

Measuring Voltage and Current – In Class Lab

In this lab you will measure the voltage and current through a real circuit using a bench top power supply and digital multimeter.

Niagara College Photonics Engineering Technology

No sector of business or industry remains untouched by photonics, the science of generating and harnessing light. The Photonics Engineering Technology program at Niagara College encompasses optics, lasers, electro-optics, spectroscopy and electronics technology.

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Purpose

In this lab you will measure the voltage and current through a real circuit using a bench top power supply and digital multimeter.

Parts Required:

Digital Multimeter (DMM)

DC Power Supply

Resistors (220 Ω, 470Ω, 2.2 k Ω, 4.7kΩ, 22 k Ω, 220 k Ω)

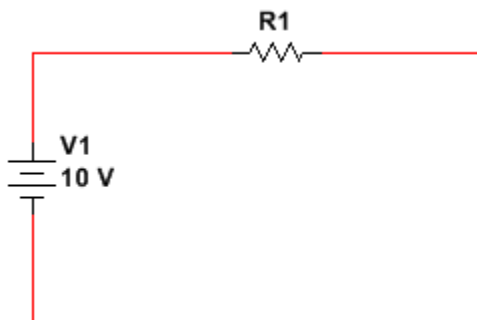
Red LED

Calculations

1. Create the following table in you log book:

Resistor Value (Nominal)	Calculated Current using Nominal Value of Resistance	Measured Resistance (DMM)	Measured Current (DMM)	Measured Voltage across R	Calculated R based on measurements $\frac{V_{(Measured)}}{I_{(Measured)}}$
220 Ω					
470Ω					
2.2 kΩ					
4.7 kΩ					
22kΩ					
220 kΩ					

2. Given the following circuit, calculate the current present when R is equal to each value of resistance in the table (record your result in the table – in the log book)



Procedure

There are two major adjustments on the power supply, voltage and current. The voltage control sets the potential difference between the output terminals. The current control sets the maximum current that can be drawn.

Setting the Current Limit (Link to YouTube)

We can adjust the maximum current the power supply is capable of sourcing in order to protect the circuit from excessive current.

1. Be sure the power supply is off
2. Turn the voltage fully Clock Wise (maximum)
3. Turn the current fully Counter Clock Wise (minimum)
4. Use a jumper to short the terminals of the power supply
5. Turn on the supply and adjust the current until meter reads 50mA
6. Turn off and turn voltage fully Counter Clock Wise

Setting the Voltage Source (Link to YouTube)

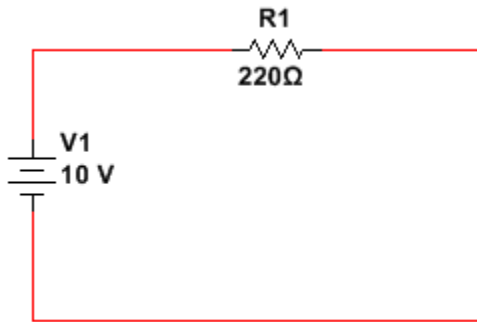
In this lab we will set the voltage source to 10V without the circuit connected.

1. Be sure the power supply is off
2. Set the DMM to measure voltage, and connect it across the plus/minus terminals of the supply.
3. Turn on and adjust the voltage dial until the DMM reads approx. 10.00V. Record the actual voltage in your log book next to your table.

******Do not readjust the power supply for the rest of the lab******

Measuring Current and Resistance Part 1 (Link to YouTube)

1. Using the DMM, measure the actual resistance values for each resistor, and record your results in the table. (Remember to always use the lowest possible range).
2. Place the 220Ω resistor in the breadboard and connect the voltage source across it using your leads to create the circuit shown below:

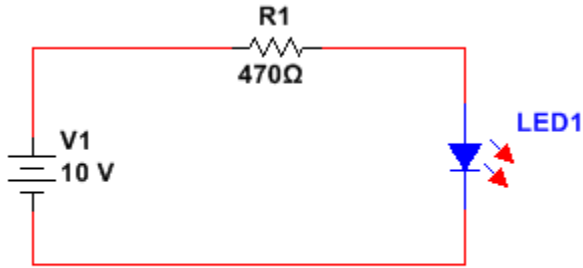


3. Set the DMM to measure current (Remember to place the leads in the correct plugs on the meter) and set the range to the highest value. Measure the current flowing through the circuit, adjusting the range to get the most precise reading. Enter the results in the table.
4. Set the DMM to measure voltage and remember to move the leads back to the correct plugs. Measure the voltage across the resistor using the most precise range and record the value in the table.
5. Repeat the measurements, replacing R_1 with each resistor shown in the table. Record all your values in the table.
6. Using the measured (DMM) value of current, and the measured value of voltage, use Ohm's law to calculate the resistance in the circuit for each case and record in the table.
7. Compare the nominal, measured, and calculated based on measure values of resistance and note in your log book any discrepancies.

*****Show your professor your results before proceeding to part 2*****

Measuring Current and Resistance Part 2 (Link to YouTube)

1. Construct the following circuit on your breadboard:



2. Create the following table in your log book:

With resistor in place

	Across Source V1	Across R1	Across LED1
Voltage			

Current in Circuit	
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3. Measure the values in the table and record your results.

*****Show your professor your results before proceeding*****