

ANNOUNCEMENTS

- Homework 1 graded
 - Use GitHub Desktop to sync for feedback
 - Please come see me ASAP if you need help with GitHub
- Homework 2 posted; due Monday
- Quiz 1 on Friday
 - Last 20 minutes of class
 - No cheat sheets; all formulas will be provided
 - Solve a Gauss' Law Problem with spherical symmetry
 - Sketch a graph of the resulting electric field

In the interior of a metal in static equilibrium the charge density ρ is:

- A. zero always.
- B. never zero.
- C. sometimes zero, sometime non-zero, depending on the conditions.

Which of the following is a correct statement of charge conservation?

- A. $\frac{dQ_{enc}}{dt} = - \int \mathbf{J} \cdot d\mathbf{l}$
- B. $\frac{dQ_{enc}}{dt} = - \int \mathbf{J} \cdot d\mathbf{A}$
- C. $\frac{dQ_{enc}}{dt} = - \int \nabla \cdot \mathbf{J} d\tau$
- D. $\frac{dQ_{enc}}{dt} = - \nabla \cdot \mathbf{J}$
- E. None of these or *more* than one of these

For everyday currents in home electronics and wires, which answer is the order of magnitude of the instantaneous speed of the electrons in the wire?

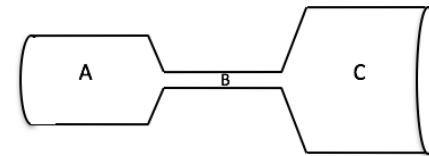
- A. more than km/s
- B. m/s
- C. mm/s
- D. $\mu\text{m/s}$
- E. nm/s

An electric current I flows along a copper wire (low resistivity) into a resistor made of carbon (high resistivity) then back into another copper wire. In which material is the electric field largest?



- A. In the copper wire
- B. In the carbon resistor
- C. It's the same in both copper and carbon
- D. It depends on the sizes of the copper and carbon

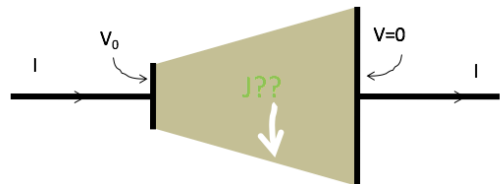
Activity: A copper cylinder is machined to have the following shape. The ends are connected to a battery so that a current flows through the copper.



Rank order (from greatest to smallest, e.g. $A=C>B$)

Magnitude of E field, Conductivity, Current, & Current Density

Inside this resistor setup, what can you conclude about the current density \mathbf{J} near the side walls (in steady state)?



- A. Must be exactly parallel to the wall
- B. Must be exactly perpendicular to the wall
- C. Could have a mix of parallel and perp components
- D. No obvious way to decide!?