CHEMISTRY

BOOKS - NEET PREVIOUS YEAR (YEARWISE + CHAPTERWISE)

ELECTROCHEMISTRY

Exercise

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

$Zn|ZnSO_4(0.01M)||CuSO_4(1.0M)|Cu$

When the concentration of $ZNSO_4$ is $1.0M$ and that of $CuSO_4$ is $0.01M$, the emf changed to E_2. What is the relationship between E_1 and $E(2)$?

A. $E_1 = E_2$

B. $E_1 < E_2$

C. $E_1 > E_2$

D. $E_2 = 0 \neq E_1$

Answer: C

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2. The pressure of H_2 required to make the potential of $H_2 -$ electrode zero in pure water at 289K is :

A. $10^{-12} atm$

B. $10^{-10} atm$

C. $10^{-4} atm$

D. $10^{-14} atm$

Answer: D

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3. The molar conductivity of a $0.5mol/dm^3$ solution of $AgNO_3$ with electrolytic conductivity of $5.76 \times 10^{-3} Scm^{-1}$ at $298K$ is

A. $2.88Scm^2/mol$

B. $11.52Scm^2/mol$

C. $0.086Scm^2/mol$

D. $28.8Scm^2/mol$

Answer: B

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4. During the electrolysis of molten sodium chloride, the time required to produce $0.10mol$ of chlorine gas using a current of 3

amperes is

A. 55 minutes

B. 110 minutes

C. 220 minutes

D. 330 minutes

Answer: B

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5. If $E_{cell}^{\ominus}$ for a given reaction is negative, which gives the correct relationships for the values of $\Delta G^{\ominus}$ and K_{eq}?

A. $\Delta G^{\circ} > 0, K_{eq} < 1$

B. $\Delta G^{\circ} > 0, K_{eq} > 1$

C. $\Delta G^{\circ} < 0, K_{eq} > 1$

D. $\Delta G^{\circ} < 0, K_{eq} < 1$

Answer: A

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6. The number of electrons delivered at the cathode during electrolysis by a current of 1 ampere in 60 seconds is (charger on electron $= 1.60 \times 10^{-19} C$)

A. 6×10^{23}

B. 6×10^{20}

C. 3.75×10^{20}

D. 7.48×10^{23}

Answer: C

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7. Zine can be coated on iron to produce galvanize3d iron but the reverse is not possible it is because

A. zinc is lighter than iron

B. zinc has lower melting point than iron

C. zinc has lower negative electrode potential than iron

D. zinc has higher negative electrode potential than iron.

Answer: D

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8. A device that convers energy of combustion of fueles like hydrogen and methane, directly into electrical energy is known as .

A. fuel cell

B. electrolytic cell

C. dynamo

D. Ni-Cd cell

Answer: A

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9. Aqueous solution of which of the following compounds is the best conductor of electric current?

A. Acetic acid , $C_2H_4O_2$

B. Hydrochloric acid , HCl

C. Ammonia , NH_3

D. Fructose , $H_6H_{12}O_6$

Answer: B

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10. When $0.1 mol MnO_4^{2-}$ is oxidized the quantity of electricity required to completely oxidize MnO_4^{2-} to MnO_4^- is

A. 96500 C

B. $2 \times 96500 C$

C. $9650 C$

D. $96.50 C$

Answer: C

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11. The weight of silver (at $wt. = 108$) displaced by a quantity of electricity which displaced $5600 mL$ of O_2 at STP will be:

A. 5.4 g

B. 10.8g

C. 54.0 g

D. 108.0 g

Answer: D

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12. A hydrogen gas electrode is made by dipping platinum wire in a solution of HCl or $pH = 10$ and by passing bydrogen gas around the platinum wire at one atm pressure . The oxidation potential of electrode would be ?

A. 0.059 V

B. 0.59 V

C. 0.118 V

D. 1.18 V

Answer: B

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13. At $25^{\circ}C$ molar conductance of 0.1 molar aqueous solution of ammonium hydroxide is $9.54 ohm^{-1} cm^{2} mol^{-1}$ and at infinte dilution its molar conductance is $238 ohm^{-1} cm^{2} mol^{-1}$ The degree of ionisation of ammonium hydroxide at the same concentration and termperature is

A. $2.080\ \%$

B. $20.800\ \%$

C. $4.008\ \%$

D. $40.800\ \%$

Answer: C

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14. A button cell used in watched funcations as follwing

$$Zn(s) + Ag_2O(s) + H_2O(l) \Leftrightarrow 2Ag(s) + Zn^{2+}(aq.) + 2OH^-(aq)$$

If half cell potentials are

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

$$Ag_2O(s) + H_2O(l) + 2e^- \rightarrow 2Ag(s) + 2OH^-(aq.), , E^\circ = 0.34V$$

The cell potential will be

A. 1.10V

B. 0.42V

C. 0.84V

D. 1.34V

Answer: A

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15. Limiting molar conductivity of NH_4OH [i.e., $\Lambda_m^\circ(NH_4OH)$] is equal to:

A. $\Lambda_{m(NH_4Cl)}^\circ + \Lambda_{m(NaCl)}^\circ - \Lambda_{m(NaOH)}^\circ$

B. $\Lambda_{m(NaoH)}^\circ + \Lambda_{m(NaCl)}^\circ - \Lambda_{m(NH_4Cl)}^\circ$

C. $\Lambda_{m(NH_4OH)}^\circ + \Lambda_{m(NH_4Cl)}^\circ - \Lambda_{m(HCl)}^\circ$

D. $\Lambda_{m(NH_4Cl)}^\circ + \Lambda_{m(NaOH)}^\circ - \Lambda_{m(NaCl)}^\circ$

Answer: D

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16. Standard electrode potential of three metal X, Y and Z are $-1.2V$, $+0.5V$ and $-3.0V$ respectively. The reducing power of

these metals will be:

A. $Y > X > Z$

B. $Z > X > Y$

C. $X > Y > Z$

D. $Y > Z > X$

Answer: B

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17. The electrode pptenticals for

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

and $Cu^+(aq) + e^- \rightarrow Cu(s)$

are $+0.15V$ and $+0.50V$ repectively. The value of $E^\circ_{cu^{2+}/Cu}$ will be.

A. 0.325V

B. 0.650V

C. 0.150 V

D. 0.500 V

Answer: A

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18. Standard electrode potential for Sn^{4+}/Sn^{2+} couple is $0.15V$ and that for the Cr^{3+}/Cr couple is $-0.74V$. These two couples in their standard state are connected to make a cell. The cell potential will be

A. $+0.89V$

B. $+0.18V$

C. $+1.83V$

D. $+1.199V$

Answer: A

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19. For the reduction of silver ions with copper metal, the standard cell potential was foound to be $+0.46V$ at $25^{\circ}C$. The value of standard Gibbs energy, ΔG° will be $\left(F = 96,500Cmol^{-1}\right)$:

A. $-89.0kJ$

B. $-89.0J$

C. $-44.5kJ$

D. $-98.0kJ$

Answer: A

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20. An increase in equivalent conductance of a strong electrolyte with dilution is mainly due to:

A. increase in ionic mobility of ions

B. 100% ionisation of electrolyte at normal dilution

C. increase in both , i.e. number of ions and ionic mobility of ions

D. increase in number of ions

Answer: A

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21. Given:

(i) $Cu^{2+} + 2e^- \rightarrow Cu, E^\circ = 0.337V$

(ii) $Cu^{2+} + e^- \rightarrow Cu^+, E^\circ = 0.153V$

Electrode potential, E° for the reaction, $Cu^+ + e^- \rightarrow Cu$, will be

A. 0.52 V

B. 0.90 V

C. 0.30 V

D. 0.38 V

Answer: A

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

A. 1.25×10^{-5}

B. 1.5×10^{-6}

C. 6.25×10^{-4}

D. 1.25×10^{-4}

Answer: A

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23. Al_2O_3 is reduced by electrolysis at low potentials and high current. If 4.0×10^4 amperes of currernt is passed through molten

Al_2O_3 for 6 hours, what mass of aluminium is produced? (Assume 100 % current efficiency, At. Mass of $Al = 27u$)

A. $9.0 \times 10^3 g$

B. $8.1 \times 10^4 g$

C. $2.4 \times 10^5 g$

D. $1.3 \times 10^4 g$

Answer: B

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24. Standard free energies of formation (I $kJ/$mol) at $298K$ are $-237.2, \ -394.4$ and -8.2 for $H_2O(1), CO_2(g)$ and pentange (g) , respectively . The value of E°_{cell} for the pentane-oxygen fuel cell is .

A. $1.968V$

B. $2.0968V$

C. $1.0968V$

D. $0.1968V$

Answer: C

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25. Kohlrausch's law states that:

A. inifinite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte, whatever be the nature of the other ion of the electrolyte

B. inifinite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte, depend on the nature of the other ion of the electrolyte

C. inifinite dilution, each ion makes definite contribution to conductance of an electrolyte, whatever be the nature of the other ion of the electrolyte

D. inifinite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte, whatever be the nature of the other ion of the electrolyte

Answer: D

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26. On the basis of the following E° values, the stongest oxidizing agent is $[Fe(CN)_6]^{4-} \rightarrow [Fe(CN)_6]^{3-} + e^-, E^\circ = -0.35V$

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

A. $[Fe(CN)_6]^{4-}$

B. Fe^{2+}

C. Fe^{3+}

D. $\left[Fe(CN)_6\right]^{3-}$

Answer: C

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27. The efficiency of a fuel cell is given by:

A. $\Delta G / \Delta S$

B. $\Delta G / \Delta H$

C. $\Delta S / \Delta G$

D. $\Delta H / \Delta G$

Answer: B

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28. Calculate the equilibrium constant of the reaction :

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

$E^{c-}{}_{\cdot cell} = 0.46V$

A. 2.0×10^{10}

B. 4.0×10^{10}

C. 4.0×10^{15}

D. 2.4×10^{10}

Answer: C

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29. If $E^{\circ}_{Fe^{2+}}/Fe = -0.441V$

and $E^{\circ}_{Fe^{3+}}/Fe^{2+} = 0.771V$

The standard EMF of the reaction

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

will be:

A. 0.111 V

B. 0.330 V

C. 1.653 V

D. 1.212 V

Answer: D

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30. A hypothetical elecrochemical cell is shown below:

$$A^{\ominus}|A^{+}(xM)||B^{+}(yM)|\ |\ B^{\oplus}$$

The emf measured is $+0.20V$. The cell reaction is

A. $A + B^+ \rightarrow A^+ + B$

B. $A^+ + B \rightarrow A + B^+$

C. $A^+ + e^- \rightarrow A, B^+ + e^- \rightarrow B$

D. the cell reaction cannot be predicted

Answer: A

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31. $4.5g$ of aluminium (at mass $27u$) is deposited at cathode from Al^{3+} solution by a certain quantity of electric charge. The volume of hydrogen gas produced at STP from H^+ ions in solution by the same quantity of electric charge will be:

A. 44.8 L

B. 22.4 L

C. 11.2 L

D. 5.6 L

Answer: D

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32. The standard emf of a galvanic cell involving cell reaction with $n = 2$ is found to be $0.295V$ at $25^\circ C$. The equilibrium constant of the reaction would be (Given $F = 96,500Cmol^{-1}$, $R = 8.314JK^{-1}mol^{-1}$):

A. 2.0×10^{11}

B. 4.0×10^{12}

C. 1.0×10^{2}

D. 1.0×10^{10}

Answer: D

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33. On the basis of information available from the reaction $\frac{4}{3}Al + O_2 \rightarrow \frac{2}{3}Al_2O_3, \Delta G = -827kJmol^{-1}$ of O_2, the minimum emf required to carry out of the electrolysis of Al_2O_3 is $(F = 96,500Cmol^{-1})$

A. $2.14V$

B. $4.28V$

C. $6.42V$

D. $8.56V$

Answer: A

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34. In electrolysis of $NaCl$ when Pt electrode is taken H_2 is liberated at cathode while Hg cathode it forms sodium amalgam because

A. Hg is more inert than Pt

B. more voltage is required to reduce H^+ at Hg than at Pt

C. Na is dissovled in Hg while it does not dissolved in Pt

D. concentration of H^+ ion is larger when Pt electrode is taken

Answer: B

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35. Standard electrode potentials are

$Fe^{2+}/Fe, E^\circ = -0.44V$

$Fe^{3+}/Fe^{2+}, E^{\circ} = +0.77V$

If Fe^{3+}, Fe^{2+}, and Fe block are kept together, then

A. Fe^{3+} increase

B. Fe^{3+} decrease

C. $\frac{Fe^{2+}}{Fe^{3+}}$ remains unchanged

D. Fe^{2+} decrease

Answer: B

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36. The most convenient method to protect the bottom of the ship made of iron is

A. coating it with red lead oxide

B. white tin plating

C. connecting it with Mg block

D. connecting it with Pb block

Answer: B

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37. Cell reactiomn is spontaneous when

A. E_{red}° is negative

B. E_{red}° is positive

C. ΔG° is negative

D. ΔG° is positive

Answer: C

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38. $Cu^{2+}(aq.)$ is unstable in solution and under goes simultaneous oxidation and reduction according to the reaction

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

Choose the correct E° for the above reaction if

$E^{\circ}_{Cu^{2+}}/Cu = 0.34V$ and $E^{\circ}_{Cu^{2+}}/Cu^{+} = 0.15V$

A. $-0.38V$

B. $+0.49V$

C. $+0.38V$

D. $-0.19V$

Answer: C

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39. The molar conducatance of Ba^{2+} and Cl^{-} are 127 and $76ohm^{-1}cm^{-1}mol^{-1}$ respectively at infinite dilution. The equivalent conductance of $BaCl_2$ at infinte dilution will be

A. 139.52

B. 203

C. 279

D. 101.5

Answer: A

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40. The specific conductance of a $0.1NKCl$ solution at $23^{\circ}C$ is $0.012ohm^{-1}cm^{-1}$. The resistance of cell containing the solution

at the same tempreature was found to be $55ohm$. The cell constant will be

A. $0.142cm^{-1}$

B. $0.66cm^{-1}$

C. $0.918cm^{-1}$

D. $1.12cm^{-1}$

Answer: B

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41. Which one of the following pairs of substances on reaction will not not evolve H_2 gas?

A. Iron and $H_2SO_4(aq)$

B. Iron and steam

C. Copper and HCl(aq)

D. Sodium and ethyl alcohol

Answer: C

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42. Without losing its concentration, $ZnCl_2$ solution can't be kept in contact with

A. Au

B. Al

C. Pb

D. Ag

Answer: B

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43. For the cell reaction

$$Cu^{2+}(C_1, aq.) + Zn(s) \Leftrightarrow Zn^{2+}(C_2, aq) + Cu(s)$$

of an electrochemical cell, the change in free energy (ΔG) of a given temperature is a function of

A. In (C_1)

B. In (C_2/C_1)

C. In (C_2)

D. In $(C_1 + C_2)$

Answer: B

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44. Equivalent conductances of $NaCl$, HCl and CH_3COONa at infinite dilution are 126.45, 426.16 and 91 $ohm^{-1}cm^2eq^{-1}$ respectively. The equivalent conductance of CH_3COOH at infinite dilution would be :

A. $201.28\Omega^{-1}cm^2$

B. $390.71\Omega^{-1}cm^2$

C. $698.28\Omega^{-1}cm^2$

D. $540.48\Omega^{-1}cm^{-1}$

Answer: B

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45. E° for the electrochemical cell

$Zn(s)|Zn^{2+}1M(Aq.)||Cu^{2+}1M(aq.)|Cu(s)$

is 1.10 V at $25^{\circ} C$. The equilibrium constant for the cell reaction,

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

Will be :

A. 10^{-37}

B. 10^{-28}

C. 10^{18}

D. 10^{17}

Answer: A

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46. Reduction potential for the following h alf-cell reaction are

$$Zn \rightarrow Zn \rightarrow Zn^{2+} + 2e^{-}, E^{\circ}_{Zn^{2+}/Zn} = -0.76V$$

$$Fe \rightarrow Fe^{2+} + 2e^{-}, E^{\circ}_{Fe^{2+}/Fe} = -0.44V$$

The emf for the cell reaction

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

will be

A. $+0.32V$

B. $-0.32V$

C. $+1.20V$

D. $-1.20V$

Answer: A

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47. A $5A$ current in passed through a solution of zinc sulphate for 40 min . These amount of zinc deposited at the cathode is

A. 40.65 g

B. 0.4065g

C. 4.065g

D. 65.04 g

Answer: C

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48. An electrochemical cell is shown below $Pt, H_2(1\text{atm})|HCl(0.1M)|CH_3COOH(0.1M) \mid H_2(1\text{atm})$, The emf of the cell will not be zero, because

A. EMF depends on molarities of acids used

B. pH of 0.1 M HCl and 0.1 M CH_3COOH is same

C. the temperature is constant

D. acids used in two compartments are different

Answer: B

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49. Standard reducation potential at $25^\circ C$ of Li^+/Li, Ba^{2+}/Ba, Na^+/Na and Mg^+/Mg are -3.05, -2.90, -2.71 and -2.37 volt respectively. Which one of the following is the strongest oxidising agent ?

A. Mg^{2+}

B. Ba^{2+}

C. Na^+

D. Li^+

Answer: A

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