

# Drift Speed in a Copper Wire

Friday, 29 January, 2021 21:24

The 12-gauge copper wire in a typical residential building has a cross-sectional area of  $3.31 \times 10^{-6} \text{ m}^2$ . It carries a constant current of  $10.0 \text{ A}$ . What is the drift speed of the electrons in the wire? Assume  $n = 8.46 \times 10^{28} \text{ electron/m}^3$ .

# The Resistance of Nichrome Wire

Tuesday, 2 February, 2021 20:55

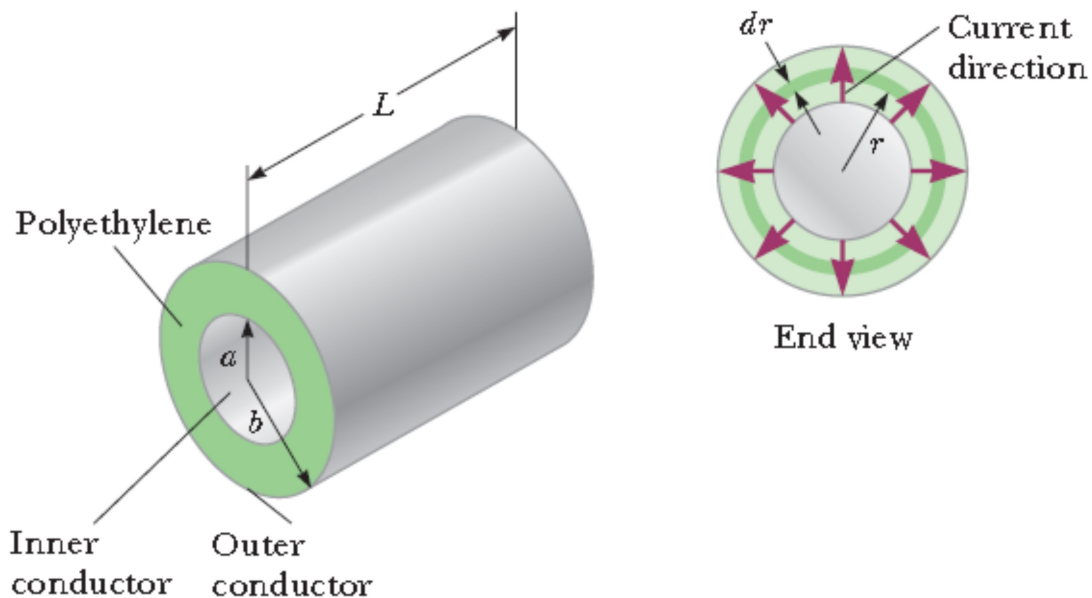
The radius of 22-gauge Nichrome wire is  $0.32 \text{ mm}$ .

- Calculate the resistance per unit length of this wire.
- If a potential difference of  $10 \text{ V}$  is maintained across a  $1.0 \text{ m}$  length of the Nichrome wire, what is the current in the wire?

# The Radial Resistance of a Coaxial Cable

Tuesday, 2 February, 2021 20:57

Coaxial cables are used extensively for cable television and other electronic applications. A coaxial cable consists of two concentric cylindrical conductors. The region between the conductors is completely filled with polyethylene plastic as shown. Current leakage through the plastic, in the radial direction, is unwanted. (The cable is designed to conduct current along its length, but that is not the current being considered here.) The radius of the inner conductor is  $a = 0.500 \text{ cm}$ , the radius of the outer conductor is  $b = 1.75 \text{ cm}$ , and the length is  $L = 15.0 \text{ cm}$ . The resistivity of the plastic is  $\rho = 1.0 \times 10^{13} \Omega \cdot m$ . Calculate the resistance of the plastic between the two conductors.



# Power in an Electric Heater

Tuesday, 2 February, 2021 21:07

An electric heater is constructed by applying a potential difference of  $120\text{ V}$  across a Nichrome wire that has a total resistance of  $8.00\ \Omega$ . Find the current carried by the wire and the power rating of the heater.

# Linking Electricity and Thermodynamics

Tuesday, 2 February, 2021 21:11

An immersion heater must increase the temperature of  $1.50 \text{ kg}$  of water from  $10.0 \text{ }^\circ\text{C}$  to  $50.0 \text{ }^\circ\text{C}$  in  $10.0 \text{ min}$  while operating at  $110 \text{ V}$ .

- What is the required resistance of the heater?
- Estimate the cost of heating the water.