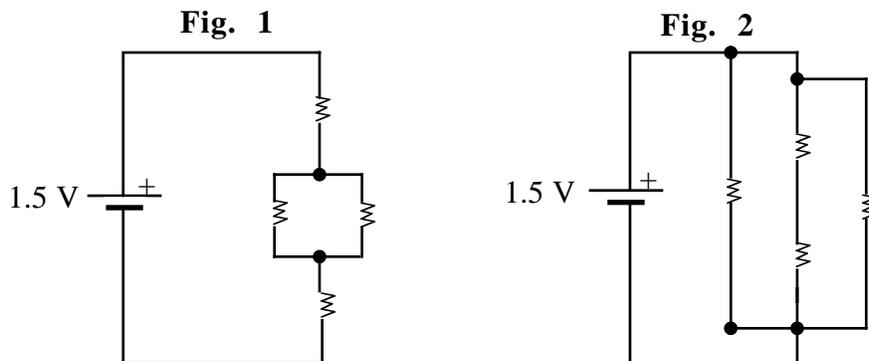


EXPERIMENTAL GOAL

Your goal in this laboratory is to combine what you learned in lab last week and in class this week to predict and verify the behavior of circuits involving batteries and ohmic resistors. You will also investigate how the current flowing through a light-emitting diode (LED) depends on the voltage difference across it.

In the first part of the lab, you should construct a number of circuits involving resistors in various configurations, predict the current flowing through and the voltage difference across each element in each circuit, and then verify those predictions. Work on enough circuits until you are confident that you can do this for *any* multi-resistor circuit problem. In particular, be sure that you can do this for the following circuits:



(You will actually be using a “battery eliminator” power supply set to 1.5 V instead of batteries.)

The LED is an example of a *non-ohmic* circuit element whose resistance varies with the voltage difference across it. In the second part of the laboratory, you should design and construct a simple test circuit (involving the LED, a “battery eliminator” set to 3.0 V, and a resistor or resistor substitution box) that you can use to investigate and describe *as completely you can* how the current flowing through an LED depends on the voltage difference placed across it. At the end of your investigation, you should be able to tell someone *exactly* how to build a circuit that sets the current flowing through the LED to any specified value from 0.2 mA to 20 mA.

LABORATORY SKILLS you will be developing:

Using the digital multimeter as a voltmeter. (In this setting, the multimeter displays the potential difference *across* a circuit element.)

SOME PROCEDURAL SUGGESTIONS AND NOTES

1. Like last week, you may want to study three-element circuits first before looking at four-element circuits.
2. Your simple circuit for investigating the LED must not allow *more* than 20 mA of current to flow through the LED or you will fry it within a tiny fraction of a second. Be sure that you design your test circuit so (at least at first) the current *must* be less than 20 mA, even if the LED’s resistance has the worst possible value.
3. Unlike a resistor, the LED is *not* a bidirectional device, i.e. its behavior depends on the direction current is flowing through it. Make sure you investigate this aspect of its behavior.
4. You may want to observe the behavior of the LED physically and *qualitatively* before studying it quantitatively. (But again, make sure even in your qualitative explorations that your circuit never sends more than 20 mA through the LED.) When you get to your *quantitative* study, you may find the resistor substitution box at your station handy. Disconnect your circuit from the power supply before changing the dials on the resistor substitution box.