

Activity description: Making Magic Wands

Age level: 8+ (older kids might be able to work through this sheet on their own)

Time frame: varying

You might have watched the Harry Potter movies, and wanted a magic wand of your own. While we can't quite do magic yet, we can build a pretty cool magic wand. In this activity we'll build a magic wand that lights up.



required equipment:

- a piece of dowling or similar for the magic wand
- for each wand: a 5mm LED, 39 ohm resistor, and 3V watch battery (e.g. CR2032)
- paperclips
- beading wire or conductive thread
- scissors and pliers
- scotch tape

(note: all of this can be bought at the dollar store with the exception of the LEDs and resistors. These can be purchased at the Source, or from Digikey.com. Digikey also sells the button watch batteries, and buying them in bulk is quite a bit cheaper. Making use of resistors will allow your batteries to last longer, but if you can't get them then you can build the wands without them.)

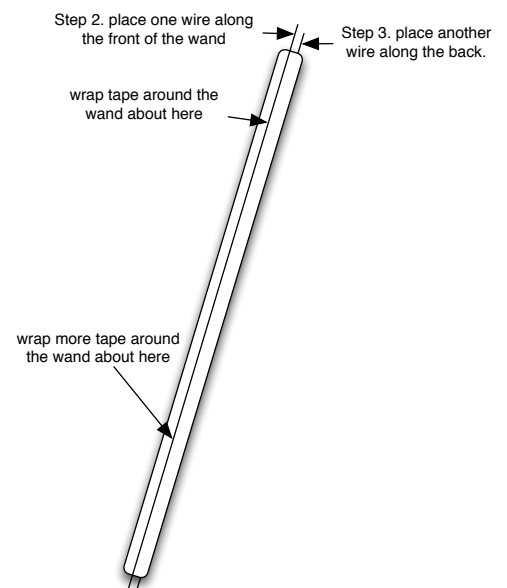
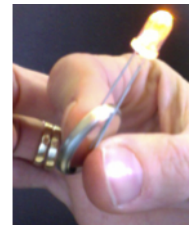
optional equipment:

- packing tape or duct tape to wrap up your wand and protect the wires
- Sharpies, ribbon, stickers, or anything else you like to decorate the wands

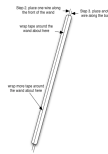
Steps:

1. Get a LED and a battery and test your LED to make sure it works. Did you see that one leg of the LED is longer than the other? Which side of the battery does it need to be on, the + side or the other side? **REMEMBER THIS!**
2. Lay out a long piece of wire along one side of your wand, and tape it in two places near the top and bottom, but not too near.
3. Do the same with another piece of wire along the other side. **DON'T LET THE WIRES TOUCH** (or your wand won't work).

Step 1. This is how you test your LED.



4. Now get a resistor and curl the ends like in the picture.



This is a resistor after I curled the ends. Hold the end of the wire with the tip of your pliers, and curl the pliers around just like you are curling your hair.

5. Cut one of your pieces of wire (it doesn't matter which one) in the middle and connect your resistor. Poke the ends of your wires through the curled ends of your resistor, then twist them a few times to make sure they won't come loose. Tape down the connections and the resistor so that they won't wiggle around.
6. Now the hard part – connecting the battery. One wire has to touch the top of the battery, and the other wire has to touch the bottom of the battery. If the wires touch each other then your circuit will have a “short” in it and it won't work. With **one** of your wires make a sandwich like this: wire, battery, paperclip. Tape it down really well (this can be tricky). Now you should have one loose wire which you can touch to the bit of the paper clip that is sticking out from the tape – this is your “on/off” switch. Twist your wire loosely around the paper clip for now.



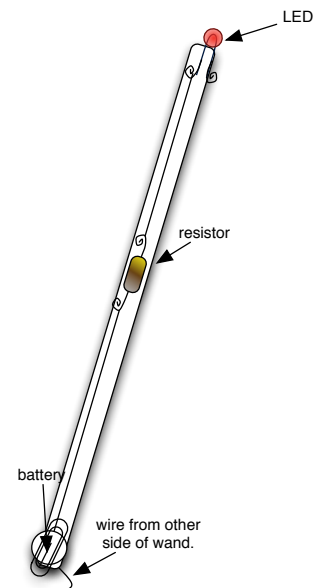
The left picture shows the wire before I put the battery and paper clip on. The right picture shows the wire, battery and paperclip sandwich. Can you see how the paperclip pokes out so that you can connect your other wire to it?



7. Take your LED and curl its legs like you did for the resistor. BUT WAIT – you have to remember which is the longer leg!
8. FINALLY – take your LED and put it at the end of your wand. Loosely connect one wire to one leg of the LED and the other wire to the other leg. You wand should look something like in the diagram on the right.

Does the LED light up? If not, did you remember which leg had to connect to the + side of the battery? Try connecting the wires the other way around (that is, disconnect them and turn your LED around and reconnect the wires).

9. If your LED lights up then YAY! Tighten your wires and wrap tape around the connections. You are done! You might want to put tape along all the wires now, to ensure that nothing gets bumped.



10. If your LED doesn't light up then try this:

- check your battery connection. Is there any possibility of a short circuit? This could be caused by the two wires touching each other, both wires touching the paper clip, or one wire touching both sides of the battery.
- check all of your connections – the wire connections to the LED, the wire connections to the resistor, and the wire connections to the batteries. Is there a path for the electricity to flow at all these points? Remember it can't jump through air!
- check your LED again with another battery – does it still work?
- check that your LED is connected with the long leg to the wire going to the + side of the battery and short leg connected to the wire going to the other side.
- check your battery connections again – this is almost always the site of the problem.