CHEMISTRY

BOOKS - NARENDER AVASTHI CHEMISTRY (ENGLISH)

ELECTROCHEMISTRY

Level 01

1. A cell reaction would be spontaneous if the cell potential and $\triangle_r G$ are respectively:

A. positive and negative

B. negative,negative

C. zero,zero

D. positive,zero

Answer: a

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2. which of the following statement is correct?

A. cathode is -ve terminal in both ,galvanic and electrolytic cells

B. Anode is +ve terminal in both,galvanic and electrolytic cells

C. cathode and anode are -ve terminal in electrolytic and galvanic cell respectively.

D. Cathode and anode are +ve terminal in electroytic and galvanic cell respectively.

Answer: c

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3. Electrolytes when dissolved in water dissociate into ions because:

A. (a) they are unstable

B. (b) the water dissolves it.

C. (c) the force of repulsion increases

D. (d) the force of electrostatic attraction is broken down by water.

Answer: d

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4. The electric charge required for electrode deposition of one gram-equivalent of a substance is :

A. (a) one ampere per second

B. (b) 96500 coulombs per second

C. (c) one ampere for one hour

D. (d) charge on one mole of electrons

Answer: D

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5. The amount of an ion liberated on an electrode during electrolysis does not depend upon:

A. (a) conductance of the solution

B. (b) current strength

C. (c) time

D. (d) electrochemical equivalent of the element

Answer: A

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

A. 6.023×10^{23}

B. 1.64×10^{-24}

C. 6.24×10^{18}

D. 6.24×10^{-24}

Answer: C

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7. How many coulombs are provided by a current 0.010 mA in the calculator battery that can operate for 1000 hours?

A. 1

B. 10

C. 0.01

D. 36

Answer: D

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8. How many minutes are required to deliver 3.21×10^6 coulombs using a current of 500 A used in the commercial production of chlorine?

A. 8.3

B. 5.3×10^4

C. 6420

D. 107

Answer: D

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9. Passage of a current for 548 seconds through a siver coulometer results in the deposition of 0.746g of silver.What is the current (in A)?

A. 1.22

B. 1.16

C. 1.07

D. 1

Answer: A

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10. Electrolysis can be used to determine atomic masses. A current of 0.550 A deposits 0.55g of a certain metal in 100 minutes. Calculate the atomic mass of the metal if eq. mass=molar Mass/3

A. 100

B. 45

C. 48.25

D. 144.75

Answer: C

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11. Beryllium occurs naturally in the form of beryl. The metal is produced from its ore by electrolysis after the ore has been converted to the oxide and then to the chloride.How many grams of Be(s) is deposited form a $BeCl_2$ solution by a current of 5.0 A that flows for 1.0 h? (Atomic weight:Be=9)

A. (a) 0.84

B. (b) 1.68

C. (c) 1.42

D. (d) 1.08

Answer: A

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12. How many minutes will it take to plate out 5.2g of Cr from a $Cr_2(SO_4)_3$ solution using a current of 9.65 A ? (Atomic mass:Cr=52.0)

A. 200

B. 50

C. 100

D. 103

Answer: B

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13. Calculate the current (in mA) required to deposite 0.195g of platinum metal in 5.0 hours from a solution of $\left[PtCl_6^{2-}\right.$:(Atomic mass:Pt=195)

A. 310

B. 31

C. 21.44

D. 5.36

Answer: C

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14. How many Faradays are required to reduce 0.25g of Nb (V) to the metal?

A. 2.7×10^{-3}

B. 1.3×10^{-2}

C. 2.7×10^{-2}

D. 7.8×10^{-3}

Answer: B

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15. One gm metal M^{3+} was discharged by the passage of 1.81×10^{23} electrons.What is the atomic mass of metal?

A. (a) 33.35

B. (b) 133.4

C. (c) 66.7

D. (d) None of these

Answer: D

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16. Total charge required to convert three moles of Mn_3O_4 to MnO_4^{-2} in present of alkaline medium

A. (a) 5F

B. (b) 10F

C. (c) 20F

D. (d) None of these

Answer: C

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17. The electrolytic decomposition of dilute sulphuric acid with platinum electrode, cathodic reaction is :

A. (a) reduction of H^{+}

B. (b) oxidation of SO_4^{2-}

C. (c) reduction SO_3^{2-}

D. (d) oxidation of H_2O

Answer: A

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18. Which one of the following metals can not be obtained on electrolysis of aqueous solution of its salts?

A. (a) Mg

B. (b) Ag

C. (c) Cu

D. (d) Cr

Answer: A

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19. A solution of sodium sulphate in water is electrolysed using inert electrodes, The products at the cathode and anode are respectively.

A. H_2, O_2

B. O_2, H_2

C. O_2, Na

D. $H_2, S_2O_8^{2-}$

Answer: D

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20. The passage of current through a solution of certain electrolyte results in the evolution of H_2(g) at cathode and Cl_2(g) at anode. The electrolytic solution is :

A. $water$

B. $aq.\ H_2SO_4$

C. $aq.\ NaCl$

D. aq. $CuCl_2$

Answer: C

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21. when an aqueous solution of H_2SO_4 is electrolysed the product at anodes is :

A. $H^{\,-}$

B. $OH^{\,-}$

C. SO_4^{2-}

D. O_2

Answer: D

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22. An aqueous solution of Na_2SO_4 is electrolysed using Pt electrodes. The products at the cathode and anode are respectively:

A. H_2, SO_2

B. $O_2, NaOH$

C. H_2, O_2

D. O_2, SO_2

Answer: C

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23. The electrolysis of a solution resulted in the formation of H_2(g) at the cathode and Cl_2 (g) at anode. The solution is :

A. water

B. $H_2SO_4(aq)$

C. highly concentrated NaCl(aq) solution

D. $CuCl_2(aq)$

Answer: B

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24. If Pt is used as cathode in the electrolysis of aqueous NaCl solution, the ion reduced at cathode is :

A. H^+

B. Na^+

C. OH^-

D. Cl^{-}

Answer: A

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25. A dilute aqueous solution of $CuSo_4$ is electrolysed using platinum electrods. The products at the anode and cathode are:

A. O_2, H_2

B. H_2, O_2

C. O_2, Cu

D. $S_2O_8^{2-}, H_2$

Answer: C

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26. what products are formed during the electrolysis of concentrated aqueous solution of sodium chloride?

(I) Cl_2(g) at anode (II) NaOH (aq) (III) H_2(g) At cathode

A. I only

B. I and II only

C. I and III only

D. I,II and III

Answer: D

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27. Which of the following aqueous solution produces metal after electrolysis?

A. $K_2Cr_2O_7$

B. $KMnO_4$

C. CH_3COONa

D. $CuCl_2$

Answer: D

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28. How much time is required for complete decomposition of 4 moles of water using 4 ampere?

A. 3.86×10^5sec

B. 1.93×10^5sec

C. 96500sec

D. 48250sec

Answer: B

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29. 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

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

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: C

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30. If 0.50L of a 0.60M $SnSo_4$ solution is electrolysed for a period of 30.0min using a current of 4.60 A. If inert electrods are used, what is the final concentration of Sn^{2+} remaining in the solution?[at.mass of Sn=119]

A. 0.342M

B. 0.544M

C. 0.389M

D. 0.514M

Answer: D

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31. A 100.0mL dilute solution of Ag^+ is electrolysed for 15.0 minutes with a current of 1.25mA and the silver is removed completely. What was the initial $[Ag^+]$?

A. 2.32×10^{-1}

B. 2.32×10^{-4}

C. 2.32×10^{-3}

D. 1.16×10^{-4}

Answer: D

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32. A 250.0 mL sample of a 0.20M Cr^{3+} is electrolysed with a current of 96.5 A. If the remaining $\left[Cr^{3+}\right]$ is 0.1 M, the duration of process is:

A. 25sec

B. 225sec

C. 150sec

D. 75sec

Answer: D

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33. The element indium is to be obtained by electrolysis of a molten halide of the element. Passage of a current of 3.20 A for a period of 40.0 min results in formation of 3.05 g of In. what is the oxidation state of indium in the halide melt? (Atomic mass of In=114.8)

A. 3

B. 2

C. 5

D. 1

Answer: A

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34. An electrolysis of a oxytungsten complex ion using 1.10 A for 40min produces 0.838 g of tungsten. What is the charge on tungsten in the material? (Atomic mass of W=184)

A. 6

B. 2

C. 4

D. 1

Answer: A

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35. In the electrolysis of aqueous $NaCl$,what volume of Cl_2(g) is produced in the time that it takes to liberate 5.0 liter of H_2(g) ? Assume that both gases are measured at STP.

A. 5

B. 2.5

C. 7.5

D. 10

Answer: A

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36. How many grams of Cr are deposited in the electrolysis of solution of Cr$(NO_3)_3$ in the same time that it takes to deposite 0.54g of Ag in a silver coulometer arranged in series with the $Cr(NO_3)_3$ cell? (Atomic mass: Cr=52.0,Ag=108)

A. 0.0866

B. 0.0288

C. 0.173

D. 0.22

Answer: A

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37. In the electolysis of a $CuSO_4$ solution, how many grams of Cu are plated out on the cathode in the time that it takes to liberate 5.6 litre of O_2(g) , measured at 1 atm and 273 K, at the node?

A. 31.75

B. 14.2

C. 4.32

D. None of these

Answer: A

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38. Ammonium perchlorate, NH_4ClO_4 , used in the solid fuel in the booster rockets on the space shuttle, is prepared from sodium perchlorate, $NaClO_4$, which is produced commercially by the electrolysis of a hot, stirred solution of sodium chloride. How many faradays are required to produce 1.0kg of sodium perchlorate?

$NaCl + 4H_2O \rightarrow NaClO_4 + 4H_2$

A. 40.3

B. 18.3

C. 31.6

D. 65.3

Answer: D

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39. In the commercial preparation of aluminum,aluminum oxide (Al_2O_3) is electrolysed at 1000° C. How many coulombs of electricity are required to give 54kg of aluminum ? Assume following reaction takes place at cathode:

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

A. 17.3×10^8

B. 3.21×10^7

C. 1.82×10^4

D. 57.6×10^7

Answer: D

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40. When molten lithium chloride (LiCl) is electrolysed, lithium metal is formed at the cathode. If current efficiency is 75% then how many grams of lithium are liberated when 1930 C charge pass through the cell? (Atomic mass of Li=7)

A. 0.105

B. 0.12

C. 0.28

D. 0.24

Answer: A

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41. Sodium metal is produced commercial by the electrolysis of molten sodium chloride and chlorine is produced as a by product. How many litres of chlorine at 1.8 atm and 27° C will be produced if a current of 1.0×10^{3} A is passed through NaCl (l) for 9.65 h?

A. 2463

B. 460

C. 1800

D. 1231.6

Answer: A

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42. H_2(g) and O_2(g), can be produced by the electrolysis of water. What total volume (in L) of O_2 and H_2 are produced at 1 atm and 273K when a current of 30 A is passed through a K_2SO_4 (aq) solution for 193 min?

A. 120.96

B. 40.32

C. 60.48

D. 80.64

Answer: C

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43. The cost of 2Rs/kWh of operating an electric motor for 10hours takes 10amp at 110V is:

A. 79200 Rs

B. 22000Rs

C. 220Rs

D. 22Rs

Answer: D

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44. A 1 M solution of H_2SO_4 is electrolysed. Select correct statement in respect of products obtain at anode and cathode respectively:

Given : $2SO_4^{2-} \rightarrow S_2O_8^{2-} + 2e^-, E^\circ = -2.01V$

$H_2O(l) \rightarrow 2H^+(aq) + 1/2O_2(g) + 2e^-, E^\circ = -1.23V$

A. concentration of H_2SO_4 remain constant, H_2, O_2

B. concentration of H_2SO_4 remain constant, O_2, H_2

C. concentration of H_2SO_4 remain constant, O_2, H_2

D. concentration of H_2SO_4 remain constant, $S_2O_8^{2-}$, H_2

Answer: B

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45. Cadmium amalgam is prepared by electrolysis of a sodium of $CdCl_2$ using a mercury cathode. How long should a current of 4 A be passed in order to prepare 10% by mass Cd in Cd-Hg amalgam on cathode of 4.5 g Hg? (atomic mass of Cd=112)

A. 400sec

B. 215.40 sec

C. 861.6 sec

D. 4308.8 sec

Answer: D

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46. Use of electrolysis is .

A. electrorefining

B. electroplating

C. both (a) and (b)

D. None of these

Answer: C

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47. When a solution of $AgNO_3$ (1 M) is electrolysed using Pt anode and Cu cathode, the products at two electrodes are?

$E^{\circ}_{cu^{2+}|cu} = +0.34\text{V}, E^{\circ}_{O_2, H^+|H_2O} = +1.23\text{V}, E^{\circ}_{ag^+|Ag} = +0.8\text{V}$

A. $Cu \rightarrow Cu^{2+}$ at anode, $Ag^+ \rightarrow Ag$ at cathode

B. $H_2O \rightarrow O_2$ at anode, $Cu^{2+} \rightarrow Cu$ at cathode

C. $H_2O \rightarrow O_2$ at anode, $Ag^+ \rightarrow Ag$ at cathode

D. $NO_3^- \rightarrow NO_2$ at anode, $Ag^+ \rightarrow Ag$ at cathode

Answer: C

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48. Which of the following statement is correct about Galvanic cell?

A. (a) It converts chemical energy into electrical energy

B. (b) It converts electrical energy into chemical energy.

C. (c) It converts metal from its free state to the combined state.

D. (d) It converts electrolyte into individual ions.

Answer: A

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49. E° for Cl_2(g) $+2e^{-} \rightarrow 2Cl^{-}$ (aq) is 1.36 V, E° for Cl^{-} (aq) $\rightarrow 1/2cl_2$(g)$+e^{-}$ is:

A. 1.36V

B. -1.36V

C. -0.68

D. 0.68V

Answer: B

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50. when two half-cells of electrode potential of E_1 and E_2 are combined to form a half cell of electrode potential E_3 , then

(when $n_1, n_2 \text{and} n_3$ are no. of electrons exchanged in first second and combined half-cells:

A. $E_3 = E_2 - E_1$

B. $E_3 = \dfrac{E_1 n_1 + E_2 n_2}{n_3}$

C. $E_3 = \dfrac{E_1 n_1 + E_2 n_2}{n_3^2}$

D. $E_3 = E_1 - E_2$

Answer: B

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51. The function of a salt bridge is to :

A. (a) maintain electrical neutrality of both half cells

B. (b) increases the cell potential at the positive electrode

C. (c) decrease the cell potential at the negative electrode

D. (d) eliminate the impurities present in the electrolyte

Answer: A

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52. Saturated solution of KNO_3 with agar-agar is used to make 'salt bridge' because:

A. size of K^+ is greater than that of NO_3^-

B. velocity of NO_3^- is greater than that of K^+

C. velocity of K^{+} and NO_3^{-} are nearly the same

D. both velocity and size of K^{+} and NO_3^{-} ions are nearly same

Answer: C

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53. A salt bridge may contain:

A. (a) a saturated solution of KCl and agar-agar

B. (b) a saturated solution of KNO_3 and agar-agar

C. (c) a saturated solution of NH_4NO_3 and agar-agar

D. (d) all of these

Answer: D

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54. The nature of curve of E°_{cell} vs. log K_c is :

A. straight line

B. parabola

C. hyperbola

D. elliptical curve

Answer: A

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55. Consider the following equations for a cell reaction

$A + B \Leftrightarrow C + D, E^{\circ} = x\text{volt}, K_{eq} = K_1$

$2A + 2B \Leftrightarrow 2C + 2D, E^{\circ} = y\text{volt}, K_{eq} = K_2$ then:

A. (a) $x = y, k_1 + k_2$

B. (b) $x = 2y, K_1 = 2K_2$

C. (c) $x = y, K_1^2 = K_2$

D. (d) $x^2 = y, K_1^2 = K_2$

Answer: C

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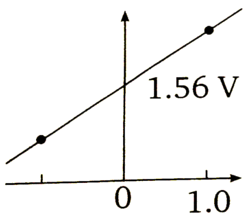
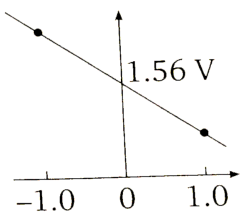
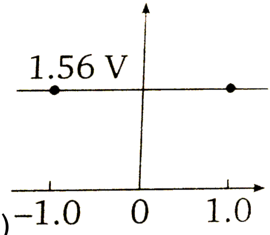
56. Which graph correctly correlates E_{cell} as a function of concentration for the cell

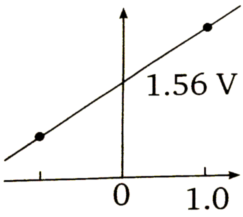
$$Zn(s) + 2Ag^+(aq) \rightarrow Zn^{2+}(aq) + 2Ag(s), E^\circ_{cell} = 1.56V$$

y-axis: E_{cell}, X-axis: $\log_{10}\frac{[Zn^{2+}]}{[Ag^+]^2}$

A. (a) 

B. (b) 

C. (c) 

D. (d) 

Answer: B

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57. The Nernst equation E=E°-RT/nF in Q indicates that the Q will be equal to equilibrium constant K_c when:

A. E=E°

B. RT/nF=1

C. E=zero

D. $E^\circ = 1$

Answer: C

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58. The cell reaction $2Ag^{+}(aq) + H_2(g) \rightarrow 2H^{+}(aq) + 2Ag(s)$,best represented by :

A. $Ag(s)|Ag^{+}(\text{aq})||H^{+}(aq)|H_2(g) \mid Pt(s)$

B. $Pt(s)|H_2(g)|H^{+}(aq)||Ag^{+}(aq) \mid Ag(s)$

C. $Ag(s)|Ag^{+}(\text{aq})||H_2(g)|H^{+}(aq) \mid Pt(s)$

D. $Ag^{+}(\text{aq})|Ag(s)||H_2(g)|H^{+}(aq)$

Answer: B

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59. The cell reaction $Hg_2Cl_2(s) + cu(s) \rightarrow cu^{2+}(aq) + 2Cl^{-}(aq) + 2Hg(l)$,best

represented by :

A. $cu(s)\Big|cu^{2+}(aq)\Big|\Big|Hg_2Cl_2(s)\Big|Hg(l)$

B. $cu(s)\Big|cu^{2+}(aq)\Big|\Big|Hg(l)\Big|HgCl_2(s)$

C. $cu(s)\Big|cu^{2+}(aq)\Big|\Big|Cl^-(aq)\Big|Hg_2Cl_2(s)|Hg(l)|Pt(s)$

D. $Hg_2Cl_2(s)\Big|Cl^-(aq)\Big|\Big|Cu^{2+}(aq)\Big|Cu(s)$

Answer: C

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60. The cell reaction

$Cr_2O_7^{2-}(aq) + 14H^+(aq) + 6Fe^{2+}(aq) \rightarrow 6Fe^{3+}(aq) + 2Cr^{3+}(aq) + 7H$

is best represented by:

A. $Pt(s)\Big|Fe^{2+}(aq), Fe^{3+}(aq)\Big|\Big|Cr_2O_7^{2-}(aq), Cr^{3+}(aq)\Big|Pt(s)$

B. $Pt(s)\Big|Cr_2O_7^{2-}(aq), Cr^{+3}(aq)\Big|\Big|Fe^{3+}(aq), Fe^{+2}(aq)\Big|Pt(s)$

C. $Fe^{2+}(aq)\Big|Fe^{3+}(aq)\Big|\Big|Cr_2O_7^{2-}(aq)\Big|Cr^{3+}(aq)$

D. $Cr_2O_7^{2-}(aq)\left|Cr^{3+}(aq)\right|\left|Fe^{3+}(aq)\right|Fe^{2+}(aq)$

Answer: A

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61. Select the correct cell reaction of the cell $Ag(s) \mid Ag^{+}(aq)||cu^{2+}(aq)|cu(s)$:

A. $2Ag(s) + cu(s) \rightarrow cu^{+2}(aq) + 2Ag^{+}(aq)$

B. $cu(s) + 2Ag^{+}(aq) \rightarrow cu^{2+}(aq) + 2Ag(s)$

C. $2Ag(s) + cu^{2+}(aq) \rightarrow cu(s)(aq) + 2Ag^{+}(aq)$

D. $cu^{2+}(aq) + 2Ag^{+}(aq) \rightarrow 2Ag(s) + cu(s)$

Answer: C

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62. Select the correct cell reaction of the cell $Pt(s)|Cl_2(g)|Cl^-(aq)||Ag^+(aq) \mid Ag(s)$:

A. $Cl_2(g) + Ag^+(aq) \rightarrow Ag(s) + 2Cl^-(aq)$

B. $Cl_2(g) + Ag(s) \rightarrow 2Cl^-(aq) + Ag^+(aq)$

C. $2Cl^-(aq) + 2Ag^+(aq) \rightarrow 2Ag(s) + Cl_2(g)$

D. $AgCl(s) \rightarrow Ag^+(aq) + Cl^-(aq)$

Answer: C

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63. Standard electrode potential of SHE at 298 K is :

A. 0.05V

B. 0.10V

C. 0.50V

D. 0.00V

Answer: D

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64. The e.m.f of the following galvanic cells:

A. $Zn|z^{2+}(1M)||Cu^{2+}(1M)|Cu$

B. $Zn|z^{2+}(0.1M)||Cu^{2+}(1M)|Cu$

C. $Zn|z^{2+}(1M)||Cu^{2+}(0.1M)|Cu$

D. $Zn|z^{2+}(0.1M)||Cu^{2+}(0.1M)|Cu$

Answer: D

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65. Based on the cell notation for a spontaneous reaction, at the anode:

$Ag(s)|AgCl(s)|Cl^{-}(aq)||Br^{-}(aq)|Br_2(l)|C(s)$

A. AgCl gets reduced

B. Ag gets oxidized

C. Br^{-} gets oxidized

D. Br_2 gets reduced

Answer: B

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66. Given the listed standard electrode potentials, what is E° for the cell:

$$4BiO^{+}(aq)+3N_2H_5^{+}(aq)\to 4Bi(s)3N_2(g)+4H_2O)l)+7H^{+}(aq)$$

$$N_2(g)+5H^{+}(aq)+4e^{-}\to N_2H_5^{+}(aq), E^{\circ}=+0.23V$$

$$BiO^{+}(aq)+2H^{+}(aq)+3e^{-}\to Bi(s)+H_2O(l), E^{\circ}=+0.32V$$

A. 0.55

B. 0.34

C. 1.88

D. 0.09

Answer: A

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67. what is the standard electrode potential for the reduction of HClO?

$HClO(aq) + H^+(aq + 2e^- \rightarrow Cl^-(aq) + H_2O(l)$

Given: $Cr^2(aq) \rightarrow Cr^{3+}(aq) + e^-, E^\circ = 0.41V$

$HClO(aq) + H^+(aq) + 2Cr^{2+}(aq) \rightarrow 2Cr^{3+}(aq) + H_2O(l), E^\circ = 1.80$

A. 1.39

B. 1.54

C. 1.22

D. 0.9

Answer: A

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68. The E° for the following cell is +0.34 V.

$In(s) \mid In(OH)_3(aq) || SbO_2^-(aq) | Sb(s)$.

Using $E^{\circ} = -1.0V$ for the $In(OH)_3 \mid In$, couple, calculate E° for the $SbO_2^- \mid Sb$half-reaction:

A. -1.34

B. 0.66

C. 0.82

D. -0.66

Answer: D

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69. From the fllowing half-cell reactions and their standard potentials ,what is the smallest possible standard e.m.f for spontaneous reactions?

$PO_4^{3-}(aq) + 2H_2O(l) + 2e^- \rightarrow HPO_3^{2-} + 3OH^-(aq), E^{\circ} = -1.05V$

$PbO_2(s) + H_2O(l) + 2e^- \rightarrow PbO(s) + 2OH^-(aq), E^{\circ} = +0.28V$

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70. Determine which substance is the best reducing agent.

A. HPO_3^{2-}

B. PO_4^{3-}

C. IO^{-}

D. IO_3^{-}

Answer: A

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71. Which substance is the best oxidizing agent ?

A. IO_3^{-}

B. IO^{-}

C. PbO

D. PO_4^{3-}

Answer: A

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72. Consider the following half-cell reaction and associated standerd half-cell potentials and determine the maximum voltage thatr can be obtained by combination resulting in spontenous process :

$AuBr_4^-(aq) + 3e^- \rightarrow Au(s) + 4BR^-(aq), E^\circ = -086V$

$Eu^{3+}(aq) + e^- \rightarrow Eu^{2+}(aq), E^\circ = -043V$

$Sn^{2+}(aq) + 2e^- \rightarrow Sn(s), E^\circ = -0.14V$

$IO^-(aq) + H_2O(l) + 2e^- \rightarrow I^-(aq) + 2OH^-, E^\circ = +0.49V$

A. $+0.72$

B. $+1.54$

C. $+1.00$

D. $+1.35$

Answer: D

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73. The position of some metals in the electrochemical series in dectreasing electropositeve character is given as $Mg > Al > Zn > Cu > Ag$. What will happen if a copper spoon is used to stir a solution of aluminimum nitrate ?

A. The spoon gets coated with aluminium

B. Aan alloy of aluminium and copper is formed

C. No reaction occurs

D. The solution starts turning blue

Answer: C

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74. Zn can displace :

A. (a) Mg from its aqueous solution

B. (b) Cu from its aqueous solution

C. (c) Na from its aqueous solution

D. (d) Al from its aqueous solution

Answer: B

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75. 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 does 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: D

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76. When an aqueous solution of $CuSO_4$ is stirred with a silver spoon then :

A. (a) Cu^{+} will be formed

B. (b) Ag^{+} will be formed

C. (c) Cu^{2+} will be deposited

D. (d) None of these

Answer: D

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

(I) Only C react with 1 M HCl to give H_2(g)

(II) When A is added to solution of the other metal ions, metallic D is formed but not B or C

A. (a) $D > A > C > B$

B. (b) $A > D > C > B$

C. (c) $B > D > A > C$

D. (d) $D > A > B > C$

Answer: D

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78. In the reaction :

$4Fe(s) + 3O_2(g) \rightarrow 4Fe^{3+}(aq) + 6O^{2-}(aq)$

which of the following statement is incorrect ?

A. (a) It is a redox reaction

B. (b) Fe is reducing agent

C. (c) O_2 is an oxidizing agent

D. (d) Fe is reducing to Fe^{3+}

Answer: D

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79. Which of the following is displaced by Fe ?

A. (a) Ag

B. (b) Zn

C. (c) Na

D. (d) All of these

Answer: A

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80. The standerd potential at 25° for the following Half rection is given :

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

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

When Zinc dust is added to the solution of $MgCl_2$.

A. $ZnCl_2$ is formed

B. Mg is percipitaed

C. Zn dissolved in the solution

D. No reaction take place

Answer: D

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81. The element which can displace three other halogens from their compound is :

A. F

B. Cl

C. Br

D. I

Answer: A

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82. Using the standerd half-cell potential listed, calculate the equilibrium constant for the reaction :

$Co(s) + 2H^{+}(aq) \rightarrow Co^{2+}(aq) + H_2(g) \quad \text{at 298 K}$

$Co^{2+}(aq) + 2e^{-} \rightarrow Co(s) E^{\circ} = -0.277V$

A. 2.3×10^{9}

B. 4.8×10^4

C. 4.8×10^7

D. 4.8×10^{11}

Answer: A

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83. The E° at 25°C for the following reaction is 0.22 V. Calculate the equilibrium constant at 25°C :

$H_2(g) + 2AgCl(s) \rightarrow 2Ag(s) + 2HCl(aq)$

A. 2.8×10^7

B. 5.2×10^8

C. 5.2×10^6

D. 5.2×10^3

Answer: A

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84. Electrode potential of the half Pt(s)|Hg(l)|$Hg_2Cl_2(s)|Cl^-(aq)$ can be incresed by :

A. Increasing $[Cl^-]$

B. decreasing $[Cl^-]$

C. Increasing $Hg_2Cl_2(s)$

D. decreasing $Hg(l)$

Answer: A

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85. The equillibrium constant for thefollowing general reaction is 10^{30}. Calculate E° for the cell at 298 K.

$2X_2(s) + 3Y^{2+}(aq) \rightarrow 2X_2^{3+}(aq) + 3Y(s)$

A. $+0.105V$

B. $+0.2955V$

C. 0.0985 V

D. -0.2955 V

Answer: B

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86. A solution containing H^{+} and D^{+} ions is in equilibrium with a mixture of H_2 and D_2 gases at 25°C. If the partial pressures of both gases are 1.0 atm, find the ratio of $[D^{+}]/[H^{+}]$:

(Given : E_{D^{+}/D_2} =-0.003V]

A. 1.23

B. 1.12

C. 0.11

D. 1

Answer: B

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87. The E° at 25°C for the following reaction is 0.55 V. Calculate the ΔG° in kJ/mol :

$$4BiO^{+}(aq) + 3N_2H_5^{+} \rightarrow 4Bi(s) + 3N_2(g) + 4H_2O(l) + 7H^{+}$$

A. -637

B. -424

C. -106

D. -318.5

Answer: A

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88. Use the following standard electrode potentials, calculate ΔG° in kJ / mol for the indicated reaction :

$$5Ce^{4+}(aq) + Mn^{2+}(aq) + 4H_2O(l) \rightarrow 5Ce^{3+}(aq) + MnO_4^-(aq) + 8H^+$$

$$MnO_4^-(aq) + 8H^+(aq) + 5e^- \rightarrow Mn^{2+}(aq) + 4H_2O(l), E^{\circ} = +1.51V$$

$$Ce^{4+}(aq) + e^{=} \rightarrow Ce^{3+}(aq) \qquad E^{\circ} = +1.61V$$

A. -9.65

B. -24.3

C. -48.25

D. -35.2

Answer: C

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89. Consider an electrochemical cell in which the following reaction occurs and predict which changes will decrease the cell voltage :

$$Fe^{2+}(aq) + Ag^+(aq) \rightarrow Ag(s) + Fe^{3+}(aq)$$

(I) Decrease the Ag+

(II)Increase in Fe3+

(III)Increase the amount of Ag

(a) I

(b) II and III

(c) II

(d) I and II

A. I

B. II and III

C. II

D. I and II

Answer: D

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90. Consider the following equation for an electrochemical cell reaction.

Which of the following changes in condition will increase the cell voltage

?

$H_2(g) + PbCl_2(s) \rightarrow Pb(s) + 2HCl(aq)$

(I) addition of concentrated $HClO_4$ solution

(II)Increase the pressure of $H_2(g)$$(III)$increase the amount of $Pb(s)\}$

A. III

B. I and II

C. II and III

D. II

Answer: D

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91. The standard electrode potential for the following reaction is $+1.33$ V. 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. $+1.608$ V

D. $+1.0542$ V

Answer: D

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92. The standard electrode potential for the following reaction is -0.57 V. What is the potential at pH=12.0 ?

$TeO_3^{2-}(aq, 1M) + 3H_2O(l) + 4e^- \rightarrow Te(s) + 6OH^-(aq)$

A. $-017V$

B. $+0.21V$

C. $-0.39V$

D. +1.95 V`

Answer: C

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93. $Co|Co^{2+}(C_2)||Co^{2+}(C_1)|Co$, for this cell, ΔG is negative if :

A. $C_2 > C_1$

B. $C_1 > C_2$

C. $C_1 = C_2$

D. unpredictable

Answer: B

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94. What will be the emf for the given cell ?

$Pt|H_2(g, P_1)|H^+(aq)|H_2(g, P_2)|Pt$

A. $\frac{RT}{F}.\ln\frac{P_1}{P_2}$

B. $\frac{RT}{2F}.\ln\frac{P_1}{P_2}$

C. $\frac{RT}{F} \cdot \ln \frac{P_2}{P_1}$

D. None of these

Answer: B

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95. For the electro chemical cell $Pt(s)\left|\underset{1atm}{H_2(g)}\right|H^+(1M) \mid |Cu^{2+}(1M)|Cu(s)$, which one of the following statements are true ?

A. H^+ ions are formed at anode and Cu is deposited at cathode.

B. H_2 liberated at cathode and Cu is deposited at anode.

C. Oxidation occurs at cathode

D. Reduction occurs at anode

Answer: A

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96. In a concentration cell the same reagents are present in both the anode and the cathode compartments , but at different concentrations. Calculate the emf of a cell of a cell containing 0.040 M. Cr^{3+} in one compartment and 1.0 M Cr^{3+} in the other if Cr electrodes are used in both.

A. 0.028 V

B. 0.249 V

C. 0.083 V

D. 0.125 V

Answer: A

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97. A 1.0 M solution of Cd^{2+} is added to excess iron and the system is allowed to reach equillibrium. What is the concentration of Cd^{2+} ?

$Cd^{2+}(aq) + Fe(s) \rightarrow Cd(s) + Fe^{2+}(aq), E^{\circ} = 0.037$

A. 0.195

B. 0.097

C. 0.053

D. 0.145

Answer: C

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98. The measured voltage for the reaction with the indicated concentration is 1.50 V. Calculate E°.

$Cr(s) + 3Ag^{+}(aq, 0.10M) \rightarrow 3Ag(s) + Cr^{3+}(aq, 0.30M)$

A. 1.35

B. 1.4

C. 1.65

D. 1.55

Answer: D

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99. Calculate the standard voltage that can be obtained from an ethane oxygen fuel cell at $25^{\circ}C$. $C_2H_6(g)+\frac{7}{2}O_2(g)\rightarrow 2CO_2(g)+3H_2O(l)$ $\Delta G^{\circ}=-1467k\frac{J}{m}ol$.

A. $+0.91$

B. $+0.54$

C. $+0.72$

D. $+1.08$

Answer: D

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100. $I_2(s) \mid I^-$ (0.1M) half cell is connected to a H^+ (aq)|H_2(1 bar)|Pt half celland e.m.f. is found to be 0.7714 V. If $E^\circ_{I_2 \mid I^-} = 0.535V$, find the pH of $H^+ \mid H_2$ half cell.

A. 1

B. 3

C. 5

D. 7

Answer: B

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101. Estimate the E° reduction for $Cu \mid CuS$ electrode.

Given : K_{sp} of $CuS = 8.0 \times 10^{-36}$, $E^\circ \cdot_{(Cu \mid Cu^{2+})} = -0.34V$

A. 1.034 V

B. 1.0 V

C. $-0.694V$

D. 0.694 V

Answer: C

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102. Given the folowing standerd electrode potentials, the K_{sp} for $PbBr_2$ is :

$PbBr_2(s) + 2e^- \rightarrow Pb(s) + 2Br^-(aq), E^\circ = -0.248V$

$Pb^{2+}(aq) + 2e^- \rightarrow Pb(s), E^\circ = -0.126V$

A. 7.4×10^{-5}

B. 4.9×10^{-14}

C. 5.2×10^{-6}

D. 2.3×10^{-13}

Answer: A

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103. The standard free energy change for the following reaction is -210kJ / mol. What is the standerd cell potential?

$2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$

A. $+0.752$

B. $+1.09$

C. $+0.420$

D. $+0.640$

Answer: B

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104. At equilibrium :

A. $E^{\circ}_{\text{cell}} = 0, \Delta G^{\circ} = 0$

B. $E^{\circ}_{\text{cell}} = 0, \Delta G = 0$

C. both are correct

D. none is correct

Answer: B

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105. The E° at 25°C for the following reaction at the indicated concentrations is 1.50 V. Calculate the ΔG in kJ / mol 25°C :

A. -140.94

B. -295

C. -212

D. -422.83

Answer: D

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106. If $E^{\circ}_{Au^{+}/Au}$ is 1.69 V and $E^{\circ}_{Au^{3+}/Au}$ is 1.40 V, then $E^{\circ}_{Au^{+}/Au^{3+}}$ will be :

A. 0.9 v

B. 0.945 V

C. 1.255 V

D. None of these

Answer: D

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107. Consider the following standard electrode potentials and calculate the eqillibrium constant at 25°C for the indicated disproportional reaction :

$3Mn^{2+}(aq) \rightarrow Mn(s) + 2Mn^{3+}(aq)$

$Mn^{3+}(aq) + e^{-} \rightarrow Mn^{2+}(aq), E^{\circ} = 1.51V$

$Mn^{2+}(aq) + 2e^{-} \rightarrow Mn(s), E^{\circ} = -1.185V$`

A. 1.2×10^{-43}

B. 2.4×10^{-73}

C. 6.3×10^{-92}

D. 1.5×10^{-62}

Answer: C

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108. A galvanic cell is composed of two hydrogen electrods, one of which is a standard one. In which of the following solutions should the other electrode be immersed to get maximum e.m.f:

A. 0.1M HCl

B. 0.1 M H_2SO_4

C. 0.1 M NH_4OH

D. 0.01 M HCOOH

Answer: C

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

A. $C_1 = C_2$

B. $C_1 > C_2$

C. $C_2 > C_1$

D. Both (a) and (c)\

Answer: C

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110. By how much is the oxidizing power of $Cr_2O_7^{2-}|Cr^{3+}$ couple decreased if the H^+ concentration is decreased from 1M to 10^{-3}M at

25° C?

A. 0.001 V

B. 0.207 V

C. 0.441 V

D. 0.414 V

Answer: D

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111. The temperature coefficient of a cell whose operation is based on the reaction

$Pb(s) + HgCl_2(aq) \rightarrow PbCl_2(aq) + Hg(l)$ is :

$\left(\frac{dE}{dT}\right)_P = 1.5 \times 10^{-4} VK^{-1}$ at 298 K

The change in entropy (in J/k mol) during the operation is :

A. 8627

B. 57.9

C. 28.95

D. 14.475

Answer: C

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112. The thermodynamic efficiency of cell is given by

A. $\frac{\triangle H}{\triangle G}$

B. $-\frac{nFE}{\triangle G}$

C. $-\frac{nEF}{\triangle H}$

D. nFE°

Answer: C

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113. calculate the value of equilibrium constant (K_f) for the reaction:

$Zn^{2+}(aq) + 4OH^{-}(aq) \Leftrightarrow Zn(OH)_4^{2-}(aq)$

Given: $Zn^{2+}(aq) + 2e^{-} \rightarrow Zn(s0, E^{\circ} = -0.76V$

$Zn(OH)_4^{2-}(aq) + 2e^{-} \rightarrow Zn(s) + 4OH^{-}(aq), E^{\circ} = -1.36V$

$2.303\frac{RT}{F} = 0.06$

A. 10^{10}

B. 2×10^{10}

C. 10^{20}

D. None of these

Answer: C

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114. Which of the following statement is false for fuel cell?

A. They are more efficient

B. They are free from pollution

C. They run till reactants are active

D. Fuel burned with O_2

Answer: D

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115. When a lead storage battery is charged it acts as:

A. a fuel cell

B. an electrolytic cell

C. a galvanic cell

D. a concentration cell

Answer: B

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116. The metal that forms a self-protecting film of oxide to prevent corrosion is:

A. Na

B. Al

C. Cu

D. Au

Answer: B

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117. Rusting of iron is catalyzed by which of the following?

A. Fe

B. Zn

C. O_2

D. H^+

Answer: D

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118. Which of the following is a highly corrosive salt?

A. Hg_2Cl_2

B. $HgCl_2$

C. $FeCl_2$

D. $PbCl_2$

Answer: B

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119. The Zn acts as sacrificial of cathodic protection to prevent rusting of iron because:

A. E°_{OP} of $Zn < E^{\circ}_{OP}$ of Fe

B. E°_{OP} of $Zn > E^{\circ}_{OP}$ of Fe

C. E°_{OP} of $Zn = E^{\circ}_{OP}$ of Fe

D. Zn is cheaper than iron

Answer: B

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120. In electrochemical corrosion of metals, the metal undergoing corrosion:

A. acts as anode

B. acts as cathode

C. undergoes reduction

D. None

Answer: A

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121. When an acid cell is charged, then: A) voltage of cell increases B) resistance of cell increases C) electrolyte of cell dilutes D) None of the above

A. voltage of cell increases

B. resistance of cell increases

C. eletrolyte of cell dilutes

D. None of these

Answer: A

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122. Electrolytic conduction is due to the movement of :

A. electrons

B. ions

C. atoms

D. electrons as well as ions

Answer: B

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123. Molten sodium chloride conducts electricity due to the presence of:

A. free electron

B. free ions

C. free molecules

D. atoms of sodium and chlorine

Answer: B

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124. Pure water does not conduct electricity because it :

A. is neutral

B. is readily decomposed

C. is almost totally unionized

D. has a low boiling point

Answer: C

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125. The relation among conductance (G), specific conductance (K) and cell constant (l/A) is :

A. $G = k\frac{l}{A}$

B. $G = k\frac{A}{l}$

C. $Gk = \frac{l}{A}$

D. G=kAL

Answer: B

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126. If X is specific resistance of the electrolytic solution and Y is the molarity of the solution then molar conductivity of solution is (in Scm^2mol^{-1}) given by:

A. $\frac{1000X}{Y}$

B. $1000\frac{Y}{X}$

C. $\frac{1000}{XY}$

D. $\frac{XY}{1000}$

Answer: C

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127. Equivalent conductivity can be expressed in terms of specific conductance (k) and concentration (N) in gram equivalent dm^{-3} as:

A. $k \times N$

B. $\frac{k \times 1000}{N}$

C. $\frac{k \times N}{1000}$

D. $k \times N \times 1000$

Answer: B

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128. Resistance of a decimolar solution between two electrodes 0.02 meter apart and 0.0004 m^2 in area was found to be 50 ohm. Specific conductance (k0 is :

A. $0.1Sm^{-1}$

B. $1Sm^{-}$

C. $10Sm^{-1}$

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

Answer: B

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129. Resistance of 0.1 M KCl solution in a conductance cell is 300 ohm and conductivity is 0.013Scm^{-1}. The value of cell constant is :

A. $3.9cm^{-1}$

B. $39m^{-1}$

C. $3.9m^{-1}$

D. None of these

Answer: A

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130. Ionisation constant of a weak acid (HA) in terms of A_m^{∞} and A_m is:

A. $K_a = \dfrac{C\Lambda_m^{\infty}}{\Lambda_m - \Lambda^{\infty}}$

B. $K_a = \dfrac{C\Lambda_m^2}{\Lambda_m^{\infty}(\Lambda_m^{\infty} - \Lambda_m)}$

C. $K_a = \dfrac{C\Lambda(\Lambda_m^{\infty})^2}{\Lambda_m^{\infty}(\Lambda_m^{\infty} - \Lambda_m)}$

D. None of these

Answer: B

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131. When a concentrated solution of an electrolyte is diluted

A. its specific conductance increases

B. its equivalent conductivity decreases

C. its specific conductivity decreases and equivalent conductivity increases

D. Both specific and equivalent conductivity increases

Answer: C

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132. Molar conductivity of a solution of an electrolyte AB_3 is 150 Scm^2mol^{-1} . If it ionises as $AB_3 \rightarrow A^{3+} + 3B^-$, its equivalent conductivity will be :

A. 150 (inScm^2eq^{-1})

B. 75 (in Scm^2eq^{-1})

C. 50 (in Scm^2eq^{-1})

D. 80 (in Scm^2eq^{-1})

Answer: C

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133. 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: D

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134. 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: D

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135. The specific conductance of a saturated solution of silver bromide is $kScm^{-1}$. The limiting ionic conductivity of Ag^{+} and Br^{-} ions are x and y respectively. The solubility of silver bromide in gL^{-1} is : (molar mass of AgBr=188)

A. $\dfrac{k \times 1000}{x - y}$

B. $\dfrac{k}{x + y} \times 188$

C. $\dfrac{k \times 1000 \times 188}{x + y}$

D. $\dfrac{x + y}{k} \times \dfrac{1000}{188}$

Answer: C

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136. 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: A

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137. A conductance cell was filled with a 0.02 M KCl solution which has a specific conductance of $2.768 \times 10^{-3} ohm^{-1} cm^{-1}$. If its resistance is 82.4 ohm at 25° C the cell constant is:

A. $0.2182 cm^{-1}$

B. $0.2281 cm^{-1}$

C. $0.2821 cm^{-1}$

D. $0.2381 cm^{-1}$

Answer: B

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138. The equivalent conductance of Ba^{2+} and Cl^{-} are $76 ohm^{-1} cm^2 eq^{-1}$ and $63.5 ohm^{-1} cm^2 eq^{-1}$, respectively, at infinite dilution . The equivalent conductance (in $ohm^{-1} cm^2 eq^{-1}$) of $BaCl_2$ at infinite dilution will be

A. 203

B. 279

C. 101.5

D. 139.5

Answer: A

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139. Unit of ionic mobility is :

A. $mV^{-1}s^{-1}$

B. $m^2V^{-2}s^{-1}$

C. $m^2V^{-1}s^{-1}$

D. $m^{-2}Vs^{-1}$

Answer: C

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140. A_{AgCl}^{∞} can be obtained:

A. by extraplotation of the graph Λ and $\sqrt{C}$ to zero concentration

B. by known values of Λ^{∞} of $AgNO_3$, HCl and HNO_3

C. both (a) and (b)

D. None of these

Answer: B

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141. The conductance of a salt solution (AB) measured by two parallel electodes of area $100cm^2$ separated by 10cm was found to be $0.0001\Omega^{-1}$. If volume enclosed between two electrode contain 0.1 mole of salt, what is the molar conductivity (Scm^2mol^{-1}) of salt at same concentration:

A. 10

B. 0.1

C. 1

D. None of these

Answer: B

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142. The conductivity of a strong electrolyte:

A. increases on dilution

B. decrease on dilution

C. does not change with dilultion

D. depends upon density of electrolytes

Answer: B

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143. The increase in equivalent conductivity of a weak electrolyte with dilution is due to :

A. increase in degree of dissociation and decrease in ionic mobility

B. decrease in degree of dissociation and decrease in ionic mobility

C. increase in degree of dissociation and increase in ionic mobility

D. decrease in degree of dissociation and increase in ionic mobility

Answer: C

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144. Strong electrolytes are those which:

A. conduct electricity

B. dissolve readily in water

C. dissolve into ions at high dilution

D. completely dissociation into ions

Answer: D

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145. The electric conduction of a salt solution in water depends on the :

A. size of its molecules

B. shape of its molecules

C. size of solvent molecules

D. extent of its ionization

Answer: D

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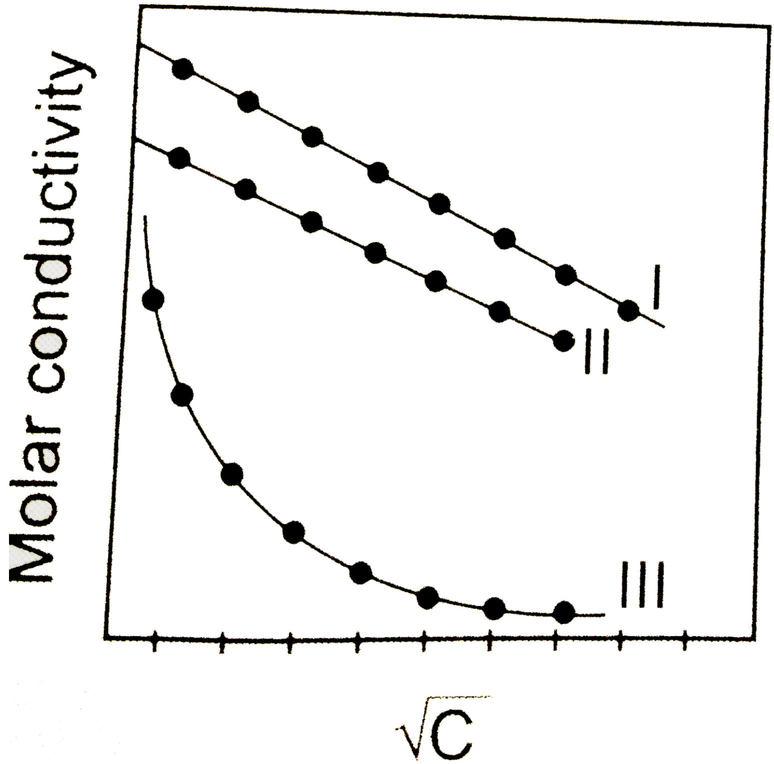
146. A graph was plotted between molar conductivity of various electrolytes (NaCl, HCl and NH_4OH) and $\sqrt{C}$ (in molL^{-1}) . Correct set is :



a. I(NaCl),II(HCl) , III(NH_4OH)

b. I(HCl),II(NaCl) , III(NH_4OH)

c. I(NH_4OH), II(NaCl), III(HCl)

d. I(NH_4OH), II(HCl) , III(NaCl)

A. I(NaCl),II(HCl) , III(NH_4OH)

B. I(HCl),II(NaCl) , III(NH_4OH)

C. I(NH_4OH), II(NaCl), III(HCl)

D. I(NH_4OH), II(HCl) , III(NaCl)

Answer: B

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147. Which of the following is arranged in increasing order of ionic mobility?

A. $I^{-} < Br^{-} < Cl^{-} < F^{-}$

B. $F^{-} < Cl^{-} < Br^{-} < I^{-}$

C. $F^{-} < I^{-} < Cl^{-} < Br^{-}$

D. $F^{-} < Cl^{-} < I^{-} < Br^{-}$

Answer: B

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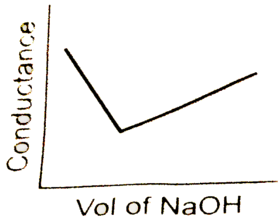
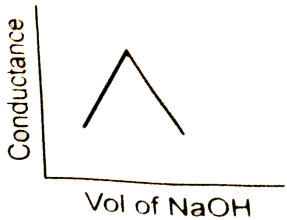
148. HNO_3(aq) is titrated with NaOH(aq) condutomatrically, graphical representation of the titration is :

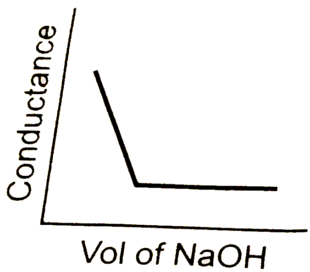
a.



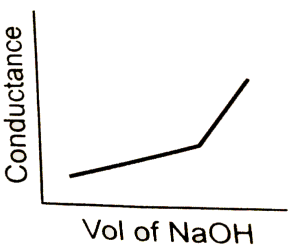
b.

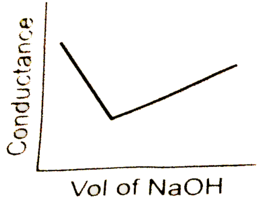


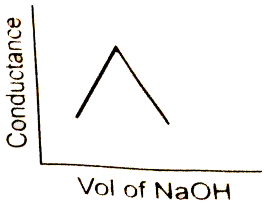
c.

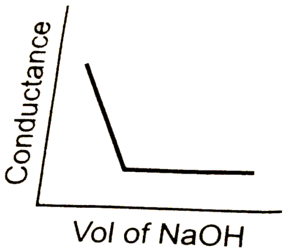


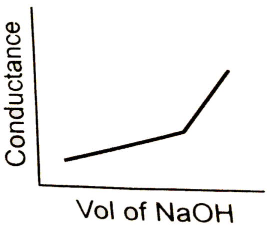
d.



A. 

B. 

C. 

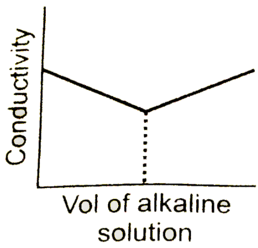
D. 

Answer: A

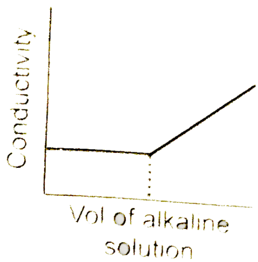
Watch Video Solution

149. which of the following plots will obtained for a conductometric titration of strong acid against a weak base?

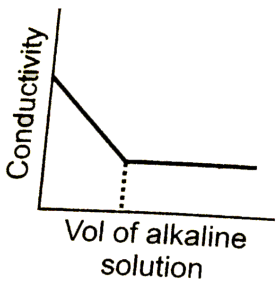
A. (a)



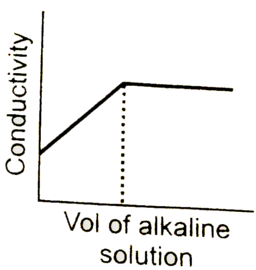
B. (b)



C. (c)



D. (d)



Answer: C

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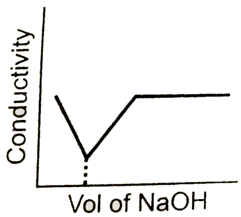
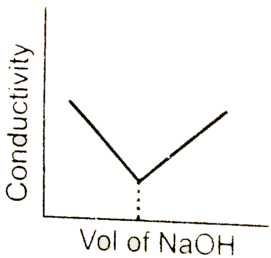
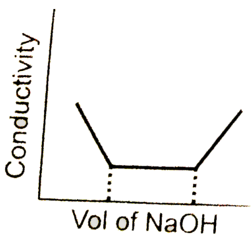
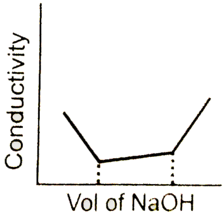
150. conductometric titration curve of a equimolar mixture of a HCl and HCN with NaOH(aq) is :

A. (a) 

B. (b) 

C. (c) 

D. (d) 

Answer: D

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Level 2

1. In the Hall process, aluminium is produced by the electrolysis of molten Al_2O_3. How many second would it take to produce enough aluminium by the Hall process to make a case of 24 cans of auminium soft-drink, if each can uses 5.0g of Al, a current of 9650amp is employed and the current efficiency of the cell is 90%:

A. 203.2

B. 148.14

C. 333

D. 6.17

Answer: B

Watch Video Solution

2. 108 g fairly concentrated solution of $AgNO_3$ is electrolysed by using 0.1 F charge the mass of resulting solution is

(a)94g

(b)11.6g

(c)96.4g

(d)None of these

A. 94g

B. 11.6g

C. 96.4g

D. None of these

Answer: C

Watch Video Solution

3. The electolysis of acetate solution produces ethane according to reaction:

$2CH_3COO^- \rightarrow C_6H6(g) + 2CO_2(g) + 2e^-$

The current efficiency of the process is 80% . What volume of gases would be produced at 27° C and 740 torr, if the current of 0.5 amp is used though the solution for 96.45 min?

(a)6.0L

(b)0.60L

(c)1.365L

(d)0.91L

A. 6.0L

B. 0.60L

C. 1.365L

D. 0.91L

Answer: D

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4. A layer of chromium metal 0.25 mm thick is to be plated on an auto bumper with a total area of 032m^2 from a solution cantaining CrO_4^{2-}? What current flow is required for this electroplating if the bumper is to be plated in 60s ? The density of chromium metal is 7.20g/cm^3

a. 4.9×10^3A

b. 1.78×10^3A

c. 5.3×10^4A

d. 10.69×10^4A

A. 4.9×10^3A

B. 1.78×10^3A

C. 5.3×10^4A

D. 10.69×10^4A

Answer: D

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5. $100mLCuSO_4$ (aq) was electrolyzed using inert electrodes by passing $0.965A$ till the pH of the resulting solution was 1. the soluton after electrolysis was neutralized treated with excess KI and titrated with $0.04MNa_2S_2O_3$. Volume of $Na_2S_2O_3$ required was 35mL. Assuming no volume change during electrolysis calculate:

(a) during of electrolysis if current efficiency is 80%

(b) initial concentration (M) of $CuSO_4$.

A. 112.5mL

B. 100mL

C. 125mL

D. None of these

Answer: A

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6. If the equilibrium constant for the reaction $H^{+}(aq)+OH^{-}(aq) \Leftrightarrow H_2O(l)$ is 10^{13} at certain temperature then what is the E° for the reaction, $2H_2O(l)+2e^{-} \Leftrightarrow H_2(g)+2OH^{-}(aq)$

(a)-0.858V

(b)0.547V

(c)4.37V

(d)1.09V

A. -0.858 V

B. 0.547V

C. 4.37V

D. 1.09V

Answer: B

Watch Video Solution

7. A fuel cell develops an electrical potential from the combustion of butane at 1 bar and 298 K

$C_4H_{10}(g) + 6.5O_2(g) \rightarrow 4CO_2(g) + 5H_2O(l), \ \triangle_r G^\circ = -2746kJ/mol$

what is E° of a cell?

(a)4.74V

(b)0.547V

(c)4.37V

(d)1.09V

A. 4.74V

B. 0.547V

C. 4.37V

D. 1.09V

Answer: D

Watch Video Solution

8. The cell $Pt \mid H_2(g, 01$ bar) $|H^+(aq), pH = x||Cl^-(1M)|Hg_2Cl_2|Hg|Pt$ has emf of 0.5755 V at $25^\circ C$ the SOP of calomel electrode is $-0.28V$ then pH of the solution will be

(a)11

(b)4.5

(c)5

(d)None of these

A. 11

B. 4.5

C. 5

D. None of these

Answer: C

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9. For a cell reaction $2H_2(g) + O_2(g) \rightarrow 2H_2O(l) \ \triangle_r \ S^{\circ}_{198} = -0.32KJ/k$. What is the value of $\triangle_f \ H^{\circ}_{298}(H_2O, l)$?

Given: $O_2(g) + 4H^+(aq) + 4e^- \rightarrow 2H_2O(l), E^{\circ} = 1.23V$

A. $-285.07kJ/mol$

B. $-570.14kJ/mol$

C. $285. \ kJ/mol$

D. None of these

Answer: A

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10. What is the potential of an electrode which originally contained 0.1 MNO_3^- and $0.4MH^+$ and which has been treated by 8% of the cadmium necessary to reduce all the NO_3^- to NO(g) at 1 bar?

Give: $NO_3^- + 4H^+ + 3e^- \rightarrow NO + 2H_2O, E^{\circ} = 0.96V, \log 2 = 0.3$

A. 0.84V

B. 1.08V

C. 1.23V

D. 1.36V

Answer: A

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11. The standard reduction potential of normal calomel electrode and reduction potential of saturated calomel electrodes are 0.27 and 0.33 volt respectively. What is the concentration of Cl^{-} in saturated solution of KCl?

(a)0.1M

(b)0.01M

(c)0.001M

(d)None

A. 0.1M

B. 0.01M

C. 0.001M

D. None

Answer: A

Watch Video Solution

12. Determine the potential of the following cell:

$Pt|H_2(g, 0.1\text{bar})|H^+(aq, 10^{-3}M||MnO_4^-)(aq), 0.1M)$

$Mn^{2+}(aq, 0.01M), H^+(aq, 0.01M) \mid Pt$

Given : $E^\circ_{MnO_4^- | Mn^{2+}} = 1.51V$

(a)1.54V

(b)1.48V

(c)1.84V

(d)none of these

A. 1.54V

B. 1.48V

C. 1.84V

D. none of these

Answer: B

Watch Video Solution

13. Copper reduced NO_3^- into NO and NO_2 depending upon conc.of HNO_3 in solution. Assuming $[Cu^{2+}] = 0.1M$, and $P_{NO} = P_{NO_2} = 10^{-3}$ atm and using data answer the following questions:

$E^{\circ}_{Cu^{2+}/Cu} = +0.34$ volt, at $298K \frac{RT}{F}(2.303) = 0.06$ volt

E_{cell} for reduction of $NO_3^- \rightarrow NO$ by $Cu(s)$ when $[HNO_3] = 1M$ is [At $t = 298]$

A. $10^{1.23}M$

B. $10^{0.56}M$

C. $10^{0.66}M$

D. $10^{0.12} M$

Answer: C

Watch Video Solution

14. For the cell,

$Pt|Cl_2(g, 0.4\text{bar})|Cl^-(aq, 0.1M)||Cl^-(aq), 0.01M)|Cl_2(g, 0.2\text{bar})|pt$

Emf is?

(a)0.051V

(b)-0.051V

(c)0.102V

(d)0.0255V

A. 0.051V

B. -0.051

C. 0.102V

D. 0.0255V

Answer: A

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15. The chlorate ion can disproportinate in basic solution according to reaction,

$2ClO_3^- \Leftrightarrow ClO_2^- + ClO_4^-$

what is the equilibrium concentration of perchlorate ions from a solution initially at 0.1 M in chlorate ions at 298 K?

Given: $E^\circ_{Cl_4^- | ClO_3^-} = 0.36V \text{and} E^\circ_{Cl_3^- | ClO_2^-} = 0.33V \text{at} 298K$

(a)0.019M

(b)0.024M

(c)0.1M

(d)0.19M

A. 0.019 M

B. 0.024M

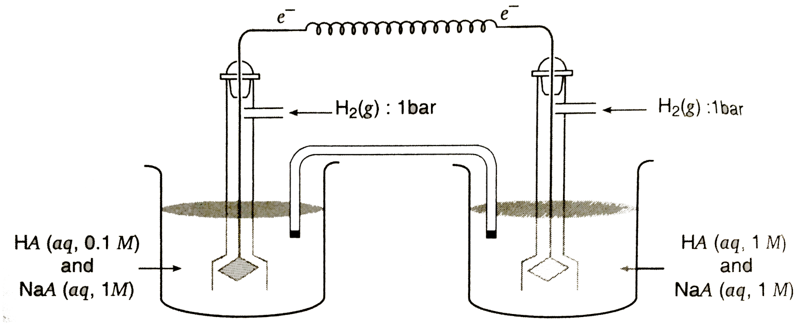
C. 0.1M

D. 0.19M

Answer: A

Watch Video Solution

16. A cell diagram shown below contains of one litre of buffer solution of $HA(PK_a = 4)$ and NaA in both compartments. What is the cell e.m.f?



A. 0.03V

B. 0.06V

C. -0.06V

D. None of these

Answer: B

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17. Given the cell:

$Cd(s)|Cd(OH)_2(s)|NaOH(aq, 0.01M)|H_2(g, 1\text{bar})|Pt(s)$

with $E_{cell} = 0.0V.\text{ if}E^{\circ}_{Cd^{2+}|Cd} = -0.39V, \text{ then}K_{sp}\text{of}Cd(OH_2)$is:

(a)0.1

(b)10^{-13}

(c)10^{-15}

(d)None of these

A. 0.1

B. 10^{-13}

C. 10^{-15}

D. None of these

Answer: C

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18. calculate the e.m.f (in V) of the cell:

$Pt|H_2(g)|BOH(Aq)||HA(Aq)|H_2(g)|Pt,$

0.1bar 1M 0.1M 1bar

Given : $K_a(HA) = 10^{-7}, K_b(BOH) = 10^{-6}$

(a)0.39V

(b)0.36V

(c)0.93V

(d)None of these

A. 0.39V

B. 0.36V

C. 0.93V

D. None of these

Answer: A

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19. Calculate the potential of a half cell having reaction : $Ag_2S(s) + 2e^- \Leftrightarrow 2Ag(s) + S^{2-}(aq)$ in a solution buffered at $pH = 3$ and which is also saturated with 0.1 MH_2S(aq):

[Given:$K_{sp}(Ag_2S) = 10^{-49}, K_{a1} \cdot K_{a2} = 10^{-21}$]

A. 1.18

B. 0.19

C. -0.19V

D. none of these

Answer: C

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20. The conductivity of 0.1 N NaOH solution is 0.022 Scm^{-1}.When equal volume of 0.1 N HCl solution is added, the conductivity of resultant solution is decreased to 0.0055 S cm^{-1} . The equivalent conductivity of NaCl solution is :

A. 0.0055

B. 0.11

C. 110

D. None of these

Answer: C

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21. In above question after formation of NaCl, further 0.1 N HCl is added, the volume of which is double to that of the first portion added, the conductivity increases to 0.018 Scm^{-1}. The value of $bid \wedge_{\_}$ $(eq)(HCl)$ is [assume no change in equivalent conductivity of NaCl(aq)]:

A. 330 Scm^2eq^{-1}

B. 305 Scm^2eq^{-1}

C. 415 Scm^2eq^{-1}

D. 360 Scm^2eq^{-1}

Answer: B

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22. Given the following molar conductivity at 25° C:, HCl,426 $\Omega^{-1}cm^2mol^{-1}$, NaCl, $126\Omega^{-1}cm^2mol^{-1}$, NaC(sodium crotonate), $83\Omega^{-1}cm^2mol^{-1}$. What is the dissciation constant of crotonic acid,if the conductivity of a 0.001 M crotonic acid solution is $3.83 \times 10^{-5}\Omega^{-1}cm^{-1}$?

A. 10^{-5}

B. 1.11×10^{-5}

C. 1.11×10^{-4}

D. 0.01

Answer: B

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23. Equivalent conductivity of $BaCl_2, H_2SO_4$ and HCl, are $x_1, x_2 \text{and} x_3 Scm^{-1}eq^{-1}$ at infinite dilution. If conductivity of saturated $BaSo_4$ solution is xScm^{-1}, then K_{sp} of $BaSO_4$ is :

A. $\dfrac{500x}{(x_1 + x_2 - x_3)^2}$

B. $\dfrac{10^6 x^2}{(x_1 + x_2 - 2x_3)^3}$

C. $\dfrac{2.5 \times 10^5 x^2}{(x_1 + x_2 - 2x_3)^2}$

D. $\dfrac{0.25x^2}{(x_1 + x_2 - 2x_3)^2}$

Answer: C

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24. The conductivity of 0.001M Na_2SO_4 solution is $2.6 \times 10^{-4} Scm^{-1}$ and increases to $7.0 \times 10^{-4} Scm^{-1}$, When the solution is saturated with $CaSO_4$. The molar conductivities of Na^+ and Ca^{2+} are 50 and 120 $Scm^2 mol^{-1}$, respectively. Neglect conductivity of used water. What is the solubility product of $CaSO_4$?

A. 4×10^{-6}

B. 1.57×10^{-3}

C. 4×10^{-4}

D. 1.52×10^{-4}

Answer: A

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25. The dissociation constant of a weak acid is 1.6×10^{-5} and the molar conductivity at infinite dilution is 380×10^{-4} S$m^2 mol^{-1}$. If the cell constant is 0.01m^{-1} then conductace of 0.1M acid solution is :

A. 1.52×10^{-5}S

B. 1.52 S

C. 1.52×10^{-3}S

D. 1.52×10^{-4}S

Answer: B

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26. Three electrolytic cells X,Y,Z containing solution of NaCl, $AgNO_3$ and $CuSO_4$ respectively are connected in series combination. During electrolysis 21.6gm of silver deposits at cathode in cell Y. Which is incorrect statement.

A. 6.35 gm copper deposits at cathode in cell z

B. 2.24 litre Cl_2 is liberated(at 1atm and 273 K) at anode in cell X

C. 2.24 litre O_2 is liberated(at 1atm and 273 K) at anode in cell Y

D. 2.24 litre H_2 is liberated(at 1atm and 273 K) at anode in cell X

Answer: C

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27. During electrolysis of H_2SO_4(aq) with high charge density, $H_2S_2O_8$ formed as by product. In such electrolysis 22.4L $H_2(g)$ and 8.4 L $O_2(g)$ liberated at 1 atm and 273 K at electrode. The moles of $H_2S_2O_8$ formed is :

A. 0.25

B. 0.5

C. 0.75

D. 1

Answer: A

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28.

$Zn(s)\left|Zn(CN)_4^{2-}(0.5M), CN^-(0.01)\right|\left|Cu(NH_3)_4^{2+}(0.5M), NH_3(1M)\right|C$

Given: $K_f \text{of} Zn(CN)_4^{-2} = 10^{16}$, $K_f \text{of} Cu(NH_3)_4^{2+} = 10^{12}$,

$$E^{\circ}_{Zn \mid Zn^{2+}} = 0.76V, E^{\circ}_{Cu^{+2} \mid Cu} = 0.34V, \frac{2.303RT}{F} = 0.06$$

The emf of above cell is :

A. 1.22V

B. 1.10V

C. 0.98V

D. None of these

Answer: C

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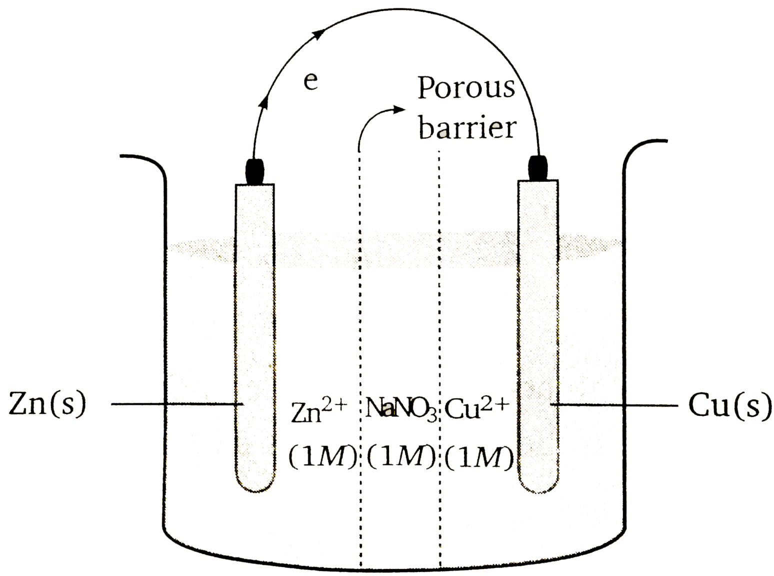
Level 3

1.



A Galvanic cell consits of three compartment as shown in figure. The first compartment contain $ZnSO_4$(1M) and III compartment contain $CuSO_4$ (1M). The mid compartment contain $NaNO_3$ (1M). Each compartment contain 1L solution:

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

The concertation of Zn^{2+} in first compartment after passage of 0.1 F charge will be:

A. 1M

B. 1.05M

C. 1.025M

D. 0.5M

Answer: C

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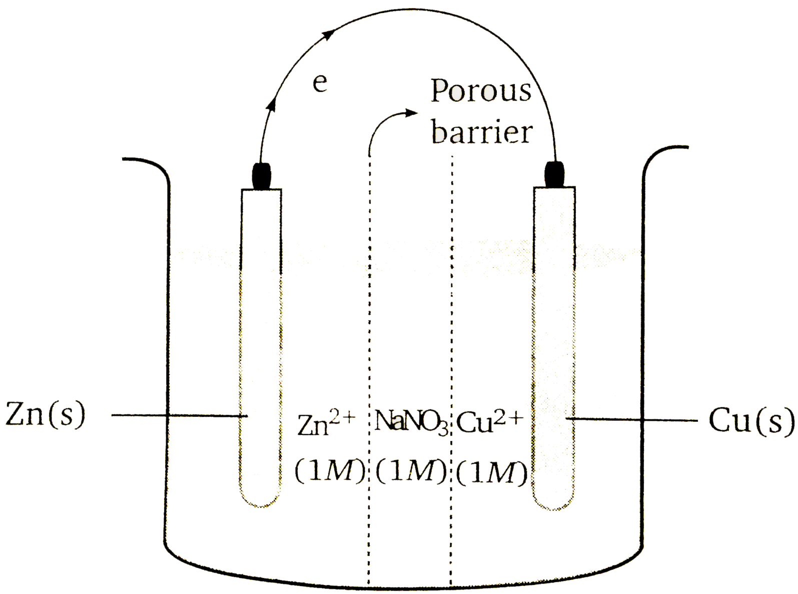

2.

A Galvanic cell consits of three compartment as shown in figure. The first compartment contain $ZnSO_4$(1M) and III compartment contain $CuSO_4$ (1M). The mid compartment contain $NaNO_3$ (1M). Each compartment contain 1L solution:

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

The concentration of NO_3^- in mid compartment after passage of 0.1 F of charge will be:

A. 0.95M

B. 0.90M

C. 0.975M

D. 1.05M

Answer: A

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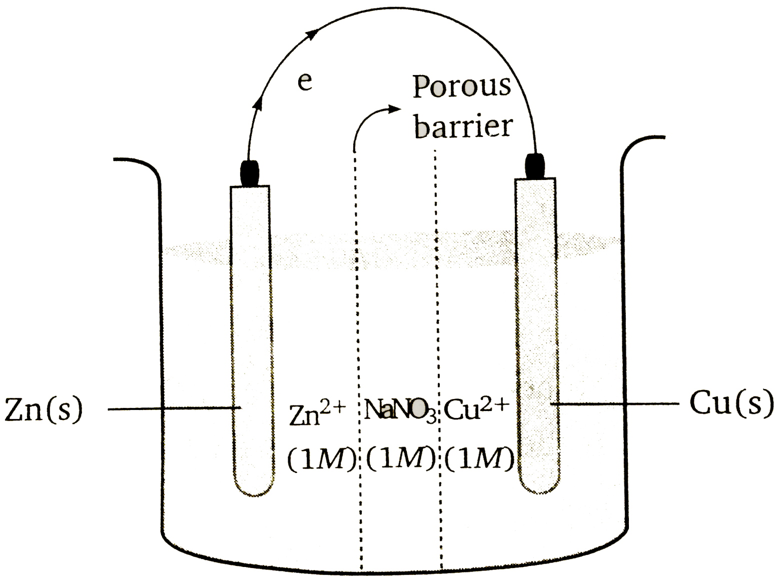
3.



A Galvanic cell consits of three compartment as shown in figure. The first compartment contain $ZnSO_4$(1M) and III compartment contain $CuSO_4$ (1M). The mid compartment contain $NaNO_3$ (1M). Each compartment contain 1L solution:

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

The concentration of SO_4^{2-} ions in III compartment after passage of 0.1 F of charge will be:

A. 1.05M

B. 1.025M

C. 0.95M

D. 0.975M

Answer: D

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4. The cell potential (E_{cell}) of a reaction is related as $\triangle G = -nFE_{cell}$

, where $\triangle G$represents max. useful electrical work

n=no. of moles of electrons exchanged during the section

for reversible cell reaction $d(\triangle G) = (\triangle_r V)dp - (\triangle_r S), dT$

at constant pressure $d(\triangle G) = -(\triangle_r S).dT$

:' At constant pressure $\triangle G = \triangle H - T. \triangle S$

:. $\triangle G = H + T\frac{d(\triangle G)}{(dT)_P}$

$\left(\frac{dE_{cell}}{dT}\right)_P$ is known as temperture coefficient of the e.m.f of the cell.

The temperature coefficient of the e.m.f of cell, $\left(\frac{dE}{dT}\right)_P$ si given by:

A. $\frac{nF}{\triangle S}$

B. $\frac{\triangle S}{nF}$

C. $\frac{\triangle S}{nFT}$

D. #REF!

Answer: B

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5. At 300 k, $\triangle H$for the reaction

$Zn(s) + AgCl(s) \rightarrow ZnCl_2(aq) + 2Ag(s)$ is

-218 KJ/mol while the e.m.f of the cell was 1.015V. $\left(\frac{dE}{dT}\right)_p$ of the cell is :

A. $-4.2 \times 10^{-4} VK^{-1}$

B. $-3. .81 \times 10^{-4} VK^{-1}$

C. $0.11 VK^{-1}$

D. $7.62 \times 10^{-4} VK^{-1}$

Answer: B

Watch Video Solution

6. At 300 k, $\triangle H$for the reaction

$Zn(s) + AgCl(s) \rightarrow ZnCl_2(aq) + 2Ag(s)$ is

$-218K\frac{J}{m}ol$while the e.m.f of the cell was 1.015V. $\left(\frac{dE}{dT}\right)_p$ of the cell is

$-0.000381VK^{-1}$. Calculate $\triangle S$ for the given cell reaction.

A. -73.53J/Kmol

B. 83.53J/Kmol

C. 100J/Kmol

D. None of these

Answer: A

Watch Video Solution

7. The molar conductivity of 0.04 M solution of $MgCl_2$ is 200 Scm^2mol^{-1} at 298 k. A cell with electrodes that are 2.0cm^2 in surface area and 0.50cm apart is filled with $MgCl_2$ solution.

Conductance of $MgCl_2$ solution is :

A. 8×10^{-3}S

B. 32S

C. 0.032S

D. None of these

Answer: C

Watch Video Solution

8. The molar conductivity of 0.04 M solution of $MgCl_2$ is 200 Scm^2mol^{-1} at 298 k. A cell with electrodes that are 2.0cm^2 in surface area and 0.50cm apart is filled with $MgCl_2$ solution

How much current will flow when the potential difference between the two electrodes is 5.0V?

A. 156.25V

B. 0.16A

C. 160A

D. None of these

Answer: B

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9. In a hydrogen oxyge fuel cell, electricity is produced. In this process H_2 (g) is oxided at anode and O_2(g) reduced at cathode

Given: Cathode $O_2(g) + 2H_2O(l) + 4e^- \rightarrow 4OH^-(aq)$

Anode $H_2(g) + 2OH^-(aq) \rightarrow 2H_2O(l) + 2e^-$

4.48 litre H_2 at 1atm and 273 k oxidised in 9650 sec.

The current produced is (in amp):

A. 1A

B. 2A

C. 4A

D. 8A

Answer: C

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10. In a hydrogen oxyge fuel cell, electricity is produced. In this process H_2(g) is oxided at anode and O_2(g) reduced at cathode

Given: Cathode $O_2(g) + 2H_2O(l) + 4e^- \rightarrow 4OH^-(aq)$

Anode $H_2(g) + 2OH^-(aq) \rightarrow 2H_2O(l) + 2e^-$

4.48 litre H_2 at 1atm and 273 k oxidised in 9650 sec.

The mass of water produced is :

A. 7.2g

B. 3.6g

C. 1.8g

D. 0.9g

Answer: B

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11. In a hydrogen oxyge fuel cell, electricity is produced. In this process H_2 (g) is oxided at anode and O_2(g) reduced at cathode

Given: Cathode $O_2(g) + 2H_2O(l) + 4e^- \rightarrow 4OH^-(aq)$

Anode $H_2(g) + 2OH^-(aq) \rightarrow 2H_2O(l) + 2e^-$

4.48 litre H_2 at 1atm and 273 k oxidised in 9650 sec.

If current produced in fuel cell, is used for the deposition of Cu^{+2} in 1L,2M $CuSO_4$(aq) solution for 241.25 sec using Pt. electrode, the pH of solution after electrolysis is:

A. 1

B. 2

C. 3

D. 4

Answer: B

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12. A saturated solution in $AgX(K_{sp} = 3 \times 10^{-12})$ and $AgY(K_{sp} = 10^{-12})$ has conductivity $0.4 \times 10^{-6} \Omega^{-1} cm^{-1}$.

Given: Limiting molar conductivity of $Ag^{+} = 60 \Omega^{-1} cm^2 mol^{-1}$

Limiting molar conductivity of $X^{-} = 90 \Omega^{-1} cm^2 mol^{-1}$

The conductivity of Y^{-} is (in $\Omega^{-1} cm^{-1}$):

A. 1.45×10^{-7}

B. 1.45×10^{-5}

C. 1.45×10^{-9}

D. None of these

Answer: A

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13. A saturated solution in $AgX(K_{sp} = 3 \times 10^{-12})$ and $AgY(K_{sp} = 10^{-12})$ has conductivity $0.4 \times 10^{-6} \Omega^{-1} cm^{-1}$.

Given: Limiting molar conductivity of $Ag^{+} = 60\Omega^{-1}cm^{2}mol^{-1}$

Limiting molar conductivity of $X^{-} = 90\Omega^{-1}cm^{2}mol^{-1}$

The conductivity of Y^{-} is (in $\Omega^{-1}cm^{-1}$):

A. 50

B. 2900

C. 2.9

D. None of these

Answer: A

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14. If the e.m.f of a galvanic cell is negative, it implies that:

A. the cell reaction is spontaneous

B. the cell reaction is non-spontaneous

C. the cell reaction is exothermic

D. the cell is working in reverse direction

Answer: A::B

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15. Select correct statement(s) about electrolysis:

A. Electric current is used to drive a non -spontaneous reaction

B. $\triangle G$ is positive for chemical process during electrolysis

C. Cations and anions are moved toward the anode and cathode respectively

D. Over voltage is generally associated with evolution of O_2 gas

Answer: A::B::D

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16. If the half-cell reaction $A + e^- \rightarrow A^-$ has a large negative reduction potentials, it follows that:

A. A is readly reduced

B. A is readily oxidised

C. A^- is readily reduced

D. A^- is readily oxidised

Answer: D

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17. Which of the following statements is correct? If $E^\circ_{Cu^{2+}|Cu} = 0.34V, E^\circ_{Sn^{2+}|Sn} = -0.136V, E^\circ_{H^+|H_2} = -0.0V$

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

B. cu can be oxidised

C. Sn^{2+} ions can be reduced by H_2

D. Sn can be oxidized by Cu^{2+}

Answer: A::D

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18. The oxidation potential of hydrogen half-cell will be negative if:

A. $p(H_2) = 1 atm \text{ and } [H^+] = 1M$

B. $p(H_2) = 1 atm \text{ and } [H^+] = 2M$

C. $p(H_2) = 0.2 atm \text{ and } [H^+] = 1M$

D. $p(H_2) = 0.2 atm \text{ and } [H^+] = 0.2M$

Answer: B::C

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19. which of the following arrangement will procedure oxygen at anode during electrolysis?

A. Dilute H_2SO_4 with Pt electrodes

B. Fused NaOH with inert electrodes

C. Dilute H_2SO_4 with Cu electrodes

D. Concentrated aq. NaCl with Pt electrodes

Answer: A::B

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20. When an aqueous concentrated solution of lithium chloride is electrolysed using inert electrodes:

A. Cl_2 is liberated at the anode

B. Li is deposited at the cathode

C. as the current flows. pH of the solution around the cathode remains constant

D. as the current flows, pH of the solution around the cathode increases

Answer: A::D

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21. Oxygen and hydrogen gas are produced at the anode and cathode during the electrolysis of fairly concentration aqueous solution of :

A. K_2SO_4

B. $AgNO_3$

C. H_2SO_4

D. NaOH

Answer: A::C::D

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22. During the purification of copper by electrolysis:

(a)the anode used is made of copper ore

(b)pure copper is deposited on the cathode

(c)the impurities such as Ag, Au present in solution as ions

(d)concentration of $CuSO_4$ solution remains constant during dissolution of Cu

A. the anode used is made of copper ore

B. pure copper is deposited on the cathode

C. the impurities such as Ag, Au present in solution as ions

D. concentration of $CuSO_4$ solution remains constant during dissolution of Cu

Answer: A::B::D

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23. When a lead storage battery is discharged:

A. SO_2 is evolved

B. lead sulphate is produced at both electrodes

C. sulphuric acid is consumed

D. water is formed

Answer: B::C::D

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24. Which of the following is characteristic of the cathode in a voltaic cell?

A. It may gain weight during reaction

B. Electrons flow to it through the external circuit

C. It is where oxidation occurs

D. it receives electrons from ions in solution

Answer: A::B

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25. In an electrochemical process, a salt bridge is used:

A. to maintain electrical neutrality in each solution

B. to complete the external circuit so that current can flow for long time

C. to mix the solution of anodic and cathodic compartment

D. to supply voltage

Answer: A

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26. For a reaction in a galvanic cell the value of $-\triangle G^{\circ}$ at certain temperature is not necessarily equal to:

A. nFE°

B. RT In K

C. $T \triangle S^{\circ} - \triangle H^{\circ}$

D. zero

Answer: B::D

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27. Given that $E^{\cdot}_{Fe^{2+}/Fe} = -0.44V, E^{\circ}_{Fe^{3+}/Fe^{2+}} = 0.77V$ if Fe^{2+}, Fe^{3+} and Fe solid are kept together then

A. the concentration of Fe^{3+} increases

B. the concentration of Fe^{3+} decreases

C. the mass of Fe increases

D. the concentration of Fe^{2+} decreases

Answer: B

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28. which of the following statements are correct regarding to galvanic cell?

A. A reaction is spontaneous from right to left if $E_{cell} > 0$

B. A reaction occurs from right to left if $E_{cell} < 0$

C. If the system is at equilibrium no net reaction occurs

D. E_{cell} is temperature-independent

Answer: A::B::C

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29. Which of the following are concentration cell?

A. $Pt|\underset{P_1}{H_2(g)}|HCl|\underset{P_2}{H_2(G)} \mid Pt$

B. $Cd,\underset{(a_1)}{(Hg)}|\underset{(C)}{C}d^{2+}|\underset{a_2}{(Hg)}, Cd$

C. $Zn(s)|\underset{c_1}{Zn^{2+}}||\underset{c_2}{Cu^{2+}}|Cu$

D. $Ag|AgCl|\underset{c_1}{Cl^-}(aq)||\underset{c_2}{Br^-}(aq)|AgBr|Ag$

Answer: A::B::D

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30. In electrolyte concentration cell:

A. the electrode material and the solution in both half-cells are composed of the same substances

B. only the concentrations of solutions of ther same substances is different

C. $E^\circ_{cell} = 0$

D. the Nernst equations reduces to $E_{cell} = -\left(\frac{0.0591}{n}\right)$ log Q at $25^\circ C$

Answer: A::B::C::D

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31. The standard electrode of a metal ion $\left(Ag \mid Ag^{\oplus}\right)$ and metal $-$ insoluble salt anion $\left(Ag|AgCl|Cl^{-}\right)$ are related as

A. $E^{\circ}_{Ag^{+}|Ag} = E^{\circ}_{Cl(-)|AgCl|Ag} + \frac{RT}{F} InK_{sp}$

B. $E^{\circ}_{Cl(-)|\text{AgCl}|Ag}$=$E^{\circ}_{Ag^{+}|Ag} + \frac{RT}{F} InK_{sp}$

C. $E^{\circ}_{Cl(-)|AgCl|Ag}$=$E^{\circ}_{Ag^{+}|Ag} - \frac{RT}{F} In\frac{[Cl^{-}]}{K_{sp}}$

D. $E^{\circ}_{Cl(-)|AgCl|Ag}$=$E^{\circ}_{Ag^{+}|Ag} - \frac{RT}{F} In\frac{[Cl^{-}]}{K_{sp}}$

Answer: B

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32. Which of the following units is correctly matched?

A. SI units of conductivity is Sm^{-1}

B. SI units of molar conductivity is $Scm^{2}mol^{-1}$

C. SI unit of conductance is S^{-1}

D. All of these

Answer: A

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33. Which of the following statements is/are correct?

A. The conductance of one cm^3 (or 1 $unit^3$) of a solution is called specific conductance

B. Specific conductance increases while molar conductivity decreases on progressive dilution

C. The limiting equivalent conductivity of weak electrolyte cannot be determined exactly by extraplotation of the plot of $\wedge_{eq}$ against $\sqrt{c}$

D. The conductance of metals is due to the movement of free electrons

Answer: A::C::D

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34. Which is/are correct statement?

A. No corrosion takes place in vaccum

B. Corrosion is protected by electroplating

C. During rusting $Fe_2O_3 \cdot xH_2O$ formed

D. In presence of electrolyte, corrosion takes place with greater rate

Answer: A::B::C::D

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35. A dilute solution of KCl was placed between two Pt electrodes 10cm apart across which a potential difference of 10 volt was applied. Which is

/are correct statement (Given: molar conductivity of K^+ at infinite dilution is $96.5 S cm^2 mol^{-1}$

A. Ionic mobility of K^+ is $10^{-3} cm^2 \sec^{-1} \text{volt}^{-1}$

B. The speed of K^+ is 10^{-3} cm $\sec^{-1}$

C. Distance travelled by K^+ in 5×10^3 sec is 5cm

D. The potential gradient is 1.0 volt cm^{-1}

Answer: A::B::C::D

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36. Given: $Pt(s)|\underset{P_1 atm}{C}l_2(g)|Cl^-(C_1)||Cl^-(C_2)|_{P_2 atm}(Cl)_2$(g)| $Pt(s)$

identify in which of following condition working of cell takes place:

A. $C_1 > C_2 \text{and} P_1 = P_2$

B. $P_1 > P_2 \text{and} C_1 = C_2$

C. $C_2 > C_1 \text{and} P_1 = P_2$

D. $P_1 < P_2 \text{and} C_1 = C_2$

Answer: A::B

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37. 1000mL 1M $CuSO_4$(aq) is electrolysed by 9.65 A current for 100 sec using Pt-electrode which is /are correct statements?

A. Blue colour intensity decreases during electrolysis

B. Blue colour intensity remains constant if Cu-electrode used.

C. pH of solution is 8 after electrolysis.

D. 28mL of CH_4 at 1 atm and 273 K required for its combustion by O_2, liberated during electrolysis.

Answer: A::B::D

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Match The Column

1. Column-1 and column-II contains four entries each. Entries of column-I are to be matched with some entries of column-II .One or more than one entries of column-I may have the matching with the same entries of column-II

Column–I	Column–II
(A) Dilute solution of HCl	(P) O_2 evolved at anode
(B) Dilute solution of NaCl	(Q) H_2 evolved at cathode
(C) Concentrated solution of NaCl	(R) Cl_2 evolved at anode
D) Fairly concentrated solution of $AgNO_3$	(S) Ag deposition at cathode

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2. Column-1 and column-II contains four entries each. Entries of column-I are to be matched with some entries of column-II .One or more than one entries of column-I may have the matching with the same entries of column-II

Column–I	Column–II (SRP)
(A) $F_2 + 2e^- \rightleftharpoons 2F^-$	(P) 0.54
(B) $Cl_2 + 2e^- \rightleftharpoons 2Cl^-$	(Q) 1.09
(C) $Br_2 + 2e^- \rightleftharpoons Br^-$	(R) 1.36
(D) $I_2 + 2e^- \rightleftharpoons 2BI^-$	(S) 2.87

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3. Column-1 and column-II contains four entries each. Entries of column-I are to be matched with some entries of column-II .One or more than one entries of column-I may have the matching with the same entries of column-II

Column–I	Column–II
(A) $Pt \mid Fe^{3+}, Fe^{2+}$	(P) Metal-metal ion half-cell
(B) $Pt \mid H_2 \mid H^+$	(Q) Gas-gas ion half-cell
(C) $Pt \mid Hg \mid Hg_2^{2+}$	(R) Oxidation-reduction half-cell
(D) $Pb \mid PbSO_4 \mid SO_4^{2-}$	(S) Metal-sparingly soluble salt half-cell

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4. Column-1 and column-II contains four entries each. Entries of column-I are to be matched with some entries of column-II .One or more than one entries of column-I may have the matching with the same entries of column-II

Column–I (Property)	Column–II (Unit)
(A) Conductance	(P) Sm^{-1}
(B) Conductivity	(Q) $S^{-1}m$
(C) Molar conductivity	(R) $Sm^{2}mol^{-1}$
(D) Resistivity	(S) S

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5. Column-1 and column-II contains four entries each. Entries of column-I are to be matched with some entries of column-II .One or more than one entries of column-I may have the matching with the same entries of column-II

Column–I (Ion)	Column–II (Molar Conductivity)
(A) H^{+}	(P) 350
(B) Na^{+}	(Q) 50
(C) Li^{+}	(R) 39
(D) Cs^{+}	(S) 77

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6. Column-1 and column-II contains four entries each. Entries of column-I are to be matched with some entries of column-II .One or more than one entries of column-I may have the matching with the same entries of column-II

Column-I	Column-II
(A) Galvanic cell	(P) Used in space craft
(B) Electrolytic cell	(Q) No transformation of electrical energy into chemical energy
(C) Dead battery	(R) Cell reaction is spontaneous
(D) Fuel cell	(S) Cell reaction is non-spontaneous

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Assertion Reason Type Question

1. STATEMENT -1: E°_{cell} is negative for electrolytic cell.

STATEMENT-2: $\triangle G^{\circ}$ is +ve for electrolyte cell

(a) If both the statements are TRUE and STATEMENTS-2 is the correct explantion of STATEMENTS-1

(b)If both the statements are TRUE but STATEMENTS-2 is NOT the correct explanation of STATEMENTS-1 (c)If STATEMENTS-1 is TRUE and STATEMENTS-2 is FALSE

(d)If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

A. If both the statements are TRUE and STATEMENTS-2 is the correct explantion of STATEMENTS-1

B. If both the statements are TRUE but STATEMENTS-2 is NOT the correct explanation of STATEMENTS-1

C. If STATEMENTS-1 is TRUE and STATEMENTS-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A

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2. STATEMENT-1: when 2 faraday of charge is passed through 0.1 M H_2SO_4 (aq) ,11.2 litre O_2 evolved at STP.

STATEMENT-2: Molecular mass of oxygen is 32

A. If both the statements are TRUE and STATEMENTS-2 is the correct explantion of STATEMENTS-1

B. If both the statements are TRUE but STATEMENTS-2 is NOT the correct explanation of STATEMENTS-2

C. If STATEMENTS-1 is TRUE and STATEMENTS-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: B

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3. STATEMENT-1: Copper is dissolved at anode and deposited at cathode when Cu electrodes are used and electrolyte is 1 M $CuSO_4$ (aq) solution.

STATEMENT-2: SOP of Cu is less than SOP of water and SRP of Cu is greater than SRP of water.

A. If both the statements are TRUE and STATEMENTS-2 is the correct explantion of STATEMENTS-1

B. If both the statements are TRUE but STATEMENTS-2 is NOT the correct explanation of STATEMENTS-3

C. If STATEMENTS-1 is TRUE and STATEMENTS-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: C

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4. STATEMENT-1: 1 coulomb charge deposits 1 g-equivalent of a substance.

STATEMENT-2: 1 faraday is charge is charge on 1 mole of electrons.

A. If both the statements are TRUE and STATEMENTS-2 is the correct explantion of STATEMENTS-1

B. If both the statements are TRUE but STATEMENTS-2 is NOT the correct explanation of STATEMENTS-1

C. If STATEMENTS-1 is TRUE and STATEMENTS-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: D

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5. STATEMENT-1: If SRP of substance is -0.3V, its reduction is possible at cathode.

STATEMENT-2: Reduction potential of water lies between 0 to -0.8274 V at 25°

A. If both the statements are TRUE and STATEMENTS-2 is the correct explantion of STATEMENTS-1

B. If both the statements are TRUE but STATEMENTS-2 is NOT the correct explanation of STATEMENTS-1

C. If STATEMENTS-1 is TRUE and STATEMENTS-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A

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6. STATEMENT-1: If SRP of substance is -0.5V, then reduction of substance is possible only in basic medium .

SRP of water is -0.8274V and at reduction potential is zero at pH=7

A. If both the statements are TRUE and STATEMENTS-2 is the correct explantion of STATEMENTS-4

B. If both the statements are TRUE but STATEMENTS-2 is NOT the correct explanation of STATEMENTS-6

C. If STATEMENTS-1 is TRUE and STATEMENTS-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: C

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7. STATEMENT-1: The voltage of mercury cell remains constant for longer period of time.

STATEMENT-2: It is because net cell reaction does not involve ions.

A. If both the statements are TRUE and STATEMENTS-1 is the correct explantion of STATEMENTS-2

B. If both the statements are TRUE but STATEMENTS-1 is NOT the correct explanation of STATEMENTS-2

C. If STATEMENTS-1 is TRUE and STATEMENTS-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A

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8. STATEMENT-1: lead storage battery is a galvanic cell without salt bridge.

STATEMENT-2: A secondary cell is rechargeable cell.

A. If both the statements are TRUE and STATEMENTS-2 is the correct explantion of STATEMENTS-6

B. If both the statements are TRUE but STATEMENTS-2 is NOT the correct explanation of STATEMENTS-8

C. If STATEMENTS-1 is TRUE and STATEMENTS-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: B

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9. STATEMENT-1: The SRP of three metallic ions A,B,C are -0.3,-0.5,0.8 volt respectively, so oxidizing power of ions is $C > A > B$.

STATEMENT-2: Higher the SRP, higher the oxidizing power.

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A

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10. STATEMENT-1: If SOP of substance is less than -1.23 V and over voltage=0V, then its oxidation in its aqueous solution is not possible at 298 K. ,

STATEMENT-2: Standard reduction potential (SRP) of water is +1.23V.

A. If both the statements are TRUE and STATEMENTS-2 is the correct explantion of STATEMENTS-8

B. If both the statements are TRUE but STATEMENTS-2 is NOT the correct explanation of STATEMENTS-10

C. If STATEMENTS-1 is TRUE and STATEMENTS-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: C

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11. STATEMENT-1: We cannot add the electrode potential in order to get electrode potential of third electrode if no. of moles of electrons exchanged are not same.

STATEMENT-2: Electrode potential is an extensive property

A. If both the statements are TRUE and STATEMENTS-2 is the correct explantion of STATEMENTS-9

B. If both the statements are TRUE but STATEMENTS-2 is NOT the correct explanation of STATEMENTS-11

C. If STATEMENTS-1 is TRUE and STATEMENTS-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: C

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12. STATEMENT-1: $E^{\circ}_{cell} = 0$ for a chloride ion concentration cell.

STATEMENT-2: For this concentration cell where

$$E_{cell} = \frac{RT}{nF} In \frac{[Cl^-]_{LHS}}{[Cl^-]_{RHS}}$$

A. If both the statements are TRUE and STATEMENTS-2 is the correct explantion of STATEMENTS-10

B. If both the statements are TRUE but STATEMENTS-2 is NOT the correct explanation of STATEMENTS-12

C. If STATEMENTS-1 is TRUE and STATEMENTS-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: B

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13. STATEMENT-1: If $\left(\frac{dE_{cell}}{dT}\right)_P > 0,$ For a cell reaction then $\triangle S$ is positive.

STATEMENT-2: $\triangle S = nFT\left(\frac{dE}{dT}\right)_p$

A. If both the statements are TRUE and STATEMENTS-2 is the correct explantion of STATEMENTS-11

B. If both the statements are TRUE but STATEMENTS-2 is NOT the correct explanation of STATEMENTS-13

C. If STATEMENTS-1 is TRUE and STATEMENTS-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: C

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14. STATEMENT-1: Molar conductivity increases with decrease in concentration for weak electrolysis.

STATEMENT-2: No. of ions increases and no. of ions per unit volume decreases due to dilution.

A. If both the statements are TRUE and STATEMENTS-2 is the correct explantion of STATEMENTS-12

B. If both the statements are TRUE but STATEMENTS-2 is NOT the correct explanation of STATEMENTS-14

C. If STATEMENTS-1 is TRUE and STATEMENTS-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: A

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15. STATEMENT-1: Conductivity decreases with the decrease in concentration of both the weak and strong electrolytes.

STATEMENT-2: No. of ions per unit volume linearly decreases in both electrolytes.

A. If both the statements are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statements are TRUE but STATEMENTS-2 is NOT the correct explanation of STATEMENTS-15

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer: C

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Subjective Problems

1. How many faradays are required for reduction of 1mol $C_6H_5NO_2$ into $C_6H_5NH_2$?

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2. What is the equivalent mass of O_2 in the following reaction , $H_2O + \frac{1}{2}O_2 + 2e^- \rightarrow 2OH^-$?

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3. The amount of electricity which release 2.0g of gold from a gold salt is same as that which dissolves 0.967g of copper anode during the electrolysis of copper sulphate solution. What is the oxidation number of gold in the gold ion ? (At mass of Cu=63.5,Au=197)

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4. when molten salt was elctrolysed for 5 min with9.65 A current , 0.18g of the metal was deposited. Calculate the Eq. mass of metal.

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5. During the electrolysis of a concentrated brine solution, Calculated the moles of chlorine gas produced by the passage of 4F electricity.

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6. Calculate the cell potential (in V) if $\triangle G = -96.5$kJ/mol and $n = 1$

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7. If K_c for the reaction

$Cu^{2+}(aq) + Sn^{2+}(aq) \rightarrow Sn^{4+}(aq) + Cu(s)$

at 25° C is represented as 2.6×10^{y} then find the value of y.

(Given:$E^{\circ}_{Cu^{2+}|Cu}$=0.34V,$E^{\circ}_{Sn^{4+}|Sn^{2+}}$=0.15V

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8. If $\triangle G^{\circ}$ for the half cell $MnO_4^- | MnO_2$ in an acid solution is -xF; then find the value of x.(Given:$E^{\circ}_{MnO_4^- | Mn^{2+}} = 1.5V, E^{\circ}_{MnO_2 | Mn^{2+}} = 1.25V$)

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9. If the equilibrium constant for the reaction $Cd^{2+}(aq) + 4NH_3(aq) \Leftrightarrow Cd(NH_3)_4^{2+}(aq)$ is 10^x then find the value of x.

(Given: $E^{\circ}_{Cd^{2+} | Cd} = -0.4V, E^{\circ}_{Cd(NH_3)_4^{2+} | Cd} = -0.61V$)

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10. At What pH oxidation potential of water is -0.81V ?

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11. The resistance of a conductivity cell containing 0.001M KCl solution at 298K is 1500Ω. What is the cell constant (in mm^{-1}) if the conductivity of 0.001M KCl solution is $2 \times 10^{-3} Smm^{-1}$

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12. Molar conductivity at infinitre dilution of KCl,HCl and CH_3COOK are 0.013,0.038 and 0.009 Sm^2mol^{-1} respectively at 291K. If conductivity of 0.001M CH_3COOH is $2.72 \times 10^{-3} Sm^{-1}$ then find % degree of dissociation of CH_3COOH

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13. Molar conductivity of aqueous solution of HA is $200 Scm^2mol^{-1}, pH$ of this solution is 4

Calculate the value of $pK_a(HA)$ at $25^\circ C$.

Given $\wedge_M^\infty \ (NaA) = 100scm^2mol^{-1},$

$\wedge_{M}^{\infty}(HCl) = 425 Scm^2 mol^{-1}$,

$\wedge_{M}^{\infty}(NaCl) = 125 Scm^2 mol^{-1}$

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14. The standard reduction potential of a silver chloride electrode (metal-sparingly soluble salt electrode) is 0.029 V and for silver electrode is 0.80V. If the moles of AgCl that can dissolve in 10 L of a 0.01 M NaCl solution is represted as 10^{-z} find the value of Z.

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