductioni potential order is F gt Cl gtBr, then:

(A) Cl will oxidise Br and not F

(B) Cl will oxidise F and not Br

(C) Cl will oxidise both Br and F

(D) Cl will reduce both Br and F

CORRECT ANSWER: A

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Q-31 - 60006760

Given:

$E^0_{Cr^{3+}/Cr} = -0.74V,$

$E^0_{MnO_4^-/Mn^{2+}} = 1.51V$

$E^0_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33V,$

$E^0_{Cl/Cl^-} = 1.36V$

Based on the data given above, strongest oxidising agent will be

(A) Cl

(B) Cr^{3+}

(C) Mn^{2+}

(D) MnO_4^-

CORRECT ANSWER: D

SOLUTION:

Higher the SRP, better is oxidizing agent hence MnO_4^- is strongest oxidizing agent.

Q-32 - 12659267

The standard potentials at $298K$ for the following halfreactions are

as given

$Zn^{2+} + 2e \underset{\longleftarrow}{\longrightarrow} ZnE^{o} =$

$- \frac{0}{762}V$

.

$2H^{+} + 2E \rightarrow H_{2}(g)E^{o}$

$= 0.000V$

$Cr^{3+} + 3e \underset{\longleftarrow}{\longrightarrow} CrE^{o} =$

$- 0.740V$

$Fe^{3+}2e \rightarrow Fe^{2+}E^{o}$

$= 0.772V$

Which of the following is the strongest reducing agent ?

(A) Zn (s)

(B) Cr

(C) $H_2(g)$

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

CORRECT ANSWER: A

SOLUTION:

More negative the standard potential least the reducion tendcy of the ion. The corresponding atom has largest oxidation tendency and thus is a sterong reducing agent. Zn is the strongest reucing afent.

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Q-33 - 30710326

Given

$E_{Fe^{2+}/Fe} = -0.036 \text{ V}$,

$E_{Fe^{3+}/Fe} = -0.439 \text{ v}$

. The value of standard electrode potential for the change will be :

(A) $-0.072 \quad \mathrm{V}$

(B) $0.385 \quad \mathrm{V}$

(C) $0.770 \quad \mathrm{V}$

(D) $-0.270 \quad \mathrm{V}$

CORRECT ANSWER: C

SOLUTION:

(c) Given

$$Fe^{3+} + 3e^- \rightarrow Fe,$$
$$E_1 = -0.36 \quad \mathrm{V}$$

$$Fe^{2+} + 2e^- \rightarrow Fe,$$
$$E_2 = -0.439 \quad \mathrm{V}$$

Required equation is :

$$Fe^{3+} + e^- \rightarrow Fe^{2+},$$
$$E_3 = ?$$

Appying $\Delta G = \ -nFE_{cell}$

$$\Delta G_3 = \Delta G_1 - \Delta G_2$$

$$(-n_3FE_{3cell}) =$$

$$-(n_1FE_{1cell})$$

$$-(-n_2FE_{2cell})$$

$$E_{3cell} = 3E_{1cell}$$

$$-(-2E_{cell})$$

$$E_{3cell} = 3 \times (-0.036)$$

$$-(2 \times \ -0.439)$$

$$= (-0.08) + (0.878)$$

$$= 0.77 \ \ \mathrm{V}$$

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Q-34 - 12659270

Given that E^o values of

$Ag^{+}/Ag, K^{+}/K,$

Mg^{2+}/Mg

and Cr^{3+}/Cr are $0.08V, -2.93V, -237V$ and $-0.74V$

respectively. Therefore the order for the reducing power of the

metal is .

(A) $Ag > Cr > Mg > K$

(B) $Ag > Cr > Mg > K$

(C) $Ag > Cr > K > Mg$

(D) $Cr > Ag > Mg > K$

CORRECT ANSWER: B

SOLUTION:

More the negativ e E value , larger the reducing power

of the metal.

Q-35 - 60006651

When a rod of metal A is dipped in an aqueous solution of metal B (concentration of B^{2+} ion being 1M) at $25C$, the standard electrode potentials are $A^{2+}/A = -0.76$volts, $B^{2+}/B = +0.34$ volts

(A) A will gradually dissolve

(B) B will deposit on A

(C) No reaction will occur

(D) Water wil decompose into H_2 and O_2

CORRECT ANSWER: B

SOLUTION:

Since $E^o_{A^{2+}/A} < E^o_{B^{2+}/B}$. A has greater tendency to be oxidized.

$A + B^{2+} \rightarrow A^{2+} + B$.

Q-36 - 12659276

The standard reduction potential for Fe^{2+}/Fe and Sn^{2+}/Sn electrodes are -0.44 and -0.14 volt respectively. For the given cell reaction $Fe^{2+} + Sn \rightarrow Fe + Sn^{2+}$, the standard EMF is.

(A) $-0.30V$

(B) $-0.58V$

(C) $+0.58V$

(D) $+0.30V$

CORRECT ANSWER: A

SOLUTION:

For the cell reaction.Fe acts as cathode and Sn as anode, Hence,

$$E^2_{\text{cell}} - E^2_{\text{cathode}}$$
$$- E^{=}_{\text{anode}} - 0.44$$
$$- (-0.14) =$$
$$- 0.30V$$

The negative EMF suggests that the reaction goes spontaneously in reversed direction.

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Q-37 - 30684847

A gas X at 1 atm is bubbled through a solution containing a mixture of 1M Y^- and 1M Z^- at $25C$. If the reduction potential of $Z > Y > X$, then

(A) Y will oxidise X but not Z

(B) Y will oxidise both X and Z

(C) Y will oxidise both X and Z

(D) Y will reduce both X and Z.

CORRECT ANSWER: A

SOLUTION:

As R.P of Y is more than X, Y will ge reduced and X will get oxidised. As R.P. of Y is less than Z it can not oxidise Z.

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Q-38 - 19293568

The following facts have been observed:

$2X^- + Y_2 \rightarrow 2Y^- + X_2$

$2W^- + Y_2 \rightarrow$ No reaction $2Z^- + X_2 \rightarrow 2X^- + Z_2$

Which of the following sequence is true?

(A)

$E^{\circ} w^{-} / w_{2} > E^{\circ} Y^{-}$

$/ Y_{2} > E^{\circ} X^{-} X_{2} /$

$> E^{\circ} Z^{-} / z_{2}$

(B)

$E^{\circ} w^{-} / w_{2} < E^{\circ} Y^{-}$

$/ Y_{2} < E^{\circ} X^{-} X_{2} /$

$< E^{\circ} Z^{-} / z_{2}$

(C)

$E^{\circ} w^{-} / w_{2} < E^{\circ} Y^{-}$

$/ Y_{2} > E^{\circ} X^{-} X_{2} /$

$< E^{\circ} Z^{-} / z_{2}$

(D)

$E^{\circ} w^{-} / w_{2} > E^{\circ} Y^{-}$

$/ Y_{2} < E^{\circ} X^{-} X_{2} /$

$< E^{\circ} Z^{-} / z_{2}$

CORRECT ANSWER: B

$$MnO_4^- + 8H^= + 5e^-$$
$$\rightarrow Mn^{2+} + 4H_2O$$

If H^+ concentration is decreaded from 1M to $10^{-4}M$ at 25^C.

(A) the otential decreases by $0.\ 38V$ with decrease in oxidising power

(B) the potential increases by $0.\ 30V$ with increase in oxidising power

(C) the potential dereases by $0.25V$ with decreases in oxidising power

(D) the potential dercreases by $0.\ 38V$ without affecting oxidising power

---

CORRECT ANSWER: A

SOLUTION:

$$\Delta E$$

$$= \frac{0.0591 \times \log}{5} \left[10^{-4} \right]^{8} = -0.378V$$

.

Q-40 - 34966759

The reduction potential of hydrogen electrode when placed in a buffer solution is found to be $-0.413V$. The pH of the buffer is

(A) 10

(B) 4

(C) 7

(D) 12

CORRECT ANSWER: C

SOLUTION:

$$-0.413$$

$$= 0.059 \log\left(\frac{1}{[H^+]}\right)$$

or

$$\frac{0.414}{0.059} = -\log H^+$$

$$= pH$$

or $pH = 7$

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Q-41 - 16981558

The standard emf for the cell reactions, $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$ is 1.10 volt at $25C$. The emf for the cell reaction when 0.1 M Cu^{2+} 0.1 M Zn^{2+} solutions are used at 25C is:

(A) 1.10Volt

(B) 0.110 volt

(C) $-1.10vo <$

(D) $-0.110vo <$

CORRECT ANSWER: A

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Q-42 - 16981563

In a cell that utilizes the reactions.

$$Zn(s) + 2H^{+}(aq) \rightarrow Zn^{2+}(aq) + H_2(g)$$

addition of H_2SO_4 to cathode compartment, will

(A) lower the E and shift equilibrium to the left

(B) lower the E and shift the equilibrium to the right

(C) increase the E and shift the equilibrium to the right

(D) increase the E and shift the equilibrium to the left

CORRECT ANSWER: C

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Q-43 - 12659319

The reduction potential of a half-cell consisting of a Pt electrode immersed in $1.5MFe^{2+}$ and $0.015MFe^{3+}$ solutin at 25^{C} is $\left(E^{=}_{Fe^{3+}/Fe^{2+}}0.770V\right)$ is .

(A) $0.652V$

(B) $0.88V$

(C) $0.710V$

(D) $0.850V$

CORRECT ANSWER: A

SOLUTION:

$$E_{\text{cell}} = 0.77 - \frac{0.059}{1}\log. \frac{1.5}{0.015} = 0.652V$$

.

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Q-44 - 74449786

The cell,

$Zn\left|Zn^{2+}(1M)\right|\left|Cu^{2+}(1M)\right|Cu, (E_{cell} = 1.10V)$

, was allowed to be completely discharged at 298K. The realtive concentration of Zn^{2+} to Cu^{2+}, $\frac{\left(Zn^{2+}\right]}{[Cu^{2+}]}\Bigg)$ is

(A) 9.65×10^4

(B) antilog 24.08

(C) 37.3

(D) $10^{37.3}$

CORRECT ANSWER: B

SOLUTION:

The cell reaction is:

$$Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$$

when the cell is completely discharged,

$$E_{cell} = \frac{0.0591}{2}\log\frac{[Zn^{2+}]}{[Cu^{2+}]}$$

i.e.,

$$1.10 = \frac{0.591}{2}\log\frac{[Zn^{2+}]}{[Cu^{2+}]}$$

or $\frac{[Zn^{2+}]}{[Cu^{2+}]} = 37.3$ or $\frac{[Zn^{2+}]}{[Cu^{2+}]} = 10^{37.3}$

Q-45 - 16981685

The Gibbs energy for the decomposition of Al_2O^3 at 50C is as follows:

$\frac{2}{3}Al-(2)O_3 \rightarrow \frac{4}{3}Al=O_2, \Delta_rG$ = +966 kJ mol^(-)

$thepotentiald \Leftrightarrow erence$

$\neq ededf$ or e

$\leq ctrolyticreductionof$

Al_(2)O_(3)at500^()C` is at least:

(A) 4.5 V

(B) 3.0 V

(C) 2.5 V

(D) 5.0 V

CORRECT ANSWER: C

Q-46 - 12659332

Cosoder the reactopm: $(T = 298K)$

$Cl_2(g) + 2BR^-(aq)$

$\rightarrow 2Cl^-(aq) + Br_2(aq.)$

The emf of he cell, when

$[Cl^- = (Br_2] = [Br^-]$

$= 0.01M$ and Cl_2

gas is at 1 atm pressure, will be :

(E for the above reaction is $= 29$ volt).

(A) 0.54volt

(B) 0.35 volt

(C) 0.24 volt

(D) -0.29 volt

CORRECT ANSWER: B

SOLUTION:

$$E_{cell} = 0.29 - \frac{0.9059}{2}\log \cdot \frac{0.1 \times (0.01)^{\square}}{(0.01)^2 \times 1}$$

or $E_{cell} = 0.35$ volt.

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Q-47 - 12659266

Which one of the following will increase the voltage of the cell ?

$(T = 298K)$

$Sn + 2Ag^+ \rightarrow Sn^{2+} + 2Ag.$

(A) increase in the size of silver rod

(B) increase in the concentrationnnnn of Sn^{+2} ions

(C) increase in the concentrationnnnn of Ag^{+2} ions

(D) none of the above

CORRECT ANSWER: C

SOLUTION:

$$E_{cell} = \frac{E_{cell}^{-(0.059)}}{2}\log \cdot \frac{[Sn^{2+}]}{[Ag^{+}]^{2}}$$

Ag^{+} inceases, E_{cell} increases.

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Q-48 - 12659341

The potential of the Daniell cell,

$Zn\left|\begin{matrix}ZnSO_4\\(1M)\end{matrix}\right|\left|\begin{matrix}CuSO_4\\(1M)\end{matrix}\right|Cu$ was reported by Buckbee, Surdzial, and Metz at

$E^{=}1.1028 - 0.41 \times 10^{-3}T$
$+ 0.72 \times 10^{-5}T^{2}$
where T is the Celsius temperature. Calculate ΔS for the cell reaction at 235^{C},.

(A) -45.32

(B) -34.52

(C) -25.43

(D) -55.39

CORRECT ANSWER: D

SOLUTION:

$$\frac{dE^{\square}}{dT} = -0.647 \times 10^{-3} + 2 \times 0.72 \times 10^{-5}T$$

$$\Delta S = 2 \times 96500 \times \left[-0.647 \times 10^{-3} + 2 \times 0.7210^{-5} \times 250 \right]$$

$$= -55.39.$$

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Q-49 - 14158126

The standard emf of the cell,

$Cd(s)|CdCI_2(aq)(0.1M)||AgCI(s)|Ag(s)$

in which the cell reaction is

$Cd(s) + 2AgCI(s) \rightarrow 2Ag(s) + Cd^{2+}(aq)$

is $0.6915V$ at $0C$ and $0.6753V$ at $25C$. The ΔH of the reaction at

$25C$ is,-

(A) $-176kJ$

(B) $-234.7kJ$

(C) $+123.5kJ$

(D) $-167.26kJ$

CORRECT ANSWER: D

SOLUTION:

$\Delta G = \ -nFE = \Delta H$
$-T\Delta S$

$= \ -2F \times 0.695 =$
$\Delta H - 273\Delta S$
...(i)

$= \ -2F \times 0.6753 =$
$\Delta H - 298\Delta S$
..(ii)

Solve both equation.

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Q-50 - 74449896

Statement-1: When acidified zinc sulphate solution is electrolysed between zinc electrodes, it is zinc that is deposited at the cathode and no H_2 gas is evolved.

Statement-2: The electrode potential of zinc is more negative than that of hydrogen as the overvoltage for the H_2 evolution on zinc is quite large.

(A) Statement-1 is True, statement-2 is true, statement-2 is a correct explanation of statement-1

(B) Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation of statement-1.

(C) Statement-1 is true, statemet-2 is false

(D) Statement-1 is false, statement-2 is true

CORRECT ANSWER: A

SOLUTION:

Statement-2 is the correct explanation of statement-1

Q-51 - 12659351

The questions consist of two atatements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses :

Specifice conductiviy of an electrolytic solution decreases with dilution , whereas molar conductiviy increase with dilution .

Specific conductivirty is the conductance of a specific amount of the electorolyte, whereas molar conductivity is for 1 mole of the electrolyte.

(A) If both the assertion and reason are true but the reason is ont the correct explanation of assertion

(B) If both the assertion and reason are true but the

reason is not the correct explanation of assertion.

(C) If the assertion is true but reason is false.

(D) If assertion is false but reason is rue

CORRECT ANSWER: C

SOLUTION:

Correct Reason : Specific conductivity is the conductance of $1cm^3$ of the solution whereas molar conductivity is the conductance of a solution containing 1 mole of the electrolyte .

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Q-52 - 12659363

The questions consist of two atatements each, printed as Assertion and Reason. While answering these questions you are required to

choose any one of the following four responses :

Copper is dissolved at anode and deposited at cathode when Cu electrodes are used and electrolyted is $1MCuSO_4$ (aq) solution . SOP of Cu is less than SOP of waer and SRP of Cu is greate than SRP of water .

(A) If both the assertion and reason are true but the reason is ont the correct explanation of assertion

(B) If both the assertion and reason are true but the reason is not the correct explanation of assertion.

(C) If the assertion is true but reason is false.

(D) If assertion is false but reason is rue

CORRECT ANSWER: C

SOLUTION:

SOP fi Cu is greater than SOP of water $(H_2O \rightarrow O_2)$

and SRP of Cu si greater than SRP of water $(H_2O \rightarrow H_2)$.

Q-53 - 74449922

Assertion: The cell potential of mercury cell is 1.35 V which remains constant.

Reason: In mercury cell, the electrolyte is a paste of KOH and HgO.

(A) If both assertion and reason are true, and reason is the true explanation of the assertion

(B) if both assertion and reason are true, but reason is not the true explanation of the assertion.

(C) if assertion is true, but reason is false.

(D) If both assertion and reason are false.

CORRECT ANSWER: B

SOLUTION:

Correct explanation. The cell reaction,

$Zn + HgO \rightarrow ZnO$

$+ Hg$

does not involve any ion whose concentration may change (OH^- ions consumed in one half reaction are produced in the second half reaction).

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Q-54 - 12978638

The emf of a Daniell cell at $298K$ is E_1

$Zn|ZnSO_4(0.01M)|$

$|CuSO_4(1.0M)|Cu$

When the concentration of $ZNSO_4$ is $1.0M$ and that of $CuSO_4$ is

$0.01M$, the emf changed to E_2. What is the relationship between

E_1 and $E(2)$?

(A) $E_1 > E_2$

(B) $E_1 < E_2$

(C) $E_1 > E_2$

(D) $E_2 = 0 \neq E_1$

CORRECT ANSWER: A

SOLUTION:

For the Deniell cell, the cell reaction is

$Zn(s) + Cu^{2+}(aq.)$

$\Leftrightarrow Cu(s) + Zn^{2+}(aq$

$.)$

Applying Nernst equation, we have (at $2981C$)

$E_{\text{cell}} = E_{\text{cell}}$

$- \frac{0.0591V}{n} 10\text{g} \frac{C_{Zn^{2+}}}{C_{Zn^{2+}}}$

Since E_{cell} is positive, E_{cell} will decrease if we increase the magnitude of concentration ratio, i.e., $C_{Zn^{2+}} / C_{Cu^{2+}}$. Since $\frac{0.01M}{1.0M} < \frac{1.0M}{0.01M}$, we have $E_1 > E_2$.

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Q-55 - 60006275

An electric current is passed through silver nitrate solution using silver electrodes. 10.79g of silver was found to be deposited on the cathode if the same amount of electricity is passed through copper sulphate solution using copper electrodes, the weight of copper deposited on the cathode's

(A) 6.4 g

(B) 2.3 g

(C) 12.8 g

(D) 3.2 g

CORRECT ANSWER: D

SOLUTION:

Number of equivalents of silver formed=Number of

equivalents of copper formed

In $AgNO_{\#}$, Ag is in +1 oxidation state.

In $CuSO_4$, Cu is in +2 oxidation state.

Equivalet weight of $Ag = \frac{108}{1} = 108$

Equivalent weight of $Cu = \frac{63.6}{2} = 31.8$

$\frac{M_1}{M_2} = \frac{E_1}{E_2}, \frac{10.79}{M_{Cu}}$

$= \frac{108}{31.8}$

$M_{Cu} = \frac{10.79 \times 31.8}{108}$

$= 3.2gm$

Q-56 - 12978630

On the basis of the following E values, the stongest oxidizing agent is

$\left[Fe(CN)_6\right]^{4-}$

$\rightarrow \left[Fe(CN)_6\right]^{3-} + e^-, E$

$= -0.35V$

$Fe^{2+} \rightarrow Fe^{3+} + e^-, E =$

$-0.77V$

(A) $\left[Fe(CN)_6\right]^{4-}$

(B) Fe^{2+}

(C) Fe^{3+}

(D) $\left[Fe(CN)_6\right]^{2-}$

CORRECT ANSWER: C

SOLUTION:

Oxidizing agent oxidizes the other substance and gets reduced. Thus, higher the reduction potential, stronger the reducing agent:

$$\left[Fe(CN)_6\right]^{3-} + e^-$$
$$\rightarrow \left[Fe(CN)_6\right]^{4-}, , E$$
$$= 0.35V$$

$$Fe^{3+} + e^- \rightarrow Fe^{2+},$$
$$, E = 0.77V$$

Since

$$E_{Fe^{3+}/Fe^{2+}}$$
$$> E_{\left[Fe(CN)_6\right]^{3-}/\left[Fe(CN)_6\right]^{4-}},$$

Fe^{3+}

is the strongest oxidizing agent.

Q-57 - 30710302

4.5 g of aluminium (Atomic mass=27 amu) is deposited at cathode from Al^{3+} solution by a certain quantity of electric charge. The volume of hydrogen produced at STP from H^{+} ions in solution by the same quantity of electric charge will be :

(A) 44.8 L

(B) 22.4 L

(C) 11.2 L

(D) 5.6 L

CORRECT ANSWER: D

SOLUTION:

(d) Equivalent mass of $Al = 27/3 = 9$

No. of equiv. of Al

$$= \frac{\text{Mass of Al deposited}}{\text{Equivalent mass}}$$

$$= \frac{(4.5g)}{(9g \quad \text{equiv})}$$

$$= 0.5 \quad \text{equiv}$$

No. of equiv. of H_2 evolved $= 0.5$equiv.

Volume of H_2 evolved

$$= \frac{(0.5 \quad \text{equiv})}{(1.0 \quad \text{equiv})}$$

$$\times 11.2L$$

=5.6 L at S.T.P.

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Q-58 - 12659396

AN increases in equivalent conductivity of strong electrolyte with dilution is mainly due to .

(A) inccrease in ionic molility of ions

(B) $100\ \%$ ionisation of electrolyte at normal dilution

(C) increases in both i.e number of ions and ionic mobility

(D) increases in number of ions

CORRECT ANSWER: A

SOLUTION:

Follow Debyd Hilckel theory of strong electrolytes .

Q-59 - 60006244

Al_2O_3 is reduced by electrolysis at low potential and high currents. If 4.0×10^4 amperes of current is passed through molten Al_2O_3 for 6 hours, what mass of aluminium is produced (Assume 100%

current efficiency, At. Mass of Al=27g mol^{-1})

(A) $9.0 \times 10^3 g$

(B) $8.1 \times 10^4 g$

(C) $2.4 \times 10^5 g$

(D) $1.3 \times 10^4 g$

CORRECT ANSWER: B

SOLUTION:

Total current=

$4.0 \times 10^4 \times 6 \times 60 \times 60 C$

96500 C liberates 9g of Al (1g. Eq)

$\left(4 \times 10^4 \times 6 \times 60 \times 60\right) C$

liberates $8.1 \times 10^4 g$ of Al.

Q-60 - 52374091

Consider the change in oxidation state of bromine corresponding to different emf values as shown in the diagram below.

$$BrO_4^- \xrightarrow{1.82V} BrO_3^- \xrightarrow{1.5V} HBrO \xrightarrow{1.595V} Br_2 \xrightarrow{1.0652V} Br^-$$

Then the species undergoing disproportionation is

(A) Br_2

(B) BrO_4^-

(C) BrO_3^-

(D) $HBrO$

CORRECT ANSWER: D

SOLUTION:

Key Concept The reaction in which same species is oxidised as well as reduced is called disproportionation reaction. Firstly, calculate the value of E_{cell} of each species undergoing disproportionation reaction. The reaction whose E_{cell} value is positive will be feasible (spontaneous).

(i) Given,

$BrO_3^- \rightarrow HBrO,$

$E_{BrO_3^- / HBrO} = 1.5V$

$BrO_3^- \rightarrow BrO_4^-,$

$E_{BrO_3^- / BrO_4^-} = -1.82V$

$\therefore 2\overset{+5}{Br}O_3^- \rightarrow H\overset{+1}{B}rO + \overset{+7}{B}rO_4^-$

$$E_{\text{cell}} = E_{\text{red}} + E_{\otimes}$$

$$E_{BrO_3^- / HBrO}$$

$$+ E_{BrO_3^- / BrO_4^-}$$

$$= 1.5 - 1.82 =$$

$$- 0.32V$$

$$(ii) \overset{+1}{H}BrO \rightarrow \overset{0}{Br_2},$$

$$E_{HBr\,\frac{\emptyset}{B}\,r_2} = 1.595V$$

$$\overset{+1}{H}BrO \rightarrow \overset{+5}{Br}O_3^-,$$

$$E_{HBr\,\frac{\emptyset}{B}\,rO_3^-} = -1.5V$$

$$2\overset{+1}{H}BrO \rightarrow \overset{0}{Br_2}$$

$$+ \overset{+5}{Br}O_3^-$$

$$E_{\text{cell}} = E_{Br_2 / Br^-} +$$

$$+ E_{Br_2 / HBrO}$$

$= 1.0652 - 1.595 =$

$- 0.5298V$

$\therefore$ Among the given options, only HBrO undergoes disproportionation.