*27.2 The atomic weight of silver = 107.9, and the volume V is

$$V = (\text{area})(\text{thickness}) = (700 \times 10^{-4}\ \text{m}^2)(0.133 \times 10^{-3}\ \text{m}) = 9.31 \times 10^{-6}\ \text{m}^3$$

The mass of silver deposited is $m_{\text{Ag}} = \rho V = \left(10.5\times 10^3\ \text{kg/m}^3\right)\left(9.31\times 10^{-6}\ \text{m}^3\right) = 9.78\times 10^{-2}\ \text{kg}$.

and the number of silver atoms deposited is

$$N = (9.78 \times 10^{-2}\ \text{kg})\,\frac{6.02 \times 10^{26}\ \text{atoms}}{107.9\ \text{kg}} = 5.45 \times 10^{23}$$

$$I = \frac{V}{R} = \frac{12.0\ \text{V}}{1.80\ \Omega} = 6.67\ \text{A} = 6.67\ \text{C/s}$$

$$\Delta t = \frac{\Delta Q}{I} = \frac{Ne}{I} = \frac{(5.45 \times 10^{23})(1.60 \times 10^{-19}\ \text{C})}{6.67\ \text{C/s}} = 1.31 \times 10^4\ \text{s} = \boxed{3.64\ \text{h}}$$

27.7 $q = 4t^3 + 5t + 6 \qquad A = (2.00\ \text{cm}^2)\left(\frac{1.00\ \text{m}}{100\ \text{cm}}\right)^2 = 2.00 \times 10^{-4}\ \text{m}^2$

(a) $I(1.00\ \text{s}) = \left.\frac{dq}{dt}\right|_{t=1.00\ \text{s}} = \left.\left(12t^2 + 5\right)\right|_{t=1.00\ \text{s}} = \boxed{17.0\ \text{A}}$

(b) $J = \frac{I}{A} = \frac{17.0\ \text{A}}{2.00 \times 10^{-4}\ \text{m}^2} = \boxed{85.0\ \text{kA/m}^2}$

27.14 (a) Applying its definition, we find the resistance of the rod,

$$R = \frac{\Delta V}{I} = \frac{15.0\ \text{V}}{4.00\times 10^{-3}\ \text{A}} = 3750\ \Omega = \boxed{3.75\ \text{k}\Omega}$$

(b) The length of the rod is determined from Equation 27.11: $R = \rho\ell/A$. Solving for ℓ and substituting numerical values for R, A, and the values of ρ given for carbon in Table 27.1, we obtain

$$\ell = \frac{RA}{\rho} = \frac{(3.75\times 10^3\ \Omega)(5.00\times 10^{-6}\ \text{m}^2)}{(3.50\times 10^{-5}\ \Omega\cdot\text{m})} = \boxed{536\ \text{m}}$$

27.38 $\mathcal{P} = 0.800(1500\ \text{hp})(746\ \text{W/hp}) = 8.95 \times 10^5\ \text{W}$

$\mathcal{P} = I(\Delta V)$

$8.95 \times 10^5 = I(2000)$

$\boxed{I = 448\ \text{A}}$

27.44 (a) $\Delta U = q(\Delta V) = It(\Delta V) = (55.0\ \text{A}\cdot\text{h})(12.0\ \text{V})\left(\frac{1\ \text{C}}{1\ \text{A}\cdot\text{s}}\right)\left(\frac{1\ \text{J}}{1\ \text{V}\cdot\text{C}}\right)\left(\frac{1\ \text{W}\cdot\text{s}}{1\ \text{J}}\right) = 660\ \text{W}\cdot\text{h} = \boxed{0.660\ \text{kWh}}$

(b) $\text{Cost} = 0.660\ \text{kWh}\left(\frac{\$0.0600}{1\ \text{kWh}}\right) = \boxed{3.96¢}$

*27.51 Consider a 400-W blow dryer used for ten minutes daily for a year. The energy converted is

$$\mathcal{P}t = (400\ \text{J/s})(600\ \text{s/d})(365\ \text{d}) \cong 9\times 10^7\ \text{J}\left(\frac{1\ \text{kWh}}{3.6\times 10^6\ \text{J}}\right) \cong 20\ \text{kWh}$$

We suppose that electrical energy costs on the order of ten cents per kilowatt-hour. Then the cost of using the dryer for a year is on the order of

$$\text{Cost} \cong (20\ \text{kWh})(\$0.100/\text{kWh}) = \$2 \quad \boxed{\sim \$1}$$