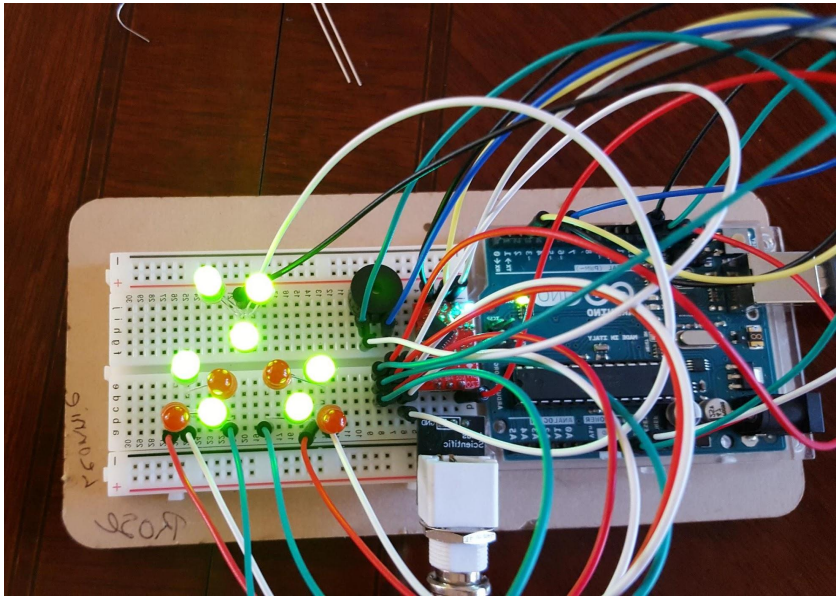
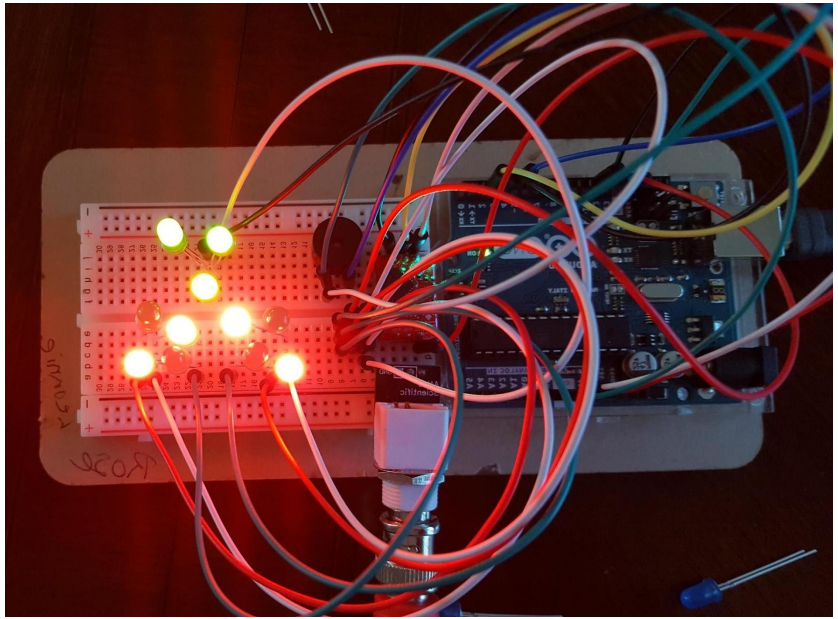
Light On pH

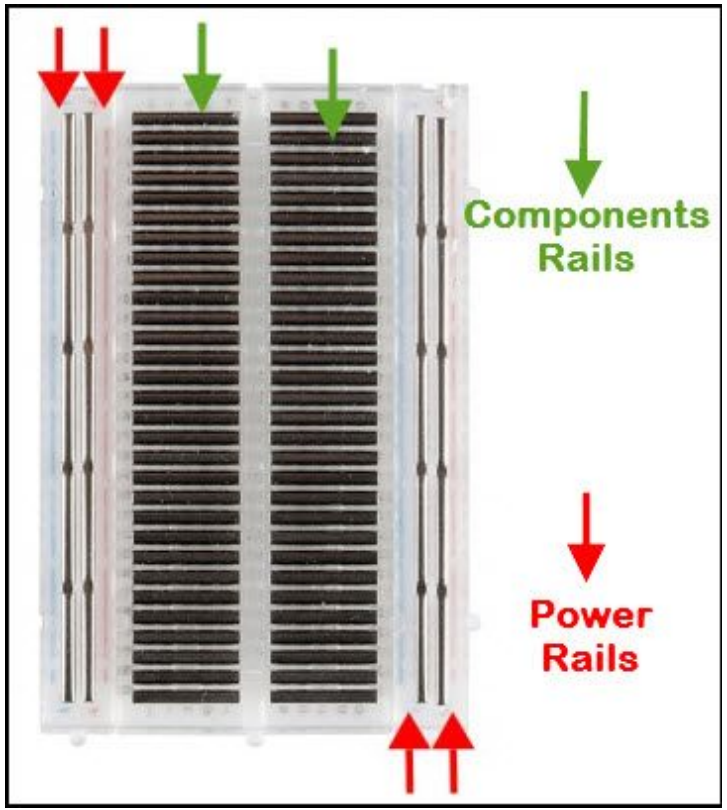


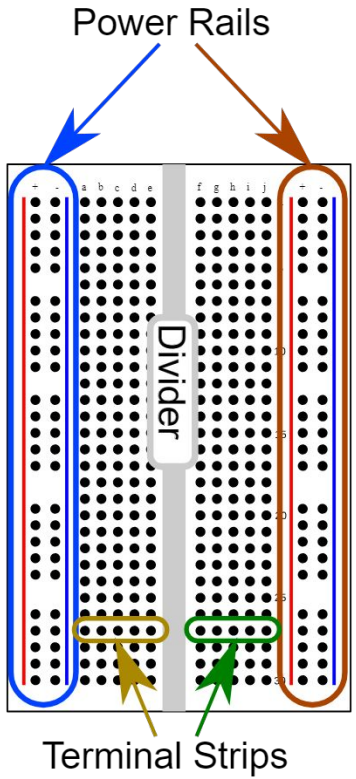


Breadboard Background

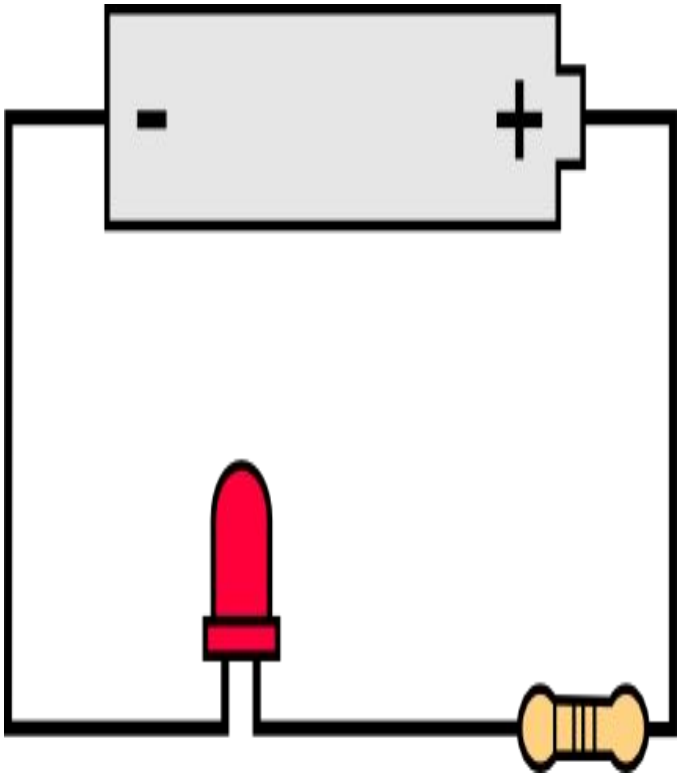
Numbers = Rows

Letters = Columns





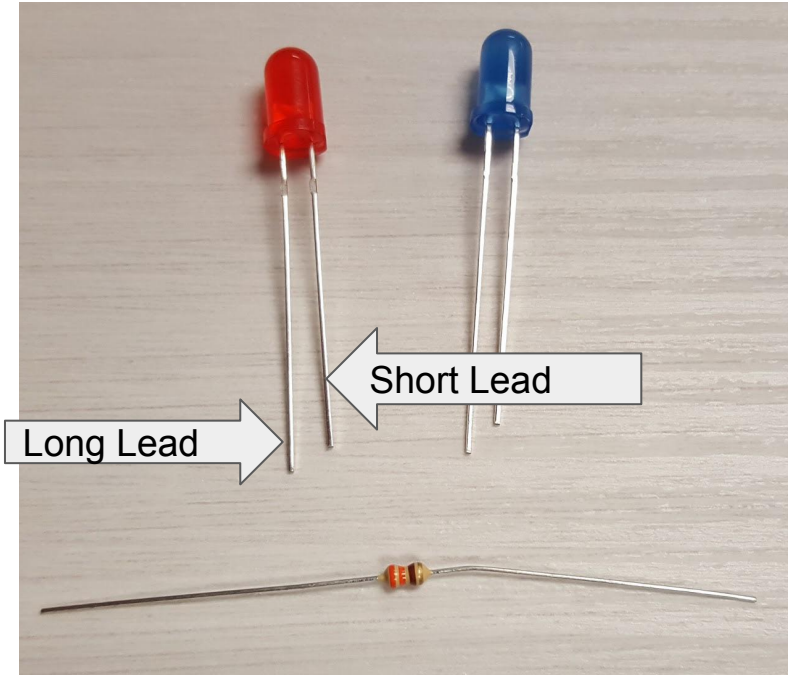
A little background...



This is a simple diagram that represents a **LED** (light emitting diode) in a circuit.

The battery runs current through the LED to make it light up and then returns to the negative terminal.

The battery runs at too high a voltage for our precious LED. To prevent our LED from burning out we need to decrease the voltage before it reaches the LED so we add a **resistor**.

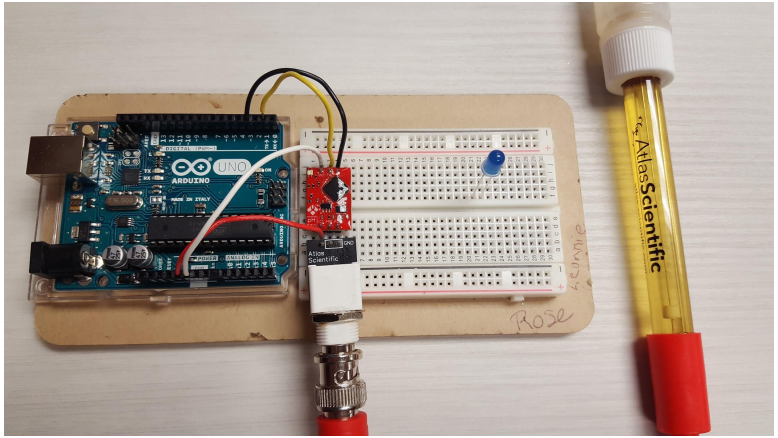


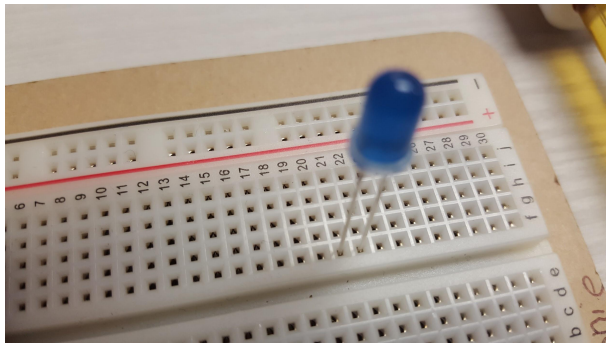
Here is a picture of the LEDs (light emitting diode) we will be working with.

They have a long lead and a short lead.

The long lead will be the end that connects closest to the resistor and the short lead will be end that connects closest to the negative terminal (in our case, the ground).

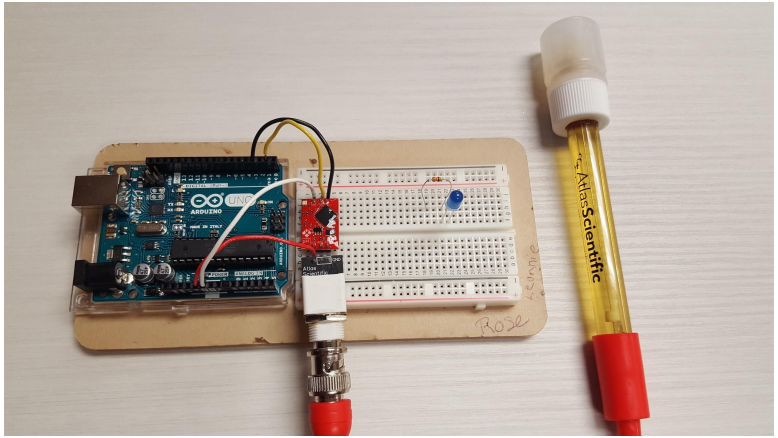
Below it is a resistor. They come in all different types, but this one has a power rating of ¼ W (watts) a resistance of 330 ohms.

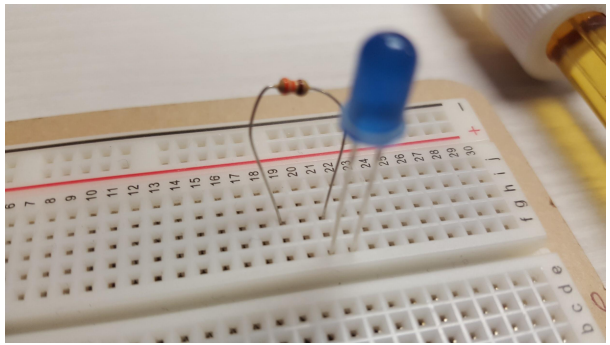




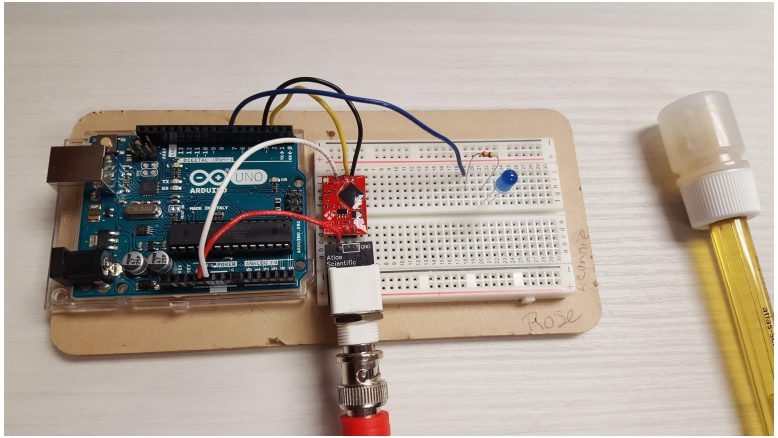
Make sure the breadboard is **unplugged** before connecting any LED or resistor.

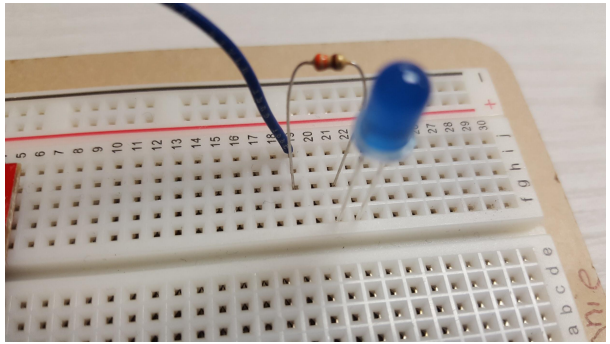
After connecting the pH probe (see pH Build and Programming), pick up a blue LED. Place the long lead of the LED into row 21 column f and the short lead into row 22 column f



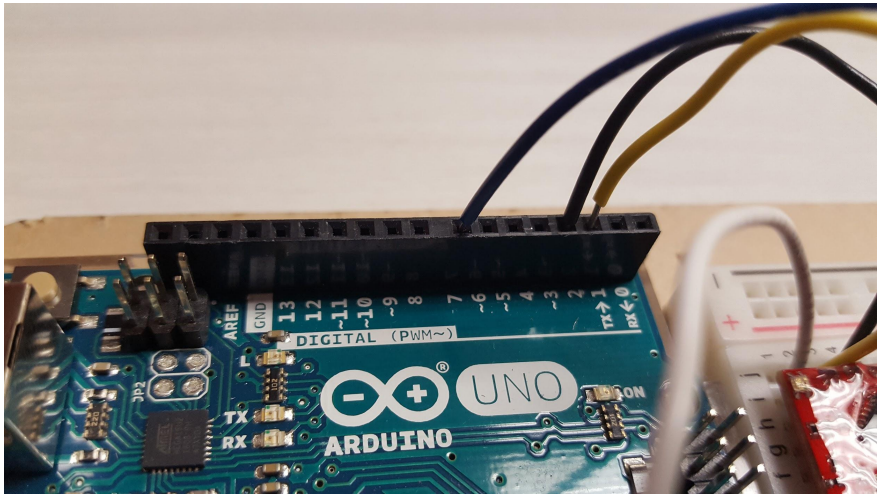


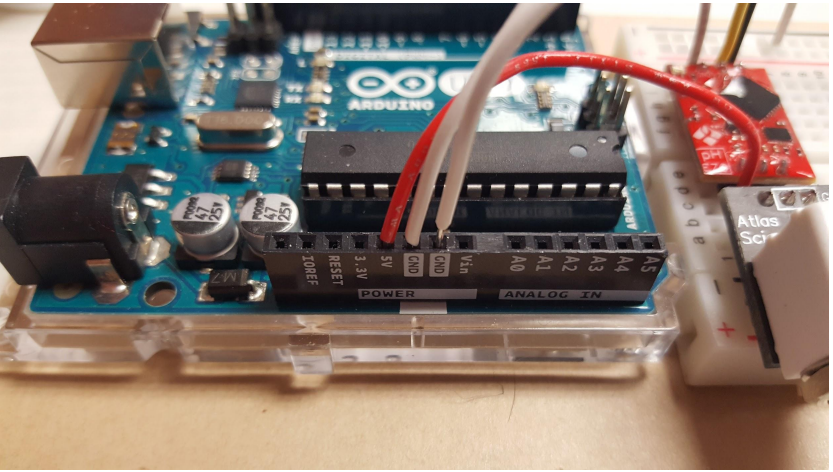
Now get a resistor, you might need to bend the legs. Place one end of the resistor into row 19 column h and the other into row 21 column h.



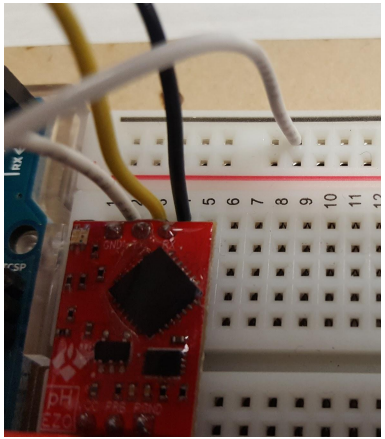


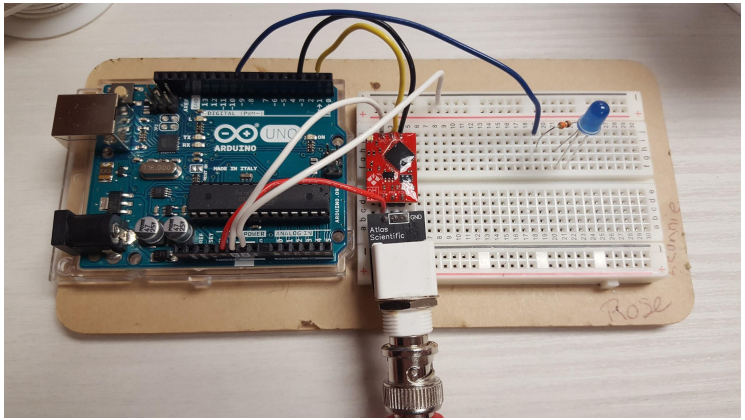
Cut some wire, strip the insulation off each end, and connect one end to pin 7 on the Arduino and the other to row 19 column j on the breadboard

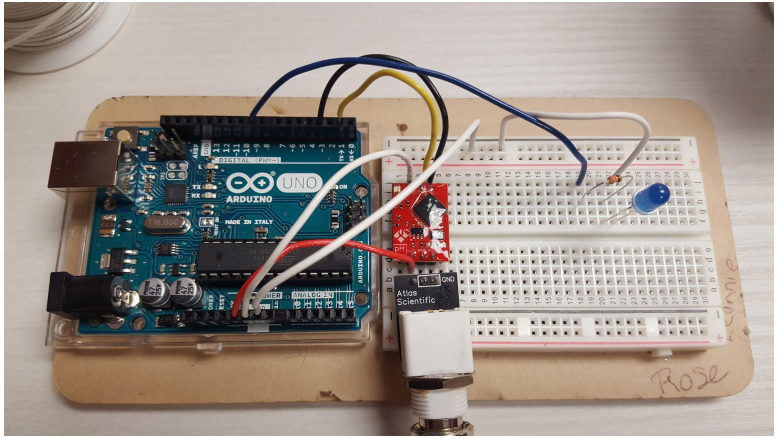




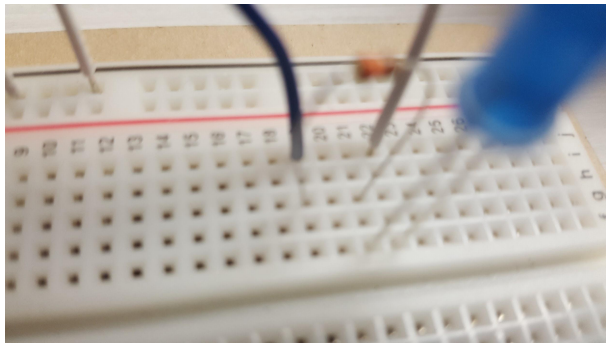
Cut some wire, strip the insulation off each end, and connect one end to the open ‘GND’ pin on the Arduino and the other end to an available slot in the negative outer column

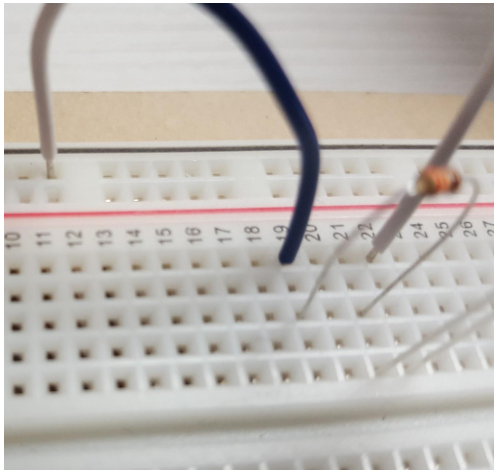






Cut some wire, strip the insulation off each end, and connect one end to the negative outer column and the other to row 22 column j



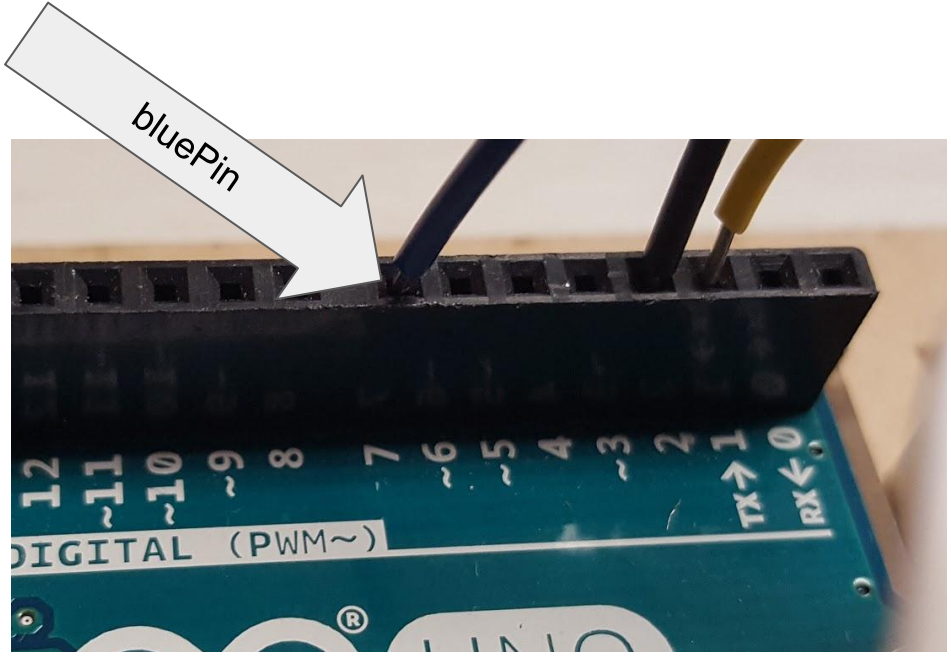


Go do your Desktop and in the “Code” folder open it. In that folder open up the ‘Lights on’ folder. Click the ‘Lights on’ Arduino program.

After it is opened, make sure your Arduino is connected and the right port is selected.

Click the arrow and upload the program.

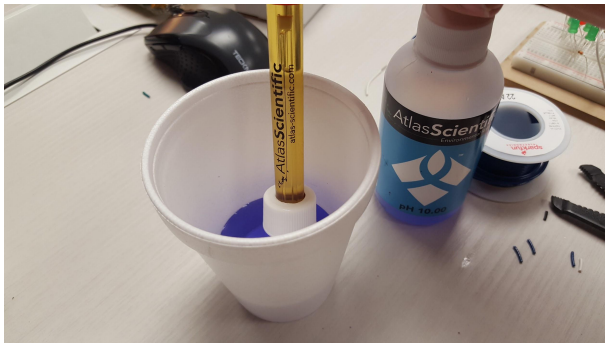
```
int redPin = 5;
int bluePin = 7;
```



If you open up the code called ‘Lights’ on your Desktop, you will see this code at the top.

We want to use pin 7 as the output for the blue LED to reset ‘bluePin’ as pin number 7.

Let’s Test It!

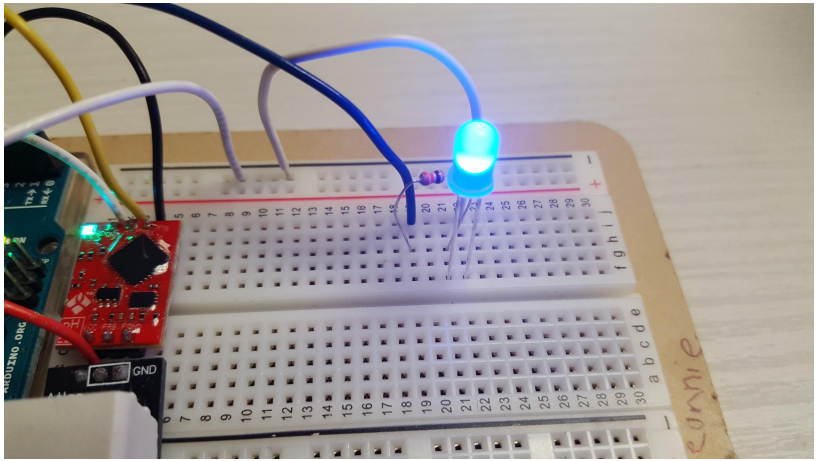


If you have not already, upload the code from the Desktop called ‘Lights on’ to the Arduino

Remove the pH probe from the storage solution, rinse it off, and dip it into the pH 10.00 calibration solution (the blue one).

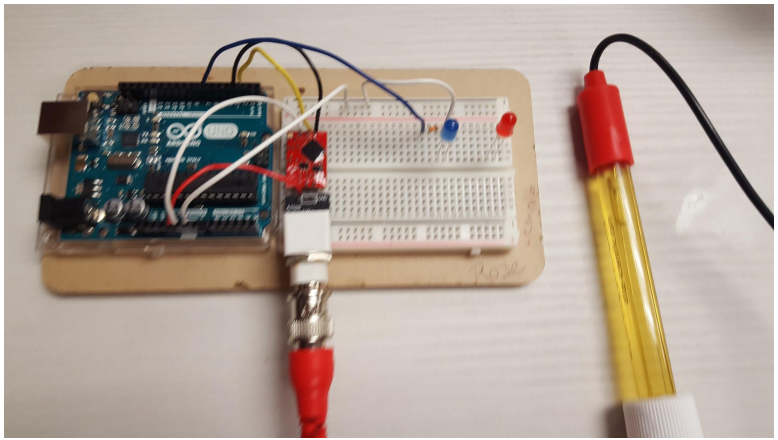
Your result should be a pretty blue light

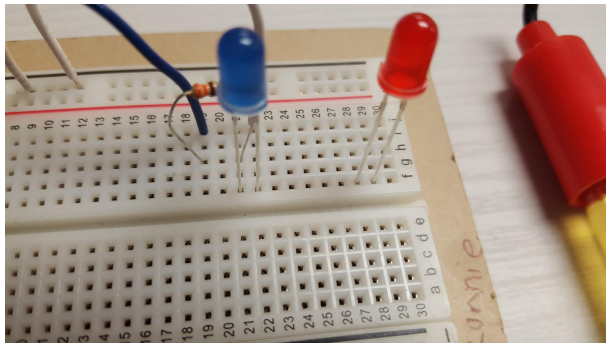
Let’s Test It!



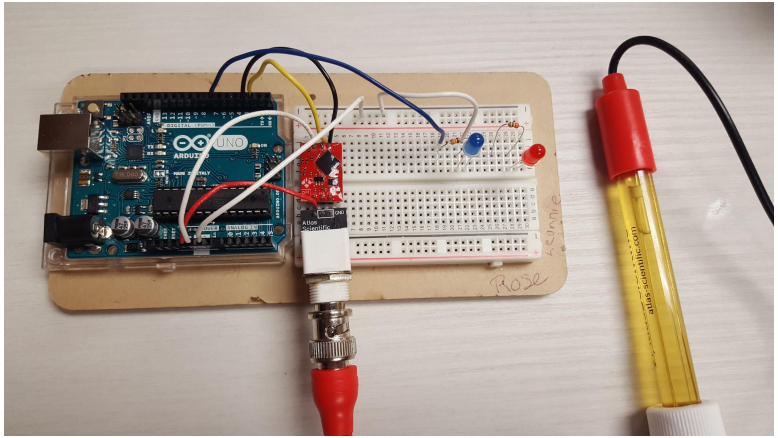
Your result should be a blue light, like this!

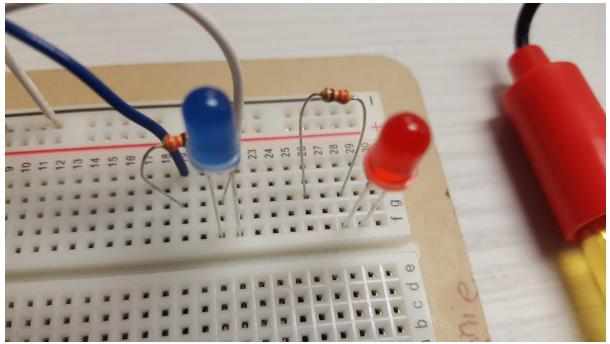
Adding Another LED



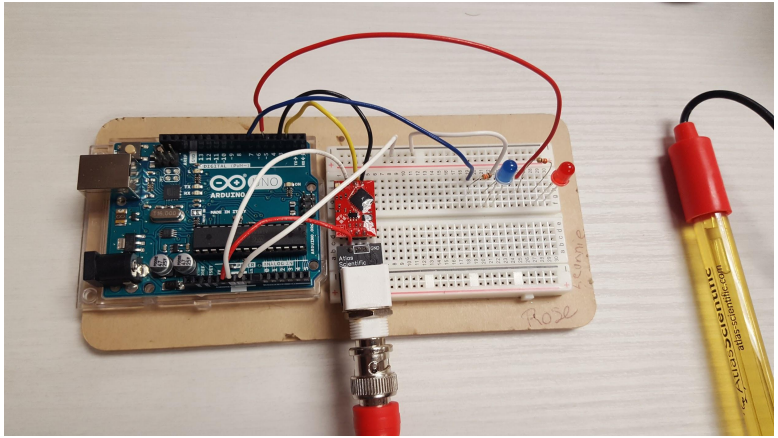


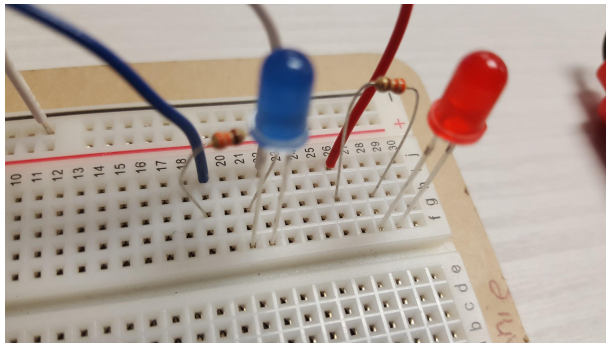
Grab a red LED and place the long lead into row 28 column f and the short lead into row 29 column f



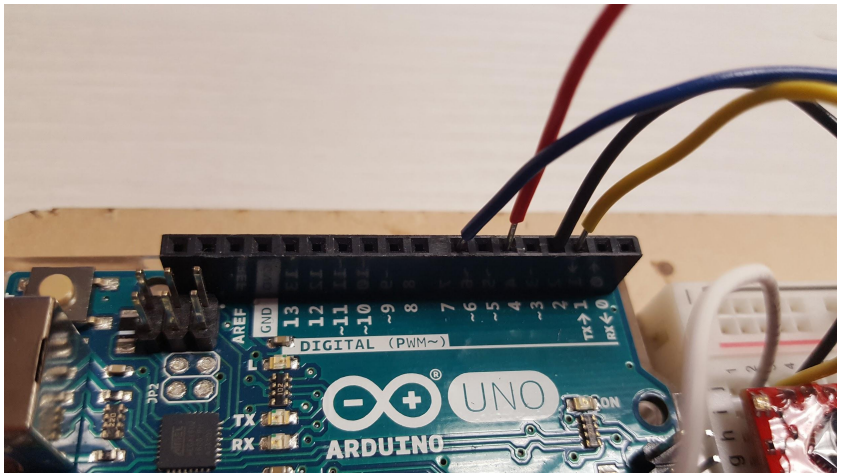


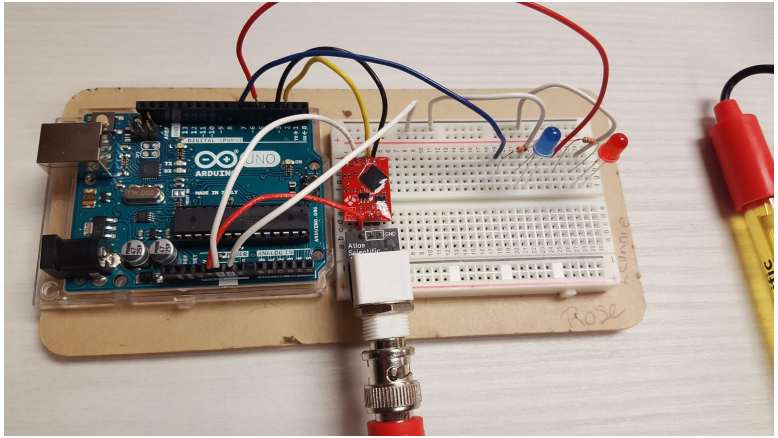
Place one end of the resistor into row 26 column h and the other into row 28 column h

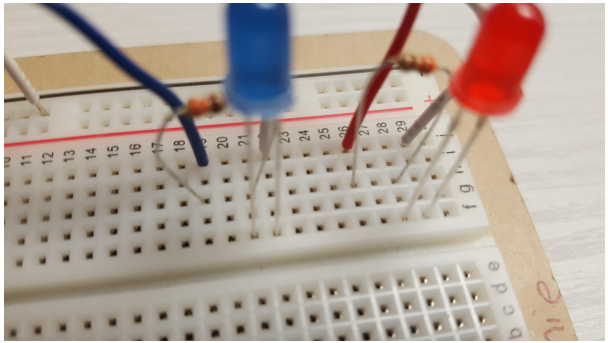




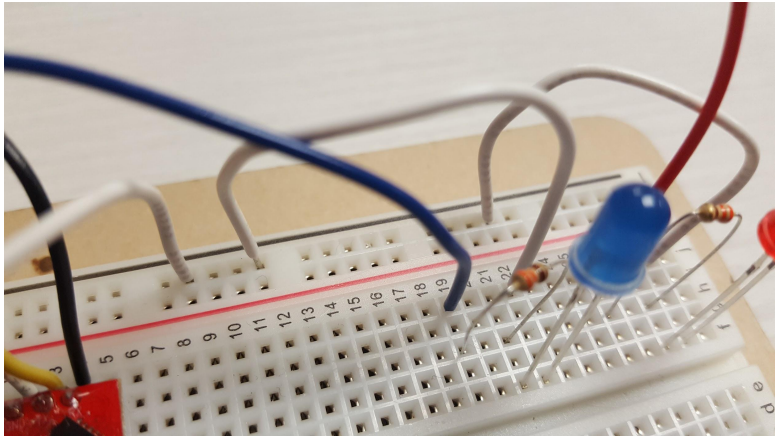
Cut some wire, strip the insulation off each end, and connect one end to pin 5 and the other to row 26 column j



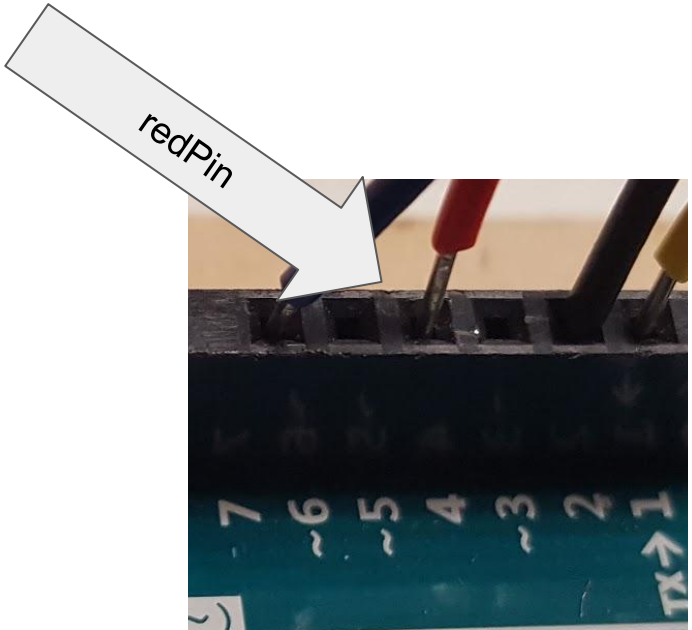




Cut some wire, strip the insulation off each end, and connect one end to the negative outer column and the other to row 29 column j



```
int redPin = 5;
int bluePin = 7;
```



If you open up the code called ‘Lights’ on your Desktop, you will see this code at the top.

We want to use pin 5 as the output for the red LED to we set ‘redPin’ as pin number 5.

```
  if (pH >= 7.0) {
    Serial.println("high");
    digitalWrite(bluePin, HIGH);
    digitalWrite(redPin, LOW);

  }
  if (pH < 7.0) {
    Serial.println("low");
    digitalWrite(redPin, HIGH);
    digitalWrite(bluePin, LOW);
  }
}
```

The parameter ‘HIGH’ and ‘LOW’ respectively tell the Arduino to turn the current on or off on a specific pin.

If the pH is greater than or equal to 7.0, the blue pin is turned on and the red pin is turned off.

If the pH is less than 7.0, the red pin is turned on and the blue pin is turned off.

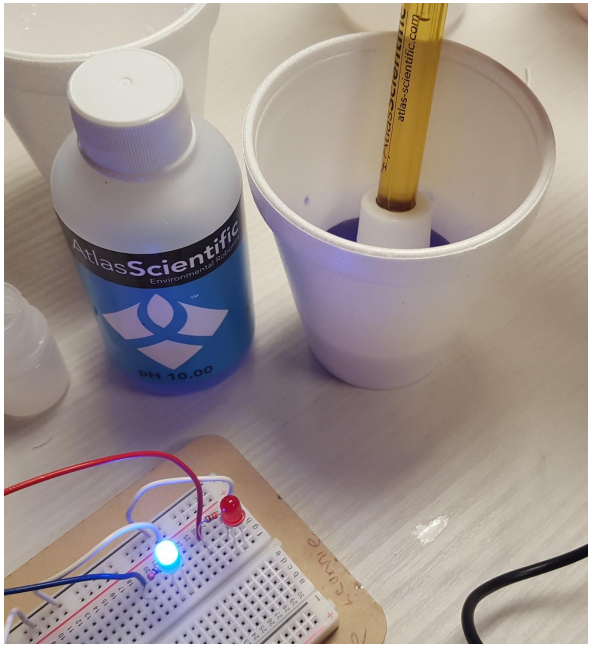
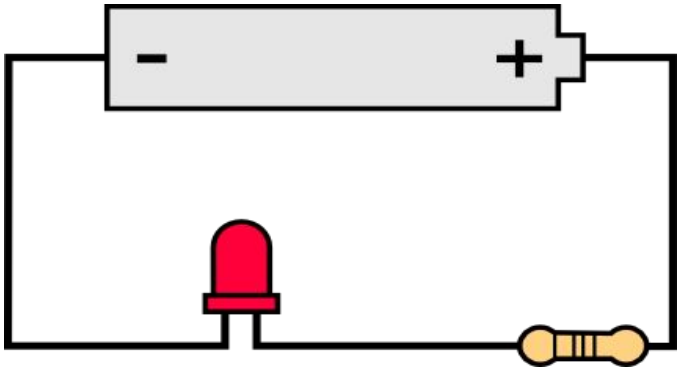


Image on the left is the result of placing the pH probe in the 4.00 pH calibration liquid (the red one) and the right is the result of placing the pH probe in the 10.00 pH calibration liquid (the blue one).

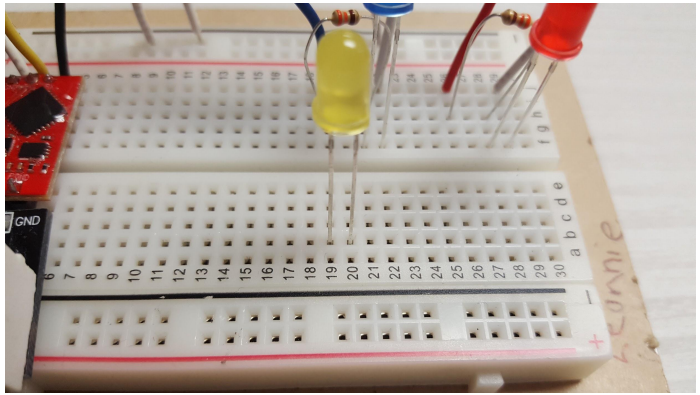
Adding your own LED



If you want to add your own LED to the mix, it is important to remember how the current flows through the system.

You have to connect a resistor to the pin from the Arduino that is providing power and then connect the long lead from the LED to that resistor. Don’t forget to connect the short lead to a ground.

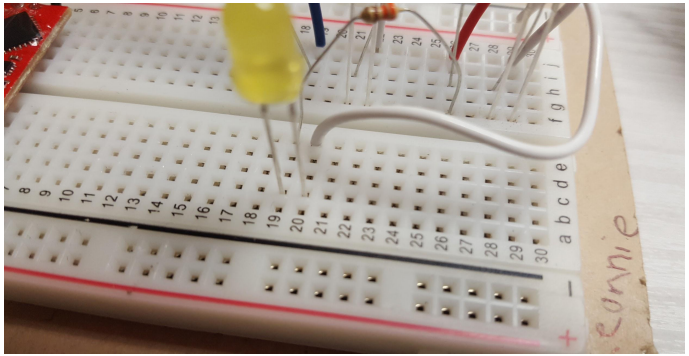
Adding your own LED

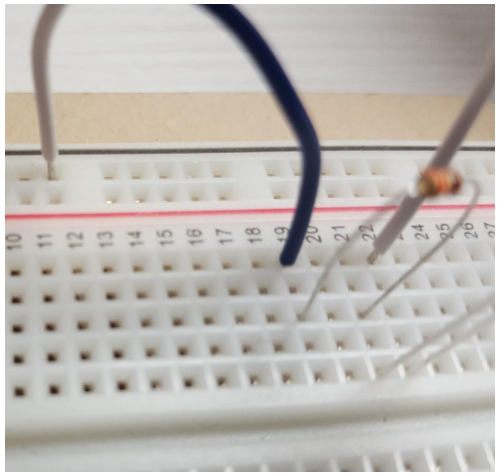


Let’s say you want a yellow light to also come on when the pH is below 7.0, so the same time the red LED comes on.

Place the yellow LED’s long and short leads in a rows and columns of your choosing.

Adding your own LED

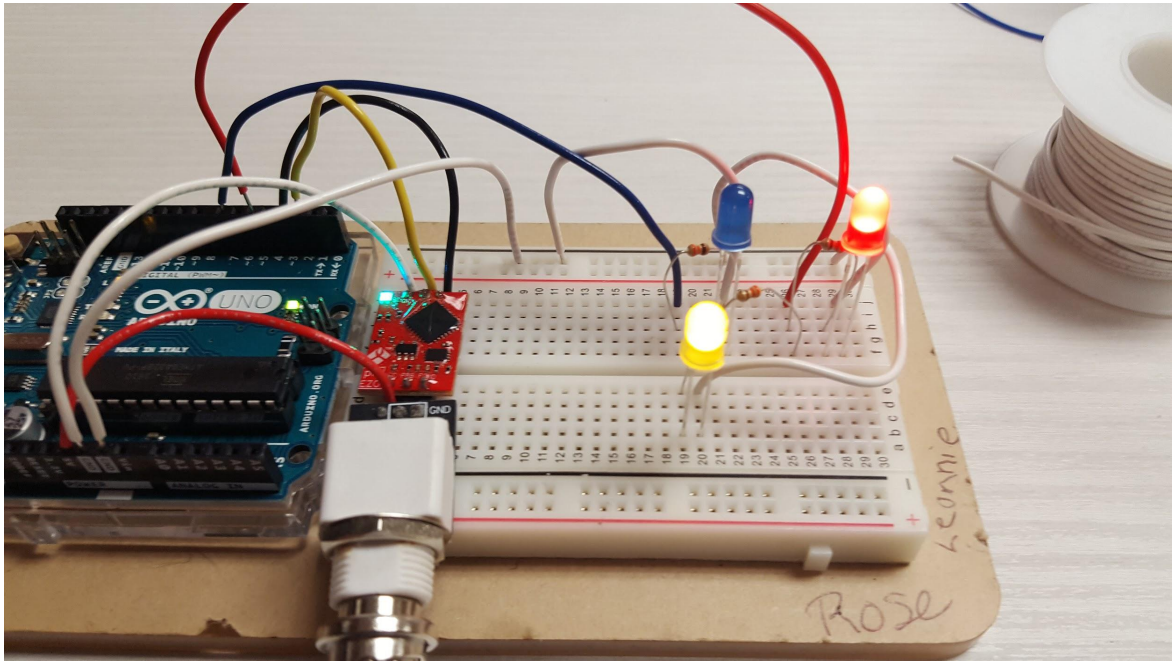




Connect one end of the resistor to the space in the same numbered row of the long lead of the yellow LED. Connect the other end of the resistor to a row across the middle divider where the red Pin is connected to the resistor (i.e. row 26, colum j). In the picture to the left, this would be a resistor connecting row 26 column f to row 19 column e.

Next cut some wire, put one end in the numbered row of the short lead and ground the other end by putting it in the outer negative column.

Your result should look something like this!



Now make your own!