69. (Third problem of **Cluster**)

(a) We use Eq. 27-17 with $\rho = \frac{10}{8}\rho_0$ (we are neglecting any thermal expansion of the material) and $T - T_0 = 100$ K in order to obtain $\alpha = 2.5 \times 10^{-3}/\text{K}$. Now with this value of α but $T = 600$ K (so $T - T_0 = 300$ K) we find $\rho = 1.75\rho_0 \rightarrow R = 1.75(8.0\,\Omega) = 14\,\Omega$.

(b) We are assuming the wires have unknown but equal length (not the lengths shown in Figure 27-33). With $\alpha_D = 5.0 \times 10^{-3}/\text{K}$, we find $\rho = 2.5\rho_0$ for $T - T_0 = 300$ K. With the same assumptions as in part (a), this implies $R = 2.5R_0$ where $R_0 = 16\,\Omega$ (that the resistance of D is twice that of C at 300 K is evident in part (a) of the *previous* solution. Therefore, $R = 2.5(16\,\Omega) = 40\,\Omega$ for wire D at $T = 600$ K.