LAKSHYA JEE 2.0_2023

Electrochemistry

DPP-02

1. The molar conductivity and equivalent conductivity are same for the solution of

(1) 1 M NaCl (2) 1 M Ba $(NO_3)_2$
(3) 1 M Ca $(NO_3)_2$ (4) 1 M Th $(NO_3)_4$

2. Specific conductance of 0.1 M nitric acid is 6.3×10^{-2} ohm^{-1} cm^{-1}. The molar conductance of solution

(1) 630 ohm^{-1} cm^{2} mole^{-1}
(2) 315 ohm^{-1} cm^{2} mole^{-1}
(3) 100 ohm^{-1} cm^{2} mole^{-1}
(4) 6300 ohm^{-1} cm^{2} mole^{-1}

3. Ionic conductivity of Al^{+3} and SO_4^{-2} ions at infinite dilution are 189 S cm^2 mol^{-1} and 160 S cm^2 mol^{-1} respectively. Find the molar conductivity at infinite dilution $Al_2(SO_4)_3$

(1) 192 S cm^2 eq^{-1} (2) 858 S cm^2 mol^{-1}
(3) 858 S cm^2 eq^{-1} (4) 143 S cm^2 mol^{-1}

4. Limiting molar ionic conductivities of univalent electrolyte are 57 and 73. The limiting molar conductivity of the solution will be

(1) 130 S cm^2 mol^{-1} (2) 65 S cm^2 mol^{-1}
(3) 260 S cm^2 mol^{-1} (4) 187 S cm^2 mol^{-1}

5. For an electrolytic solution of 0.05 mol L^{-1}, the conductivity has been found to be 0.0110 S cm^{-1}. The molar conductivity is

(1) 0.055 S cm^2 mol^{-1} (2) 550 S cm^2 mol^{-1}
(3) 0.22 S cm^2 mol^{-1} (4) 220 S cm^2 mol^{-1}

6. If x is specific resistance of the electrolyte solution and y is the molarity of the solution, then Λ_m is given by.

(1) $\frac{1000x}{y}$ (2) $1000\frac{y}{x}$
(3) $\frac{1000}{xy}$ (4) $\frac{xy}{1000}$

7. Which one of the following has the highest molar conductivity?

(1) Diamminedichloroplatinum (II)
(2) Tetraamminedichlorocobalt(III) chloride
(3) Potassium hexacyanoferrate (II)
(4) Hexaaquochromium (III) chloride

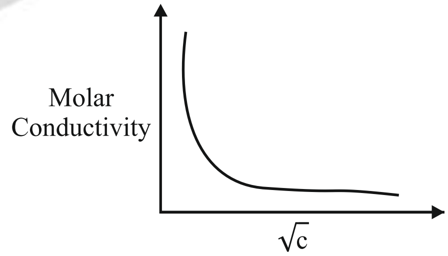
8. Equivalent conductivity of $Fe_2(SO_4)_3$ is related to molar conductivity by the expression

(1) $\Lambda_{eq} = \Lambda_m$ (2) $\Lambda_{eq} = \Lambda_m/3$
(3) $\Lambda_{eq} = 3\Lambda_m$ (4) $\Lambda_{eq} = \Lambda_m/6$

9. The molar conductance of acetic acid at infinite dilution is λ_∞. If the conductivity of 0.1 M acetic acid is S, the apparent degree of ionization is

(1) $\frac{10000S}{\lambda_\infty}$ (2) $\frac{10S}{\lambda_\infty}$
(3) $\frac{\lambda_\infty}{100S}$ (4) $\frac{100000}{\lambda_\infty S}$

10. The variation of molar conductivity with concentration of an electrolyte (X) in aqueous solution is shown in the given figure.



The electrolyte X is

(1) HCl (2) NaCl
(3) KNO_3 (4) CH_3COOH

11. The ionic conductivity of H^+ and OH^- at 298 K are 349.8 and 198.5 S cm^2 eq^{-1} respectively. The equivalent conductivity of H_2O at infinite

(1) 548.3 (2) 151.3
(3) 699.6 (4) 54.83

12. The electrical resistance of a column of 0.05 M NaOH solution of diameter 1 cm and length 50 cm is 5.55×10^3 ohm. Calculate its molar conductivity.

(1) 229.6 S cm^2 mol^{-1} (2) 129.6 S cm^2 mol^{-1}

(3) 269.6 S cm^2 mol^{-1} (4) 169.6 S cm^2 mol^{-1}

13. Debye-Huckel-Onsager equation is represented as $\Lambda_c = \Lambda_0 - b\sqrt{c}$. 'b' is

(1) $\frac{82.4}{(DT)^{1/2}\eta} + \frac{8.20\times10^5}{(DT)^{3/2}}\Lambda_0$

(2) $\frac{82.4}{(DT)^{1/2}\eta} + \frac{8.20\times10^5}{(DT)^{1/2}}\Lambda_0$

(3) $\frac{82.4}{(DT)^{1/2}\eta} - \frac{8.20\times10^5}{(DT)^{1/2}}$

(4) $\frac{8.24}{(DT)^{1/2}} - \frac{8.20\times10^5}{(DT)^{1/2}\eta}\Lambda_0$

14. The resistance of 0.5 M solution of an electrolyte in a cell was found to be 50Ω. If the electrodes in the cell are 2.2 cm apart and have an area of 4.4 cm^2 then the molar conductivity (in S m^2 mol^{-1}) of the solution is

(1) 0.2 (2) 0.02

(3) 0.002 (4) None of these

Answer Key

1. **(1)**
2. **(1)**
3. **(3)**
4. **(1)**
5. **(4)**
6. **(3)**
7. **(3)**
8. **(4)**
9. **(1)**
10. **(4)**
11. **(1)**
12. **(1)**
13. **(1)**
14. **(3)**

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Electrochemistry

DPP-03

1. In a galvanic cell electron flow will be from
(1) negative electrode to positive electrode.
(2) positive electrode to negative electrode.
(3) there will be no flow of electrons.
(4) cathode to anode in the external circuit.

2. Galvanic or voltaic cell is a device used to convert chemical energy produced in _______ reaction into ________ energy.
(1) Chemical, chemical
(2) Electrical, chemical
(3) Redox, electrical
(4) Redox, redox

3. The negative terminal in an electrochemical cell is
(1) Anode (2) Cathode
(3) Both (4) None

4. When the salt bridge is removed from a cell, its voltage?
(1) will increase
(2) will decrease to half
(3) will decrease to zero
(4) will not change

5. Electrolytes conducts electricity due to
(1) flow of ions (2) flow of electrons
(3) both (4) none

6. In the construction of a salt bridge, saturated solution of KNO_3 is used because
(1) Velocity of K^+ & NO_3^- are same.
(2) Velocity of NO_3^- is greater than that of K^+.
(3) Velocity of K^+ is greater than that of NO_3^-.
(4) KNO_3 is highly soluble in water.

7. In an electrochemical cell, the electrode having a higher reduction potential will act as
(1) Salt (2) Electrolyte
(3) Anode (4) Cathode

8. A cell is prepared by dipping a copper rod in 1 M $CuSO_4$ solution and an iron rod in 2 M $FeSO_4$ solution. What are the cathode & anode respectively?
(1) Cathode $\rightarrow$ Iron ; Anode $\rightarrow$ Copper
(2) Cathode $\rightarrow$ Copper ; Anode $\rightarrow$ Iron
(3) Cathode $\rightarrow$ Iron ; Anode $\rightarrow$ Iron
(4) Cathode $\rightarrow$ Copper ; Anode $\rightarrow$ Copper

9. Daniell cell is represented as
(1) $Zn \mid Zn^{+2}(aq) \parallel Cu^{+2}(aq) \mid Cu$
(2) $Cu \mid Cu^{+2}(aq) \parallel Zn^{+2}(aq) \mid Zn$
(3) $Zn \mid Zn^{+2}(aq) \parallel Zn^{+2}(aq) \mid Zn$
(4) $Cu \mid Cu^{+2}(aq) \parallel Cu^{+2}(aq) \mid Cu$

Answer Key

1. **(1)**
2. **(3)**
3. **(1)**
4. **(3)**
5. **(1)**
6. **(1)**
7. **(4)**
8. **(2)**
9. **(1)**

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Electrochemistry

DPP-04

1. The equilibrium constant for a cell reaction:
$Cu(g) + 2Ag^{+}(aq) \rightarrow Cu^{+2}(aq) + 2Ag(s)$ is
4×10^{16}. Find E^{o}_{cell} for the cell reaction.
(1) 0.63 V (2) 0.49 V
(3) 1.23 V (4) 3.24 V

2. The EMF and the standard EMF of a cell in the following reaction is 5V and 5.06 V at room temperature.
$$Ni_{(s)} + 2Ag^{+}_{(aq)}(nM) \rightarrow Ni^{2+}_{(aq)}(0.02M) + 2Ag_{(s)}$$
What is the concentration of Ag^{+} ion?
(1) 0.0125 M (2) 0.0314 M
(3) 0.0625 M (4) 0.0136 M

3. The standard electrode potential of zinc ions is 0.76 V. What will be the potential of a 2M solution at 300K?
(1) 0.83 V (2) 0.76 V
(3) 0.23 V (4) 0.98 V

4. The EMF of H-electrode if pH of electrolyte is 2 is [P = 1 atm]
(1) $\frac{RT}{F}$ (2) $\frac{RT}{2F}$
(3) $\frac{2.303RT}{F}$ (4) –0.118 V

5. ΔG^{o} for the reaction $Cu^{+2} + Fe \rightarrow Fe^{+2} + Cu$ is
$\left[E^{o}_{Cu^{+2}/Cu} = 0.34V, E^{o}_{Fe^{+2}/Fe} = 0.44V\right]$
(1) 19.3 kJ (2) 180.8 kJ
(3) 150.5 kJ (4) 28.5 kJ

6. The Nernst equation giving dependence of electrode oxidation potential on concentration is
(1) $E = E^{o} + \frac{2.303RT}{nF}\log[M^{+n}]$
(2) $E = E^{o} - \frac{2.303RT}{nF}\log\frac{[M^{n+}]}{[M]}$
(3) $E = E^{o} - \frac{2.303RT}{nF}\log[M^{n+}]$
(4) $E = E^{o} + \frac{2.303RT}{nF}\log\frac{[M]}{[M^{n+}]}$

7. Equilibrium constant for the reaction at equilibrium will be
$Cu^{+2} + Fe \rightarrow Fe^{+2} + Cu$
$E^{o}_{Cu^{+2}/Cu} = 0.54$ V $E^{o}_{Fe^{+2}/Fe} = 0.44$
(1) 3442 (2) 1450
(3) 3926 (4) 2449

8. The potential of single electrode depends upon
(1) The nature of the electrode
(2) Temperature
(3) Concentration of the ion with respect to which it is reversible
(4) All of the above

9. The oxidation potential of Hydrogen half-cell will be negative if
(1) $P_{(H_2)} = 1$ atm and $[H^{+}] = 1$ M
(2) $P_{(H_2)} = 1$ atm and $[H^{+}] = 2$ M
(3) $P_{(H_2)} = 0.2$ atm and $[H^{+}] = 1$ M
(4) Both (2) and (3)

10. The relationship between standard reduction potential of a cell and equilibrium constant is shown by
(1) $E^{o}_{cell} = \frac{n}{0.059}\log K_C$
(2) $E^{o}_{cell} = \frac{0.059}{n}\log K_C$
(3) $E^{o}_{cell} = 0.059\, n \log K_C$
(4) $E^{o}_{cell} = \frac{\log K_C}{n}$

11. What is the electrode potential of the following electrode at 25°C?
$Fe^{+2}(0.1\ M) + 2e^{-} \rightarrow Fe$
$[E^{o}_{Fe^{+2}/Fe} = -0.25$ V $\frac{2.303RT}{F} = 0.06]$
(1) – 0.21 V (2) – 0.76 V
(3) – 0.54 V (4) – 0.28 V

12. If E^o_{cell} for a given reaction has a positive value, then which of the following is correct?

(1) $\Delta G^o > 0, K_C < 1$ (2) $\Delta G^o > 0, K_C > 1$

(3) $\Delta G^o < 0, K_C > 1$ (4) $\Delta G^o < 0, K_C < 1$

13. At 25°C, the standard EMF of cell having reactions involving a two electron change is found to be 0.295V. The equilibrium constant of the reaction is

(1) 29.5×10^{-2} (2) 10

(3) 10^{10} (4) 29.5×10^{10}

14. E^o for $F_2 + 2e^- \rightarrow 2F^-$ is 2.8 V. E^o for $\frac{1}{2}F_2 + e^- \rightarrow F^-$ is

(1) 2.8 V (2) 1.4 V

(3) –2.8 V (4) –1.4 V

15. The oxidation potential of a hydrogen electrode at pH = 10 and $P_{H_2} = 1$ is

(1) 0.51 V (2) 0.00 V

(3) 0.59 V (4) 0.059 V

16. The potential of the cell containing two hydrogen electrodes as shown below:

Pt, $H_{2(g)}$ | $H^+_{(ag)}(10^{-8}$ M) || $H^+_{(ag)}(0.001$ M) | $H_{2(g)}$, Pt is

(1) –0.295 V (2) –0.0591 V

(3) 0.295 V (4) 0.0591 V

Answer Key

1. (2)
2. (4)
3. (2)
4. (4)
5. (1)
6. (3)
7. (4)
8 (4)
9. (4)
10. (2)
11. (4)
12. (3)
13. (3)
14. (1)
15. (3)
16. (3)

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LAKSHYA JEE 2.0_2023

Electrochemistry

DPP-05

1. When a strip of silver is placed in a solution of ferrous sulphate
(1) Silver will precipitate out
(2) Iron will precipitate out
(3) Silver and iron both will be dissolved
(4) No reaction will take place

2. The standard reduction potential values of three metallic cations X, Y and Z are 0.52, –3.03 and –1.18 V respectively. The order of reducing power of the corresponding metal is
(1) $Y > Z > X$ (2) $X > Y > Z$
(3) $Z > Y > X$ (4) $Z > X > Y$

3. To a mixture containing pieces of Zn, Cu and silver, 1 M H_2SO_4 was added. H_2 gas was found to be evolved. Which of the metal/metals do you think has/have reacted?
$E^o_{Zn^{+2}/Zn} = -0.76$ V $\quad E^o_{Cu^{+2}/Cu} = 0.34$ V
$E^o_{Ag^{+2}/Ag} = 0.80$ V
(1) All the metals (2) Only Zn
(3) Both Zn and Cu (4) Only Ag

4. The standard reduction potentials at 298 K for the following half reactions are given
$Zn^{+2} + 2e^- \rightleftharpoons Zn \quad -0.762$ V
$Cr^{+3} + 3e^- \rightleftharpoons Cr \quad -0.740$ V
$2H^+ + 2e^- \rightleftharpoons H_2 \quad 0.00$ V
$Fe^{+3} + e^- \rightleftharpoons Fe^{+2} \quad 0.770$ V
Which is the strongest reducing agent?
(1) Zn (2) Cr
(3) H_2 (4) Fe^{+2}

5. When Zn dust is added to a solution of $MgCl_2$
(1) No reaction will take place
(2) $ZnCl_2$ is formed
(3) Zinc dissolved in the solution
(4) Magnesium is precipitated

6. If a strip of copper metal is placed in a solution of ferrous sulphate
(1) Copper will precipitate out
(2) Iron will precipitate out
(3) Copper and iron both will dissolved
(4) No reaction will take place.

7. The standard reduction potential of A, B and C are 0.34 V, 0.80 V and 0.79 V respectively. The decreasing order of deposition of metals on electrodes are
(1) $A > B > C$ (2) $B > C > A$
(3) $C > B > A$ (4) $A > C > B$

8. Which metal pair will form cell of maximum EMF?
(1) Fe and Cu (2) Pb and Cu
(3) Cu and Au (4) Ca and Cu

9. Using the data given, find strongest oxidizing agent.
$E^o_{Cl_2/Cl^-} = 1.36$ V $\quad E^o_{Cr^{+6}/Cr^{+3}} = 1.33$ V
$E^o_{MnO_4^-/Mn^{+2}} = 1.51$ V $\quad E^o_{Cr^{+3}/Cr} = -0.74$ V
(1) Cl^- (2) Cr
(3) Cr^{+3} (4) MnO_4^-

10. A metal having negative reduction potential when dipped in the solution its own ions, has a tendency.
(1) to pass into the solution
(2) to be deposited from the solution
(3) to become electrically positive
(4) to remain neutral

11. Which of the following displacement does not occur?
(1) $Zn + 2H^+ \rightarrow Zn^{+2} + H_2$
(2) $Fe + 2Ag^+ \rightarrow Fe^{+2} + 2Ag$
(3) $Cu + Fe^{+2} \rightarrow Fe + Cu^{+2}$
(4) $Zn + Pb^{+2} \rightarrow Zn^{+2} + Pb$

Answer Key

1. (4)
2. (1)
3. (2)
4. (1)
5. (1)
6. (4)
7. (2)
8. (4)
9. (4)
10. (1)
11. (3)

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LAKSHYA JEE 2.0 2023

Electrochemistry

DPP-06

1. The desired amount of charge for obtaining one mole of Al from Al^{+3}
(1) 3×96500 C (2) 96500 C
(3) $\frac{96500}{3}$C (4) $\frac{96500}{2}$C

2. When electric is passed through the solution the solution of $AlCl_3$, 13.5 g of Al are deposited. The number of Faraday must be
(1) 0.50 (2) 1.00
(3) 1.50 (4) 2.00

3. One Faraday of electricity when passed through a solution of copper sulphate deposits
(1) 1 mole of Cu (2) 1 gm atom of Cu
(3) 1 molecule of Cu (4) 1 gm equiv. of Cu

4. The density of Cu is 8.94 gcm^3 the quantity of electricity needed to plate an area 10 cm × 10 cm to a thickness of 10^{-2} cm using $CuSO_4$ solution would be
(1) 13586 C (2) 27172 C
(3) 40758 C (4) 20348 C

5. A certain current liberated 0.50 gm of hydrogen in 2 hours. How many grams of copper can be liberated by the same current flowing for the same time in a copper sulphate solution.
(1) 12.7 gm (2) 15.9 gm
(3) 31.8 gm (4) 63.5 gm

6. One Faraday of electricity will liberate one mole of metal from solution of
(1) $AuCl_3$ (2) $CuSO_4$
(3) $BaCl_2$ (4) KCl

7. When a lead storage battery is discharged 1 then
(1) SO_2 is evolved
(2) Lead sulphate is consumed
(3) Lead is formed
(4) Sulphuric acid is consumed

8. $Zn_{(s)} \mid Zn^{+2}_{aq} \parallel Cu^{+2}_{aq} \mid Cu_{(s)}$ is
(1) Weston cell (2) Daniel cell
(3) Calomel cell (4) Faraday cell

9. Which one is primary cell?
(1) Leclanche cell (2) Lead storage battery
(3) Fuel cell (4) None

10. One-gram metal M^{+2} was discharged by the passage of 1.81×10^{22} electrons. What is the atomic weight of metal?
(1) 33.35 (2) 133.4
(3) 66.7 (4) 55

11. 3 Faradays of electricity was passed an aqueous solution of iron (II) bromide. The mass of iron metal (atomic mass 56) deposited at the cathode is
(1) 56 g (2) 84 g
(3) 112 g (4) 168 g

12. A current of 9.65 ampere is passed through the aqueous solution NaCl using suitable electrodes for 1000 sec. The amount of NaOH formed during electrolysis is
(1) 2.0 g (2) 4.0 g
(3) 6.0 g (4) 8.0 g

13. A current of 2.6 ampere is passed through $CuSO_4$ solution for 6 minute 20 seconds. The amount of Cu deposited is
(At wt. of Cu = 63.5, Faraday = 96500 C)
(1) 6.35 g (2) 0.635 g
(3) 0.325 g (4) 3.175 g

14. 3 Faradays of electricity are passed through molten Al_2O_3, aqueous solution of $CuSO_4$ and molten NaCl taken in three different electrolytic cells. The amount of Al, Cu and Na deposited at the cathodes will be in the ratio
(1) 1 mole : 2 mole : 3 mole
(2) 1 mole : 1.5 mole : 3 mole
(3) 3 mole : 2 mole : 1 mole
(4) 1 mole : 1.5 mole : 2 mole

Answer Key

1. (1)
2. (3)
3. (4)
4. (2)
5. (2)
6. (4)
7. (4)
8. (2)
9. (1)
10. (3)
11. (2)
12. (2)
13. (3)
14. (2)

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