CHEMISTRY

JEE MAIN AND ADVANCED

ELECTROCHEMISTRY

Example

1. The conductivity of 0.25 M solution of KCI at 300 K is 0.0275 cm^{-1} calculate molar conductivity

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2. The resistance of conductivity cell containing 0.001 M -KCI solution at 298 K is 1500 ohm what is the cell constant if the conductivity of 0.001 M KCI solution at 298 K is $0.145 \times 10^{-} Scm^{-1}$?

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3. Calculate λ_m° for NH_4OH given that values of λ_m° for $Ba(OH)_2, BaCl_2$ and NH_4Cl as $523.28, 280.0$ and $129.8 Scm^2 mol^{-1}$ respectively

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4. The resistance of 0.01 MCH_3COOH solution is found to be 2220 ohm whne measured in a cell of cell constant 0.366 cm^{-1} Given that $\lambda_m^\circ\left(H^+\right)$ and $\lambda_m^\circ\left(cH_3COO^-\right)$ as 349.1 and 40.9 $cm^2 mol^{-1}$ calculate

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5. Calculate the standard cell potential of galvanic cell in which the following reaction takes place

$2Cr_s + 3Cd_{aq}^{+2} \rightarrow 2cr_{aq}^{+3} + 3Cd_s$

Given $E_{Cr^{+3}/Cr} = -0.74(V) E^\circ\_\left(Cd^{+2}/Cd\right) = -0.04(V)$

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6. Given standard electrode potentials

$K^{\oplus} \mid K = -2.93V, Ag^{\oplus} \mid Ag = 0.80V,$

$Hg^{2+} \mid Hg = 0.79V$

$Mg^{2+} \mid Mg = -2.37V, Cr^{3} \mid Cr = -0.74V$

Arrange these metals in their increasing order of reducing power.

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7. Calculate the ΔG° of the following reaction :-

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

$E_{Ag^{+}/Ag} = 0.8V \qquad E^{0}_{Fe^{+3}/Fe^{+2}} = 0.77V$

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8. Calculate the e.m.f. of the cell in which the following reaction takes place :

$Ni(s) + 2Ag^+(0.002M) \rightarrow Ni^{2+}(0.160M) + 2Ag(s)$

Given E°_{cell}=1.05 v

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9. Write expression of E_{cell} in each of the following cell

(i) $zn(s)|ZnSO_4(C_1M)||CuSO_4(C_2M)|Cu(s)$, E_{cell}

(ii) $Pt|H_2(P_1atm)||HCI(C_1M)|AgCI(s) \mid Ag$, E_{cell}

(iii) $Pt\left|Fe^{2+}(C_1M), Fe^{+3}(C_2M)\right||Ag^+(CM)|Ag$, E_{cell}

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10. How much charge is required for the following reductins?

(i) 1 mole of $AI^{+3}\text{to}AI$

(ii) 1 mole of $MnO_4^-\text{to}Mn^{+2}$

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11. A solution of $CuSO_4$ is electroysed for 10 minutes with a current of 1.5 amperes. What is the mass of copper deposited at the cathode ?

(Molar mass of $Cu = 63.5g/mol$)

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12. If a current of $0.5A$ flows through a metallic wire for 2 hours, then how many electrons would flow through the wire ?

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13. How much electricity in terms of Faraday is required to produce $40.0g$ of Al from molter Al_2O_3?

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14. Suggest two materials other than hydrogen that can be used as fuels in fuel cells.

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15. For H^+ and Na^+ the values of λ^∞ are 349.8 and 50.11. Calculate the mobilities of these ions and their velecities if they are in a cell in which the electrodes are 5 cm apart and to which a potential of 2 volts is applied.

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16. 3.8 of motlesn $SnCI_2$ is electroysed for some time using insert electrodes 0.238 g of Sn is deposited at cathode No substance is lost during the eletroysis find the ratio of weight of $SnCI_2$ and $SnCI_4$ after electroysis (Sn=11)

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17. A 10 ampere current is passed through 500 ml NaCI solution for 965 seconds Calculate pH solution at the end of electrolysis

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18. The plot between E_{cell} versus temperature (T in kelvin) has negative slope and positive intercept whe ΔH is _____ (megative/positive) and temperature coefficient is _____ (negative/positive)

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19. The $e.m.f$ of cell $Ag|AgI_{(s)}, 0.05MKI||0.05MAgNO_3|Ag$ is $0.788V$. Calculate solubility product of AgI.

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20. The standard reduction potential of the $Ag^{\oplus}|Ag$ electrode at $298K$ is $0.799V$. Given that for AgI, $K_{sp} = 8.7 \times 10^{-17}$, evaluate the potential of the $Ag^{\oplus}|Ag$ electrode in a saturated solution of AgI. Also calculate the standard reduction potential of the I^{c-}|AgI|Ag` electrode.

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Try Yourself

1. Conductivity of 0.12 M $CuSO_4$ solution at 298 K is $1.8 \times 10^{-2} Scm^{-1}$ Calculate its equivalent conductivty

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2. Each of the two platinum electrodes having area 64 mm^2 of a conducitvity cel are separted by 8mm The resistance of the cell cont aining 7.5×10^{-3} M KCI solution at 298 K is 1250 ohm calculate

(i) Cell constant

(ii) Conductivity and

(iii) Molar conductivity

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3. Molar conductivity of a weak acid HA at infinite dilution is 345.8 cm^2mol^- calculate molar conductivity of 0.05 M HA solution

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4. Calculate molar conducity of CH_3COOH at infinit e dilution if A_m° for NACI,HCI and CH_3COONA are 126,45,426.16 an 91 S cm^2mol^{-1} respectively

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5. Calculate degree of dissociation of 0.02 M acetic acid at 298 K given that

$mho_m(CH_3COOH) = 17.37 cm^2 mol^{-1}$, $\lambda_m^\circ(H+) = 345.8 S cm^2 mol^{-1}$, λ

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6. Can conductivity alone be used to compare the conductance of (i) metllic conductor (ii) Electrolytic conductors?

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7. Calculate the equilibrium constant for the reaction at 298K.

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

Given, $E^\circ_{Zn^{2+}/Zn} = -0.76V$ and $E^\circ_{Cu^{2+}/Cu} = +0.34V$

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8. Find the E°_{cell} for the following cel reaction

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

Given $E^\circ_{Zn/Zn^{+2}} = 0.76V$, $E^\circ_{Fe/Fe^{+2}} = +0.41V$

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9. The values of some of the standard electrode potential are

$E^{\circ}{}_{-}\left(Ag^{+}/Ag\right)=0.80V.\ E^{\circ}\left(Hg_{21+}^{2+}/Hg\right)=0.79VE^{\circ}{}_{-}\left(Cu^{+2}/Cu\right)$

What is the sequence of deposition of metals on the cathode ?

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10. Arrange the following metals in the order in whiCHM they displace eaCHM other from the solution of their salts. $Al, Cu, Fe, Mg,$ and $Zn.$

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11. Calculate the ΔG° and equilibrium constant of the rectoi at $27^{\circ}C$

$Mg+Cu^{+2}-Mg^{+2}+Cu$

$E^{\circ}_{Mg^{2+}/Mg}=-2.37V$

$E^{\circ}_{Cu^{2+}/Cu}=+0.34V$

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12. The E_{cell} of the reaction

$MnO_4^- + Fe^{+2} + H^+ \rightarrow Mn^+ + H_2O$ is 0.59 V at $25^\circ C$ The equilibrium constant for the reaction is

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13. Calculate the EMF of the cel

$Fe(s) + 2H^+(1M) \rightarrow Fe^{+2}(0.001M) + H_2(g)(1\text{atm})\left(\text{given: } E^\circ_{Fe^{2+}/Fe} =\right.$

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14. Find the emf of the cell

$Zn(s)\left|Zn^{+2}(0.01M)\right|KCI\text{saturated}\left|Zn^{+2}(1.0M)\right|Zn(s)$

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15. Represent the cell for the reaction

$$Mg_s + Cu_{aq}^{+2} \rightarrow Mg_{aq}^{+2} + Cu_s$$

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16. How does fuel cell operate

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17. How does cathodic dprotectin of iron operate

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18. How many faradays fo electricity are required to liberate two moles of hydrogen gas in electolysis of a solution

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19. What is meant by faraday 's constant?

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Assignment Section A Objective Type Questions One Option Is Correct

1. The conductance (G) is the reciprocal of

A. reciprocal of specific resistacne

B. reciprocal of resistance

C. reciprocal of current

D. reciporcal of concentration

Answer:

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2. The units of specific conductance (κ) are

A. ohm cm

B. $ohm^{-1}cm^{-1}$

C. $ohm^{-1}cm$

D. ohm cm^{-1}

Answer:

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3. The cell constant is given by

A. $\frac{k}{R}$

B. kR

C. kR^2

D. $\frac{R}{K}$

Answer:

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4. The ion which has the lowest ionic mobility is

A. Li^+

B. Na^+

C. K^+

D. Rb^+

Answer:

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5. Which of the following equation is correct in the context of kohlarusch 's law

A. $\lambda = \lambda^\circ - B\sqrt{C}$

B. $\lambda^\circ = \lambda - B\sqrt{C}$

C. $\lambda = \lambda^\circ - BC$

D. $\lambda = \lambda^{\circ} - BC^{1/3}$

Answer:

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6. Select the equivalent conductivity of $1.0MH_2SO_4$, if its conductivity is $0.26ohm^{-1}cm^{-1}$:

A. 260

B. 130

C. 65

D. 200

Answer:

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7. The resistance of $1N$ solution of acetic acid is $250ohm$, when measured in a cell of cell constant $1.15cm^{-1}$. The equivalent conductance (in $ohm^{-1}cm^2eq^{-1}$) of $1N$ acetic acid is

A. 46

B. 9.2

C. 18.4

D. 2.3

Answer:

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8. For a $0.01MCH_2COOH$ solution, $\wedge_m = 7.8\Omega^{-1}cm^2mol^{-1}$ if $\wedge_m^\circ = 390\Omega^{-1}cm^2mol^{-1}$. What is the degree of the dissociation (α) of acetic acid ?

A. 0.2

B. 0.48

C. 0.02

D. 0.05

Answer:

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9. Metals have conductivity in the order of $\left(ohm^{-1}cm^{-1}\right)$

A. 10^{12}

B. 10^{18}

C. 10^{2}

D. 10^{-6}

Answer:

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10. The equivalent conductance of $M/32$ solution of a weak monobasic acid is 8.0 and at infinite dilution is 400. The dissociation constant of this acid is :

A. 1.25×10^{-6}

B. 6.25×10^{-54}

C. 1.25×10^{-4}

D. 1.25×10^{-5}

Answer:

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11. The cel constant is geven by

A. $\frac{l}{a}$

B. $\frac{k}{R}$

C. $\frac{l}{aR}$

D. $\frac{a}{l}$

Answer:

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12. The quivalnet conductance of any electrolyte MA at infinite dilution $\wedge^{\circ}{}_{.(MA)}$ is equal (more than one correct answer)

A. $\wedge^{\circ}(MA) = \wedge^{\circ}(MCI) + \wedge^{2}(NaA) + \wedge^{\circ}(NaCI)$

B. $\wedge^{\circ}(MA) = \wedge^{\circ}(MCI) + \wedge^{2}(NaA) - \wedge^{\circ}(NaCI)$

C. $\wedge^{\circ}(MA) = \wedge^{\circ}(M) + \wedge^{\circ}(A) - \wedge(MCI)$

D. $\wedge^{\circ}(MA) = \wedge^{M} + \wedge^{\circ}(A) + \wedge^{\circ}(MA)$

Answer:

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13. Which of the following solution has the highes t equivalent conductance at infinite dilution ?

A. HCOOH

B. CH_3COOH

C. $PH - COOH$

D. HCl

Answer:

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14. The conductance of a solution of an electrolyte is equal to that of its specific conductance The cell constant of the conductivity cell is equal to

A. resistacne

B. faraday

C. zero

D. unity

Answer:

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15. The potential of hydrogen electrode having a pH=10 is

A. 0.0 V

B. $-0.0592V$

C. $-0.592V$

D. $+0.592V$

Answer:

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16. If a cell reaction is spontaneous, then :

A. E° negative

B. E° is zero

C. ΔG is negative

D. ΔG is positive

Answer:

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17. For a general electrochemical reaction of the type

$$\alpha A + bB \overset{ne^-}{\Longleftrightarrow} cC + dD$$

Nernst equation can be written as

A. $\Delta G = -\Delta G^\circ + RTIn\frac{[C]^c[D]^d}{[A]^a[B]^b}$

B. $E = E^\circ - \frac{RT}{nF}In\frac{[C]^c[D]^d}{[A]^a[B]^b}$

C. $E^\circ = E - \frac{RT}{nF}In\frac{[C]^c[D]^d}{[A]^a[B]^b}$

D. $\Delta G = -\Delta G^\circ - \frac{RT}{nF}In\frac{[C]^c[D]^d}{[A]^a[B]^b}$

Answer:

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18. Which of the following releations is correct ?

A. F=Wn

B. n=FQ

C. Q=nF

D. $Q = n^2F$

Answer:

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19. Which of the following represents the electrodes of the first kind ?

A. $Ag(s) \mid AgCI(s), CI$

B. $Fe^{+3}, Fe^{+2} \mid Pt$

C. $Zn(s) \mid Zn^{2+}$

D. $Pb(s) \mid PbSO_4(s), SO_4^{-2}$

Answer:

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20. Given that $E^{\circ}_{cu^{+2}/cu} = +0.34V$

$E^{\circ}_{Mg^{+2}/Mg} = -2.37V$ which of the following correct

A. Cu can oxidized H_2 into H^+

B. Mg^{+2} can be reduced by H_2

C. Cu can reduce an Mg^{+2} ion

D. Cu^{+2} can be reduced by H_2

Answer:

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21. Which of the following expression is correct?

A. $w_{\max} = \Delta G = -nFE$

B. $w_{\max} = \Delta G = -nFK_p$

C. $-w_{\max} = \Delta G = +nFE$

D. $w_{\max} = \Delta G = -nEK_p$

Answer:

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22. Ast equilibrium

A. the cell potential is positive

B. cel potential is zero

C. the cell potential is negative

D. a cell operates first reversibly and then irreversibly

Answer:

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23. Zn can displace :-

A. Mg^{2+} form its aqueoius solution

B. Cu^{2+} form its aqueoius solution

C. Na^{+} form its aqueous solution

D. AI^{+3} form its aqueous solution

Answer:

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24. Gas electrodes utilize the phenonmennon of adsorption of gas molecurs by

A. A solution

B. H^+ ions

C. metal

D. none of these

Answer:

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25. Calculate the emf of the following cell at $25^\circ C$ Ag(s) |Ag+ (10^(-3)M) | |Cu 2+ (10^(-1)M | Cu(s) :

A. $-0.828V$

B. $-0.412V$

C. 0.414 V

D. 0.0414 V

Answer:

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26. The value of the reaction quotient Q for the cell $Zn(s)\left|Zn^{2+}(0.01M)\right|Ah^{+}(0.05M)\mid Ag(s)$ is

A. 0.25

B. 8

C. 0.2

D. 4

Answer:

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27. Which of the following is the most powerful reducing agent ?

A. F^{-}

B. CI^{-}

C. Br^-

D. I^-

Answer:

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28. For $\frac{2}{3}AI_2O_3 \rightarrow \frac{4}{3}AI + O_2\Delta G = -966KJat500^\circ C$

The potential difference needed fo relectrolytic reduction of AI_2O_3 at $500^\circ C$ is at least

A. 2.5 V

B. 5.0 V

C. 4.5 V

D. 3.0 V

Answer:

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29. 240 coulombs of electricity is passed through a soluton of dilute suplhuric acid for 20 minutes the amperes of current produced is

A. 0.2 A

B. 2A

C. 0.5 A

D. 0.01 C

Answer:

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30. The electrochemical equivalent of zinc (atomic mass $= 65.4$) is

A. 3.4×10^{-4}

B. 3.4×10^{-5}

C. 3.4×10^{-2}

D. 3.4×10^{-3}

Answer:

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31. During the electrolysis of aqueous nitric acid solution using Pt electrodes

A. O_2 liberated at the cathode

B. N_2 is liberated at anode

C. O_2 is liberated at the anode

D. H_2 is liberated at the anode

Answer:

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32. How much time will be required for a current of 0.2 amp to deposit all the silver from 50 ml of a 0.1 N $AgNO_3$ solution?

A. 40 min 10 s

B. 50 min 40 s

C. 10 min 40 s

D. 40 min 50 s

Answer:

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33. How many faradys are required to reduce one mole of $Cr_2O_7^{-2} \rightarrow Cr^{+3}$?

A. 3

B. 6

C. 12

D. 9

Answer: A

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34. Calculate the qunatity of electricity(in colulombs) necessary to deposti 15.89 g of copper form a $CuSO_4$ solution (atomic weight of Cu 63.6)

A. 48250 colulombs

B. 96500 colulombs

C. 48220 colulombs

D. 12062 coulombs

Answer:

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35. The charge required to liberate 11.5 g sodium from fused sodium chloride is

A. 2.5 f

B. 0.5 f

C. 1.0 f

D. 9650 c

Answer:

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36. Electrolysis of an 1 M HCI solution liberates

A. O_2 gs at the anode

B. CI_2 gas at the anode

C. H_2 gas at the anode

D. O_2 gas at the cathode

Answer:

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37. A fused mixture of NaF and HF on electrolysis produces

A. Na at the cathode

B. F_2 at the cathode

C. F_2 at the anode

D. H_2 at the anode

Answer:

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38. Which of the folloiwng soluttion is used as na antirusting solution?

A. Na_2SO_4

B. Na_3PO_4

C. NaCl

D. Na_2S

Answer:

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39. In a hydrogen oxygen fuel cell 67.2 litre of H_2 at STP is used in 15 min what is the average current produced ?

A. 549.4 amp

B. 643.33 amp

C. 965 amp

D. 129.8 amp

Answer:

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40. In an electroplating experiment, m gm of silver is deposited when 4 ampere of current flows for 2 minute . The amount (in gm) of silver deposited by 6 ampere of current for 40 second will be

A. 4m

B. $\frac{m}{2}$

C. $\frac{4m}{3}$

D. 3m

Answer:

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41. How many coulombs are required for the oxidation of 1 mol of H_2O_2 ?

A. $9.65 \times 10^4 C$

B. 93000C

C. $1.93 \times 10^5 C$

D. $19.3 \times 10^2 C$

Answer:

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42. A quantity of electrcity required to reduce 12.3 g of nitrobenzene to aniline arising $50\,\%$ current efficiency is

A. 115800 C

B. 579000 C

C. 23100 C

D. 289500 C

Answer:

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43. The relatioon between equivalent weight and electrochemical equivalent (Z) is

A. $E = Z \times F$

B. $F = E \times Z$

C. both 1 & 2

D. none of these

Answer:

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Assignment Section B Objective Type Questions One Option Is Correct

1. During electrolysis of aquesos solution of a slat pH in the space near one of the elctrode is increased which of the following salt solution was electrolysed ?

A. KCl

B. $CuCl_2$

C. $Cu(NO_3)_2$

D. $CuSO_4$

Answer: A

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2. By how much will the potential of half-cell $Cu^{2+} \mid Cu$ change if the solution is diluted to 100 times at 298K?

A. Increases by 59 mV

B. Decreases by 59 mV

C. Increases by 29.5 mV

D. Decreases by 29.5 mV

Answer:

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3. The E_{cell} of the reaction

$MnO_4^- + Fe^{+2} + H^+ \rightarrow Mn^+ + H_2O$ is 0.59 V at $25^\circ C$ The equilibrium constant for the reaction is

A. 50

B. 10

C. 10^{50}

D. 10^5

Answer:

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4. A current of 2.0A passed for 5 hours through a molten metal salt deposits 22.2 g of metal (At. Wt. =177). The oxidation state of the metal in the metal salt is

A. $+1$

B. $+2$

C. $+3$

D. $+4$

Answer:

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5. Some indian scientists traied to use a metal x for electroplating iron pillar in mehrauli but they ended up with E_{cell} of the reaction to be negative they concluded that

A. Reaction is spontaneous

B. Reaction is non-spontaneous

C. Reaction is reversible

D. Reaction is non-reversible

Answer:

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6. The equilibrium constant for the reaction $Sr(s) + Mg^{+2}(aq) \rightarrow Sr^{+2}(aq) + Mg(s) \text{is} 2.69 \times 10^{12} at 25^{\circ} C \text{The} E^{\circ}$ for a cel made up of Sr / Sr^{+} and Mg^{+2} / Mg half cells is

A. $0.3667V$

B. $0.7346V$

C. $0.1836V$

D. 3.667

Answer:

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7. 0.5 faraday of electricity was required to deposit all the copper in 500 mL of a copper sulphate solution. What is the normality of the copper sulphate solution ?

A. 1M

B. 0.5 M

C. 0.25 M

D. 2.5 M

Answer:

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8. Cu^+ ion is not stable in aqueous solution because because of dispropotionation reaction. E° value of disproportionation of Cu^+ is

$\left[E^\circ_{Cu^{2+}/Cu^+} = +0.15V, E^\circ_{Cu^{2+}/Cu} = 0.34V\right]$

A. $+0.683V$

B. $-0.367V$

C. $0.754\ \text{V}$

D. $+0.3415V$

Answer:

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9. 25 gm of a metal is deposited on cathode during the electrolysis of metal nitrate solution by a current of 5 apm pssing for 4 hour if atomic weight of the metal is 100 The valency of metal in metal intrates is

A. 1

B. 2

C. 3

D. 4

Answer:

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10. A well stirred solution of 0.1 $MCuSO_4$ is electrolysed at $25^\circ C$ using platinum elctrodes with is 50% At the end of the duration what would be the concentratin of copper ions in the solution ?

A. 0.0856 M

B. 0.092 M

C. 0.0986 M

D. 0.1 M

Answer:

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11. 50 ML of a buffer of 1 M NH_3 and $1MNH_4^+$ are placed in two volatic cells separately A current of 3.0 amp is passed throught both cells for 10 min If elctrolusis of water takes place as

$2H_2O + O_{25} + 4e^- \rightarrow 4OH^-(R.H.S)$

$2H_2O \rightarrow 4H^+ + O_2 + 4e^-$ (L.H.S)

Then pHm of the

A. L.H.S. will increase

B. R.H.S. will increase

C. R.H.S will decrease

D. Both side will increase

Answer:

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12. The specific conductance of saturated solution os silver chloride is $k\left(ohm^{-1}cm^{-1}\right)$. The limiting ionic conductance of Ag^+ and Cl^- ions are x and y respectively. The solubility of AgCl in gram liter^{-1} is : (Molar mass of $AgCl = 143.5\text{g mol}^{-1}$)

A. $\frac{1000K}{x+y}$

B. $\left(\frac{1000K}{x+y}\right)^2$

C. $\frac{1000 \times 143.5 \times K}{x+y}$

D. $\left(\frac{10^3 \times 143.5 \times K}{x+y}\right)^2$

Answer:

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13. The limiting equivalent conductivity of $NaCl, KCl$ and KBr are $126.5, 150.0$ and $151.5 Scm^2 eq^{-1}$, respectively. The limiting equivalent ionic conductance for Br^- is $78 Scm^2 eq^{-1}$. The limiting equivalent ionic conductance for Na^+ ions would be :

A. 25.5

B. 52.5

C. 75.5

D. 57.5

Answer:

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14. The equivalent conductances of $CH_3COONa, HCI \text{and} NaCI$ at infinit e dilution are 91,426 an 126 S cm^2eq^{-1} respecitvely at 25^2C The equivalent consductance of 1 M CH_3CIIH solution is 19.55 S cm^2eq^{-1} The pH of solution is $(pK_a = 4.74)$

A. 5.3

B. 4.3

C. 2.3

D. 1.3

Answer:

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15. $E^{\circ}\_\left(Na^{+}/Na\right) = -2.71V E^{\circ}\_\left(Mg^{+2}/Mg\right) = -2.37V$

$E^{\circ}\_\left(Fe^{+2}/Fe\right) = -0.44V, E^{\circ}\_\left(Cr^{+}/Mg\right) = -0.41V$

Based on this date which is th poorest reducing agent?

A. Na^{+}

B. Mg^{+2} can be reduced by H_2

C. Fe^{+2}

D. Cr^{+3}

Answer:

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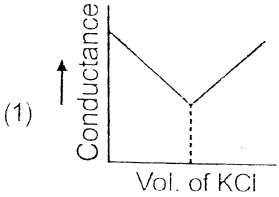
16. Which of following type of plot would you expect from the titratin of $AgNO_3$ against KCI solution?

A.



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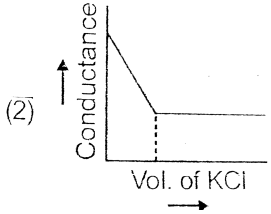
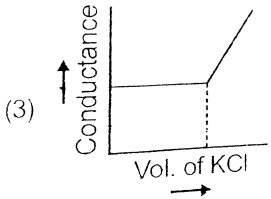
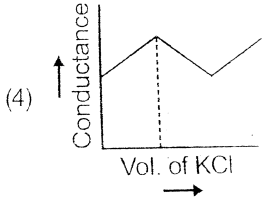


C.



D.



Answer: D

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17. The standard reduction potential of Cu^{2+}/Cu and Cu^{2+}/Cu^{+} are 0.337 and 0.153 respectively. The standard electrode potential of Cu^{+}/Cu half $-$ cell is

A. 0.521 V

B. 0.490 V

C. 0.321 V

D. 0.290 V

Answer:

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18. What is ΔG° for the following reaction

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

$E^{\circ}_{Cu^{+2}/Cu} = 0.34V\, E^{\circ}_{Ag^{+}/Ag} = 0.8V$

A. $-44.5kj$

B. 44.5 kj

C. $-89kj$

D. 89 kj

Answer:

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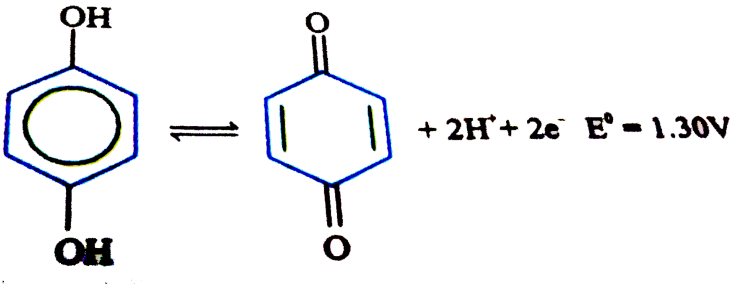
19. For the half cell



At pH = 3 electrode potential is

A. 1.48 v

B. 1.42 v

C. 1.36 v

D. 1.3 v

Answer:

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20. Rate of corrosion I maximum when

A. an electrolyte is present in water

B. metal has low S.R.P

C. metal has high standard oxidation potential

D. all of these

Answer:

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21.

$H_2(1\text{atm})|2.26MHCOOH||0.222MCH_3COOH|(1\text{atm})H_2K_a(HCOOH)$ =

Emf of the cell is (Neghlect the liquid liquid junction potential)

A. 0.0591 V

B. $-0.05491V$

C. 0.02955 V

D. $-0.02955V$

Answer:

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22. Given that

$NiO_2 + 4H^+ + 2e^- \rightarrow Ni^{2+} + 2H_2O, E^\circ = 1.678V$

$NiO_2 + 2H_2O + 2e^- \rightarrow Ni(OH) \rightarrow Ni(OH)_2 + 2OH^- E^\circ = -0.49V$

For the following reaction

$Ni(Oh)_2 + 2H^+ Ni^{2+} + 2H_2O$

Gibb 's freee energy change in kl mol^{-1} is

A. 418.424

B. -229.284

C. -418.424

D. 229.284

Answer:

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23. Zn amalgam is prepared by elctrtolysis of aqueous $ZnCI_2$ using 9 gram Hg cathode how much current is to be pased through $ZnCI_2$ solution for 1000 seconds to prepare a Zn amalagam with 25% by weight ? (atomic masss Zn =65.4 g)

A. 5.6 A

B. 7.2 A

C. 8.85 A

D. 11.2 A

Answer:

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24. Emf of cell given

$Ag(s), Ag(s)|KCI(aq)Hg_2CI_2(s)|Hg(s)$

s 0.05 V at 300 K and temperature coefficient of the cell is $3.34 \times 10^{-4} VK^{-1}$ calculate the change in thapy of the cell

A. 965

B. 9650

C. 96500

D. 96.5

Answer:

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25. Dissociation constant for $Ag(NH_3)_2^+$ into Ag^+ and NH_3 is 6×10^{-14}. Calculate E° for the half reaction.

$Ag(NH_3)_2^+ + e \rightarrow Ag + 2NH_3$

Given, $Ag^+ + e \rightarrow Ag$ has $E^\circ = 0.799V$

A. 0.019 v

B. 0.03 v

C. 0.014 v

D. 0.19 v

Answer:

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Assignment Section C Objective Type Questions More Than One Option Are Correct

1. 1.0 L of 0.1 M aqueous solution of KCI is electrolysed A current of 96.50 mA is passed through the solutoin for 10 hour which is /are correct ? (assume volume of soluto remains constant during electrolysis)

A. after electroysis molarity of K^+ is 0.064 nd molarity of CI^- is 0.0645

B. After electrolysis molarity of K^+ is 0.1 and molarity of CI^- is 0.064

C. AtS.T.P 202 ml of CI_2 porduced when current efficiency is 50%

D. At S.TgtP 606 ml of total gases produced when current efficiency is 50%

Answer:

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2. 1000 ml 2 M $CuSO_2$ is electolyses by a current of 9.65 amp for 2 hour which is //are correct?

A. afterelectrolysis remaining concentration of Cu^{+2} is 1.64 M using Cu electrode

B. After electrolysis remaining concentratin of Cu^{+2} is 1.64 M using Pt electrode

C. When remaining coincentration of Cu^{+2} is 1822 then volume of solution si reduced by 10% using Pt electrode

D. 17.15 gm copper deposit when current efficiency is 75% using copper electrode

Answer:

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3. For the electrolysis of $CuSO_4$ solution which is /are correct ?

A. cathode reaction : $2H^+ + 2e \rightarrow H_2$ suing pt electrode

B. cathode reaction : $Cu^{+2} + 2e^- \rightarrow Cu$ using cu electrode

C. anode reaction $Cu \rightarrow Cu^{+2} + 2e^-$ suing Cu electrode

D. anode reaction $Cu \rightarrow Cu^{+2} + 2e^-$ using pt electrode

Answer:

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4. Calculate the equilibrium constant for the reaction at 298K.

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

Given, $E^{\circ}_{Zn^{2+}/Zn} = -0.76V$ and $E^{\circ}_{Cu^{2+}/Cu} = +0.34V$

A. after electrolysis Zn^{+2} concentration is 1.36 M

B. after electrolysis Cu^{+2} concentration is 0.64 M

C. after electrolysis Zn^{+2} concentration is 0.82 M

D. after electrolysis Cu^{+2} concentration is 1.18 M

Answer:

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5. Which compounds have maximum conductivity ?

A. 0.2 M $\left[Cr(NH_3)_3CI_3\right]$

B. 0.15 M $\left[Cr(NH_3)_4CI_2\right]CI$

C. 0.1 M $\left[Cr(NH_3)_5CI\right]CI_2$

D. 0.07 M $\left[Cr(NH_3)_6CI_3\right.$

Answer:

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6. Molar conductance of 2 MH_2A acid is 10 S cm^2mol^{-1} Molar conductance of H_2A at infinit e dilution is 400 S cm^2mol^{-1} which statement is/are correct?

A. degreee of dissociation is 2.5 % and pH of solutoin is 1.3

B. Degree of dissociation is 4 and pH of solution is 1.4

C. Dissociation constatn of H_2A is $6.24 \times x10^{-5}$

D. Dissociation constant of H_2A is 2.56×10^{-4}

Answer:

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7. For electrolyte A_xB_y which is /are not correct relation between molar conductivity ($\wedge_M$) and equivalent conductivity ($\wedge_{eq}$)

A. $\wedge_M = xy \wedge_{eq}$

B. $\wedge_{eq} = xy \wedge_M$

C. $x \wedge_M = y \wedge_{eq}$

D. $y \wedge_M = x \wedge_{eq}$

Answer:

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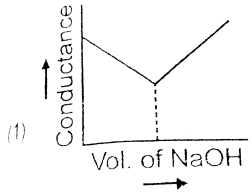
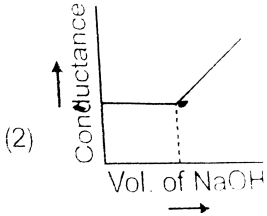
8. Which of the following plots will obtained for a conductomeric titration of strong acid against a weak base?

A.



B.



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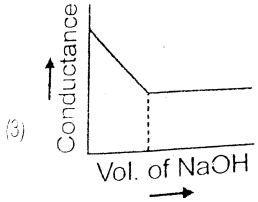
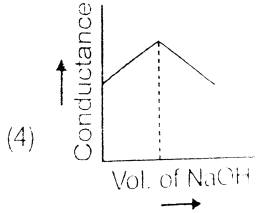


D.



Answer:

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9. Which of the statement (s) is / are correct?

A. if temperature coefficient is greater than zero cell reaction is endothermic

B. if temperature coefficent is less than zero cell reaction is endothermic

C. if temperature coefficient is less than zero cell rection is spontaneous

D. If E_{cell} negative then `DeltaG negatvie and cell reaction is spontaneous

Answer: Both A and C

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10. The standard electromitive force of the cell

$Fe|Fe^{2+}(aq)||Cd^{2+}|Cd$ is 0.0372 V

The temperature coefficient of e.m.f. is $-0.125VK^{-1}$. Calculate the quantities $\triangle G$, $\triangle H^{\circ}$ and $\triangle S^{\circ}$ at $25^{\circ}C$

A. $\Delta G^{\circ} = 7.18Kj, \Delta H^{\circ} = -7196.43kj$

B. $\Delta G^{\circ} = -7.18kj, \Delta H^{2} = 7196.43kj$

C. $\Delta G^{\circ} = -7.18kj \Delta H^{\circ} = -7196.43kj$

D. $\Delta S^{\circ} = -24.125kjk^{-1}$ reaction spontaneous

Answer:

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11. Which statement (s) is/are correct about corrosion?

A. Due to corrosion $FeO.xH_2O$ formed

B. Due to corrosion $Fe_2O_3.xH_2O$ formed `

C. presence of air and moisture increses the rate of corrosion

D. magneisum is used a s scrifical anode

Answer:

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12. Which statement (s) is /are correct ?

A. in electrochemical cell electron flow from anode to cathode

B. In electrochemical cell anode is negative electrode and cathode is positive electrode

C. oxidation take place at anode and reduction take place at cathode in elctrochemical celll

D. In electrolytic cell oxidation take pace at cathode and reduction take place at anode

Answer:

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13. Which of the following cells give the cell potential to their standard values ?

A. $Zn|Zn^{2+}(0.01M)|\ |\ H_3O^+(0.1M)(H_2(1atm), pt$

B. $Cu|Cu^{2+}(0.25M)||Ag^+(0.5M)|Ag$

C. $Cd|Cd^{2+}(0.01M)||pH = 1|H_2(1atm), pt$

D. $Zn|Zn^{2+}(0.1M)||pH = 1|\ |\ = H_2(1atm), pt$

Answer: A ,B and C

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14. Which solution (s) becomes(s) more acidic after the electrolysis using inert electrodes ?

A. NaCI solution

B. $CuSO_4$ solution

C. $AgNO_3$ solution

D. Na_2SO_4 solution

Answer:

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15. When a lead storage battery is discharged

A. H_2SO_4 is coinsumed

B. Pb is formed

C. SO_2 is evolved

D. $PbSO_4$ is consumed

Answer:

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Assignment Section D Linked Comprehension Type Questions

1. The ionic mobility for some ions in water at 298 K is given as following

ions	ionic mobility
K^+	$7.616x10^{-4}$
Ca^{+2}	$12.33 \times 10x^{-4}$
Br^-	8.09×10^{-4}
SO_{45}^{-2}	16.58×10^{-4}

The equivalent conductance of $CaSO_4$ at infinite dilution is

A. 279

B. 28.51×10^{-4}

C. 31.82×10^{-4}

D. 306

Answer:

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2. Given below are a set of half-cell reactions (acidic medium) along with their $E_\circ$ with respect to normal hydrogen electrode values. Using the data obtain the correct explanation to question given below.

$I_2 + 2e^- \rightarrow 2I^-$ $E^\circ = 0.54$

$Cl_2 + 2e^- \rightarrow 2Cl^-$ $E^\circ = 1.36$

$Mn^{2+} + e^- \rightarrow Mn^{2+}$ $E^\circ = 1.50$

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

$O_2 + 4H^+ + 4e^- \rightarrow 2H_2O$ $E^\circ = 1.23$

Among the following, identify the correct statement:

A. CI^- is oxidised by O_2

B. Fe^{+2} is oixdised by iodine

C. Mn^{+2} is oxidised by chorine

D. I^- is oxidised by chlorine

Answer:

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3. Given below are a set of half-cell reactions (acidic medium) along with their $E_\circ$ with respect to normal hydrogen electrode values. Using the data obtain the correct explanation to question given below.

$I_2 + 2e^- \rightarrow 2I^-$ $E^\circ = 0.54$

$Cl_2 + 2e^- \rightarrow 2Cl^-$ $E^\circ = 1.36$

$Mn^{2+} + e^- \rightarrow Mn^{2+}$ $E^\circ = 1.50$

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

$O_2 + 4H^+ + 4e^- \rightarrow 2H_2O$ $E^\circ = 1.23$

While Fe^{2+} is stable, Mn^{3+} is not stable in acid solution because:

A. O_2 oxidises $Mn^{+2} \rightarrow Mn^{+3}$

B. O_2 oxidises both $Mn^{+2} \rightarrow Mn^{+3}$ and $Fe^{+3} \rightarrow Fe^{+3}$

C. Fe^{+3} oxidises $H_2O \rightarrow O_2$

D. Mn^{+3} oxidises $H_2O \rightarrow O_2$

Answer:

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4. Redox reactions play a vital role in chemistry and biology. The values of standard redox potential (E°) of two half-cells reactions decide which way the reaction is expected to proceed. A simple example is a Daniell cell in which zince goes into solution and copper gets deposited. Given below are set of half-cell reactions (acidic medium) along with their E° in V

with respect to normal hydrogen electrode values.

$l_2 + 2e^- \rightarrow 2l^-$ $E^\circ = 0.54$

$Cl_2 + 2e^- \rightarrow 2Cl^-$ $E^\circ = 1.36$

$Mn^{3+} + e^- \rightarrow Mn^{2+}$ $E^2 = 1.50$

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

$O_2 + 4H^+ + 4e^- \rightarrow 2H_2O$ $E^\circ = 1.23$

while Fe^{3+} is stable, Mn^{3+} is not stable in acid solution because :

A. I^-

B. CI^-

C. Mn^{+2} is oxidised by chorine

D. Fe^{+2}

Answer:

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Assignment Section E Assertion Reason Type Questions

1. STATEMENT 1 : The molar conductivity of strong electrolyte decreases with increases in concentration and

STATEMENT 2 AT high concentration migration of ion is slow

A. Statement 1 is ture , Statement 2 is true Statement 2 is correct explanation for Statement 1

B. Statement 1 is true Statement 2 is ture Statement 2 is NOT a correct explantion for Statement 1

C. Statement 1 is true statement 2 is ture

D. Statement 1 is false Statement 2 is true

Answer: A

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2. STATEMENT 1: Electroysis of molten $PbBr$ using plantinum electrodes produces $Br_2 atanode$ and $STATEMENT 2:$ Br_(2)` is obtained in gaseous state at room temperature

A. Statement 1 is ture , Statement 2 is true Statement 2 is correct explanation for Statement 2

B. Statement 1 is true Statement 2 is ture Statement 2 is NOT a correct explantion for Statement 2

C. Statement 1 is true statement 2 is ture

D. Statement 1 is false Statement 2 is true

Answer: C

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3. STATEMENT 1 : For the concentration cell $Zn(s)\left|Zn_{C_2}^{+2}(aq)\right|Zn$ for spontaneous cell reaction $C_1 < C_2$ and

STATEMENT 2 For concentration cell $E_{cell} = \frac{RT}{nF}\frac{\log_e(C_2)}{C_1}$ for spontaneous rection $E_{cell} = +ve \to c_2 > c_1$

A. Statement 1 is ture , Statement 2 is true Statement 2 is correct explanation for Statement 3

B. Statement 1 is true Statement 2 is ture Statement 2 is NOT a correct explantion for Statement 3

C. Statement 1 is true statement 2 is ture

D. Statement 1 is false Statement 2 is true

Answer: A

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4. STATEMENT 1 A Saturated solution of KCI is used to make salt bridge in concentration cells and

STATEMENT 2 Mobility of K^- and CI^- are nearly same

A. Statement 1 is ture , Statement 2 is true Statement 2 is correct explanation for Statement 4

B. Statement 1 is true Statement 2 is ture Statement 2 is NOT a correct explantion for Statement 4

C. Statement 1 is true statement 2 is ture

D. Statement 1 is false Statement 2 is true

Answer: A

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5. STATEMENT 1 The motar conductance of weak electrolyte at infinite dilutin is equal to sum of molar conductanced of cation and anion and STATEMENT 2 Kohlraushc 's law is applicable for both strong and weak electrolytes

A. Statement 1 is ture , Statement 2 is true Statement 2 is correct explanation for Statement 5

B. Statement 1 is true Statement 2 is ture Statement 2 is NOT a correct explantion for Statement 5

C. Statement 1 is true statement 2 is ture

D. Statement 1 is false Statement 2 is true

Answer: C

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6. STATEMENT 1 when a copper wire is placed in a solution of $AgNO_3$ the solution blue colour and

STATEMENT 2 E°_{RP} of Cu^{+2}/Cu is lesser than $E^{\circ}_{Ag^{+}/Ag}$

A. Statement 1 is ture , Statement 2 is true Statement 2 is correct explanation for Statement 6

B. Statement 1 is true Statement 2 is ture Statement 2 is NOT a correct explantion for Statement 6

C. Statement 1 is true statement 2 is ture

D. Statement 1 is false Statement 2 is true

Answer: A

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7. STATEMENT 1 $\Delta G^{\circ} = -nFE^{\circ}$ and

STATE/MENT 2: E° should be positive fo ra spontaneous reaction

A. Statement 1 is ture , Statement 2 is true Statement 2 is correct explanation for Statement 7

B. Statement 1 is true Statement 2 is ture Statement 2 is NOT a correct explantion for Statement 7

C. Statement 1 is true statement 2 is ture

D. Statement 1 is false Statement 2 is true

Answer: B

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8. STATEMENT 1 : one coulomb of electric charge deposits the weight that is equal to electrochemical equivalent of substance and

STATEMENT 2 One faraday deposits one mole of substance

A. Statement 1 is ture , Statement 2 is true Statement 2 is correct explanation for Statement 8

B. Statement 1 is true Statement 2 is ture Statement 2 is NOT a correct explantion for Statement 8

C. Statement 1 is true statement 2 is ture

D. Statement 1 is false Statement 2 is true

Answer: C

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9. Statement-I: If an aqueous solution of $NaCI$ is electrolysed, the product obtained at the cathode is H_2 gas and no Na.

Because Statement-II: Gases are liberated faster than the metals.

A. Statement 1 is ture , Statement 2 is true Statement 2 is correct explanation for Statement 9

B. Statement 1 is true Statement 2 is ture Statement 2 is NOT a correct explantion for Statement 9

C. Statement 1 is true statement 2 is ture

D. Statement 1 is false Statement 2 is true

Answer: C

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10. Statement-I: $H_2 + O_2$ fuel cell gives a constant voltage throughout its life.

Because Statement-II: In this fuel cell, H_2 reacts with OH^- ions yet the overall concentration of OH^- ions does not change.

A. Statement 1 is ture , Statement 2 is true Statement 2 is correct explanation for Statement 10

B. Statement 1 is true Statement 2 is ture Statement 2 is NOT a correct explantion for Statement 10

C. Statement 1 is true statement 2 is ture

D. Statement 1 is false Statement 2 is true

Answer: A

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Assignment Section F Matrix Match Type Questions

1. Match the following

	column I (complex)		column II (Molar conductivity Ω^{-1})
(A)	$COCI_3.6NH_3$	(p)	97
(B)	$COCI_3.5NH_3$	(q)	0
(C)	$COCI_3.4NH_3$	(r)	404
(D)	$COCI_3.3NH_3$	(s)	229

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2. Match the following

	column I		column II
(A)	$Au\|AuCI_4^-\|Li^+ \mid Li$	(p)	Spontaneous cell
(B)	$Zn\|Zn^{2+}\|\|AI^{3+}\|AI$	(q)	$Nonspon\tan eouscell$
(C)	$Cu\|Cu^{2+}\|\|Cu^{2+}\|CuC_1 > C_2$	(r)	$E^\circ_{cell} < 0$
(D)	$Ni\|Ni^{2+}\| \mid Cu^{2+}Cu$	(s)	$E^\circ_{cell} < 0$

A. A(p,q) ,B(q,r) ,C(s,p), D(q,r,s)

B. A(r,s), B(q,r), C(q,r,p),D(q)

C. A(q,s),B(q),s),C(q),D(p,r,t)

D. A(r,s), B(q,s), C(r,s,p), D(r,q)

Answer: A(q,s),B(q),s),C(q),D(p,r,t)

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3. Match the following

	column I		column II
(A)	Leclanche cell	(p)	primary battery
(B)	Car battery	(q)	secondary battery
(C)	Fuel cell	(r)	converts energy of combustion ofH_2, CH_4etc into
(D)	NICAD cell	(s)	Anode : $Zn \rightarrow Zn^{2+} + 2e^-$
			Cathode : $MnO_2 + NH_4^+ + e^- \rightarrow Mn(OH) +$
		(t)	$Cd(s) + 2Ni(OH)_3(s) \rightarrow CdO(s) + 2Ni(OH)$

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4. Match the following

	column I	
(A)	$\wedge_c$ versus $\sqrt{c}$ (for KCI solution)	(p)
(B)	$E_{Cu^{2+}/Cu}$ versus $\log_{10}$ _ $(10)\left[Cu^{2+}\right]\left(f \text{ or } Cu^{2+} + 2e^- \rightarrow Cu\right)$	(q)
(C)	E_{cell} versus temperature (in K) (temperature coefficent lt 0)	(r)
(D)	$E_{Au/Au^{3+}}$ Versus $\log_{10}\left[Au^{3+}\right]$ (for $Au \rightarrow Au^{3+} + 3e^-$)	(s)
		(t)

A. A(r,s,q),B(q,r,p),C(s,t), D(p,r,s)

B. A(p,q),B(p,s,t),C(q,r) ,D(t,r,p)

C. A(q,r),B(r,s,t),C(p,s,t), D(q,r,p)

D. A(r,s,t),B(p,r,t),C(r,s,t),D(q,s,t)

Answer: A(r,s,t),B(p,r,t),C(r,s,t),D(q,s,t)

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Assignment Section G Integer Answer Type Question

1. The half cell potentials of a halfcell $A^{(x+n)+}, A^{x+} \mid pt$ were found to be as follows :

$\%$of reduced form	24.4	48.8
Half cell potential (V)	0.101	0.115

Determinwe the value of n.

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2. The Standard reduction potential values, $E^{\circ}\left(Bi^{3+}/Bi\right)$ and $E^{\circ}\left(Cu^{2+}/Cu\right)$ are 0.226 V and 0.344 V respectively. A mxiture of salt of bismut and copper at unit concentration each is electrolysed at $25^{\circ}C$ to

what value can $[Cu^{2+}]$ be brought down before bismuth starts to deposit, in electrolysis.

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3. A cell is containing two H electrode The negative electrode is in contact with a solution of pH =6 eMF of the cell is 0.118 V at $25^{\circ}C$ calculate conc of H ions ?

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4. How many faradays of eletricity is required to deoposit 2 mot copper from $CuSO_4$ solution

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5. A current of 3 ampere has to be passed through a solution of $AgNO_3$ solution to coat a metal surface of $80cm^2$ with 0.005 mm thick layer for a

duration of approximately y^3 second what is the value of y?

Density of Ag is 10.5 g/cm^3

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6. The cost at 5 paise/KWH of operating an electric motor for 8 hours which takes 15 amp at $110V$ is

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Assignment Section H Multiple True False Type Question

1. STATEMENT 1 Corrosion of iron is essentially an electrochemical phenomenon

STATEMENT 2 : Corrosion reaction at anode : $2Fe(s) \rightarrow 2Fe^{3+} + 6e^-$

STATEMENT 3: Corrosion reaction at cathode : $O_2(g) + 4H^+(aq) + 4e^- \rightarrow 2_2O(l)$

A. TTT

B. TFT

C. TFF

D. FFT

Answer: B

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2. STATEMENT 1 Using koihlrausch's law of independent migration of ions it is possible to calculate $\wedge^{\circ}$ for anyelectrolyte form the λ° of individual ions

STATEMENT 2 : Limiting molar molar conductivity of na electrolyte can be repersented as the sum of hte individual contribution of the anion and cation of hte electrolyte

STATEMENT 3: When concentration appraches zero molar conductivity reaches the lowest limit

A. TTF

B. TTT

C. FTT

D. FFT

Answer:

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3. STATEMENT 1 Electrolysis of acidulated water using inert electrodes results in evolution of gases at cathode and anode both

STATEMNET 2 AI^{3+} discharges more readily than Zn^{2+} at cathode

STATEMENT 3 In an electrolytic cell cation move towards anode

A. FTT

B. TTT

C. FTF

D. TFF

Answer: D

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Assignment Section I Subjective Type Question

1. 500 ml $CuSO_4$ solution was electrolysed using a current of 2 amp (efficiency =75%) for 60 min calculate the pH of solution at the end of electrolysis (Assume initial pH=7)

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2. A constant current flowed for 30 min throiugh a solution of Kl oxidising the iodide ion to ioidine At the end of experiment the iodine eas titrated with 10ml 0.075 M $Na_2S_2O_3$ solution calculate the strength of current

A. 0.082 A

B. 0.632 A

C. 0.999 A

D. 0.0402 A

Answer: 0.0402 A

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3. A direct current of 3.0 amp (efficiency 75%) was passed through 400 ml 0.2 M $Fe_2(SO_4)_3$ solution for a period of 60 min The resulting solution in cathode chamber was nalaysed by titrating against acidic $KMnO_4$ solution 20 ml of $KMnO_4$ required to reach the end point determine the molarity of $KMbO_2$ solution

A. 0.84 M

B. 0.23 M

C. 0.42 M

D. 0.69 M

Answer: 0.84 M

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4. Hydrogen peroxide can be prepared by successive reaction:

$2NH_4HSO_4 \rightarrow H_2 + (NH_4)_2S_2O_8$

$(NH_4)_2S_2O_8 + 2H_2O \rightarrow 2NH_4HSO_4 + H_2O_2$

The first reaction is an electrolytic reaction the second is steam distillation. what amount ofcurrent would have to be used in first reaction to produce enough intermediate to yield 100g pure H_2O_2 per hour ? Assume $50\ \%$ anode current efficiency.

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5. During dischare of a lead storage battery the denisty of suphuric acid fell form 1.3 to 1.15 gm/ml sulphuric acid of denisity 1.3 gm/ml is 40 % H_2SO_4 by wt and that of denisty 1.15 gm/ml is 20% by wt the battery hold amp hours for which the battery must have been used

$Pb + SO_4^{-2} \rightarrow PbSO_4 + 2e^-$ (discharging)

$PbO_2 + 4H^+ + SO_4^{2-} + 2e \rightarrow PnSO_4 + 2H_2O$ (discharging)

A. 265.04 AH

B. 317.3 AH

C. 289.56 AH

D. 385.12 AH

Answer: 317.3 AH

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6. A dilute solution NaCI was placed between two Pt electrodes 8 cm apart across which a potential of 4V was appied how far would the Na^+ move in 2.5 hour? Ionic conductance of Na^+ at infinit e dikution at $25^\circ C$ is 50.11 mho cm^2

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7. The resistacnce of a conductivity cell filled with 0.01 N KCI at 25° was found to be 500 Ω The specific conductance of 0.01 N KCI at 25° is $1.41 \times 10^{-3}\Omega^{-}cm^{-1}$ The resistance of same cell filled with $0.3NZnSO_4$

at $25^\circ C$ was found to be 69 Ω Calculate the cell constant equivalent and molar conductivityes of $ZnSO_4$ solution

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8. The equivalent conductance of 0.1 N of H_3PO_4 at $18^{f\circ}C$ is 96.5 $\Omega^{-1}cm^2eq^{-1}$ if $\wedge^\circ_{HCI} = 378.3,\ \wedge^\circ_{NaCI} = 109,\ \wedge^\circ_{NaH_2PO_4} = 70\Omega^{-1}cm^{-2}eq^{-1}$ respectively calculate the degree of dissoication and dissoication constant for the reaction

$H_3PO_4 \to H_2PO_4$

A. $\alpha = 0.668, K = 6.63 \times 10^{-2}$

B. $\alpha = 0.389, K = 5.53 \times 10^{-2}$

C. $\alpha = 0.2844, K = 1.13 \times 10^{-2}$

D. $\alpha = 0.2587, K = 2.56 \times 10^{-2}$

Answer: C

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9.

$Ag(s)|AgCI(\text{saturated salt})KCI(C=0.025)||KNO_3, AgNO_3(C=0.2)|A$

The emf of above cell is 0.43 V

(a) write down the cell reactio

(b) calculate the solubility product of AgCI

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10. $Pt|H_2(1^-)H^+|\ |\ KCI(1.0M\text{saturated}|Hg_2CI_2|Hg$ was used to measure the pH of 0.05 M acetic acid in 0.04 M CH_3COONa Calculate the cell potential

$K_{CH_3COOH}=1.8\times10^{-5}, E_{Hg_2CI_2/Hg,Cr}=0.28V$

A. 0.695 V

B. 0.83 V

C. 0.96 V

D. 0.555 V

Answer: 0.555 V

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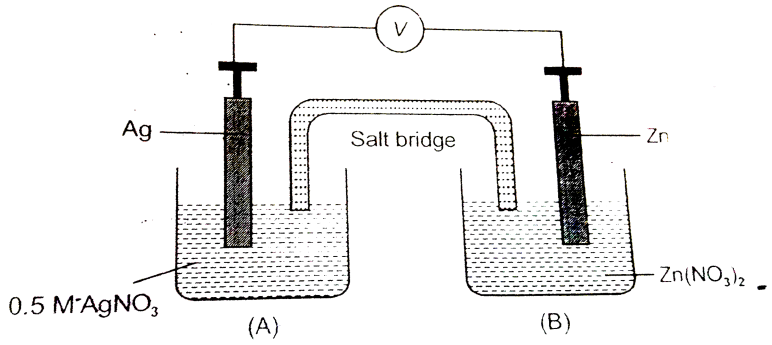
11.



(a) If the cell emp is -1.58 V what is the concentrtion of $Zn^{+2}(b)\text{If}NH_3$ added to half cel A how emf of cel will change ?

$E^{\circ}_{Ag^{+}/Ag} = 0.8V$, $E^{\circ}_{Zn^{+23}/Zn} = 0.76V$ Antilog (0.6768) =1.4768

A. (a) $\left[Zn^{+2}\right] = 0.381M$ (b) emp decrease

B. (a) $\left[Zn^{+2}\right] = 0.0241M$ (b) emp increase

C. (a) $\left[Zn^{+2}\right] = 0.589M$ (b) emp increase

D. (a) $\left[Zn^{+2}\right] = 0.562M$ (b) emp decrease

Answer: (a) $\left[Zn^{+2}\right] = 0.0241M$ **(b) emp increase**

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12. $E^{\circ}_{Cu^{+2}/Cu} = 0.34V, E^{\circ}_{Zn/Zn^{+}} = 0.76V$

A cell formed by the conbination of Cu and Zn

(a) when $CuSO_4$ is added to Cu^{+2} compartment what is the effect on emf of cell

(b) when ZNH_3 is added to Cu^{+2} compartment what is the effect on emf of cell

(c) When $ZnSO_4$ is added to Zn^{+2} compartment is the effect on emf of cell

(d) When Zn^{+2} is diluted what is the effect on emf of cell ?

A. (a) increases

(b) decreases

(c) decreases

(d) increases

B. (a) decreases

(b) decreases

(c) increases

(d) increases

C. (a) increases

(b) decreases

(c) decreases

(d) decreases

D. (a) increases

(b) increases

(c) decreases

(d) increases

Answer: (a) increases
(b) decreases
(c) decreases
(d) increases

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Assignment Section J Aakash Challengers Questions

1. The standard potential of the following cell is 0.23 V at $15^{\circ}C$ and $0.21V$ at $35^{\circ}C.Pt|H_2|HCl(aq)|Agcl(s)|g(s)$

(i) write the cell reaction .

(ii) Calculate ΔH° and ΔS° for the cell reaction by assuming that these quantities remain unchanged in the range $15^{\circ}C$ to $35^{\circ}C$.

(iii) calculate the solubility of $AgCl$ in water at $25^{\circ}C$.

Give , the standard reduction potential of the $\left(Ag^{+}(aq)/Ag(s)\right.$ is 0.80 V at $25^{\circ}C$.

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2. Calculate ΔG_r° of the following reaction

$Ag^{+}(aq)+cI^{-}(aq)\rightarrow AgCI(s)$

Given

$\Delta G_r^{\circ}(AgCI) \rightarrow 109kJMol^{-1}$

$\Delta G_r^{\circ}\left(CI^{-}\right) \rightarrow -129kJMol^{-1}$

$\Delta G_r^{\circ}\left(ag^{-}\right) \rightarrow 77kJMol^{-1}$

(i)Represent the above reaction in form of a cel

(ii) Calcualte E° of the cel

(iii) Find $\log_{10} K_{sp}$ of AgCI

A. $68kjmol^{-}$

(i) $Ag(s)\left|Ag^{+}||AgCI||CI^{-}\right|CI_2, pt$

(ii) $E_{cell}^{\circ} = 0.89V$

(iii)$\log_{10} K_{sp} = -10$

B. $82kjmol^{-}$

(i) $Ag(s)\left|Ag^{+}||AgCI||CI^{-}\right|CI_2, pt$

(ii) $E_{cell}^{\circ} = 0.59V$

(iii)$\log_{10} K_{sp} = -8$

C. $57kjmol^{-}$

(i) $Ag(s)\left|Ag^{+}||AgCI||CI^{-}\right|CI_2, pt$

(ii) $E^{\circ}_{cell} = 0.59V$

(iii)$\log_{10} K_{sp} = -10$

D. $69kjmol^{-}$

(i) $Ag(s)\left|Ag^{+}\right|\left|AgCI\right|\left|CI^{-}\right|CI_2, pt$

(ii) $E^{\circ}_{cell} = 0.52V$

(iii)$\log_{10} K_{sp} = -4$

Answer: $57kjmol^{-}$

(i) $Ag(s)\left|Ag^{+}\right|\left|AgCI\right|\left|CI^{-}\right|CI_2, pt$

(ii) $E^{\circ}_{cell} = 0.59V$

(iii)$\log_{10} K_{sp} = -10$

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3. The following electrochemical cell has been set up.

$Pt_{(I)}\left|Fe^{3+}, Fe^{2+}(c=1)\right|\left|Ce^{4+}, Ce^{3+}(c=1)\right|Pt_{(II)}$

$E_{Fe^{3+}/Fe^{2+}} = 0.77V$ and $E^{\circ}_{Ce^{4+}/Ce^{3+}} = 1.61V$

If an ammeter is connected between the two platinum electrode, predict

the direction of flow of current. Will the current increase or decrease with time ?

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4. An excess of liquid mercury is added to an acidicfied solution of $1.0 \times 10^{-3} MFe^{3+}$. It is found that 5% of Fe^{3+} remains at equilibrium at $25^{\circ} C$. Calculate $E^{c-}_{.(Hg_2^{2+}|Hg)}$ assuming that the only reaction that occurs is

$2Hg + 2Fe^{3+} \rightarrow Hg_2^{2+} + 2Fe^{2+}$

Given : $E^{c-}_{.(Fe^{3+}|Fe^{2+})} = 0.77V$

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5. Chromium metal can be plated out from an acidic solution containing CrO_3 according to the following equation.

$CrO_3(aq) + 6H^+(aq) + 6e^- \rightarrow Cr(s) + 3H_2O$

Calculate (i) How many grams of chromium will be plated out by 24,000 C

and (ii) How long will it take to plate out 1.5g of chromium by using 12.5 current?

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6. The specific conductivity of a saturated solution of silver chloride is $2.30 \times 10^{-6} mhocm^{-1}$ at $25^{\circ}C$. Calculate the solubility of silver chloride at $25^{\circ}C$ if $\lambda_{Ag^+} = 61.9 mhocm^2 mol^{-1}$ and $\lambda_{Cl^-} = 76.3 mhocm^2 mol^{-1}$

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7. Neglecting the liquid-liquid junction potential, calculate the emf of the following cell at $25^{\circ}C$

$H_2(1atm)|0.5MHCOOH||1MCH_3COOH|(1atm)H_2$

K_a for $HCOOH$ and CH_3COOH are 1.77×10^{-4} and 1.8×10^{-5} respectively.

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8. For the cell reaction,

$Mg|Mg^{2+}(aq.)||Ag^{+}(aq.)|Ag$

calculate the equilibrium constant at $25^{\circ}C$ and maximum work that can be obtained by operating the cell.

$E^{\circ}_{Mg^{2+}/Mg} = -2.37$ volt and $E^{\circ}_{Ag^{+}/Ag} = +0.80$ volt

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9. Answer, whether under standard conditions, the following reactions are possible or not:

(i) Will copper reduce Ag^{+} to Ag? Given $E^{\circ}_{Ag^{+}/Ag} = 0.799$ volt, $E^{\circ}_{Cu^{2+}/Cu} = -0.337$ volt

(ii) Will Fe^{3+} be reduced to Fe^{2+} by Sn^{2+} ions? given

$Fe^{3+} \mid Fe^{2+} = 0.771$ volt

$Sn^{2+} \mid Sn^{4+} = -0.250$ volt

(iii) would you use a silver spon to stir a solution of $Cu(NO_3)_2$?

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10. A weak monobasic acid is 5% dissociated in 0.01 mol dm^{-3} solution. The limiting molar conductivity at infinite dilution is $4.00 \times 10^{-2} ohm^{-1} m^2 mol^{-1}$. Calculate the conductivity of a 0.05 mol dm^{-3} solution of the acid.

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