ELECTROCHEMISTRY

ELECTROCHEMICAL SERIES

1. Zn can not displace following ions from their aqueous solution :

(1) Ag^+ (2) Cu^{2+}

(3) Fe^{2+} (4) Na^+

2. The standard reduction potentials at 25 °C for the following half reactions are given against each :

$Zn^{2+}(aq) + 2e^- \rightleftharpoons Zn(s)$, –0.762 V

$Cr^{3+}(aq) + 3e^- \rightleftharpoons Cr(s)$, –0.740 V

$2H^+ + 2e^- \rightleftharpoons H_2(g)$, 0.00 V

$Fe^{3+} + 2e^- \rightleftharpoons Fe^{2+}$, 0.77 V

Which is the strongest reducing agent ?

(1) Zn (2) Cr

(3) $H_2(g)$ (4) $Fe^{2+}(aq)$

3. Adding powdered Pb and Fe to a solution containing 1.0 M in each of Pb^{+2} and Fe^{+2} ions, would result into the formation of :–

(1) More of Fe and Pb^{2+} ions

(2) More of Fe^{+2} and Pb^{2+} ions

(3) More of Pb and Fe^{+2} ions

(4) More of Fe and Pb

4. Using the standard electrode potential values given below, decide which of the statements, I, II, III and IV are correct. Choose the right answer from (1), (2), (3) and (4).

$Fe^{2+} + 2e^- \rightleftharpoons Fe$; $E° = -0.44$ V

$Cu^{2+} + 2e^- \rightleftharpoons Cu$; $E° = +0.34$ V

$Ag^+ + e^- \rightleftharpoons Ag$; $E° = +0.80$ V

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

II. Iron can displace copper from $CuSO_4$ solution.

III. Silver can displace copper from $CuSO_4$ solution.

IV. Iron can displace silver from $AgNO_3$ solution.

(1) I and II (2) II and III

(3) II and IV (4) I and IV

5. The standard electrode potential value of the elements A, B and C are 0.68, –2.50 and 0.50 V respectively. The order of their reducing power is :

(1) A > B > C (2) A > C > B

(3) C > B > A (4) B > C > A

ELECTROLYSIS

6. When an electric current is passed through acidified water, 112 mL of hydrogen gas at STP collects at the cathode in 965 s. The current passed, in ampere is :

(1) 1.0 (2) 0.5

(3) 0.1 (4) 2.0

7. A current of 9.65 A flowing for 10 minute deposits 3.0 g of a metal. The equivalent weight of the metal is :

(1) 10 (2) 30 (3) 50 (4) 96.5

8. How many coulombs of electricity are required for the oxidation of 1 mol of H_2O to O_2 ?

(1) 9.65×10^4 C (2) 4.825×10^5 C

(3) 1.93×10^5 C (4) 1.93×10^4 C

9. When a quantity of electricity equal to that required to liberate 2.24 L of hydrogen at STP from 0.1 M aqueous H_2SO_4 is passed (At. mass of Cu = 63.5) then the mass of copper that will be deposited at cathode in electrolysis of 0.2 M solution of copper sulphate will be :

(1) 1.59 g (2) 3.18 g

(3) 6.35 g (4) 12.70 g

10. A silver cup is plated with silver by passing 965 A current for one second, the mass of Ag deposited is :–(At. wt. of Ag = 107.87)

(1) 9.89 g. (2) 107.87 g.

(3) 1.0787 g. (4) 100.2 g.

11. One Faraday of electricity will liberate one mole of the metal from the solution of

(1) Auric chloride (2) Silver nitrate

(3) Calcium chloride (4) Copper sulphate

12. A factory produces 40 kg of calcium in two hours by electrolysis. How much aluminium can be produced by the same current in two hours :–

(At wt. of Ca = 40, Al = 27)

(1) 22 kg (2) 18 kg

(3) 9 kg (4) 27 kg

ANSWER KEY

ELECTROCHEMISTRY												
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Ans.	4	1	3	3	4	1	3	3	3	3	2	2

SOLUTION

1. SRP of Zn is less than Fe, Cu, Ag

So it can not displace Na^+ from its solution.

2. Element having High –ve SRP (less value of SRP) will be strongest reducing agent.

So Zn is strongest reducing agent among given all.

3. SRP (Pb) > SRP (Fe)

So Fe oxidised it self.

Thats why in solution more Fe^{2+} ions and more Pb obserbed.

4. From given data

$E°(Ag^+/Ag) > E°(Cu^{2+}/Cu) > E°(Fe^{2+}/Fe)$

So Fe can displace Cu from $CuSO_4$

Fe can displace Ag from $AgNO_3$

Cu can displace Ag from $AgNO_3$

Rest are incorrect statement

5. Element with High –ve SRP

(less value of SRP) will be good reducer So.

Reducing Power

B > C > A

6. $H_2O \underset{}{\overset{\text{Electrolysis}}{\rightleftharpoons}} H_2\uparrow$

$n_f = 2$

$$n_{H_2} = \frac{Q}{n_f.F}$$

$$\frac{112\text{ ml}}{22400\text{ ml}} = \frac{i \times 965\text{sec}}{2 \times 96500}$$

i = 1 amp.

7. $$\omega = \frac{E \times i \times t}{96500}$$

$$3\text{gm} = \frac{E \times 9.65 \times 10 \times 60\text{sec}}{96500\text{ C}}$$

E = 50

8. $\overset{-2}{H_2O} \longrightarrow \overset{0}{O_2}$

$n_f = 2$

1 mole

$$n = \frac{Q}{n_f \times F}$$

$$1 = \frac{Q}{2.F}$$

$Q = 2F = 2 \times 96500$ C

$Q = 1.93 \times 10^5$ C

9. Q is same So $\frac{\omega t(H_2)}{\omega t(Cu)} = \frac{E(H_2)}{E(Cu)}$

$$\frac{\left(\frac{2.24}{22.4} \times 2\right)\text{gm}}{\omega t(Cu)} = \frac{2/2}{63.5/2}$$

$\omega t(Cu) = 6.35$ gm

10. $Ag^+ \rightarrow Ag$

$$\omega_{Ag} = \frac{107.87/1}{96500} \times 965\text{ Amp} \times 1\text{ sec} = 1.0787\text{ gm}$$

11. $n = \frac{Q}{n_f.F} \Rightarrow 1\text{ mole} = \frac{1 \times F}{n_f.F}$

$n_f = 1$ $\quad (\overset{+1}{Ag}\ NO_3)$