AP Chemistry Chapter 17 Section 7 Electrolysis/Quantitative Electrochemistry

1. How many amps are required to deposit 5.00 grams of gold per hour on the cathode of an electrolytic cell containing a solution of a salt of gold in the +3 oxidation state?

$$5.00\text{g Au} \times \frac{1\text{mol Au}}{196.97\text{g}} \times \frac{3\text{mol e}^-}{1\text{mol Au}} \times \frac{96500\text{C}}{1\text{mol e}^-} \times \frac{1}{1\text{hour}} \times \frac{1\text{hour}}{3600\text{sec}} = \boxed{2.04\text{ C/sec}}$$

amps.

2. How many coulombs per hour pass through an electroplating bath which has a current of 5.0 amperes?

$$1\text{ hour} \times \frac{3600\text{sec}}{1\text{ hour}} \times \frac{5.0\text{ C}}{1\text{sec}} = \boxed{1.8 \times 10^4\text{ C}}$$

3. A current of 1.6 amperes flows through a lamp when it is connected to a 112 volt source. What is the wattage of the bulb in the lamp?

$$\frac{1.6\text{ C}}{1\text{sec}} \times \frac{112\text{ J}}{1\text{ C}} = 179.2 = \boxed{1.80 \times 10^2\text{ J/sec}}$$

watts.

4. How long does it take to deposit 100.0 grams of $Cr_{(s)}$ from an electrolytic cell containing molten Cr_2O_3 at a current of 125 amps?

$$100.0\text{g Cr} \times \frac{1\text{mol Cr}}{52.00} \times \frac{3\text{mol e}^-}{1\text{mol Cr}} \times \frac{96500\text{C}}{1\text{mol e}^-} \times \frac{1\text{sec}}{125\text{ C}} \times \frac{1\text{min}}{60\text{sec}} = \boxed{\begin{array}{l} 4454\text{sec} \\ 74.23\text{min} \\ 1.237\text{ hours} \end{array}}$$

5. The common zinc-carbon cell uses $Zn_{(s)}$ as the reducing agent at the anode. What mass of $Zn_{(s)}$ will be consumed if 0.25 amps is drawn "from" the cell for a period of 2.0 hours?

$$2.0\text{ hour} \times \frac{3600\text{sec}}{1\text{hour}} \times \frac{0.25\text{C}}{1\text{sec}} \times \frac{1\text{mol e}^-}{96500\text{C}} \times \frac{1\text{mol Zn}}{2\text{mol e}^-} \times \frac{65.39\text{g Zn}}{1\text{mol Zn}} = \boxed{.61\text{g}}$$