

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?

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

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?

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

4. How long does it take to deposit 100.0 grams of  $\text{Cr}_{(s)}$  from an electrolytic cell containing molten  $\text{Cr}_2\text{O}_3$  at a current of 125 amps?

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

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

$$2.0 \text{ hour} \times \frac{3600 \text{ sec}}{1 \text{ hour}} \times \frac{0.25 \text{ C}}{1 \text{ sec}} \times \frac{1 \text{ mol } e^-}{96500 \text{ C}} \times \frac{1 \text{ mol Zn}}{2 \text{ mol } e^-} \times \frac{65.39 \text{ g Zn}}{1 \text{ mol Zn}} = \boxed{0.61 \text{ g}}$$