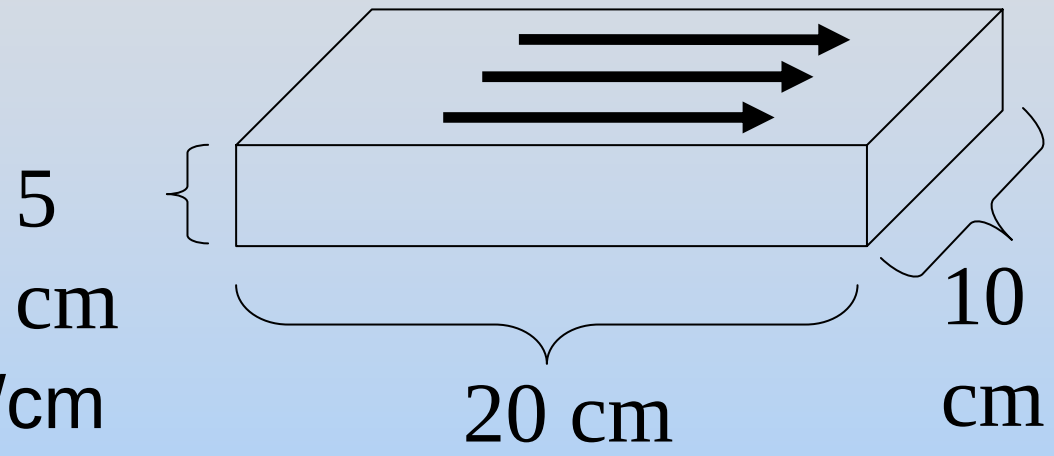
Concept Question: Current Density

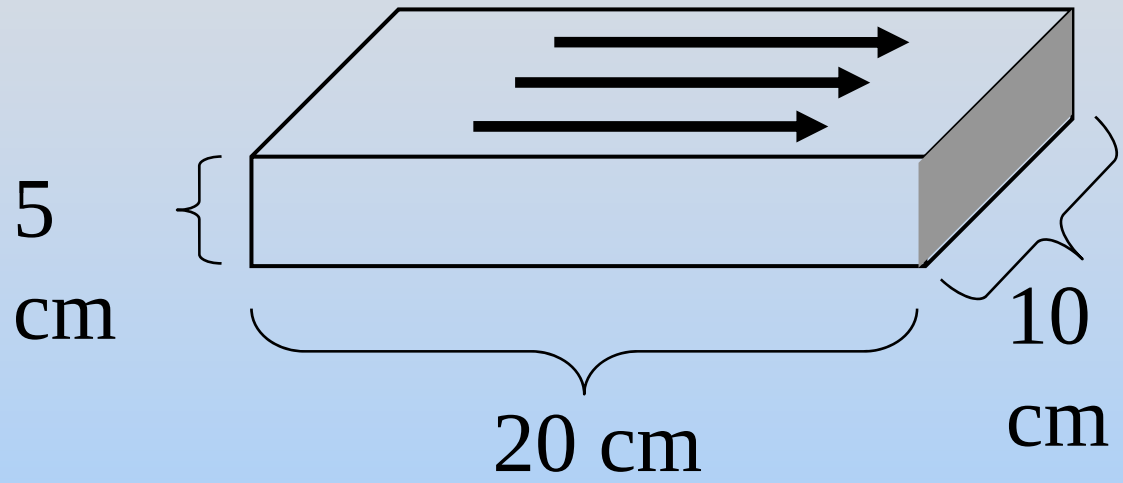
A current *I* = 200 mA flows in the above wire. What is the magnitude of the current density J?



1. J = 40 mA/cm
2. J = 20 mA/cm
3. J = 10 mA/cm
4. J = 1 mA/cm^2
5. J = 2 mA/cm^2
6. J = 4 mA/cm^2
7. I don't know

Concept Question Answer: Current Density

Answer: 6. J = 4 mA/cm^2

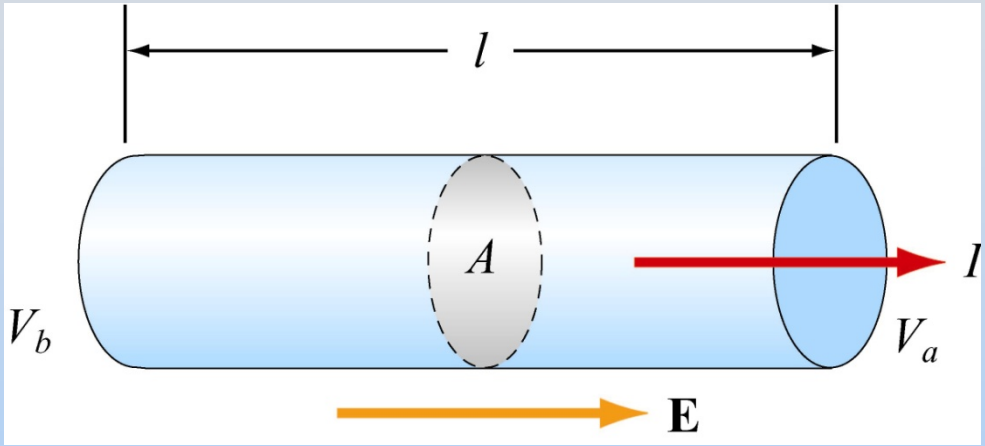


The area that matters is the cross-sectional area that the current is punching through – the 50 cm^2 area shaded grey.

So:

Concept Question: Resistance

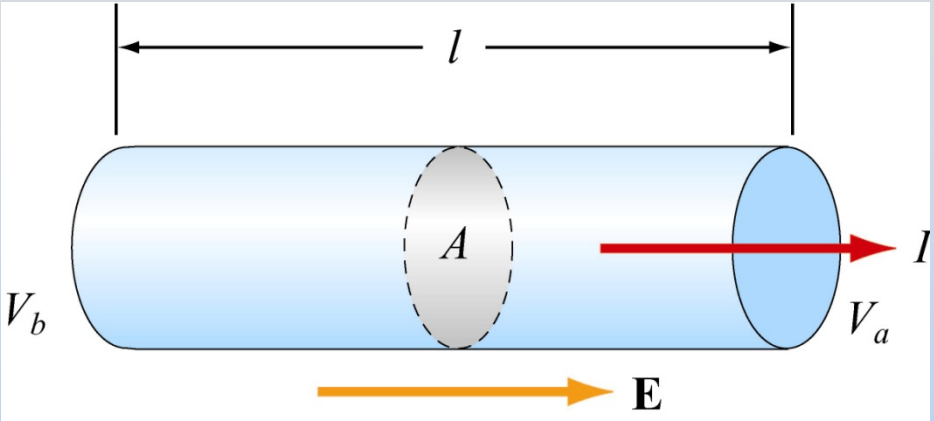
When a current flows in a wire of length *L* and cross sectional area *A*, the resistance of the wire is



1. Proportional to *A*; inversely proportional to *L*.
2. Proportional to both *A* and *L*.
3. Proportional to *L*; inversely proportional to *A*.
4. Inversely proportional to both *L* and *A*
5. Do Not Know

Concept Question Answer: Resistance

3. Proportional to *L*; inversely proportional to *A*.



The longer the wire the higher the resistance.
The bigger the cross-sectional area of the wire, the more ways that current can flow through it, so the lower the resistance.

So, if resistivity is ρ, then

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

8.02SC Physics II: Electricity and Magnetism

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