1. The temperature in Laramie, WY can vary between 10 °C and 30 °C in one summer day. By what amount will an aluminum wire's resistance change during the day? This aluminum wire has cylindrical shape with the diameter of 1 mm and the length of 1 m. Aluminum has the temperature coefficient of $\alpha = 0.0039\ °C^{-1}$, and a resistivity (at 20 °C) of $\rho = 2.65 \times 10^{-8}\ \Omega \cdot m$.

2. A particle accelerator produces a beam with a radius of 1.25 mm with a current of 2.00 mA. Each proton has a kinetic energy of 10.00 MeV. (a) What is the velocity of the protons? (b) What is the number, n, of protons per unit volume? (c) How many protons pass a cross sectional area each second?

3. Consider a square rod of material with sides of length L = 3.00 cm with a current density of $\vec{J} = J_0 e^{\alpha x} \hat{k}$, where $J_0 = 0.35\ \frac{A}{m^2}$ and $\alpha = 2.1 \times 10^{-3} m^{-1}$. Find the current that passes through the surface of the rod.