WebAssign
CH19-HW01-FALL2010 (Homework)

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PHYS 272-FALL 2012, Fall 2012
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Current Score : 15 / 15 **Due :** Tuesday, October 16 2012 11:59 PM EDT

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1. 1/1 points | Previous Answers MI3 18.1.X.001

If 1.5×10^{16} electrons enter a light bulb in 3 milliseconds, what is the magnitude of the electron current at that point in the circuit?

5e18 ✓ electrons/second

- *Read the eBook*
- Section 18.1

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2. 1/1 points | Previous Answers MI3 18.1.X.002

If the electron current at a particular location in a circuit is 10×10^{18} electrons/s, how many electrons pass that point in 5 minutes?

3e21 ✓ electrons

- *Read the eBook*
- Section 18.1

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3. 2/2 points | Previous Answers MI3 18.5.X.008

The density of mobile electrons in copper metal is 8.4×10^{28} m^{-3}. Suppose that $i = 7.8 \times 10^{18}$ electrons/s are drifting through a copper wire. (This is a typical value for a simple circuit.) The diameter of the wire is 3.7 mm. In this case, about how many minutes would it take for a single electron in the electron sea to drift from one end to the other end of a wire 21 cm long?

405.27 ✓ minutes

(A puzzle: if the drift speed is so slow, how can a lamp light up as soon as you turn it on? We'll come back to this in the next chapter.)

- *Read the eBook*
- Section 18.5

4. 2/2 points | Previous Answers MI3 19.2.X.029

Which of the following statements about a metal wire *in equilibrium* are true? Select all that apply.

- [x] There may be excess charges on the surface of the wire.
- [x] The interior of the metal wire is neutral.
- [ ] There may be a constant flow of mobile electrons inside the wire.
- [x] The net electric field everywhere inside the wire is zero.
- [x] There are no excess charges in the interior of the wire.
- [ ] There may be excess charges in the interior of the wire.
- [x] There is no net flow of mobile electrons inside the wire.
- [ ] There cannot be excess charges on the surface of the wire.
- [ ] The electric field inside the wire may be nonzero but uniform.

- *Read the eBook*
- Section 19.2

5. 2/2 points | Previous Answers MI3 19.2.X.030

Which of the following statements about a metal wire *in the steady state* are true? Select all that apply.

- [ ] There is no net flow of mobile electrons inside the wire.
- [ ] There may be excess charges in the interior of the wire.
- [x] The interior of the metal wire is neutral.
- [x] There are no excess charges in the interior of the wire.
- [x] There is a constant flow of mobile electrons inside the wire.
- [x] There may be a nonzero, uniform electric field inside the wire.
- [ ] The net electric field everywhere inside the wire is zero.
- [x] There may be excess charges on the surface of the wire.
- [ ] There cannot be excess charges on the surface of the wire.

- *Read the eBook*
- Section 19.2

6. 1/1 points | Previous Answers MI3 19.3.X.003

In the previous chapter you calculated the drift speed in a copper wire to be 5.00×10^{-5} m/s for a typical electron current. Calculate the magnitude of the electric field E inside the copper wire. The mobility of mobile electrons in copper is shown below.

$$u = 4.5 \text{ x } 10^{-3} \text{ (m/s)/(N/C)}$$

(Note that though the electric field in the wire is very small, it is adequate to push a sizeable electron current through the copper wire.)

E = 1.11e-2 N/C

- *Read the eBook*
- Section 19.3

7. 4/4 points | Previous Answers MI3 19.3.X.004

Suppose a wire leads into another, thinner wire of the same material which has only a third the cross sectional area. In the "steady state," the number of electrons per second flowing through the thick wire must be equal to the number of electrons per second flowing through the thin wire.

(a) If the drift speed $\bar{v}_1$ in the thick wire is 9×10^{-5} m/s, what is the drift speed $\bar{v}_2$ in the thinner wire?

$\bar{v}_2$ = 27e-5 ✓ m/s

(b) If the electric field E_1 in the thick wire is 12×10^{-3} N/C, what is the electric field E_2 in the thinner wire?

E_2 = 36e-3 ✓ N/C

- *Read the eBook*
- Section 19.3

8. 2/2 points | Previous Answers MI3 19.3.X.005

Suppose wire A and wire B are made of different metals, and are subjected to the same electric field in two *different* circuits. Wire B has 2 times the cross-sectional area, 1.6 times as many mobile electrons per cubic centimeter, and 2 times the mobility of wire A. In the steady state, 1×10^{18} electrons enter wire A every second. How many electrons enter wire B every second?

6.4e18 ✓ electrons/second

- *Read the eBook*
- Section 19.3