PRE-LAB

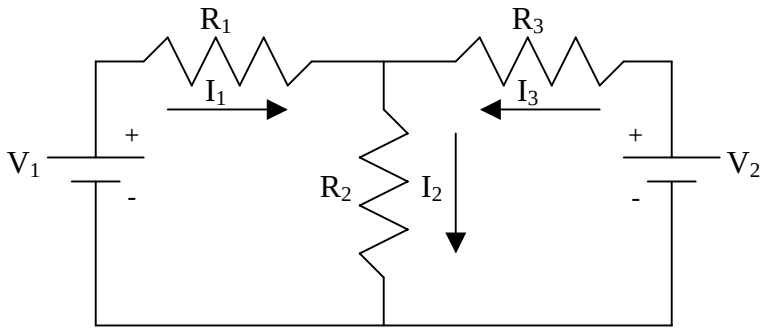
DC Circuits and Kirchoff's Rules

1. Three resistors, $\mathbf{R_1}$, $\mathbf{R_2}$, and $\mathbf{R_3}$ are connected in **series**. Determine their equivalent resistance, $\mathbf{R_e}$.

2. Three resistors, $\mathbf{R_1}$, $\mathbf{R_2}$, and $\mathbf{R_3}$ are connected to one another in **parallel**. Determine their equivalent resistance, $\mathbf{R_e}$.

3. (a) State Kirchoff's Law pertaining to currents at a junction, and (b) state Kirchoff's Law pertaining to voltages in a circuit.

4. For the circuit shown, using Kirchoff's Laws, determine the currents $\boldsymbol{I_1}$, $\boldsymbol{I_2}$, and $\boldsymbol{I_3}$. Show your work attached an additional sheet if necessary.



DC Circuits and Kirchoff's Laws

OBJECTIVES

The objectives of this experiment are to verify the relationships for determining the value of equivalent resistance for resistors in series, the equivalent resistance for resistors in parallel and to view the practical application of Kirchoff's Laws.

Procedure

1. Measure the resistance of each of the four resistors contained in the equipment container and compare their values to the value indicated by the color code. Determine the stated tolerance of the resistors and ascertain whether or not the measured resistances fall within the stated tolerance.

STATED RESISTANCE (Ω)	ACTUAL RESISTANCE (Ω)	STATED TOLERANCE (Ω)	ACTUAL DIFFERENCE (Ω)

CAUTIONARY NOTE: When connecting or disconnecting wires, meters or meter leads, make certain that all power supplies are turned <u>off</u> .

2. **Series Circuit**

a. Connect one of the digital multi-meters (DMM) provided to one of the Low Voltage Power Supplies. Pay close attention to the polarity of the meter.
b. Connect the Common to the negative output and the positive lead to the positive output of the power supply. Make certain that the D.C. voltage adjust knob on the power supply is in the full counter-clockwise position.
c. Set the DMM to a scale where it will read up to 2 volts.
d. Turn on the power supply. Carefully rotate the voltage adjust knob **clockwise** until the DMM reads **1.50** volts.
e. Turn off the power supply.
f. Connect the 1kΩ, R_1, and 2 kΩ, R_2, resistors in **series** and connect them to the power supply.

g. With the first DMM still connected across the power supply, connect a second DMM across the 1 kΩ resistor.
h. Turn on the power supply and record the power supply voltage as well as the voltage across the 1 kΩ resistor.

Draw and label a circuit diagram.

Repeat steps 2g and 2h wit the 2 kΩ resistor.

2i. After turning off the power supply, connect the second DMM in series with the resistors and set the scale to the highest current reading.
2j. Turn on the power supply and adjust the current scale on the DMM in series with the resistors until you get a reading of at least two decimal places. Record the results.

Where V = Power supply voltage, I = Current through the circuit, V_1 = voltage across R_1, V_2 = voltage across R_2.

Power supply voltage V = _____ Equivalent resistance R_e = _____

	Calculated	**Measured**	**Percent Difference**
I			
V_1			
V_2			

3. **Parallel Circuit**

a. Connect one of the digital multi-meters (DMM) provided to one of the Low Voltage Power Supplies. Pay close attention to the polarity of the meter.
b. Connect the Common to the negative output and the positive lead to the positive output of the power supply. Make certain that the D.C. voltage adjust knob on the power supply is in the full counter-clockwise position.
c. Set the DMM to a scale where it will read up to 2 volts.
d. Turn on the power supply. Carefully rotate the voltage adjust knob **clockwise** until the DMM reads **1.50** volts.
e. Turn off the power supply.
f. Connect the 1kΩ, R_1, and 2 kΩ, R_2, resistors in **parallel** and connect them to the power supply.
g. With the first DMM still connected across the power supply, connect a second DMM in series with the 1 kΩ resistor.
h. Turn on the power supply and record the power supply voltage as well as the current , I_1, through the 1 kΩ resistor.

Draw and label a circuit diagram.

Repeat steps 2g and 2h with the 2 kΩ resistor.

2i. After turning off the power supply, connect the second DMM in series with the resistors and set the scale to the highest current reading.
2j. Turn on the power supply and adjust the current scale on the DMM in series with the resistors until you get a reading of at least two decimal places. Record the results.

Where V = Power supply voltage, I = Current through the circuit, V_1 = voltage across R_1, V_2 = voltage across R_2, I_1 = current through R_1 and I_2 = current through R_2.

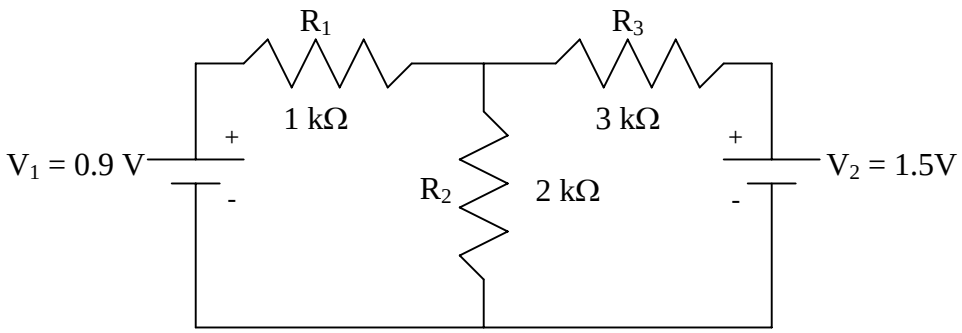
Power supply voltage V = _____ Equivalent resistance R_e = _____

Current through circuit I = _____

	Calculated	Measured	Percent Difference
I			
I_1			
I_2			

4. Kirchoff's Law

Connect the resistors and power supplies as shown in the diagram below.



Using the cautions and methods of measurement described in 2 and 3, measure **V_1, V_2,** and **V_3** as well as **I_1**, **I_2**, and **I_3**.

Power Supply voltage V_1 = _____ V_2 = _____

	Calculated	Measured	Percent Different
I_1			
I_2			
I_3			
V_1			
V_2			
V_3			

ATTACH ALL OF YOUR CALCULATIONS APPROPRIATELY LABELED.