Name _____

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Quiz 4: Current and so forth

$$\mathscr{P} = I\Delta V = [\text{Watts}] \qquad \varrho = \frac{m_e}{ne^2\tau} = \frac{RA}{l} = [\Omega \cdot \text{m}]$$

$$\Delta V = IR = [\text{Volts}] \qquad v_d = \frac{-e\tau}{m_e}E = [\text{m/s}]$$

$$I = \frac{\Delta Q}{\Delta t} = [\text{Amps}] \qquad I = nqAv_d = \frac{\Delta V}{R}$$

1. The resistance of a 150 W, 115 V light bulb is 88 Ω when the light bulb is at its operating temperature. What current passes through the light bulb when in operation?

- ◯ 1.3 A
- ◯ 0.45 A
- ◯ 2.7 A
- ◯ 8.1 A

2. How many electrons per second does the current above correspond to?

- ◯ 4.7×10^{17} electrons/s
- ◯ 8.2×10^{18} electrons/s
- ◯ 3.1×10^{20} electrons/s
- ◯ 5.6×10^{13} electrons/s

3. When we power a light bulb, are we using up charges and converting them to light?

- ◯ Yes, moving charges produce "friction" which heats up the filament and produces light
- ◯ Yes, charges are emitted and observed as light
- ◯ No, charge is conserved. It is simply converted to another form such as heat and light.
- ◯ No, charge is conserved. Moving charges produce "friction" which heats up the filament and produces light.

4. In semiconductors such as Si, the number of carriers is not fixed, it depends on *e.g.,* temperature. For a certain sample of Si, the number of carriers doubles but their drift velocity decreases by 10 times. By how much does the sample's resistance change?

- ◯ 2 times lower
- ◯ 5 times lower
- ◯ 5 times higher
- ◯ 2 times higher

5. An electric current of 1 mA flows through a conductor, which results in a 150 mV potential difference. The resistance of the conductor is:

- ◯ 150 Ω
- ◯ 6.7×10^{-4} Ω
- ◯ 1.5×10^{-6} Ω
- ◯ 6.7 Ω