

38. (a) From $P = V^2/R = AV^2/\rho L$, we solve for the length:

$$L = \frac{AV^2}{\rho P} = \frac{(2.60 \times 10^{-6} \text{ m}^2)(75.0 \text{ V})^2}{(5.00 \times 10^{-7} \Omega \cdot \text{m})(5000 \text{ W})} = 5.85 \text{ m} .$$

- (b) Since $L \propto V^2$ the new length should be

$$L' = L \left(\frac{V'}{V} \right)^2 = (5.85 \text{ m}) \left(\frac{100 \text{ V}}{75.0 \text{ V}} \right)^2 = 10.4 \text{ m} .$$