

39. Let R_H be the resistance at the higher temperature (800°C) and let R_L be the resistance at the lower temperature (200°C). Since the potential difference is the same for the two temperatures, the power dissipated at the lower temperature is $P_L = V^2/R_L$, and the power dissipated at the higher temperature is $P_H = V^2/R_H$, so $P_L = (R_H/R_L)P_H$. Now $R_L = R_H + \alpha R_H \Delta T$, where ΔT is the temperature difference $T_L - T_H = -600^\circ\text{C} = -600\text{ K}$. Thus,

$$P_L = \frac{R_H}{R_H + \alpha R_H \Delta T} P_H = \frac{P_H}{1 + \alpha \Delta T} = \frac{500\text{ W}}{1 + (4.0 \times 10^{-4}/\text{K})(-600\text{ K})} = 660\text{ W} .$$