Science 9

Ohm's Law Practice

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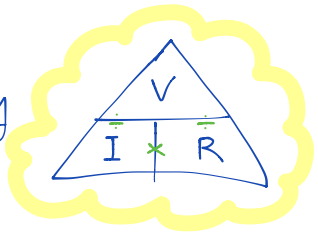


1. An alarm clock draws 0.500 A of current when connected to a 120.0 volt circuit. Calculate its resistance.

V = 120.0 V
I = 0.500 A
R = ?

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

$R = \frac{120.0\,V}{0.500\,A} = 240\,\Omega$

2. A subwoofer needs a household voltage of 110.0 V to push a current of 5.5 A through its coil. What is the resistance of the subwoofer?

V = 110.0 V
I = 5.5 A
R = ?

$R = \frac{110.\,V}{5.5\,A} = 20\,\Omega$

3. A walkman uses a standard 1.5 V battery. How much resistance is in the circuit if it uses a current of 0.01A?

V = 1.5 V
I = 0.01A
R = ?

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

$= \frac{1.5\,V}{0.01\,A}$

$= 150\,\Omega$

4. A circuit contains a 1.5 volt battery and a bulb with a resistance of 3.0 ohms. Calculate the current.

V = 1.5V
I = ?
R = 3.0 Ω

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

$= \frac{1.5\,V}{3.0\,\Omega}$

$= 0.5\,A$

5. What current flows through a hair dryer plugged into a 120.0 Volt circuit if it has a resistance of 25.0 ohms?

V = 120.0V
I = ?
R = 25.0 Ω

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

$= \frac{120.0\,V}{25.0\,\Omega}$

$= 4.8\,A$

6. What happens to the current in a circuit if a 1.50-volt battery is removed and is replaced by a 3.00-volt battery?

V = 1.50 V ⟶ 3.0 V

I = 1.5A ⟶ 3.0A

R = assume R is constant = 1 Ω

if you double the voltage, the current also doubles!

7. If a toaster produces 12.0 ohms of resistance in a 120.0-volt circuit, what is the amount of current in the circuit?

V = 120.0V

I = ?

R = 12.0 Ω

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

$= \frac{120.0V}{12.0\Omega}$

$= \boxed{10A}$

8. A 12.0 Volt car battery pushes charge through the headlight circuit resistance of 10.0 ohms. How much current is passing through the circuit?

V = 12.0V

I = ?

R = 10.0 Ω

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

$= \frac{12.0V}{10.0\Omega}$

$= \boxed{1.2A}$

9. How much voltage would be necessary to generate 10.0 amps of current in a circuit that has 5.00 ohms of resistance?

V = ?

I = 10.0A

R = 5.00 Ω

$V = I \times R$

$= (10.0A)(5.00\Omega)$

$= \boxed{50.0V}$

10. An electric heater works by passing a current of 100.0 A though a coiled metal wire, making it red hot. If the resistance of the wire is 1.100 ohms, what voltage must be applied to it?

V = ?

I = 100.0A

R = 1.100 Ω

$V = I \times R$

$= (100.0)(1.100\Omega)$

$= \boxed{110.0V}$

11. A light bulb has a resistance of 5.0 ohms and a maximum current of 10.0 A. How much voltage can be applied before the bulb will break?

V = ?

I = 10.0 A

R = 5.0 Ω

$V = I \times R$

$= (10.0\,A)(5.0\,\Omega)$

$= 50\,V$

12. What happens to the current in a circuit if a 10.0 Ω resistor is removed and replaced by a 20.0 Ω resistor?

V = assume voltage stays constant

I = ?

R = 10.0 Ω → 20.0 Ω

$V = 1$

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

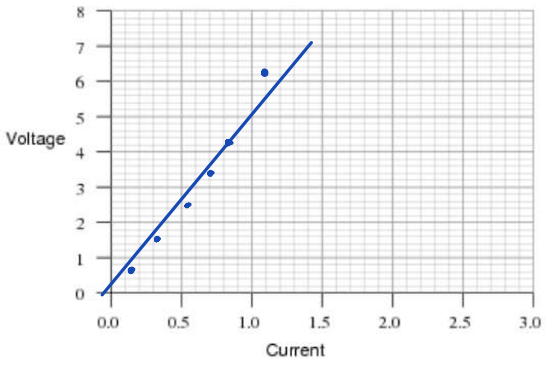
$= \frac{1}{10} = 0.1A$

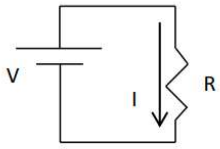
$I = \frac{1}{20}$

$= 0.05A$

If you double the resistance, current is halved

13. Suppose you did a lab with this simple circuit and got the following data. Plot the points of the provided graph.





y-axis Voltage (V)	x-axis Current (A)
0.65	0.12
1.41	0.29
2.55	0.51
3.28	0.67
4.11	0.81
6.15	1.23

* Challenge! *

a) What mathematical relationship do you see between voltage and current?

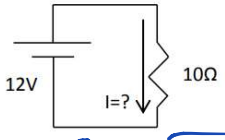
linear relationship

b) Is the resistance constant?

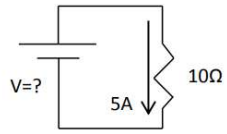
$\frac{\text{Rise}}{\text{Run}} = \frac{\text{Voltage}}{\text{current}} = \text{Resistance}$

Yes!

14. Solve for the unknown in each of these circuits.

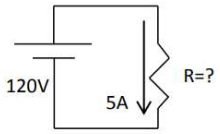


$I = \frac{12V}{10\Omega} = 1.2A$

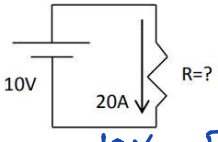


$V = (5A)(10\Omega)$

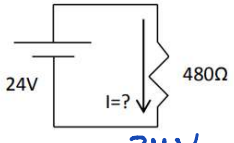
$= 50V$



$R = \frac{120V}{5A} = 24\,\Omega$

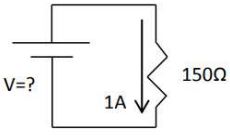


$R = \frac{10V}{20A} = 0.5\,\Omega$



$I = \frac{24V}{480\Omega}$

$= 0.05A$



$V = (1A)(150\Omega)$

$= 150V$