Problem 27.27

According to the text, the temperature dependence of resistivity, as applied to aluminum, is

$$\rho_{Al} = (\rho_o)_{Al}\left[1 + \alpha_{Al}(T - T_o)\right]$$

where ρ_o is the resistivity at temperature T_o (room temperature) and α_{Al} is aluminum's *temperature coefficient of resistance*.

If $\rho_{Al} = 3(\rho_o)_{Cu}$, we can write:

$$\rho_{Al} = (\rho_o)_{Al}\left[1 + \alpha_{Al}(T - T_o)\right] = 3(\rho_o)_{Cu}$$

$$\Rightarrow \quad T - T_o = \frac{1}{\alpha_{Al}}\left[\frac{3(\rho_o)_{Cu}}{(\rho_o)_{Al}} - 1\right]$$

$$\Rightarrow \quad T - (20^\circ C) = \frac{1}{\left(3.9 \times 10^{-3}\,(^\circ C)^{-1}\right)}\left[\frac{3\left(1.7 \times 10^{-8}\ \Omega \cdot m\right)}{\left(2.82 \times 10^{-8}\ \Omega \cdot m\right)} - 1\right]$$

$$\Rightarrow \quad T = 227^\circ C$$

Again, obscure!