Activity

Using Ohm's Law

Study the following sample problem to learn how to use Ohm's law. Then solve the following problems. More sample problems are provided in Appendix A on page 397.

Sample Problem

Imagine that you are testing an electrical toy. You are going to plug it into your home outlet, which provides an electrical potential difference of 120 V. The wires are small and you do not want the current to go above 1.5 A. How high must the resistance of the electrical toy be?

Solution

Because you want to determine a resistance, you will need to rearrange the formula $V = IR$ into the formula $R = \frac{V}{I}$.

Substitute the values into the formula.

$$R = \frac{V}{I}$$

$$= \frac{120\ \text{V}}{1.5\ \text{A}}$$

$$= 80\ \Omega$$

The electrical toy must have a resistance of at least 80 Ω to ensure that the current does not go above 1.5 A.

Answer questions below. Show all calculations.

1. A television that is plugged into a wall socket has an electrical potential difference of 120 V. If a current of 1.25 A is flowing through the television, what is its resistance?

2. The filament of a flashlight bulb has a resistance of 40 Ω. if a 6.0 V battery is used in the circuit, what is the current?

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3. A circuit board has a resistance of 12 Ω and requires a current of 0.25 A. What electrical potential difference is required to operate the circuit board?

4. A desktop computer is plugged into a standard 120 V outlet. If the computer has a total resistance of 50 Ω, what is the current that is passing through the computer?

5. A current of 0.2 A is passing through an ink jet printer that is plugged into a 120 V outlet. What is the resistance of the printer?

6. A current of 0.001 A is passing through a hearing aid that has a resistance of 1500 Ω. What electrical potential difference is supplied by the battery?

7. A hair dryer is plugged into a 120 V outlet in the bedroom. If the resistance of the hair dryer is 8.0 Ω, what is the current to the hair dryer?

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8. A smart phone charger draws a current of 0.025 A when plugged into a 120 V outlet. What is the resistance of the charger?

9. A washing machine has a resistance of 25 Ω. How much current does it draw when it is plugged into a 120 V outlet?

10. A cell phone draws a current of 0.205 A and has a resistance of 18 Ω. What electrical potential difference is provided by the battery?

11. If you look at the plug and outlet for an electric stove, you will see that it is not a standard 120 V outlet. The burner in an oven has a resistance of 27.5 Ω. If it draws a current of 8 A when the oven is turned on, what is the electrical potential difference supplied by the special outlet?

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