Physics 2B, Electricity and Magnetim -- Spring 2009 Instructor: B. Grinstein
Quiz # 5

INSTRUCTIONS: Fill, tear and return the bottom strip of the front page with your scantron. Keep the top portion of the front page and the rest of the quiz. Use a pencil #2 to fill your scantron. Write your code number and bubble it in under "EXAM NUMBER". Bubble in the quiz form (see letter A--D at bottom of page) in your scantron under "TEST FORM"

Useful numbers: $K = 9.0 \times 10^{9}\ Nm^2/C^2$, $\varepsilon_o = 8.85 \times 10^{-12}\ C^2/Nm^2$, $e = 1.60 \times 10^{-19}\ C$, $m_e = 9.11 \times 10^{-31}\ kg$
$\mu_o = 4\pi \times 10^{-7}\ T\ m/A$

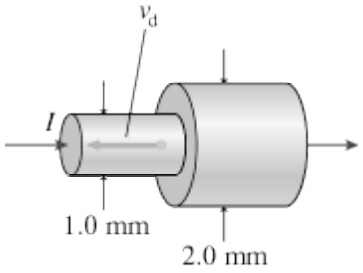
1) Electrons in an electric circuit pass through a resistor. The wire has the same diameter on each side of the resistor. Compared to the potential energy of an electron before entering the resistor, the potential energy of an electron after leaving the resistor is

A) less
B) greater
C) the same
D) not enough information given to decide

2) Copper wire #1 has a length L and a radius b. Copper wire #2 has a length $2L$ and a radius $2b$. Which statement is true?

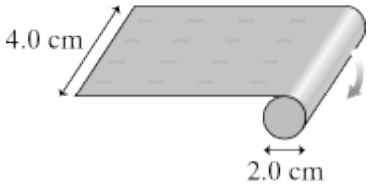
A) The total resistance of wire #1 is equal to that of wire #2.
B) The total resistance of wire #1 is half that of wire #2.
C) The total resistance of wire #1 is four times higher than that of wire #2.
D) The total resistance of wire #1 is twice as high as that of wire #2.

3) The figure shows two connected wires that are made of the same material. The current entering the wire on the left is I = 2.0 A and in that wire the electron drift speed is $v_d = 6.6 \times 10^{-4}$ m/s. What is the electron drift speed in the wire on the right side?



A) 1.7×10^{-4} m/s B) 3.3×10^{-4} m/s C) 1.3×10^{-3} m/s D) 2.6×10^{-3} m/s

4) The figure shows a 2.0 cm diameter roller that turns at 90 rpm. A 4.0 cm wide plastic film is being wrapped onto the roller. The plastic is charged. It carries uniform surface charge density of 8.9 nC/cm^2. What is the current of the moving film?



A) 53 nA B) 40 μA C) 340 nA D) 20 μA

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5) A wire of resistance R is melted and reconfigured (keeping its volume constant) into a new wire with twice the diameter of the original wire. What happens to the resistance?

A) it stays the same

B) it decreases by a factor 4

C) it decreases by a factor 8

D) it decreases by a factor 2

E) it decreases by a factor 16

6) A copper wire of length L and radius b is attached to another copper wire of length L and radius $2b$, forming one long wire of length $2L$. This long wire is attached to a battery, and a current is flowing through it. Relative to the electric field within the wire of radius b, the magnitude of the electric field within the wire of radius $2b$ is

A) four times weaker.

B) four times stronger.

C) two times stronger.

D) two times weaker.

E) equal.

7) Electrons in an electric circuit pass through a source of emf. The wire has the same diameter on each side of the source of emf. Compared to the drift speed of the electrons before entering the source of emf, the drift speed of the electrons after leaving the source of emf is

A) slower

B) the same

C) faster

D) not enough information given to decide

8) A proton beam that carries a total current of 1.2 mA has 10.0 mm diameter. The current density in the proton beam increases linearly with distance from the center. This is expressed mathematically as $J = J_e(r/R)$, where R is the radius of the beam and J_e is the current density at the edge. Determine the value of J_e.

A) 23 A/m^2 B) 11 A/m^2 C) 15 A/m^2 D) 5.7 A/m^2

Answer Key
Testname: QZ5

1) A
2) D
3) A
4) C
5) E
6) A
7) B
8) A

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