Circuits Preliminary Lab
Physics

Your goal in this preliminary lab is to familiarize yourself with circuits, circuit design, resistance, Ohm's Law, and using a multimeter. While there is no specific set of tasks you need to accomplish, you will know you've accomplished your goal when you can:
   a) Diagram a circuit and build the circuit you've diagramed
   b) Correctly predict the size of resistors needed to achieve desired current in series and parallel circuits (given a fixed voltage power source)
   c) Use light bulbs and/or LED's in series and parallel circuits with predictable results
   d) Use a digital multimeter to correctly measure resistance, voltage, and current of circuits and circuit components

Task 1: Experiment with a series circuit; one resistor; LED
   1. Using a power supply set to 5V, design and draw a circuit that allows for around 15 mA (15 milliamps, or 0.015 amps) of current to flow through an LED. Assume that your LED will have a resistance of about 100 Ohms.
   2. Build your circuit and test your current **without** the LED order to prevent burn-out. (Note – since the LED has resistance, you should expect to see a larger current than 15 mA when the LED is not hooked up.)
   3. Add your LED and measure the voltage across and resistance of each of the components of this circuit (ignore wires).
   4. You do not need to measure the current through each component. Why?
   5. Verify that your measured results match with what Ohm's Laws and the equation for resistance in series would predict.

Task 2: Experiment with a parallel circuit; two or three resistors, two LED's
   1. Design and draw a circuit that will drive one LED with 15 mA of current and another LED with 11 mA of current. (Again, assume that your LED's will have about 100 Ohms of resistance.)
   2. Build and test your circuit WITHOUT using LED's to verify the correct levels of current.
   3. Add your LED's and test the voltage, resistance, and current of each circuit path and circuit component.
   4. Verify that your measured results match with what Ohm's Laws and the equations for resistance in series and parallel would predict.

Task 3: Determine the actual resistance of your LED's in each circuit

1. LED's do not show a linear relationship between the applied voltage and the resulting current – they have a variable amount of resistance. Use the data provided on the LED box to determine the nominal resistance of your LED's at 24 mA.
2. Using your measurements from Tasks 1 and 2, estimate the actual resistance of your LED's at the current you used.