42. (a) Since $P = i^2R = J^2A^2R$, the current density is

$$\begin{aligned} J &= \frac{1}{A}\sqrt{\frac{P}{R}} = \frac{1}{A}\sqrt{\frac{P}{\rho L/A}} = \sqrt{\frac{P}{\rho LA}} \\ &= \sqrt{\frac{1.0\,\mathrm{W}}{\pi(3.5\times10^{-5}\,\Omega\cdot\mathrm{m})(2.0\times10^{-2}\,\mathrm{m})(5.0\times10^{-3}\,\mathrm{m})^2}} = 1.3\times10^5\ \mathrm{A/m^2}\ . \end{aligned}$$

(b) From $P = iV = JAV$ we get

$$V = \frac{P}{AJ} = \frac{P}{\pi r^2 J} = \frac{1.0\,\mathrm{W}}{\pi(5.0\times10^{-3}\,\mathrm{m})^2(1.3\times10^5\,\mathrm{A/m^2})} = 9.4\times10^{-2}\ \mathrm{V}\ .$$