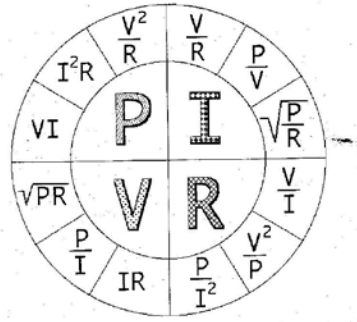


Physics 42 Chapter 27 Lecture Problems

$$J = \frac{I}{A} = \sigma E = qnv$$



$$R = \rho \frac{L}{A}$$

$$I = \frac{dQ}{dt}$$

$$\Delta V = IR$$

$$v_d = \frac{qE}{m} \tau$$

$$\rho = \frac{1}{\sigma} = \frac{m}{q^2 n \tau}$$

$$P = I\Delta V = I^2 R = \frac{\Delta V^2}{R}$$

The starter motor of a car engine draws a current of 150 A from the battery. The copper wire to the motor is 5.0 mm in diameter and 1.2 m long. The starter motor runs for 0.80 s until the car engine starts.

- How much charge passes through the starter motor?
- What is the drift speed of the electrons? Show how the units work out!
- What is the resistance in the copper wire?

You need to design a 1.0 A fuse that ‘blows’ if the current exceeds 1.0 A. The fuse material in your stockroom melts at a current density of 500 A/cm². What diameter wire of this material will do the job?

If the magnitude of the drift velocity of free electrons in a copper wire is 7.84×10^{-4} m/s, what is the electric field in the conductor? The number density for copper is 8.49×10^{28} electrons/m³ and resistivity is 1.70×10^{-8} .

A rod is made of two materials. The figure is not drawn to scale. Each conductor has a square cross section 3.00 mm on a side. The first material has a resistivity of $4.00 \times 10^{-3} \Omega \cdot \text{m}$ and is 25.0 cm long, while the second material has a resistivity of $6.00 \times 10^{-3} \Omega \cdot \text{m}$ and is 40.0 cm long. What is the resistance between the ends of the rod?

