Physics 121 Lab 5: Electric Circuits

Introduction:
In the last experiment, we used multi-meters to measure the voltage across and the current through a single carbon resistor. From these measurements we determined the resistance and verified whether it was ohmic in the range of voltages in our experiment. In this lab we again use multi-meters to measure the voltages and currents, but now in a circuit made up of three resistors.

Objective:
We will determine how voltages and currents vary in three different circuits. In the first experiment we connect three resistors $R_1 = 220\ \Omega$, $R_2 = 330\ \Omega$, and $R_1 = 470\ \Omega$ in *series* to our power supply. We then measure the current through each resistor and the voltage across it to inquire how voltages and currents behave in a series circuit. In the second experiment we connect these three resistors in *parallel* and again make current and voltage measurements for each. In our third experiment we connect two of the resistors in parallel and connect this in series to the third resistor and again measure the currents and the voltages.

Experiment #5a –resistors in series:
Connect your three resistors in series head-to-tail) to the power supply. For each ΔV on the power supply measure ΔV across each resistor, the current, I_R, through it, and the total ΔV across all the resistors and the total I.

On a single graph, plot ΔV_{R1} vs I_{R1}, ΔV_{R2} vs I_{R2}, ΔV_{R3} vs I_{R3} and ΔV_{total} vs I_{total} and label each curve.

Do regression analyses to find the resistance of each resistor and the equivalent (total) resistance of the circuit and enter in the table below.

	R_1	R_2	R_3	$R_{equivalent}$
$R + \delta R$ ( )				

Briefly describe the behavior of voltages and the currents in a **series** circuit:

Experiment #5b – parallel resistors:
Connect your three resistors in parallel (heads-to-heads and tails-to-tails) to the power supply. For each ΔV on the power supply measure ΔV across each resistor, the current, I_R, through it, and the total ΔV across all the resistors and the total I.

On another single graph, plot ΔV_{R1} vs I_{R1}, ΔV_{R2} vs I_{R2}, ΔV_{R3} vs I_{R3} and ΔV_{total} vs I_{total} and label each curve.

Do regression analysis to find the resistors of each resistor and the equivalent (total) resistance of the circuit and enter in the table below.

	R_1	R_2	R_3	$R_{equivalent}$
$R + \delta R$ ( )				

Briefly describe the behavior of voltages and the currents in a **parallel** circuit:

Experiment #5c – mixed circuit:
For this part connect R_1 and R_2 in parallel and then connect them in series to R_3. For each ΔV on the power supply measure ΔV across each resistor, the current, I_R, through it, and the total ΔV across all the resistors and the total I.

Briefly describe the behavior of voltages and the currents in this **mixed** circuit: