

60. (a) The current is

$$\begin{aligned} i &= \frac{V}{R} = \frac{V}{\rho L/A} = \frac{\pi V d^2}{4 \rho L} \\ &= \frac{\pi (1.20 \text{ V}) [(0.0400 \text{ in.}) (2.54 \times 10^{-2} \text{ m/in.})]^2}{4 (1.69 \times 10^{-8} \Omega \cdot \text{m}) (33.0 \text{ m})} = 1.74 \text{ A} . \end{aligned}$$

(b) The magnitude of the current density vector is

$$|\vec{J}| = \frac{i}{A} = \frac{4i}{\pi d^2} = \frac{4(1.74 \text{ A})}{\pi [(0.0400 \text{ in.}) (2.54 \times 10^{-2} \text{ m/in.})]^2} = 2.15 \times 10^6 \text{ A/m}^2 .$$

(c) $E = V/L = 1.20 \text{ V}/33.0 \text{ m} = 3.63 \times 10^{-2} \text{ V/m}$.

(d) $P = Vi = (1.20 \text{ V})(1.74 \text{ A}) = 2.09 \text{ W}$.