**Notes Ohm’s Law Relationships and Problem Solving**

**How is voltage related to current?**

****The amount of current that flows through a wire depends on the voltage. The greater the voltage the faster the charges flow.

**V = IR**

**If ↑ V then ↑ I**

**If ↓ V then ↓ I**

**How is current related to resistance?**

Amount of current also depends on
how the wire resists the flow of the charge.

**V = IR**

**If ↓ R then ↑ I**

**If ↑ R then ↓ I**

**Ohm’s Law**

Unit for Resistance is called the \_\_\_\_\_\_\_\_\_\_\_ ( )

**Ohm’s Law shows the relationship between Voltage (V), Current (I), and Resistance (R):**

)

*\*If the units in the problem* ***DO NOT*** *match the* ***standard units******above****, you must convert them to the standard units above!!!*

To use Ohm’s Law, units must be in the standard ***volts (V), amperes (A), and ohms (Ω)***.

Mega = 1 000 000 times, kilo = 1000 times, milli = 1/1000 times (times the base unit)

|  |  |  |  |
| --- | --- | --- | --- |
| Current **Conversion** | **Conversion Factors** | **Conversion**  | **Conversion Factor** |
| **1 kA = 1000 A** | $\frac{1 kA}{1000 A}$ **or** $\frac{1000 A}{1 kA} $ | **1 A = 1000 mA** | $\frac{1 A}{1000 mA}$ **or** $\frac{1000 mA}{1 A}$ |

**Solving for Voltage (V) in Volts (V) *V=IR***

1. What is the Voltage (V) across a battery in a circuit if the Current (I) is 30 A and the Resistance (R) is 10 Ω? V = ?, I = \_\_\_\_\_\_ and R =\_\_\_\_\_\_\_

Don’t forget to write the unit!

 V =

1. What is the Voltage (V) across a battery in a circuit if the Current (I) is 3000 mA and the Resistance (R) is 10 Ω?

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

**Solving for Current (I) in Amps (A)**

*\*Again, always double-check to make sure the units in the question are the standard units (Volts, Amps, and Ohms) otherwise you must convert them to the standard units!!!*

1. A circuit has a battery providing a Voltage (V) of 12V. What is the Current (I) going through the circuit if it has a resistor with a Resistance (R) of 10 Ω? I =?, V=\_\_\_\_\_\_\_, R=\_\_\_\_\_\_\_\_

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

 *I =*

Don’t forget to write the unit!

Always BOX your answer

 *I =*

1. A circuit has a battery providing a Voltage (V) of $1 ×10^{2}$ V. **What is the Current (I)** going through the circuit if it has a resistor with a Resistance (R) of 20 Ω?
2. A circuit has a battery providing a Voltage (V) of 125V. **What is the Current (I)** going through the circuit if it has a resistor with a Resistance (R) of $1 ×10^{-1}$kΩ? I = ?, V =\_\_\_\_\_, R = \_\_\_\_\_

**Solving for Resistance (I) in Ohms (**Ω**)**

*\*Again, always double-check to make sure the units in the question are the standard units (Volts - V, Amps- A, and Ohms-Ω) otherwise you must convert them to the standard units!!!*

1. A circuit has a battery providing a Voltage (V) of 100 V. What is the total Resistance (R) in the circuit if the Current (I) is found to be 30 A? Round to the **nearest tenth**.

R = ?, V=\_\_\_\_\_\_\_, I=\_\_\_\_\_\_\_\_

*V = I R – Rearrange formula to solve for R!*

1. A vacuum cleaner is plugged into a 120 V outlet. The vacuum cleaner is rated at 12000 mA. What is the resistance of the motor and circuitry of the vacuum? (V=IR)

Now using the *three forms* of the Ohm’s Law formula practiced above, see if you can decide which form to use in the following mixed problems! Show all steps and work!

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

**Practice Questions** – SHOW ALL WORK and UNITS!
*\*Again, always double-check to make sure the units in the question are the standard units (Volts - V, Amps- A, and Ohms-Ω) otherwise you must convert them to the standard units!!!*

1. How much electrical potential (voltage) would there be if a hairdryer has a current of 2A and a resistance of 25Ω?
2. If a washer has an electrical potential of $5×10^{2}$V and a current of 50A, what is the resistance?
3. What is the voltage of a computer if the current is 20 amperes and the resistance is 10 ohms?
4. Find the total current by using the following information measured in a circuit if V= 200V and R = 5Ω
5. If an Xbox has a current of 20 amps and a voltage of 600 volts, what is the resistance?
6. If a stove has a voltage drop of 900V and a total resistance of $3×10^{4}$ mΩ. What would be the current running through the stove?

 Key: 1) 50V 2) 10Ω 3) 200V 4) 40A 5) 30Ω 6) R = 30 Ω and I = 30A

 **Additional Practice:** *Textbook pgs 293, #1-3 and 294 #1-3***.** *Textbook pgs. 301 #8-13 (Omit 11) and 303, #26 – 31 (omit 30);*