
LAB:

1) Using your Outreach Kit, build the basic LED circuit, (see diagram below but leave out yellow meter or see the following URL: http://www.ece.utah.edu/eceCTools/_Outreach/Outreach_LED/Outreach_LEDVmeas.jpg) Once the LED lights up, move to step 2.

2) Set up a meter (shown in yellow in the diagram below) to measure the voltage across the resistor and LED. Set up the meter as follows. First, make sure that the black probe for the meter is plugged into the input labeled COM or GND. This input is usually located in the lower right on the front of the meter. Second, make sure that the red probe for the meter is plugged into the input labeled V (along with other labels such as Ω). Third, to make the voltage measurement, turn the knob on the front of the meter to a position labeled with a voltage that is just larger than 9 V. For example, your meter might have a setting labeled 20 V or 40 V.

   In the steps that follow, you will measure voltage drops across resistors and examine Kirchhoff's voltage law.

3) Measure the voltage across the resistor as shown in the diagram (the value should be around 5 V) and record the value, (always remember to include units):

   V Resistor = _____

4) Measure the voltage across the LED (the value should be close to 2 V) and record the value:

   V LED = _____

5) Measure the voltage across the entire circuit, from the end of the resistor in row 2 to the bottom side of the LED in row 18. Record the value:

   V Circuit = _____

6) Measure the voltage across the battery (from where the red wire of the battery connector plugs into the top right hole of the board to where the black wire of the battery connector plugs into the top left hole of the board). Record the value:

V Battery = _____

7) According to Kirchhoff's voltage law, the sum of the voltage drops around a loop is equal to zero. This means the voltage of the battery minus the voltage drop across the entire circuit should equal zero. (Note that the voltage drops on wires are approximately zero.) Determine how close the measured voltage drop around the loop is to zero.

V Battery – V Circuit = _____

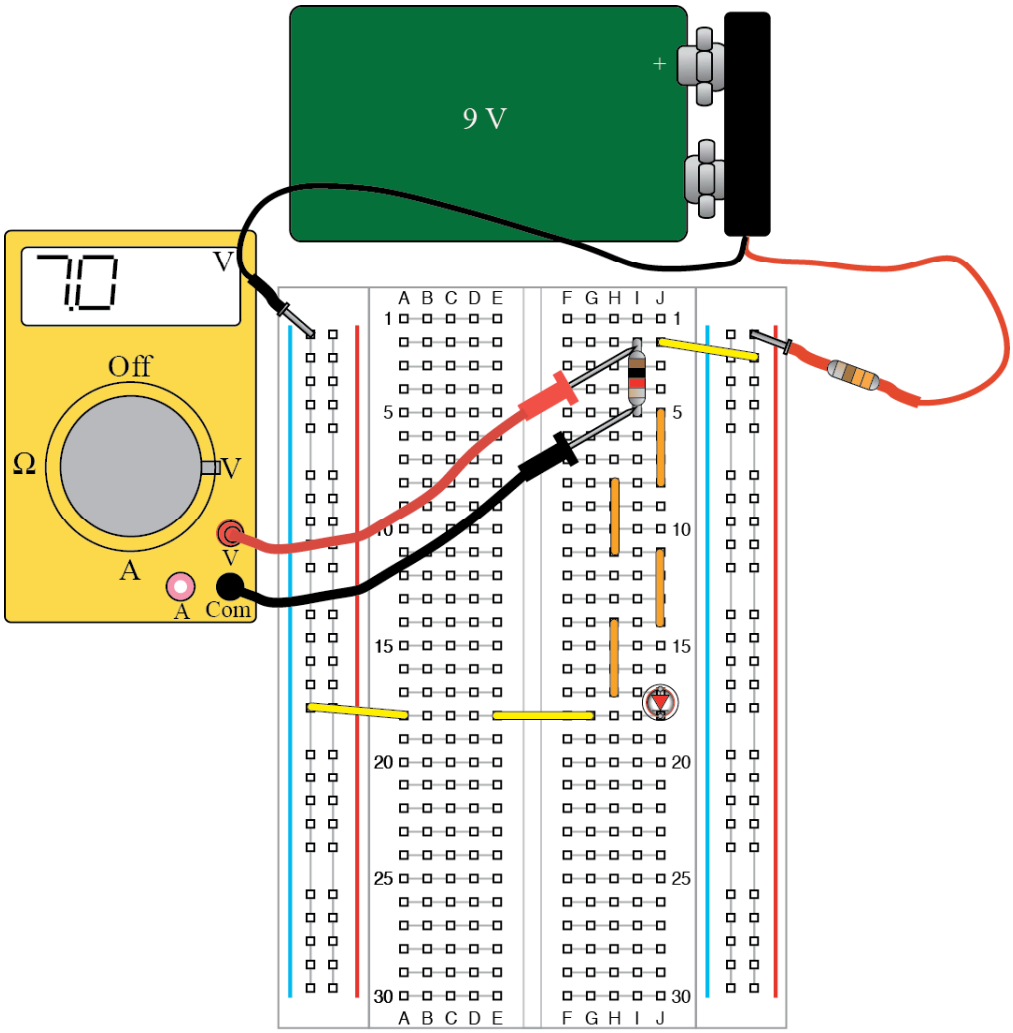
8) Kirchhoff's voltage law also requires that the voltage across the entire circuit must be related to the voltage drops across the resistor and LED. Write down the appropriate equation for this relationship using the names of the voltages (such as V Circuit), and then use your measured values to determine how closely the circuit obeys Kirchhoff's voltage law.

Eqn: _____

Meas: _____ = _____

9) Kirchhoff's current law says that the same current must flow everywhere in a circuit if the current split does not split into several paths. (If the current does split, the total current flowing into the split equals the sum of the currents flowing out of the split.) Here, Kirchhoff's law implies that the same current flows everywhere in the circuit. Using Ohm's law, the current in the resistor is equal to V Resistor / Resistance, where the resistance is 1000 ohms. Use these ideas to find the current in the LED. Explain your approach and show your calculations.

I LED = _____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