

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.

ANNOUNCEMENTS

- Project homework is graded
 - Use GitHub Desktop to sync for feedback
 - Quite a few empty repositories...
 - Please come see me ASAP if you need help with GitHub
- Homework 2 posted; due Friday

MOAR ANNOUNCEMENTS

- Quiz 1 on Friday (CU-WIP folks Thursday)
 - 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
- Help session starts this week
 - 3-5pm (6pm?) in Help Room (Strosacker Center)

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. $\frac{dQ_{enc}}{dt} = - \int \nabla \cdot \mathbf{J} d\tau$

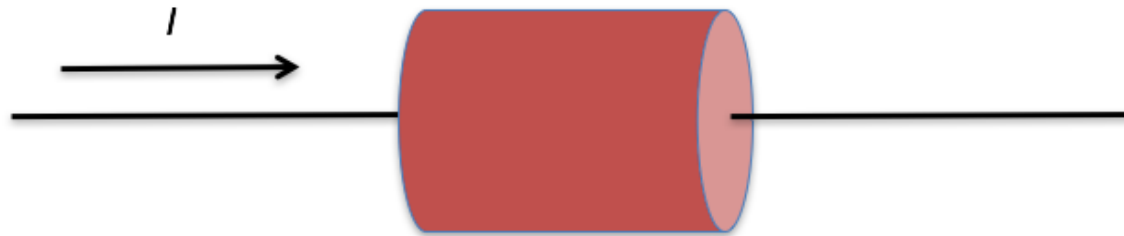
D. $\frac{dQ_{enc}}{dt} = - \nabla \cdot \mathbf{J}$

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?

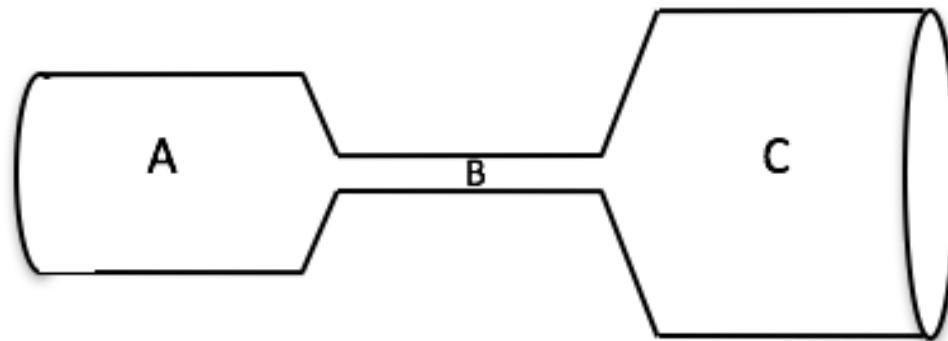
- A. more than km/s
- B. m/s
- C. mm/s
- D. $\mu\text{m/s}$
- E. nm/s

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, (real world, finite sizes!) What does the E field look like inside ?



- A. Must be uniform and horizontal
- B. Must have some nonuniformity, due to fringing effects!