PHYSICS IN MOTION
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Unit 5E
Current Electricity
Practice Problems

Name:

Date:

Work each of the following problems. SHOW ALL WORK.

1. How much current is flowing through a wire if 21.5 C of charge passes a point in 6.3 seconds?

2. A 210 Ω resistor is connected in a circuit with a 110 V battery. How much charge passes through a point in the circuit in two minutes?

3. How long would these devices need to be in operation before 1,000,000 C of charge passes through them?

   a. LED night light (I = 0.0041 A)
   b. incandescent night light (I = 0.052 A)
   c. 60 W incandescent light bulb (I = 0.4 A)
   d. large light fixture (I = 2.1 A)

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4. An electric saw at a local hardware store features a motor that supplies 15 A. Find the resistance of the saw when it is plugged into a 110 V outlet.

5. Defibrillator machines are used to deliver an electric shock to the human heart and resuscitate a heart that has stopped beating. A current as low as 18 mA can trigger resuscitation. Using 95 kΩ as the resistance, determine the minimum output voltage needed by a defibrillator for it to be effective.

6. A taser sends about 1100 V through the human body, resulting in an average current of 2.5 mA. Using these numbers, estimate the electrical resistance of the human body.

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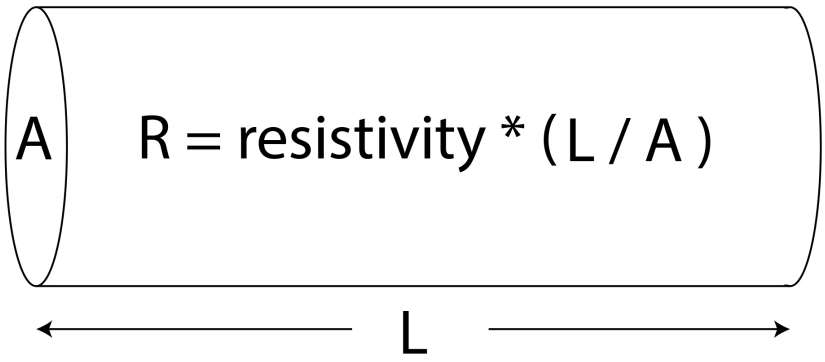
7. **Resistivity indicates the overall resistance of a material. It is measured by units of Ωm and depends on material type. To determine the resistivity of a wire, divide its length by its area as indicated in the diagram below:**



The wire heating element of an electric toaster is 190 cm long with a diameter of 0.05 cm. If the heating element is made of nichrome, which has a resistivity of 1.1 x 10^{-6} Ωm, what is its overall resistance?

8. **You are analyzing an electrical circuit around a battery with a 9 V output. The circuit is designed to carry a maximum current of 2 A. Anything above that and a fuse in the circuit will blow out to keep the circuit from being overloaded. Currently, a 3.2 Ω appliance is the only resistor in the circuit. Will the fuse blow out? If so, what resistance is needed to stay below the 2 A limit?**

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9. A lamp draws a current of 0.34 A from a power outlet that supplies 120 V. What is the resistance of the lamp?