**Resistance and Ohm’s Law**

**Resistance** is the property of any material that \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_, or hinders, the flow of electrons

* A ***load***, which converts \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ into other forms of energy, works as a ***resistor***. While passing through the ***load***, electrons in the current will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with atoms that make up the load, or even with each other; these ***collisions*** interfere with current and slow it down.
* For example, a conducting wire has \_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, whereas the filament of a lightbulb has \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_!
* A **resistor** is an electrical component that has a specific resistance, designed to *\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_*. High voltage power lines that travel long distances often have very high current which must be \_\_\_\_\_\_\_\_\_\_\_\_\_ prior entering households.
	+ Resistors *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* electrical energy into other forms, such as \_\_\_\_\_\_\_\_\_.
	+ The circuit symbol for a resistor is:
* The symbol for Resistance is “**R**”, and it is measured in **“Ohms” (Ω)**
* An \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ measures resistance in a circuit ***(it may be connected in parallel OR in series).***
* Resistors are marked with *\_\_\_\_\_\_\_\_\_\_\_\_\_* bands indicating their *\_\_\_\_\_\_\_\_\_\_\_\_\_\_* value, and there is a legend for which numbers these colours represent!

**Ohm’s Law:**

* German physicist **Georg Ohm** discovered a *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* between resistance, current and voltage (*aka electrical potential difference*) in a conductor.
* For example, he found that when he increased the *\_\_\_\_\_\_\_\_\_\_\_\_\_\_* in a conductor, the *\_\_\_\_\_\_\_\_\_\_\_\_\_\_*also increased proportionally (for given resistance).
* This relationship is defined as “**OHM’S LAW**”:

***\_\_\_*** stands for voltage *(measured in volts, V)*

 ***\_\_\_***stands for current *(measured in amperes or amps, A)*

***\_\_\_*** stands for resistance *(measured in ohms, Ω)*

* By ***rearranging*** the variables in Ohm’s Law, we can use the equation to calculate any ***unknown*** value (if given the other two values)!

|  |  |
| --- | --- |
| By dividing both sides of the equation by ***R***, we get an equation for calculating current ***I***: | By dividing both sides of the equation by ***I***, we get an equation for calculating resistance ***R***: |



Example 1:

The current through a load in a circuit is 1.5 A. If the potential difference across the load is 12 V, what is the resistance of the load?

Example 2:

The resistance of a car headlight is 15 Ω. If there is a current of 0.80 A through the headlight, what is the voltage across the headlight?

**Ohm’s Law & Metric Conversions**

**Ohm’s Law V = IR**

Units used in the equation must be:

\*\*If we encounter a problem with *\_\_\_\_\_\_\_\_\_\_\_\_\_* *\_\_\_\_\_\_\_\_*than the base units, we must *\_\_\_\_\_\_\_\_\_\_\_\_*the units to the base unit before using the Ohms’ Law equation!

Example 3:

A 15 mA current flows through a 400 Ω lamp. What is the voltage across the lamp?

Example 4:

A 12 kΩ load is connected to a 90 V power supply. What is the current through the load in milliamperes (mA)?

**Ohm’s Law & Scientific Notation**

*\*\*You will encounter* ***scientific notation*** *either in the questions, or you will be asked to write your answers in scientific notation!*

Convert the following into scientific notation:

1. 12 000 Ω =
2. 0.00005 mA =
3. 2300 V =