



Lesson 2 - Introduction to LEDs and Resistors

Test your Knowledge -

- What is a conductor?
- What is an insulator?
- What are some circuit elements?
- Which way does electricity flow (draw a line)?

Negative

Positive

New Things!

- New circuit elements
 - Introduce the resistor
- The “breadboard” ... no, it’s now made of bread!
- Activity: Make a resistor light on a breadboard!



The RESISTOR

Circuit elements do things to electricity, like turn electricity into light. Let’s review:

Conductors.... CONDUCT electricity

Insulators... INSULATE from electricity

Batteries.... Make ELECTRICITY

LEDs.... Make LIGHT

We used ALL of these elements in the last lesson. The battery gave us electricity, the LED lit up. What type of circuit element were the other two?

Playdough? _____

Modeling Clay? _____

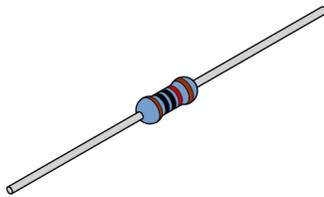
So here's the thing.... Our playdough *was* a conductor, but not a very good one. In fact, every conductor has something called **RESISTANCE**. What is resistance?

Well, what if you don't do what your teacher, mom or dad asks you to do? You are not minding, right? Well, in a fancy way, you can say you are **RESISTING!**

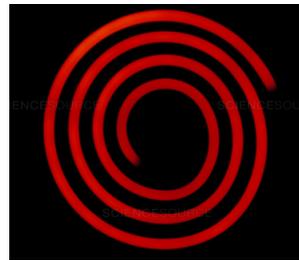
Since we're talking about electricity, and electricity flows through things... what do you think resistance means for a circuit?

That's right, resistance means the circuit "resists" the flow of electricity. If we think of electricity like water, it's like a really small pipe that keeps all the water from running through!

When we make a conductor that has lots of resistance, we call it a **RESISTOR!** Some real-world resistors:



A Resistor (circuit)



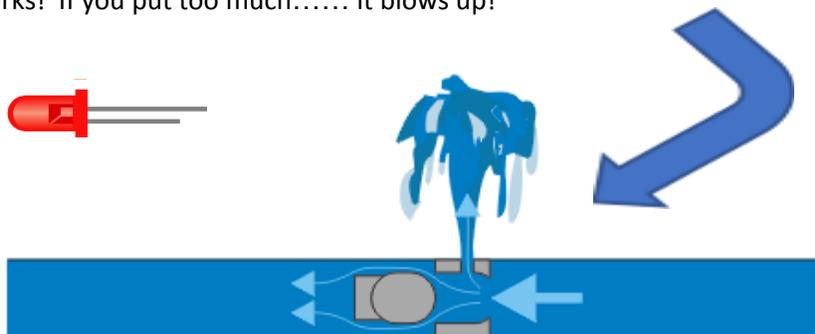
A heating coil – a special kind of resistor

If a resistor "resists" the electricity, why do we want to use one? Well, with electricity (just like candy), too much electricity can be a bad thing! Sometimes we need to make sure we don't have too much electricity, and that's when a resistor is just the thing!

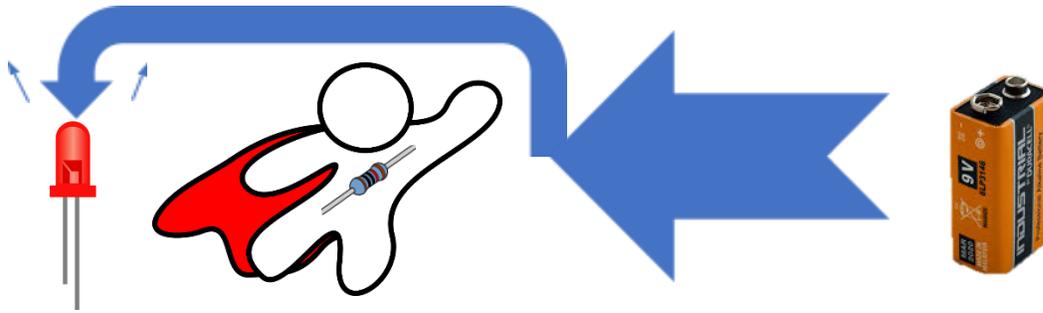
Remember the LED, our special light? There are two funny things about LEDs...

- Electricity only flows through them one direction (remember, positive to negative?)
- If you put too much electricity through it, it burns up!

This is a cool picture to help you think about how an LED works.. If you put just enough electricity through it, it works! If you put too much..... it blows up!



So, we need a resistor to make our LED light up, just right!



The BREADBOARD to the rescue

So, last time we used playdough for our resistor, and for our wires (since a resistor is just a special kind of wire, right?)

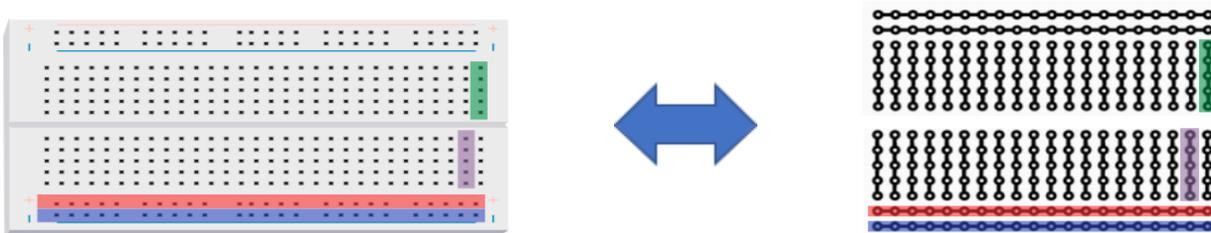
But, playdough is probably not a great way to make a circuit if we want it to work for a long time. Seems like it was pretty easy for it to fall apart!

So, we need to use WIRES and our circuit elements to build our circuits. In fact, we're going to use wires and a special kind of board to help us make it easy to connect our ELEMENTS and WIRES together.... The BREAD BOARD! Which one do you think we'll use?



So, I guess it does kind of look like a board with holes like bread, right? Here is how the bread board works: Inside, it's made of WIRES!

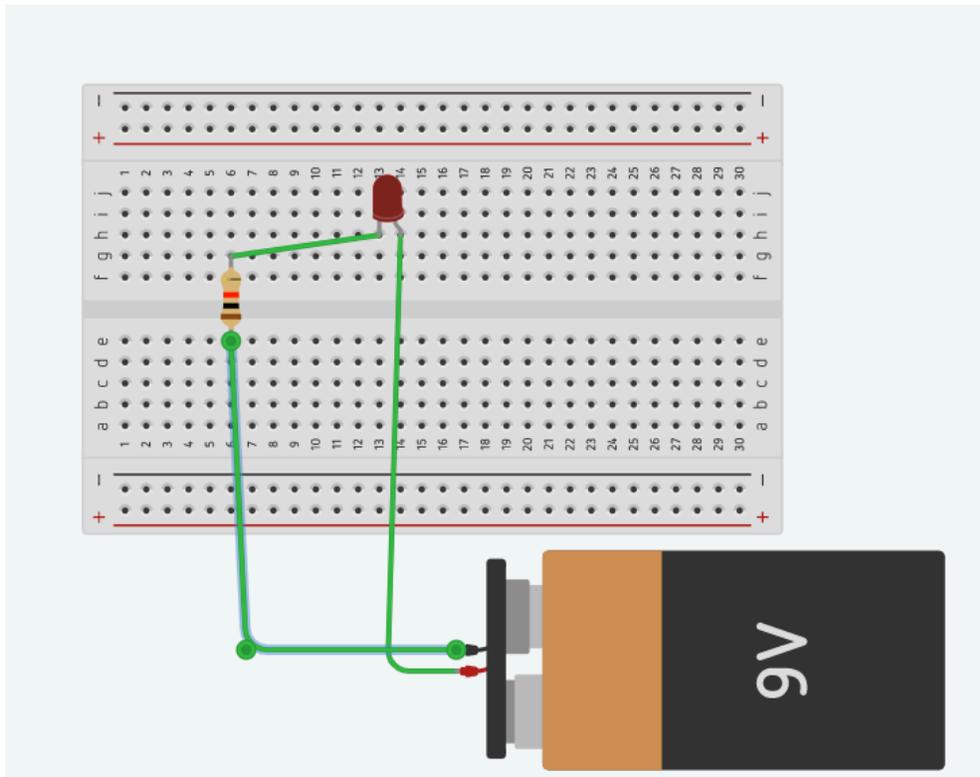
Every COLUMN (up and down) on the left and right connect together, and every ROW connects together. So, in this picture all of the blue pins are connected together, all of the red pins are connected together, all of the green pins are connected together and all of the purple pins are connected together. But, none of the purple are connected to the green, or the red, or the blue. Get it?



Activity 1: Make an LED light with a breadboard

So, using a breadboard, an LED, a battery and a resistor (and some wires, of course), you can build a circuit just like you did with play dough!

There are LOTS of ways to make it work, so try and see what you come up with!



Can you make two LEDs light at once?

Here's a hint - there are 2 types of circuits, **Parallel** and **Series** - In a series circuit, all components are connected end-to-end to form a single path for current flow. In a parallel circuit, all components are connected parallel to each other to form multiple paths for current flow. You can add your second LED either in series or in parallel to get it to work.

Which type of circuit did you use? Can you figure out how to build the other?