Introduction to Electronics

Lesson 8 Checklist and Multimeter Activity

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- ❑ Read Student Guide p. 25 – 27
- ❑ Do **Projects #7, #8** in your Project Guide.
- ❑ Do the **Multimeter Activity** described below.
- ❑ Complete **Lesson 8** of your Electronics Course.
- ❑ Take **Quiz 8** of your Electronics Course.

Lesson 8 Objectives

After this lesson you will be able to:

- ✦ describe how resistance limits current in a circuit
- ✦ use your multimeter to test diodes
- ✦ use your multimeter to measure resistance
- ✦ use Ohm's Law to solve simple problems

Lesson 8 Multimeter Activity A

Light Emitting Diode

You will be using your multimeter to measure voltage, current, and resistance in the circuit from Project #7.

Measure voltage first

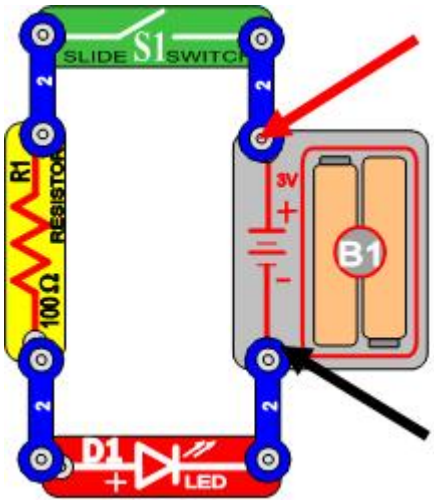
Multimeter settings:

Set your multimeter **selector switch** to DCV 20, which is the 20 V scale. Plug the **red** lead into the VΩmA socket. Plug the **black** lead into the COM socket.

Step 1: Switch **S1** to the **ON** position. Diode **D1** should be on.

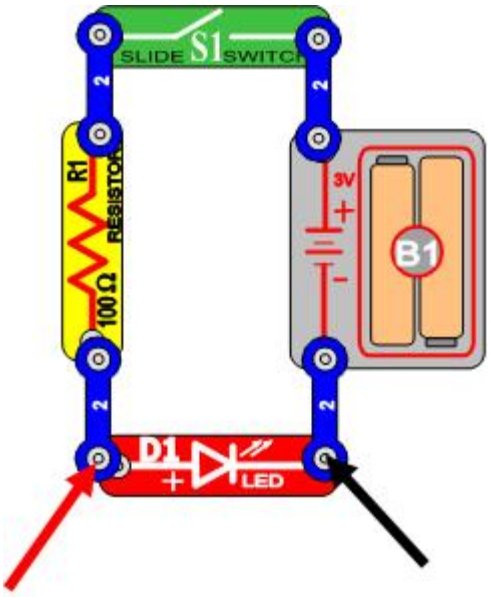
Step 2: Now measure the **voltage** across the batteries **B1**. Place the **red** and **black** leads as shown.

Record the **voltage for B1**:_____.



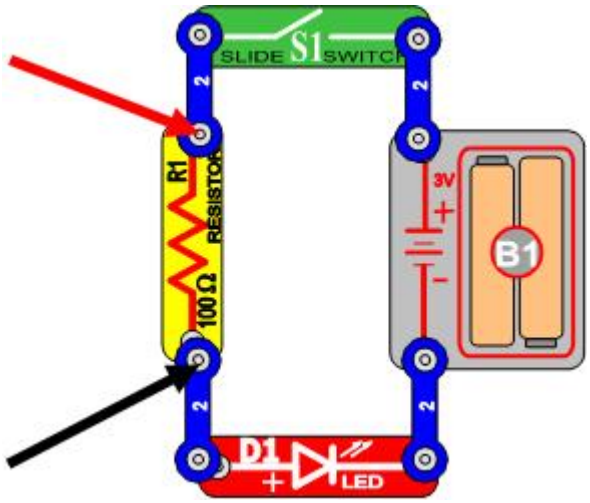
Step 3: Now measure the **voltage** across **D1**. Place the **red** and **black** leads as shown.

Record the **voltage for D1**: _____.



Step 4: Now measure the **voltage** across **R1**. Place the **red** and **black** leads as shown.

Record the **voltage for R1**:_____.



Measure the current

Change your multimeter settings:

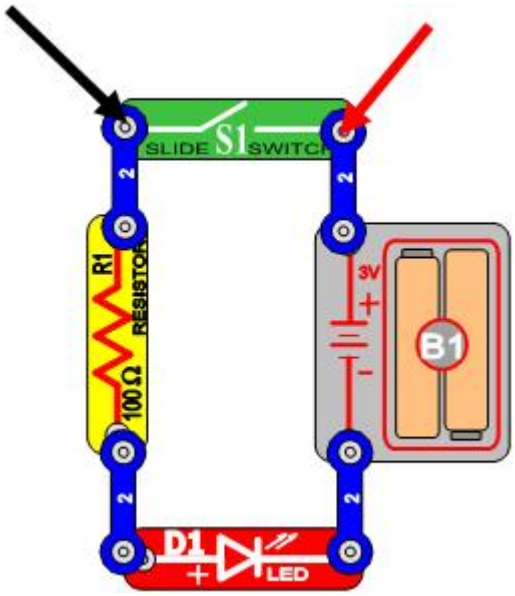
Set your multimeter **selector switch** to 10A. Plug the **red** lead into the 10ADC socket. Leave the **black** lead in the COM socket.

Step 1: Turn **S1** to the **off** position. The diode will turn off.

Step 2: Now measure the current flowing through the circuit by placing the **red** and **black** leads **with S1 still off** as shown.

Current will be flowing through the circuit and your multimeter, and the diode will turn on again.

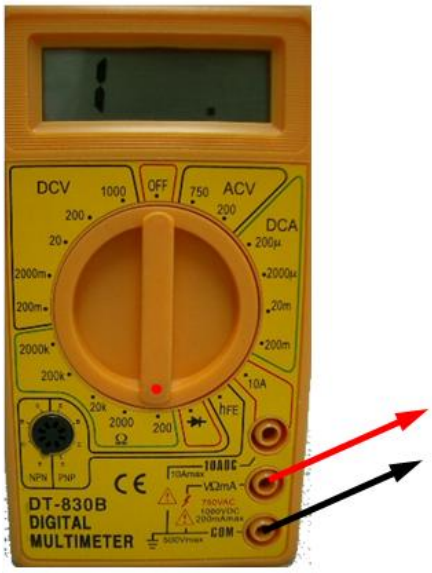
Record the value of the current: _____



Now measure the resistance

Change your multimeter settings:

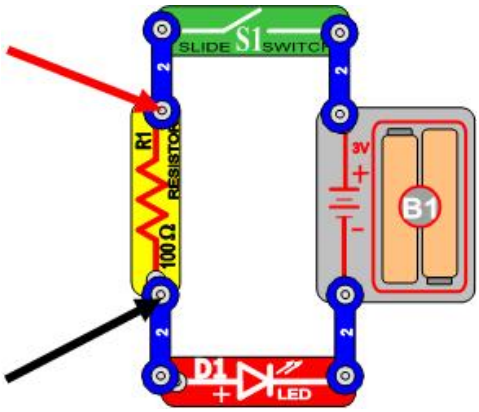
Set your multimeter **selector switch** to 200Ω. Plug the **red** lead into the VΩmA socket. Leave the **black** lead in the COM socket.



Step 1: Turn **S1** to the **off** position. The diode will be off.

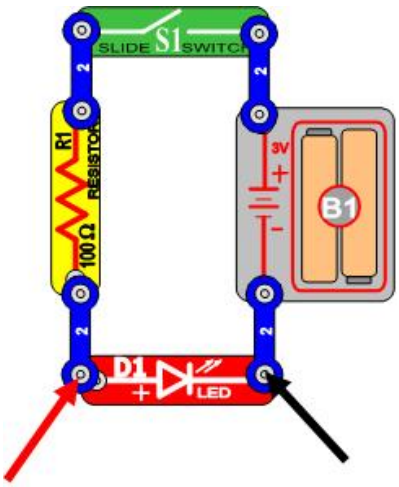
Step 2: Measure the resistance of the resistor **R1** by placing the **red** and **black** leads **with S1 still off** as shown.

Record the value of resistance for **R1**: _____



Step 3: Measure the resistance across Diode **D1** by placing the red and black leads **with S1 still off** as shown.

Notice that you don't get a good reading even if you switch the red and black leads.

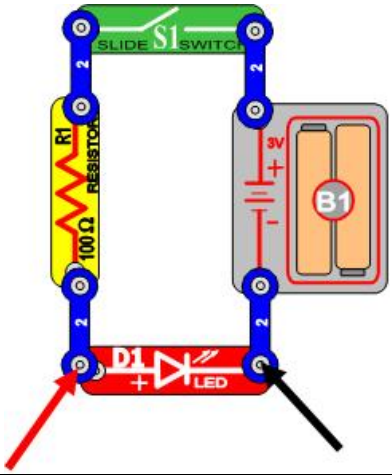


Change your multimeter settings:

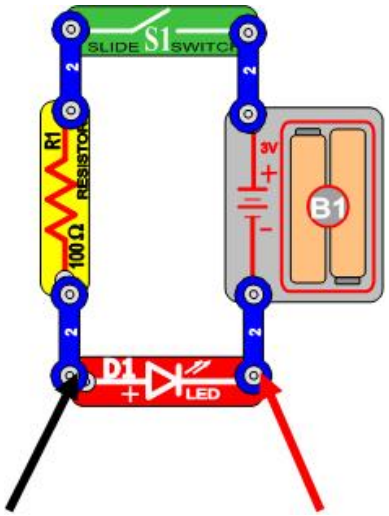
Set your multimeter **selector switch** to diode setting (picture). Leave the **red** lead into the VΩmA socket. Leave the **black** lead in the COM socket.

Step 1: Measure Diode **D1** by placing the red and black leads **with S1 still off** as shown. Your diode should turn on because your multimeter is supplying a small amount of voltage to the diode.

Record the voltage value _____. (It should be approximately 170 mV.)



Step 2: Now reverse the red and black leads across **D1.** There should be no reading for voltage.



Summary

This exercise demonstrated how to measure **resistance** in a circuit using your multimeter. Across resistor R1, you should have measured approximately .8 V. Your measurement for current should have been approximately 8 mA (.008 A). Your resistor measured approximately 100 Ω.

You should now be able to use **Ohm's Law** to verify your measurements:

resistance (Ω) = voltage (V) / current (A)

r = v / i

100 Ω = .8 V / .008 A

You saw that you can not measure the resistance of a Diode with a multimeter, but now you can calculate it! Using the values you recorded above for the circuit current and the D1 voltage, **calculate the resistance of D1**. Your Diode **D1** voltage should be approximately 2 V. The circuit current you recorded should have been around 8 mA (.008 A).

voltage (V) / current (A) = resistance (Ω)

v / i = r

2 V / .008 A = 250 Ω

The resistance of a resistor is fixed, but the resistance of a diode changes depending on the voltage applied. Diodes are **non-linear** devices.

Your multimeter has a setting you can use to check diodes. With your meter on the diode setting, you got a reading of approximately 170 mV, and your diode turned on. You should also check that you get no reading when you reverse the red and black leads. This confirms that the diode is good.