Electrolysis Practice Problems

1. What mass of Co can be produced when a current of 15 A is passed through a solution of aqueous Co^{2+} for 1.0 hour?

15 C/s

$Co^{2+} + 2e^- \rightarrow Co(s)$

$(1\ hr)(60)(60) = 3600\ s$

$$\left(15\ \frac{C}{s}\right)(3600\ s) = \frac{54000\ C}{96485\ C}\left|\frac{1\ mol\ e^-}{2\ mol\ e^-}\right|\frac{1\ mol\ Co}{1\ mol\ Co}\left|\frac{58.93\ g\ Co}{}\right. = \boxed{16\ g\ Co}$$

2. For how many minutes must the electrolysis of a solution of $CuSO_4$ be carried out with a current of 2.25 A, to deposit 1.00 g of Cu(s) at the cathode?

$Cu^{2+} + 2e^- \rightarrow Cu(s)$

$$\frac{1.00\ g\ Cu}{}\left|\frac{1\ mol\ Cu}{63.55\ g\ Cu}\right|\frac{2\ mol\ e^-}{1\ mol\ Cu}\left|\frac{96485\ C}{1\ mol\ e^-}\right. = 3036.5\ C$$

$$2.25\ \frac{C}{s} = \frac{3036.5\ C}{x\ s} \qquad t = 1349.56\ s = \boxed{22.5\ min}$$

3. When $AgNO_3$ is electrolyzed for 21 mins and 12 seconds, 2.175 g of Ag(s) is deposited on the cathode. What is the amount of charge in Coulombs passing through the cell? What is the magnitude of the current in Amps?

$Ag^+ + e^- \rightarrow Ag(s)$

$$\frac{2.175\ g\ Ag}{}\left|\frac{1\ mol\ Ag}{107.9\ g\ Ag}\right|\frac{1\ mol\ e^-}{1\ mol\ Ag}\left|\frac{96485\ C}{1\ mol\ e^-}\right. = \boxed{1945\ C}$$

$$I = \frac{q}{t} = \frac{C}{s} = \frac{1945\ C}{1272\ s} = \boxed{1.5\ A}$$

4. What mass of I_2 can be produced when a current of 10 A is passed through a solution of aqueous KI for 30 minutes?

$2I^- + 2e^- \rightarrow I_2$

$$\left(10\ \frac{C}{s}\right)(1800\ s) = \frac{18000\ C}{96485\ C}\left|\frac{1\ mol\ e^-}{2\ mol\ e^-}\right|\frac{1\ mol\ I_2}{1\ mol\ I_2}\left|\frac{253.8\ g\ I_2}{}\right.$$

$$= \boxed{24\ g\ I_2}$$

5. How long will it take to plate out 1.0 kg of Al from aqueous Al^{3+} using a current of 100.0 A?

$Al^{3+} + 3e^- \rightarrow Al(s)$

$$1.0\ kg = \frac{1000\ g\ Al}{}\left|\frac{1\ mol\ Al}{26.98\ g\ Al}\right|\frac{3\ mol\ e^-}{1\ mol\ Al}\left|\frac{96485\ C}{1\ mol\ e^-}\right. = 1.1 \times 10^7\ C$$

$$100.0\ \frac{C}{s} = \frac{1.1 \times 10^7\ C}{t} \qquad \boxed{t = 1.1 \times 10^5\ s}$$