Name KEY [redacted] Regents Physics

UNIT 11: ELECTRICITY AND CIRCUITS
WORK PACKET

Ohm's Law and Current

1. An electrical circuit has 2.5 (m) $\times 10^{-3}$ A running through it. How much charge passes by a given point in 3.5 s?

$$I = \frac{q}{t} \rightarrow q = It$$
$$= (2.5 \times 10^{-3} A)(3.5 s) = 8.75 \times 10^{-3} C$$

2. Based on your answer to question 1, how many electrons will pass by in this given time?

$$8.75 \times 10^{-3} C \times \frac{1 e^-}{1.6 \times 10^{-19} C} = 5.47 \times 10^{16} e^-$$

3. A light bulb has a resistance of 5 ohms and is connected to a 9 V battery. Determine rate at which charge moves through the light bulb.

$$R = \frac{V}{I} \rightarrow I = \frac{V}{R} = \frac{9V}{5\Omega} = 1.8 A$$

4. A radio is connected to a wall socket that provides 120 V. If the radio requires 2.5 mA of current, what is the resistance of the circuit in the radio?

$$R = \frac{V}{I} = \frac{120V}{2.5 \times 10^{-3} A} =$$

$$R = 48{,}000 \Omega$$

Resistance:

1. By magnitude does the resistance of a copper wire change if the length is cut in half?

$$R = \frac{\rho L}{A} = \frac{1(1/2)}{1} = 1/2$$

2. By what magnitude does the resistance of a copper wire change if the radius of the wire is doubled?

$$R = \frac{\rho L}{A} = \frac{\rho L}{(\pi r^2)} = \frac{(1)(1)}{(1)(2)^2} = 1/4$$

3. Calculate the resistance of a 10 m copper wire with a cross sectional area of 8.00 x 10^{-6} m^2.

$$R = \frac{\rho L}{A} = \frac{(1.72 \times 10^{-8} \Omega m)(10 m)}{8 \times 10^{-6} m^2} = 0.0215 \Omega$$