

Ch. 9 Prob 74

$$R_0 = 5.0 \Omega \quad L_n = 2L_0$$

What is the resistance of the new wire?
 The volume of the wire is unchanged, so

$$V_0 = A_0 L_0 = A_n L_n = V_n$$

$$A_n = \frac{A_0 L_0}{L_n}$$

But $L_n = 2L_0$, so $A_n = \frac{A_0 L_0}{2L_0} = \frac{A_0}{2}$

The formula for resistance gives

$$R_0 = \frac{\rho L_0}{A_0} \quad \text{and} \quad R_n = \frac{\rho L_n}{A_n}$$

↓
 substitute in relationships for A_n & L_n

$$R_n = \frac{\rho (2L_0)}{(A_0/2)} = 4 \frac{\rho L_0}{A_0}$$

But $\frac{\rho L_0}{A_0}$ is the original resistance of the wire

$$\therefore R_n = 4R_0 = 4(5.0 \Omega) = \boxed{20 \Omega}$$

Resistor = 6.7V

How does resistance change in wires?

Length, Area, Material

Resistance = 10.0V

10.0V

10.0V