Name:_____ UIN: | | | | | | | | | | Section AB/BB: |

Notes:

Pre-Lab 1: Schematics and Breadboards

Learn to "read" a circuit schematic and build on a breadboard.

Please use the **Notes** *margin on the right for both notes to yourself about the experiment as well as for feedback to your TA on the quality or clarity of the lab procedure. Thanks!*

Learning Objectives

- Discern the difference between a circuit schematic and a physical diagram/breadboard implementation.
- Explain why the choice of wire color matters when building a circuit.

Procedures

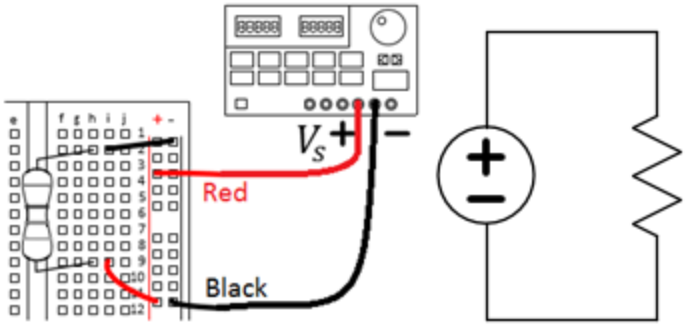
The Role of Schematics in Electronic Circuits

There are three main ways in which you are likely to encounter a circuit design in the ECE110 lab. Since this lab is hands-on, you will build prototype circuits. A **prototype** is *a preliminary version of a product that can be easily tested and modified before a final design is mass produced*. In the ECE110 laboratory, we construct prototype circuits on a ***breadboard*** (*a construction base for connecting circuit elements without the use of solder;* might also be known as a protoboard, although this later term often refers to a board where a circuit can be quickly laid out and soldered). To build a prototype, you would require a *diagram*.

A **physical diagram** might be *a photograph or detailed drawings depicting the physical structure of the components comprising a circuit*. The physical diagram is suggestive of the physical layout of the circuit and attempts to leave little room for error for the novice experimenter. The most-concise method of providing a written guide is the circuit schematic.

A **circuit schematic** is *an abstraction of a circuit that generalizes the specific components as symbols*. The circuit schematic does not necessarily suggest the physical locations of the components as they may be physically arranged in the final prototype. There is, however, a one-to-one relationship between the components described in the circuit schematic, the physical diagram, and the prototype. It is important that an aspiring engineer learn to map one representation to another!

Notes:



(a) (b)

Figure 1: A physical diagram (a) and the more-abstract circuit schematic (b) for the same circuit.

In lab, you will build simple circuits using the equipment at your bench. It is important that you learn to read a circuit schematic and use it to build a physical prototype of the circuit. Sometimes, this task can be more difficult than you would think, especially when there are many components, several test points to measure, and wires going everywhere in what may appear to be a jumbled mess! If you can learn to properly interpret physical diagrams and circuit schematics, this task will become much easier for you.

Watch this video on breadboards: https://www.youtube.com/watch?v=6WReFkfrUIk

While the choice of wire color does not make a functional difference in the operation of your circuit, it makes a big difference when debugging! As a general rule of thumb, use red wires for any connections to the positive side of your power supply/battery and use black wires for any connections to the negative side and DO NOT use red or black anywhere else. Some engineers like using a certain colored-wire for wires that carry a signal from one functional unit to the next (say, from an amplifier to a filter) and maybe a different color for wires that represent feedback in a circuit (like the feedback used in the frequency-selection of an "active" filter). Basically, use the colors you have as best you can to differentiate what you expect to measure at different locations in your circuit. Whatever you do, please do not use red and black wires randomly throughout your circuit or your TA will be slowed in aiding you when the time comes!

Question 1: Comment on wire color usage in your circuits.