

Shanna

PSC-4012 **Ohm's Law: $V=IR$**

1. If a 6-V battery produces a 0.33-A current through a flashlight, what is the resistance of the light bulb filament?

$$R = \frac{V}{I} = \frac{6V}{0.33A} = \boxed{18.18 \Omega}$$

2. Calculate the current intensity in a 300- Ω component powered directly by a 120-V power supply.

$$I = \frac{V}{R} = \frac{120V}{300\Omega} = \boxed{0.4 A}$$

3. A 9-V battery produces a 0.5-A current through an electronic scale. What is the resistance of the scale?

$$R = \frac{V}{I} = \frac{9V}{0.5A} = \boxed{18 \Omega}$$

4. A 1.7-A current runs through a television. The resistance of the television is 71 Ω . What is the voltage of the power supply?

$$V = IR \\ = (1.7A)(71\Omega) = \boxed{120.7 V}$$

5. A stove is plugged in to a 240 V outlet. The resistance of the stove is 113 Ω . What is the current through the stove?

$$I = \frac{V}{R} = \frac{240V}{113\Omega} = \boxed{2.12 A}$$

6. A 12-V battery produces a 2.5A current through an electronic game. What is the resistance of the game?

$$R = \frac{V}{I} = \frac{12V}{2.5A} = \boxed{4.8 \Omega}$$

7. An electric clothes dryer is plugged into a 240V outlet. The resistance of the dryer is 135Ω . What is the current through the dryer?

$$I = \frac{V}{R} = \frac{240V}{135\Omega} = \boxed{1.78 A}$$

8. If we have a resistor of 40Ω , and we measure the current as 15 A, what is the emf of the power supply?

$$V = IR = (15A)(40\Omega) = \boxed{600V}$$

9. A current of 9mA flows through a circuit that has an emf of 3 volts. What is the resistance of the device?

$$R = \frac{V}{I} = \frac{3V}{0.009A} = \boxed{333.33 \Omega}$$

10. A simple circuit is created using a battery and a light bulb. When lit, the bulb has a resistance of 9Ω and a recommended current intensity of 450mA. What emf does the battery require?

$$V = IR = (0.45A)(9\Omega) = \boxed{4.05 V}$$

11. In a simple circuit, a 12V battery is replaced with a 9V battery. After the change, is the current in the circuit increased or decreased? By how much? Explain your answer using the appropriate formula.

Before	After	$\frac{\text{After}}{\text{Before}} = \frac{9V}{12V} = \frac{3}{4} X \downarrow$
12V	9V	

$$I = \frac{V}{R} \quad \text{if } V \downarrow \frac{3}{4} X \quad \text{then } I \downarrow \frac{3}{4} X$$

12. In a simple circuit, a 9V battery is replaced with a 12V battery. After the change, is the current in the circuit increased or decreased? By how much? Explain your answer using the appropriate formula.

9V	12V	$\frac{A}{B} = \frac{12V}{9V} = \frac{4}{3} X \uparrow$	$I = \frac{V}{R}$
B	BA		if $V \uparrow \frac{4}{3} X$
before	after		then $I \uparrow \frac{4}{3} X$

13. In a simple circuit, a 6V battery is replaced with a 9V battery. After the change, is the current in the circuit increased or decreased? By how much? Explain your answer using the appropriate formula.

$$\begin{array}{cc}
 6V & 9V \\
 B & A
 \end{array}
 \quad
 \frac{9V}{6V} = \frac{3}{2} \times \uparrow
 \quad
 \begin{array}{l}
 I = \frac{V}{R} \\
 \text{If } V \uparrow \frac{3}{2} \times \text{ then} \\
 I \uparrow \frac{3}{2} \times. \quad \checkmark
 \end{array}$$

14. In a simple circuit, a 12V battery is replaced with a 6V battery. After the change, is the current in the circuit increased or decreased? By how much? Explain your answer using the appropriate formula.

$$\begin{array}{cc}
 12V & 6V \\
 B & A
 \end{array}
 \quad
 \frac{6V}{12V} = \frac{1}{2} \times \downarrow
 \quad
 \begin{array}{l}
 I = \frac{V}{R} \\
 \text{If } V \downarrow \frac{1}{2} \times \\
 \text{then } I \downarrow \frac{1}{2} \times \quad \checkmark
 \end{array}$$

15. In a simple circuit, a 9V battery is replaced with a 6V battery. After the change, is the current in the circuit increased or decreased? By how much? Explain your answer using the appropriate formula.

$$\begin{array}{cc}
 9V & 6V \\
 B & A
 \end{array}
 \quad
 \frac{6V}{9V} = \frac{2}{3} \times \downarrow
 \quad
 \begin{array}{l}
 I = \frac{V}{R} \\
 V \downarrow \frac{2}{3} \times \therefore I \downarrow \frac{2}{3} \times \quad \checkmark
 \end{array}$$

16. In a simple circuit, a 3V battery is replaced with a 9V battery. After the change, is the current in the circuit increased or decreased? By how much? Explain your answer using the appropriate formula.

$$\begin{array}{cc}
 3V & 9V \\
 B & A
 \end{array}
 \quad
 \frac{9V}{3V} = 3 \times \uparrow
 \quad
 \begin{array}{l}
 I = \frac{V}{R} \\
 V \uparrow 3 \times \therefore I \uparrow 3 \times \quad \checkmark
 \end{array}$$

17. If the resistance in a circuit is tripled, how is the current affected? Explain using the appropriate formula.

$$I = \frac{V}{R} \quad R \uparrow 3 \times \therefore I \downarrow \frac{1}{3} \times \quad \checkmark$$

18. A battery supplies energy to a light bulb in a simple circuit. A second light bulb is added, doubling the resistance in the circuit. After the change, is the current in the circuit increased or decreased? By how much? Explain your answer using the appropriate formula.

$$\uparrow R \ 2X \quad I = \frac{V}{R}$$

$$\text{If } R \uparrow 2X \therefore I \downarrow \frac{1}{2}X$$

19. A battery supplies energy to a light bulb in a simple circuit. One of the light bulbs is removed, reducing the resistance in the circuit by half. After the change, is the current in the circuit increased or decreased? By how much? Explain your answer using the appropriate formula.

$$\downarrow R \ \frac{1}{2}X \quad I = \frac{V}{R}$$

$$\text{If } R \downarrow \frac{1}{2}X \therefore I \uparrow 2X$$

20. In a simple circuit, a 20Ω resistor is replaced with a 30Ω resistor. After the change, is the current in the circuit increased or decreased? By how much? Explain your answer using the appropriate formula.

$$\begin{array}{cc} 20\Omega & 30\Omega \\ B & A \end{array} \quad \frac{A}{B} = \frac{30}{20} = \frac{3}{2}X \uparrow \quad I = \frac{V}{R}$$

$$\text{If } R \uparrow \frac{3}{2}X \text{ then } I \downarrow \frac{2}{3}X.$$

21. Of the following: *directly proportional* / *indirectly proportional*
Place the appropriate expression in each space below:

a) Voltage is directly proportional to current intensity.

b) Resistance is indirectly proportional to current intensity.

22. Of the following: *increases* / *decreases*

Place the appropriate expression in each space below:

a) As resistance in a circuit increases, current intensity decreases.

b) As resistance in a circuit decreases, current intensity increases.

c) As voltage in a circuit increases, current intensity increases.

d) As voltage in a circuit decreases, current intensity decreases.