DPP – 11

CLASS – 12th

TOPIC – ELECTROLYSIS

Q.1 Find the number of electrons involved in the electrodeposition of 63.5g of copper from a solution of copper sulphate is

Q.2 A current 0.5 ampere when passed through $AgNO_3$ solution for 193 sec. deposited 0.108g of Ag Find the equivalent weight of Ag

Q.3 A certain metal salt solution is electrolysed in series with a silver coulometer. The weights of silver and the metal deposited are 0.5094g and 0.2653g. Calculate the valency of the metal if its atomic weight is nearly that of silver

Q.4 3A current was passed through an aqueous solution of an unknown salt of Pd for 1Hr. 2.977g of Pd+n was deposited at cathode. Find n. (Given Atomic mass of Pd = 106.4)

Q.5 How long a current of 2A has to be passed through a solution of AgNO3 to coat a metal surface of $80cm^2$ with 5 micrometer thick layer? Density of silver = 10.8g/cm3.

SOLUTION

(CHEMISTRY) ELECTROCHEMISTRY

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Sol.1 63.5gm of Cu=1mol of Cu.

No. of equivalent = No. of moles × valency

= 1×2 = 2

1 mole of electron will deposite 1 equivale

Number of electron = $2 \times 6.022 \times 10^{23}$

= 12.044×10^{23}.

Sol.2 Given: Current, I = 0.5 A

Time, t = 193s

Deposited Ag (W) =0.108g

Q=It, where Q=quantity of electricity in Coloumb, I is current in amperes and time is in seconds.

⇒ Q=0.5 A ×193s

Q =96.5C

$AgNO_3$ ----------> $Ag^{+1} + NO_3^{-1}$

Ag^{+1} + e- --------> Ag

Therefore, Number of electrons, n=1

96.5 C of electricity deposits Ag=0.108g

96500 C of electricity deposits Ag = $\frac{0.108}{96.5} \times 96500$

= 108g

Therefore, equivalent weight is E= $\frac{108}{n}$

⇒ E=108 g

Sol.3 Equivalent mass silver = $\frac{\text{molar mass}}{\text{valency}}$

$$\frac{107.8682}{1} = 107.8682$$

$$\text{Equivalent mass of silver} = \frac{\text{Molar mass}}{\text{Valency}} = \frac{107.8682}{x}$$

Now,

$$\frac{W_{Ag}}{W_x} = \frac{E_{Ag}}{E_x}$$

$$\frac{0.5094}{0.2653} = \frac{107.88682 \times X}{107.8682}$$

$x = 1.92 \approx 2$

thus, the valency of metal is 2

Sol.4 For reduction : $pd^{n+} + na \dashrightarrow pd$

$$\frac{W}{E_{pd}} = \frac{i \times t}{96500}$$

$$\frac{2.977}{106.4/n} = \frac{3 \times 1 \times 60 \times 60}{96500}$$

implies n = 4

Sol.5 Volume of the layer coated = $(80 \times 10^{-4}) \times (2 \times 5 \times 10^{-6})$

$= (80 \times 10^{4})\ (10 \times 10^{-6})$

$= 8 \times 10^{-8}\ m^3 = 0.08$ ml

Let the density be dg/ml

Amount of Ag deposited = 0.08d

$$\text{No. of equivalents of Ag deposited} = \frac{0.08d}{108}$$

$$\frac{0.08d}{108} \times 96500 = 2 \times t$$

$$\Rightarrow \quad t = 35.741d \text{ sec}$$