CHEMISTRY

PHYSICAL, INORGANIC, AND ORGANIC CHEMISTRY

ELECTRO CHEMISTRY

Physical Chemitry Electrochemistry

1. A very thin copper plate is electro - plated with gold using gold chloride in HCl. The current was passed for $20min$. And the increase in the weight of the plate was found to be $2g$. [$Au = 197$]. The current passed was -

A. $0.816 amp$

B. $1.632 amp$

C. $2.448 amp$

D. $3.264 amp$

Answer: 3

2. The conductivity of 0.1N NaOH solution is $0.022 Scm^{-1}$. To this solution equal volume of $0.1 NHCl$ solution is added which results into decrease of conductivity of solution to $0.0055 Scm^{-1}$. The equivalent conductivity of $NaCl$ solution in Scm^2 equiv^{-1} is :

A. 0.011

B. 110

C. 0.0055

D. 55.0

Answer: 2

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3. Two aqueous solutions A and B containing solute $CuSO_4$ and $NaBr$ respectively were electrolysed using platinum electrodes. The pH of the resultins will show a/an:

A. Increase in both the solutions

B. Decrease in both the solutions

C. Increases in A and decrease in B

D. Decrease in A and increase in B

Answer: 4

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4. What is the time (in sec) required for depositing all the silver present in $125mL$ of $1MAgNO_3$ solution by passing a current of $241.25A$? $(1F = 96500C)$

A. 10

B. 50

C. 1000

D. 100

Answer: 2

5. The products formed when an aqueous solution of $NaBr$ is electrolysed in a cell having inert electrodes are :

    A. Na and Br_2

    B. Na and O_2

    C. H_2, Br_2 and $NaOH$

    D. H_2 and O_2

Answer: 3

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6. $E_{Al^{3+}/Al}^{\cdot} = -1.66V$ and K_{SP} of $Al(OH)_3 = 1.0 \times 10^{-33}$.
Reduction potential of the above couple at $pH = 14$ is :
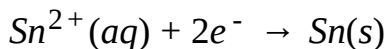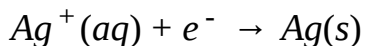
    A. $-2.31V$

B. +2.31

C. -1.01V

D. +1.01V

Answer: 1

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7. The standard electrode potential for the reactions,

$Ag^+(aq) + e^- \rightarrow Ag(s)$

$Sn^{2+}(aq) + 2e^- \rightarrow Sn(s)$

at $25\,^\circ C$ are 0.80 volt and -0.14 volt, respectively. The *emf* of

the cell $Sn\left|Sn^{2+}(1M)\right| \mid Ag^+(1M)Ag$ is :

A. 0.66volt

B. 0.80 volt

C. 1.08 volt

D. 0.94 volt

Answer: 4

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8. 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. $0.184V$

B. $0.827V$

C. $0.521V$

D. $0.490V$

Answer: 3

9. $E^0_{Fe^{3+}/Fe^{+2}} = +0.77V$, $E^0_{Fe^{+3}/Fe} = 0.036V$. What is $E^0_{Fe/Fe^{+2}}$

and is Fe^{+2} stable to disproportionation in aqueous solution

under standard conditions

    A. $+0.44V$, yes

    B. $-0.44V$, No

    C. $+0.44V$, No

    D. $-0.44V$, yes

Answer: 1

10. $E°$ for $F_2 + 2e^- \Leftrightarrow 2F^-$ is 2.8V, $E°$ for $\frac{1}{2}F + e^- = F^-$ is -

A. 2.8V

B. 1.4V

C. -2.8V

D. -1.4V

Answer: 1

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11. Given that $E_{Fe^{2+}/Fe} = -0.44V$, $E°_{Fe^{3+}/Fe^{2+}} = 0.77V$ if Fe^{2+}, Fe^{3+} and Fe solid are kept together then
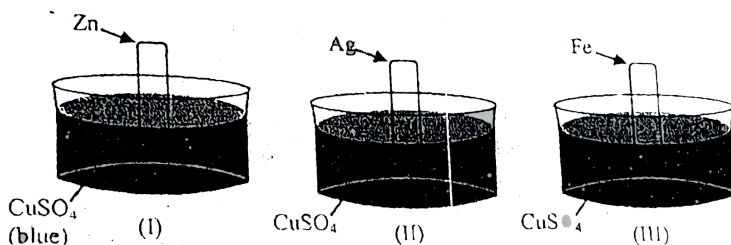
A. Fe^{3+} Increase

B. Fe^{3+} decrease

C. Fe^{2+}/Fe^{3+} remains unchanged

D. Fe^{2+} decreases

Answer: B

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12. Consider following sets :

CuSO₄ (blue)   (I)   CuSO₄   (II)   CuS   (III)

Blue colour solution changes to colourless (or fades) in

A. I, II, III

B. I, II

C. II, III

D. I, III

Answer: 4

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13. $E^{\circ}_{Al^{3+}/Al} = -1.66V$ and K_{SP} of $Al(OH)_3 = 1.0 \times 10^{-33}$.

Reduction potential of the above couple at $pH = 14$ is :

A. $-2.31V$

B. $+2.31$

C. $-1.01V$

D. $+1.01V$

Answer: A

14. The $E_{Call}^{\circ} = 1.18V$ for $Zn(s)\big|\big|Zn^{+2}(1M)\big|\big|Cu^{+2}(1M) \mid Cu(s)$. The value of x if when excess granulated zinc is added to $1MCu^{+2}$ solution the $\big[Cu^{+2}\big]_{eq}$ becomes $10^{-x}M$ is $\left(T = 298K, \dfrac{2.303RT}{F} = 0.059\right)$
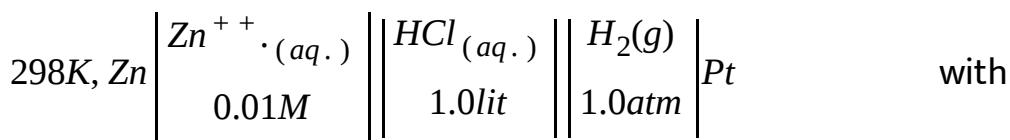
A. 40

B. 30

C. 20

D. 10

Answer: 1

15. You are given the followin cell at

$$298K, Zn \left| \begin{array}{c} Zn^{++} \cdot (aq.) \\ 0.01M \end{array} \right| \left| \begin{array}{c} HCl (aq.) \\ 1.0lit \end{array} \right| \left| \begin{array}{c} H_2(g) \\ 1.0atm \end{array} \right| Pt \quad \text{with}$$

$E_{cell} = 0.701$ and $E^0_{Zn^{2+}/Zn} = -0.76V$. Which of the following amounts of $NaOH$(equivalent weight $= 40$) will just make the pH of cathodic compartment to be equal to 7.0:

A. $0.4g$

B. $4g$

C. $10g$

D. $2g$

Answer: A

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16. What must be concentration of Ag^+ in an aqueous solution containing $Cu^{2+} = 1.0M$ so that bot the metals can be deposited on the cathode simultaneously. Given that $E^0_{Cu/Cu^{2+}} = -0.34V$ and $E^0_{Ag^+/Ag} = 0.812V, T = 298K$

A. nearly $10^{-19}M$

B. $10^{-12}M$

C. $10^{-8}M$

D. nearly $10^{-16}M$

Answer: 3

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17. Consider the cell potentials $E^0_{Mg^{2+}|Mg} = -2.37V$ and $E^0_{Fe^{3+}|Fe} = -0.04V$

The best reducing agent would be

A. Mg^{2+}

B. Fe^{3+} decrease

C. Mg

D. Fe

Answer: 3

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18. Use the standard potentials of the couples $Au^+/Au(+1.69V)$, $Au^{3+}/Au(+1.40V)$, and $Fe^{3+}/Fe^{2+}(+0.77V)$ to calculate the equilibrium constnat for the reaction $2Fe^{2+}(aq) + Au^{3+}(aq) \leftrightarrow 2Fe^{3+}(aq) + Au^+(aq)$
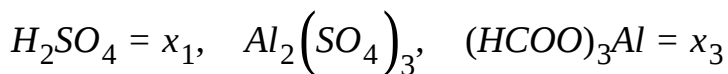
A. 4×10^{16}

B. 8×10^8

C. 4×10^{-16}

D. 1×10^{14}

Answer: 1

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19. Calculate molar conductivity of $HCOOH$ at infinite dilution, if equivalent conductivity of

$H_2SO_4 = x_1$, $Al_2\left(SO_4\right)_3$, $(HCOO)_3Al = x_3$

A. $6x_1 - 3x_2 + 6x_3$

B. $\dfrac{x_1 - x_2 + x_3}{6}$

C. $x_1 - x_2 + x_3$

D. $\dfrac{6x_1 - 3x_2 + 6x_3}{6}$

Answer: 3

20. Salts of A (atomic weight 7), B (atomic weight 27) and C (atomic weight 48) were electolysed under idential condition using the same quanity of electricity. It was found that when 2.1g of A was deposited, the weights of B and C deposited were 2.7 and 7.2g. The valencies A, B and Crespectively:

A. 3,1 and 2

B. 1,3 and 2

C. 3,1 and 3

D. 2,3 and 2

Answer: 2

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21. Given that $E^0_{Fe^{3+} \mid Fe}$ and $E^0_{Fe^{2+} \mid Fe}$ are $-36V$ and $-0.439V$, respectively . The value of $E^0_{Fe^{3+}, Fe^{2+} \mid Pt}$ would be

A. (- 0.36 - 0.439)V

B. (- 0.36 + 0.439)V

C. [3(- 0.36) + 2(- 0.439)]V

D. [3(- 0.36) - 2(- 0.439)]V

Answer: 4

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22. The standard oxidation potential for Mn^{3+} ion acid solution are $Mn^{2+} \xrightarrow{-1.5V} Mn^{3+} \xrightarrow{-1.0V} MnO_2$. Is the reaction $2Mn^{3+} + 2H_2O \rightarrow Mn^{2+} + MnO_2 + 4H^+$ spontaneous under conditions of unit activity ? What is the change in free energy ?

A. spontaneous ,$-48250J$

B. nonspontaneous, $+48250J$

C. no change in free energy

D. spontaneous , $-96500J$

Answer: 1

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23. Fe is reacted with $1.0MHCI.$ $E°$ for Fe/Fe^{2+} $=$ $+0.34$ volt. The correct observation (s) regarding this reaction is/are:

A. Fe will not oxidised to Fe^{2+}

B. Fe^{2+} will be reduced to Fe

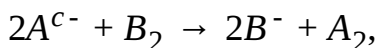C. since $e.\,m.\,f.$ is positive , the half cell reaction shall occur

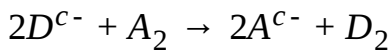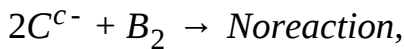D. since $e.\,m.\,f.$ is positive, the half cell reaction shall not occur

Answer: 3

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24. The following facts are availabel :

$2A^{C-} + B_2 \rightarrow 2B^- + A_2,$

$$2C^{C-} + B_2 \rightarrow No\,reaction,$$

$$2D^{C-} + A_2 \rightarrow 2A^{C-} + D_2$$

Which of the following statement is correct ?

A. $E^0_{C^-\,|\,C_2} > E^0_{B^-\,|\,B_2} > E^0_{A^-\,|\,A_2} > E^0_{D^-\,|\,D_2}$

B. $E^0_{C^-\,|\,C_2} < E^0_{B^-\,|\,B_2} < E^0_{A^-\,|\,A_2} < E^0_{D^-\,|\,D_2}$

C. $E^0_{C^-\,|\,C_2} < E^0_{B^-\,|\,B_2} > E^0_{A^-\,|\,A_2} > E^0_{D^-\,|\,D_2}$

D. $E^0_{C^-\,|\,C_2} > E^0_{B^-\,|\,B_2} < E^0_{A^-\,|\,A_2} < E^0_{D^-\,|\,D_2}$

Answer: 3

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25. $E^0_{H^+/H_2} = 0.00V,$ then $E^0_{D^+/D_2}$ at $25\,°C$ will be

A. $0.00V$

B. more than zero V

C. less than zero V

D. car not be predicted

Answer: 3

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26. When an electric current is passed through acidified water, $112ml$ of H_2 gas at NTP is collected at the cathode is 965 seconds. The current passed in amperes is
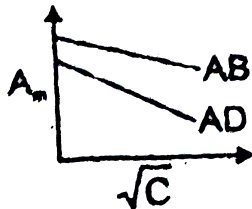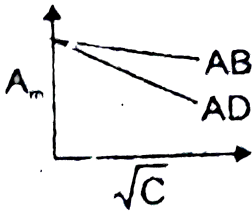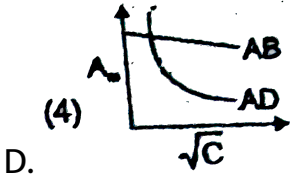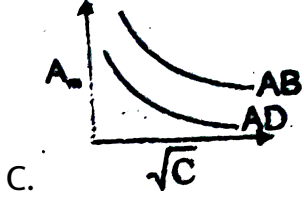
A. 1

B. 0.5

C. 0.1

D. 2

Answer: 2

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27. Which of the following graphs are correct for strgon electrolyte AD and AB.

A.

B.

C.

(4)

D.

Answer: 2

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28. Number of electrons lost during electrolysis of $0.14g$ of N^{-3} is $-\left(N_0 = 1 \text{ Avagadro number}\right)$

A. 0.03

B. $0.03N_0$

C. $0.015N_0$

D. $\dfrac{0.01}{2N_0}$

Answer: 2

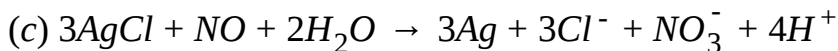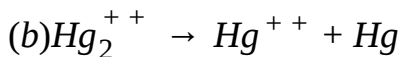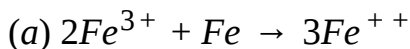▶ **Watch Video Solution**

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29. Aqueous solution of $NaCl$ containing a small amount of $MeOH$ (methyl orange) is electrolysed using Pt - electrodes . The color of the solution after some time will .

A. remains yellow

B. change from yellow to colorless

C. change from yellow to red

D. remain red

Answer: 1

30. The spontaneous redox reaction/s among the follow is/ are

(a) $2Fe^{3+} + Fe \rightarrow 3Fe^{++}$

(b) $Hg_2^{++} \rightarrow Hg^{++} + Hg$

(c) $3AgCl + NO + 2H_2O \rightarrow 3Ag + 3Cl^- + NO_3^- + 4H^+$

Given that

$E^{\cdot}_{Fe(+++)/Fe^{++}} = 0.77V$ $E^{\cdot}_{Fe^{++}/Fe} = -0.44V$

$E^{\cdot}_{Hg^{\pm}/Hg} = 0.85V$ $E^{\cdot}_{Hg^{++}/Hg_2} = 0.92V$

$E^{\cdot}_{AgCl/Ag} = 0.22V$ $E^{\cdot}_{NO_3/NO} = 0.96V$
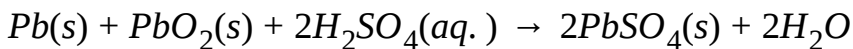
   A. a

   B. a, b, c

   C. a, b

D. a, c

Answer: 1

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31. When lead acid accumulator (battery) is dischanged , following reaction takes place.

$Pb(s) + PbO_2(s) + 2H_2SO_4(aq.\ ) \rightarrow 2PbSO_4(s) + 2H_2O$

If 1.25 ampere current is drawn for a period of 1930 minutes, mass of H_2SO_4 consumed is

A. $196g$

B. $49g$

C. $98g$

D. $147g$

Answer: 4

32. 0.169 gram of copper is deposited on the cathode by a current of 32 milliamperes passing for 5 hours through a solution of copper sulphate. Determing the current efficiency. [Atomic weight of Cu = 63.6]
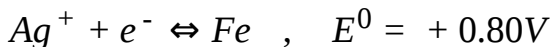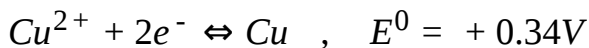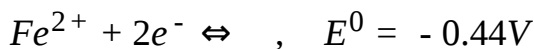
A. 98 %

B. 78 %

C. 69 %

D. 89 %

Answer: 4

33. Using the standard electrode potential values given below, decide which of the statements, I, II, III and IV are correct. Choose the right answer from (1)(2) and (4)

$Fe^{2+} + 2e^- \Leftrightarrow$, $E^0 = -0.44V$

$Cu^{2+} + 2e^- \Leftrightarrow Cu$, $E^0 = +0.34V$

$Ag^+ + e^- \Leftrightarrow Fe$, $E^0 = +0.80V$

I. Copper can displace iron from $FeSO_4$ solution.

II. Iron can displace copper from $CuSO_4$ solution

III. Silver can displace copper from $CuSO_4$ solution

IV. Iron can displace silver from $AgNO_3$ solution.
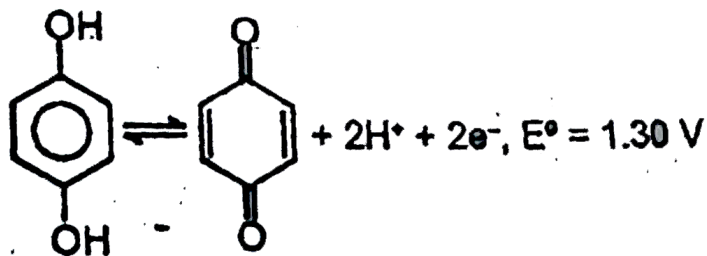
    A. I and II

    B. II and III

    C. II and IV

D. I and IV

Answer: 3

34. For the half cell

At $pH = 2$. Electrod potential is :

A. $1.36V$

B. $1.30V$

C. $1.42V$

D. 1.20V

Answer: 3

35. In the electrolysis of an aqueous potassium sulphate solution, the Ph of the solution in the space near an electrode increased. Which pole of the current source is the electrode connected to ?

A. The positive pole

B. Could be either polde

C. The negative pole

D. Cannot be determined

Answer: C

36. How many electrons are there in one coulomb of electricity?

A. 6.023×10^{23}

B. 1.64×10^{-34}

C. 6.24×10^{18}

D. 6.24×10^{-34}

Answer: 3

37. Electrolysis can be used to determine atomic masses. A current of $0.550A$ deposits $0.55g$ of a certain metal in 100 minutes. Calculates the atomic mass of the metal if $n = 3$:

A. 100

B. 45

C. 48.25

D. 144.75

Answer: 3

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38. Calculate the current (in Ma) required to deposit $0.195g$ of platinum metal in 5.0 hours from a solution of $PtCl_6^{2-}$:(

Atomic weight : $pt = 195$)

A. 310

B. 31

C. 21.44

D. 5.26

Answer: 3

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39. An aqueous solution containing $1M$ each of $Au^{3+}, Cu^{2+}, Ag^+, Li^+$ is being electrolysed by using inert electrodes. The value of standard potentials are :

$E^{\circ}_{Ag^+/Ag} = 0.80V, E^{\circ}_{Cu^+/Cu} = 0.34V$ and

$E^{\circ}_{Ag^{+3}/Au} = 1.50, E^{\circ}_{Li^+/Li} = -3.03V$

will increasing voltage, the sequence of deposition of metals on the cathode will be :

A. Li, Cu, Ag, Au

B. Cu, Ag, Au

C. Au, Ag, Cu

D. Au, Ag, Cu, Li

Answer: 3

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40. Based on the following information arrange four metals A, B, C and D in order of decreasing ability to act as reducing agents :

(I) Only A,B, and C react with $1MHCl$ to give $H_2(g)$

(II) When C is added to solutions of the other metal ions, metallic B and D are formed

(III) Metal C dows not reduced A^{n+}

A. $C > A > B > D$

B. $C > A > D > B$

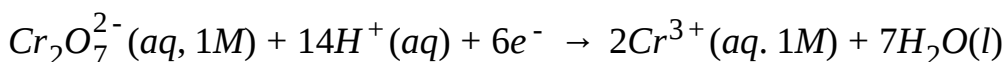C. $A > C > D > B$

D. $A > C > B > D$

Answer: 4

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41. The standard electrode potential for the following reaction is $+1.33V$. What is the potential at $pH = 2.0$?

$$Cr_2O_7^{2-}(aq, 1M) + 14H^+(aq) + 6e^- \rightarrow 2Cr^{3+}(aq. 1M) + 7H_2O(l)$$

A. $+1.820V$

B. $+1.990V$

C. $+1.608V$

D. $+1.0542V$

Answer: 4

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42. $Ag|AgCl|Cl^- (C_2)||Cl^- (C_1)||AgCl | Ag$ for this cell ΔG is negative if :

A. $C_1 = C_2$

B. $C_1 > C_2$

C. $C_2 > C_1$

D. Both (1) and (3)

Answer: 2

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43. Resistance of a decimolar solution between two electrodes 0.02 meter apart and $0.0004m^2$ in area was fround to be $50 ohm$. Specific conductance (k) is :

A. $0.1S - m^{-1}$

B. $1S - m^{-1}$

C. $10S - m^{-1}$

D. $4 \times 10^{-4}S - m^{-1}$

Answer: 2

44. Equivalent conductivity of $Fe_2(SO_4)_3$ is relative to molar conductivity by the expression :

A. $\Lambda_{eq} = \Lambda_m$

B. $\Lambda_{eq} = \lambda_m/3$

C. $\Lambda_{eq} = 3\Lambda_m$

D. $\Lambda_{eq} = \Lambda_m/6$

Answer: 4

45. 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. 128

B. 125

C. 49

D. 50

Answer: 4

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46. The resistance of $0.1N$ solution of formic acid is $200 ohm$ and cell constant is $2.0 cm^{-1}$. The equivalent conductivity (in $Scm^2 eq^{-1}$) of $0.1N$ formic acid is :

A. 100

B. 10

C. 1

D. none of these

Answer: 1

47. Given that ($ohm^{-1}cm^2eq^{-1}$), $T = 298K$

λ_E^{∞} for$Ba(OH)_2$ = 228.8

λ_E^{∞} for$BaCl_2$ = 120.3

$\lambda_E^{\infty} f$ or NH_4Cl = 129.8

specific conductance

for $0.2NNH_4OH$ solution

is$4.766 \times 10^{-4}ohm^{-1}cm^{-1}$

then value of pH of the solution of NH_4OH will be nearly

A. 9.2

B. 11.3

C. 12.1

D. 7.9

Answer: 2

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48. Na - amalgam is prepared by electrolysis of $NaCl$ solution using liquid Hg as cathode . How long should the current of $10 amp$. Is passed to produce $10 \% \, Na$ - Hg on a cathode of $10 gm Hg$. (atomic mass of $Na = 23$).

A. 7.77min

B. 9.44 min.

C. 5.24min.

D. 11.39min.

Answer: 1

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49. Find the thickness of the electro silver if the surface area over which deposition occurred was $100cm^2$ and a current of $0.2A$ flowed for $1hr$ with the cathode efficiency of 80% . Density of $Ag = 10g/cc(Ag = 108)$.

    A. $6.4 \times 10^{-5}cm$

    B. $6.4 \times 10^{-4}cm$

    C. $6.4 \times 10^{-7}cm$
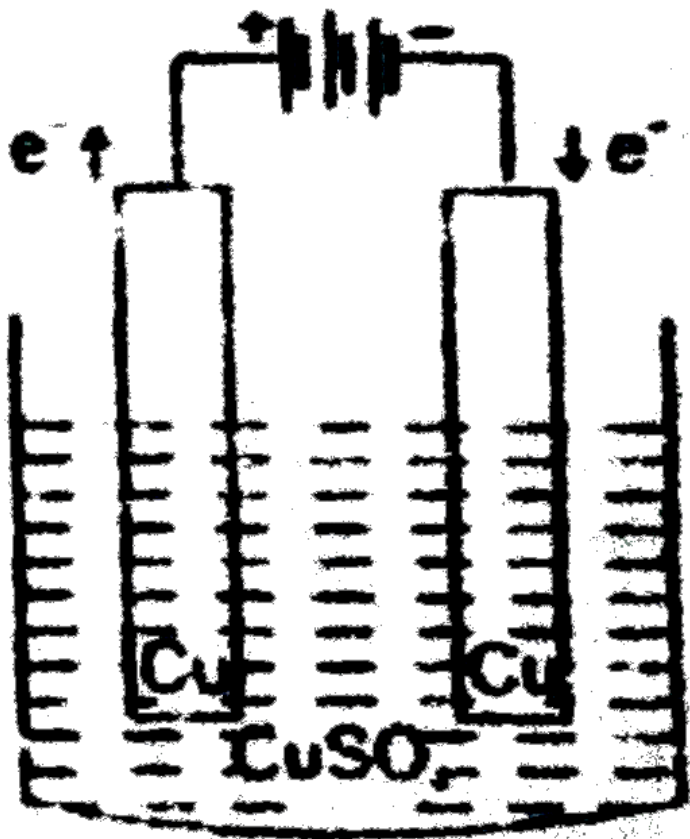
    D. $6.4 \times 10^{-8}cm$

Answer: 2

50. In the given figure the electrolytic cell contains $1L$ of an aqueous $1M$ Copper (II) sulphate solution. If 0.4 mole of electrons passed through of cell, the concentration of copper ion after passage of the charge will be

A. $0.4M$

B. $0.8M$

C. $1.0M$

D. $1.2M$

Answer: 3

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51. The equilibrium $Cu^{\cdot\cdot}(aq) + Cu(s) \Leftrightarrow 2Cu^{\cdot}$ established at

$20\,^{\circ}C$ corresponds to $\dfrac{\left[Cu^{\cdot\cdot}\right]}{\left[Cu^{+}\right]} = 2.02 \times 10^{4+}$. The standard

potential . $E^0_{Cu^{\cdot\cdot}.Cu} = 0.33$ volt at this temperature . What is

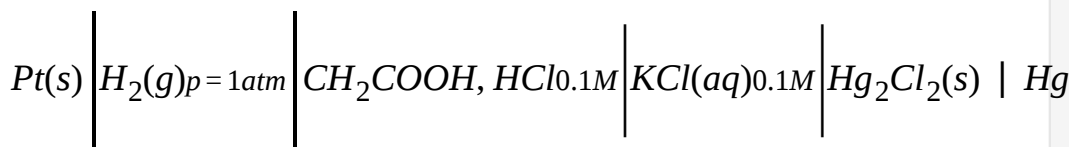the standard potential $E^0_{Cu/Cu^{+}}$?

A. $-0.457V$

B. $-0.125V$

C. -0.66V

D. -0.250V

Answer: 1

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52. What is the cell entropy change (in JK^{-1}) of the following cell :

$$Pt(s) \left| H_2(g)p = 1atm \right| CH_2COOH, HCl\text{0.1M} \left| KCl(aq)\text{0.1M} \right| Hg_2Cl_2(s) \mid Hg$$

The *EMF* of the cell is found to be 0.045V at 298K and temperature coefficient if $3.4 \times x10^{-4}VK^{-1}$

(Given : $K_a \left(CH_3COOH \right) = 10^{-5}M$)

A. 60

B. 65.2

C. 69.2

D. 63.5

Answer: B

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53. Calculate the value of Λ_m^∞ for $SrCl_2$ in water at $25\,^\circ C$ from the following data :

Conc. (mol/lt)	0.25	1
$\Lambda_m \left(\Omega^{-1}cm^2 mol^{-1}\right)$	260	250

A. 270

B. 260

C. 250

D. 255

Answer: 1

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