Electrochemistry

SET Self Evaluation Test -12

1. The mass of copper deposited from a solution of $CuSO_4$ by passage of 5 *A* current for 965 second is (*Mol. wt*. of Copper = 63.5)

(a) 15.875 *g* (b) 1.5875 *g*

(c) 4825 *g* (d) 96500 *g*

2. The current in a given wire is 1.8 *A*. The number of coulombs that flow in 1.36 minutes will be **[AIIMS 2001]**

(a) 100 *C* (b) 147 *C*

(c) 247 *C* (d) 347 *C*

3. A solution of a salt of a metal was electrolysed for 150 *minutes* with a current of 0.15 *amperes*. The weight of metal deposited was 0.783 *gm*. The equivalent weight of the metal is **[AFMC 2001]**

(a) 55.97 *gm* (b) 65.97 *gm*

(c) 75.97 *gm* (d) 85.97 *gm*

4. The resistance of 0.01*N* $NaCl$ solution at 25^oC is 200 Ω. Cell constant of conductivity cell is 1 cm^{-1}. The equivalent conductance is

(a) $5\times10^2\Omega^{-1}cm^2eq^{-1}$ (b) $6\times10^3\Omega^{-1}cm^2eq^{-1}$

(c) $7\times10^4\Omega^{-1}cm^2eq^{-1}$ (d) $8\times10^5\Omega^{-1}cm^2eq^{-1}$

5. Which of the following reaction is possible at anode

[AIEEE 2002]

(a) $2Cr^{3+}+7H_2O\rightarrow Cr_2O_7^{2-}+14H^+$

(b) $F_2\rightarrow 2F^-$

(c) $\frac{1}{2}O_2+2H^+\rightarrow H_2O$

(d) None of these

6. What is the standard cell potential for the cell

$Zn/Zn^{2+}(1M)\|\ Cu^{2+}(1M)/Cu$

E^o for $Zn/Zn^{2+}(1M)=-0.76\ V\ \&\ Cu^{2+}/Cu=+0.34\ V$

[AIIMS 1980]

(a) $-0.76+(-0.34)=-0.42\ V$

(b) $-0.34+0.76=+0.42\ V$

(c) $0.34-(-0.76)=1.10\ V$

(d) $-0.76-(+0.34)=-1.10\ V$

[AIIMS 2001]

7. Normal aluminium electrode coupled with normal hydrogen electrode gives an *emf* of 1.66 *volts*. So the standard electrode potential of aluminium is**[KCET 198**

(a) – 1.66 *V* (b) + 1.66 *V*

(c) – 0.83 *V* (d) + 0.83 *V*

8. Which one among the following is the strongest reducing agent

$Fe^{2+}+2e^-\rightarrow Fe(-0.44\ V)$

$Ni^{2+}+2e^-\rightarrow Ni(-0.25\ V)$

$Sn^{2+}+2e^-\rightarrow Sn(-0.14\ V)$

$Fe^{3+}+e^-\rightarrow Fe^{2+}(-0.77\ V)$ **[BHU 1998]**

(a) Fe (b) Fe^{2+}

(c) Ni**[CBSE PMT 1999]** (d) Sn

9. The cell reaction of the galvanic cell $Cu_{(s)}|\ Cu^{2+}{}_{(aq)}\|\ Hg^{2+}{}_{(aq)}|\ Hg_{(l)}$ is **[EAMCET 2003]**

(a) $Hg+Cu^{2+}\rightarrow Hg^{2+}+Cu$

(b) $Hg+Cu^{2+}\rightarrow Cu^++Hg^+$

(c) $Cu+Hg\rightarrow CuHg$

(d) $Cu+Hg^{2+}\rightarrow Cu^{2+}+Hg$

10. The specific conductivity of *N*/10 *KCl* solution at 20^oC is $0.0212\ ohm^{-1}cm^{-1}$ and the resistance of cell containing this solution at 20^oC is 55 *ohm*. The cell constant is

[AIIMS 1999]

(a) 1.166 cm^{-1}

(b) 2.173 cm^{-1}

(c) 3.324 cm^{-1}

(d) 4.616 cm^{-1}

11. The oxide which is not reduced by hydrogen is

[JIPMER 1999]

(a) Ag_2O (b) K_2O (c) Fe_2O_3 (d) P_4O_{10}

Answers and Solutions

(SET -12)

1. (b) Current (I) = 5A and time (t) = 965 *sec*.

We know that equivalent weight of copper $= \frac{\text{Molecular weight}}{\text{Valancy}} = \frac{63.5}{2}$ and quantity of electricity passed in coulomb = current × time = 5 × 965 = 4825*C*. Since 96500 *coulombs* will deposit $\frac{63.5}{2} g$ of copper therefore 4825 coulombs will deposit

$= \frac{63.5 \times 4825}{96500 \times 2} = 1.5875\ g$.

2. (b) $Q = I \times t$; $1.8 \times 1.36 \times 60 = 147 C$.

3. (a) Time (t) = 150 *min* = 9000 *sec*

Current (I) = 0.15 *A*

Weight of metal (w) = 0.783 *g*.

We know $Q = I \times t = 0.15 \times 9000 = 1350\ C$. Since 1350 *C* of electricity will deposited 0.783 *g* of metal, so, 96500 *C* of electricity will deposited $\frac{0.783 \times 96500}{1350} = 55.97\ g$.

4. (a) $\lambda = k \times V = \frac{1}{R} \times \frac{l}{a} \times V = \frac{1}{200} \times 1 \times 10{,}000$

$= 5 \times 10^2 \Omega^{-1} cm^2 eq.^{-1}$

5. (a) Oxidation always occurs at anode.

6. (c) $E^o = E_{\text{cathode}} - E_{\text{anode}}$

$E^o = 0.34 - (-0.76)$; $E^o = 1.10\ volt$.

7. (a) $E^o_{\text{cell}} = 1.66 = E^o_{H^+/H_2} - E^o_{Al^{3+}/Al}$

$= O - E^o_{Al^{3+}/Al}$ or $E_{Al^{3+}/Al} = -1.66\ V$.

8. (a) The reduction potential of *Fe* is very high, so it is a strongest reducing agent.

9. (b) $\underbrace{Cu_{(s)} | Cu^{2+}_{(Ag)}}_{\text{anode oxidation}} || \underbrace{Hg^{2+}_{(Ag)} | Hg_{(l)}}_{\text{cathode reduction}}$

$$\underbrace{Cu + \overbrace{Hg^{2+} \rightarrow Cu^{2+} + Hg}^{\text{Reduction}}}_{\text{Oxidation}} .$$

10. (a) $K = \frac{1}{R} \times$ cell constant

$= K \times R = 0.0212 \times 55 = 1.166\ cm^{-1}$.

11. (b) On the basis of electrochemical series K_2O is not reduced by hydrogen.

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