

JEE CHEMISTRY

Topic: Electrochemistry

The conductance of 0.1 M HCl solution is greater than that of 0.1 M NaCl. This is because

- (a) ionisation is more in HCl as compared to NaCl
 - (b) HCl is an acid and NaCl is a neutral salt
 - (c) H^+ have a greater mobility than Na^+
 - (d) internal forces in HCl are weaker than those in NaCl
2. Which of the following has the maximum conductance?
- (a) copper
 - (b) iron
 - (c) silver
 - (d) Teflon
3. KCl is used in a salt bridge. This is because
- (a) K^+ and Cl^- are isoelectronic
 - (b) K^+ and Cl^- have the same transport number
 - (c) KCl is a strong electrolyte
 - (d) none of the above
4. The standard potential of Cu/Cu^{2+} is equal to -0.337 V. This corresponds to the electrode reaction
- (a) $Cu \rightarrow Cu^{2+} + 2e^-$
 - (b) $Cu^{2+} + e^- \rightarrow Cu$
 - (c) $Cu^{2+} + 2e^- \rightarrow Cu$
 - (d) none of the above
5. The oxidation potential of Mg is $+2.37$ V and that of Al is $+1.66$ V. Mg in various chemical reactions
- (a) can replace Al
 - (b) can be replaced by Al
 - (c) will not be able to replace Al
 - (d) nothing will happen
6. $Zn(S) + Cu^{2+} \rightarrow Cu(S) + Zn^{2+}$. In a cell corresponding to this reaction, which of the following statements is true?
- (a) zinc is anode and copper is cathode
 - (b) copper is anode and zinc is cathode
 - (c) the emf of the cell will be zero
 - (d) zinc is the +ve and copper is the -ve electrode
7. Among the following salt solutions, in which case one Faraday of electricity will liberate $1/2$ gram-atom of the metal?
- (a) $AlCl_3$
 - (b) $FeCl_3$
 - (c) $CuSO_4$
 - (d) $NaCl$

- 8 Some half reactions with standard potentials at 298 K are given below. Which is the strongest reducing agent?
- $\text{Zn}^{2+}(\text{aq}) + 2\text{e}^{-} \rightarrow \text{Zn}(\text{S}) - 0.762 \text{ V}$
 $\text{Cr}^{3+}(\text{aq}) + 3\text{e}^{-} \rightarrow \text{Cr}(\text{S}) - 0.740 \text{ V}$
 $2\text{H}^{+}(\text{aq}) + 2\text{e}^{-} \rightarrow \text{H}_2(\text{g}) 0.00$
 $\text{Fe}^{3+}(\text{aq}) + 1\text{e}^{-} \rightarrow \text{Fe}^{2+}(\text{aq}) 0.770$
- (a) Zn(S) (b) Cr(S)
(c) H₂(g) (d) Fe²⁺(aq)
9. Given the electrode potentials
The most reactive metal that displaces others from their solution is
- (a) Ag (b) Cu
(c) Co (d) Zn
10. On electrolysis of dilute H₂SO₄ using Pt electrodes, the product obtained at the anode is
- (a) hydrogen (b) oxygen
(c) hydrogen sulphide (d) sulphur dioxide
11. The half-cell reactions of the cell used in hearing aids are
 $\text{Zn}(\text{S}) \rightarrow \text{Zn}^{2+} + 2\text{e}^{-}$ ($E^{\circ} = + 0.76 \text{ V}$) and $\text{Ag}_2\text{O} + \text{H}_2\text{O} + 2\text{e}^{-} \rightarrow 2\text{Ag} + 2\text{OH}^{-}$ ($E^{\circ} = 0.34 \text{ V}$).
E° of the cell is
- (a) 0.42 V (b) 1.1 V
(c) 0.84 V (d) 2.2 V
12. The pressure of H₂ (gas) is increased from 1 atm to 100 atm. Keeping the hydrogen ion concentration constant at 1 M, the voltage of a hydrogen half cell (at 25° C) is
- (a) 0.059 V (b) -0.059 V
(c) 0.295 V (d) 0.118 V
13. The emf of a Daniel cell is 1.1 V. If the value of one Faraday is 96, 500 coulombs per mole, the change in free energy in KJ is
- (a) 212.30 (b) -212.30
(c) 106.15 (d) -106.15
14. The potential of the cell consisting of two hydrogen electrodes (as given below) is
(at 298 K)
- (a) -0.118 V
(b) -0.0591 V
(c) 0.118 V
(d) 0.0591 V
- 15 The emf of the cell H₂ (1 atm) Pt | H⁺ ? || H⁺ (1M) | H₂ (1 atm) Pt at 25° C is 0.59 V. The pH of the solution is
- (a) 1.0 (b) 4.0
(c) 7.0 (d) 10.0

16. The standard reduction potentials E° for the following half-cell reactions are
 $\text{Zn}^{2+} + 2e^- \rightarrow \text{Zn}$ $E^\circ = -0.76 \text{ V}$ and $\text{Fe}^{2+} + 2e^- \rightarrow \text{Fe}$ $E^\circ = -0.41 \text{ V}$
 The emf of the cell involving the reaction $\text{Fe}^{2+} + \text{Zn} \rightarrow \text{Zn}^{2+} + \text{Fe}$ is
 (a) -0.35 V (b) $+1.17 \text{ V}$
 (c) $+0.35 \text{ V}$ (d) -1.17 V
17. The emf of the cell $\text{Zn(s)} | \text{Zn}^{2+} || \text{Cd}^{2+} | \text{Cd(s)}$ is 0.360 V at 25° C . ΔG° in KJ will be
 (a) 112.5 (b) 69.47
 (c) -34.76 (d) -69.47
18. The half-cell potential of a hydrogen electrode at pH 10.0 will be
 (a) -0.50 V (b) -0.59 V
 (c) 0.059 V (d) -0.059 V
19. How much will the potential of Zn. Zn^{2+} change if the solution of Zn^{2+} is diluted 10 times?
 (a) increase by 0.03 V (b) decrease by 0.03 V
 (c) increase by 0.059 V (d) decrease by 0.059 V
20. The number of electrons involved in the reaction when 1 Faraday of electricity is passed through an electrolytic solution is
 (a) 12×10^{46} (b) 96500
 (c) 6×10^{23} (d) 8×10^{16}
21. Two half cells and their reduction potentials are given below
 $\text{PbSO}_4 + 2e^- \rightarrow \text{Pb} + (\text{E}^\circ = -0.31 \text{ V})$
 $\text{Ag}^+ (\text{aq}) + e^- \rightarrow \text{Ag(s)} \quad (\text{E}^\circ = 0.80 \text{ V})$
 The feasible reactions are
 (a) $\text{Pb} + 2\text{Ag}^+ (\text{aq}) \rightarrow 2\text{Ag(s)} + \text{PbSO}_4$
 (b) $\text{PbSO}_4 + 2\text{Ag}^+ (\text{aq}) \rightarrow \text{Pb} + \text{SO}_4^{2-} + 2\text{Ag(s)}$
 (c) $\text{Pb} + \text{Ag(s)} \rightarrow \text{Ag}^+ (\text{aq}) + \text{PbSO}_4$
 (d) $\text{PbSO}_4 + 2\text{Ag(s)} \rightarrow 2\text{Ag}^+ (\text{aq}) + \text{Pb} + \text{SO}_4^{2-}$
22. Which of the following will turn blue when placed in a vessel made of copper?
 (a) aq. AgNO_3 (b) aq. NaCl
 (c) aq. ZnSO_4 (d) aq. $\text{Cd}(\text{NO}_3)_2$
23. The reaction taking place at the anode during the charging of a lead storage battery is
 (a) $\text{Pb} + \rightarrow \text{PbSO}_4 + 2e^-$ (b) $\text{Pb} + \text{PbO}_2 + 2\text{H}_2\text{SO}_4 \rightarrow 2\text{PbSO}_4 + 2\text{H}_2\text{O}$
 (c) $\text{PbSO}_4 + 2e^- \rightarrow \text{Pb} +$ (d) $2\text{PbSO}_4 + 2\text{H}_2\text{O} \rightarrow \text{Pb} + \text{PbO}_2 + 2\text{H}_2\text{SO}_4$

24. A solution contains one mole per litre of each $\text{Cu}(\text{NO}_3)_2$, AgNO_3 , $\text{Hg}_2(\text{NO}_3)_2$, and $\text{Mg}(\text{NO}_3)_2$. The solution is electrolysed by using inert electrodes. (Standard reduction potentials: silver \rightarrow 0.80; mercury \rightarrow 0.79; copper \rightarrow 0.34; magnesium \rightarrow -2.37). With increasing voltage, the sequence of deposition of metals on the cathode is
- (a) Ag, Hg, Cu, Mg (b) Mg, Cu, Hg, Ag
(c) Ag, Hg, Cu (d) Cu, Hg, Ag
25. The amount of electricity that can deposit 108 g of silver from AgNO_3 solution is
- (a) 1 ampere (b) 1 coulomb
(c) 1 Faraday (d) 2 amperes
26. When $E^\circ \text{Ag}^+/\text{Ag} = 0.80 \text{ V}$ and $E^\circ \text{Zn}^{2+}/\text{Zn} = -0.76 \text{ V}$, which of the following is correct?
- (a) Ag^+ can be reduced by H_2 (b) Ag can oxidise H_2 into H^+ ion
(c) Zn^{2+} can be reduced by H_2 (d) Ag can reduce Zn^{2+} ion
27. For the cell $\text{M}|\text{M}^+||\text{X}^-|\text{X}$, $E^\circ(\text{M}^+/\text{M}) = 0.44 \text{ V}$ and $E^\circ(\text{X}^-/\text{X}) = 0.33 \text{ V}$. One can deduce that
- (a) $\text{M} + \text{X} \rightarrow \text{M}^+ + \text{X}^-$ is spontaneous (b) $\text{M}^+ + \text{X}^- \rightarrow \text{M} + \text{X}$ is spontaneous
(c) $E_{\text{cell}} = 0.77 \text{ V}$ (d) $E_{\text{cell}} = -0.77 \text{ V}$
28. On the electrolysis of acidified water, if the volume of hydrogen liberated is 5.6 cm^3 , the volume of oxygen given out is
- (a) 2.8 cm^3 (b) 5.6 cm^3
(c) 8.4 cm^3 (d) 11.2 cm^3
29. E° for the cell $\text{Zn}|\text{Zn}^{2+}(\text{aq})||\text{Cu}^{2+}(\text{aq})|\text{Cu}$ is 1.10 V at 25°C . The equilibrium constant for the reaction $\text{Zn} + \text{Cu}^{2+} \rightleftharpoons \text{Cu} + \text{Zn}^{2+}$ is of the order
- (a) 10^{-37} (b) 10^{37}
(c) 10^{-17} (d) 10^{17}
30. How many Faraday(s) is required to reduce one mole of MnO_4^- to Mn^{2+} ?
- (a) 1 (b) 2
(c) 3 (d) 5

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	C	C	B	A	A	A	C	A	D	B
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	B	B	A	C	D	C	D	B	B	C
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	A	A	C	C	C	A	B	A	B	D

