Name: _____

Basic DC Lab - ELEC 101L

LAB #7: Series DC Circuits

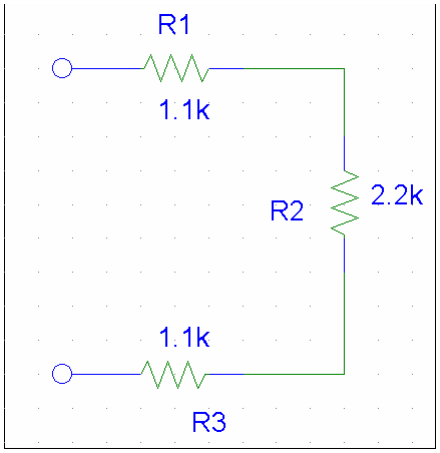
In this lab, the Series DC Circuit will be introduced. In a Series Circuit, only one current flows within the circuit, and the sum of all the voltages over each component will equal the voltage of the power supply (Kirchhoff's Voltage Law). Calculations and measurements of resistance, voltage, current, and power will be made to gain understanding about how the series circuit works. Show all calculations and use complete sentences when answering questions.

Equations: $V_T = I * R_T$ $V_T = V_1 + V_2 + V_3 + \ldots$ $R_T = R_1 + R_2 + R_3 + \ldots$

$$V_i = V_T * \frac{R_i}{R_T} \qquad I = \frac{V_T}{R_T} = \frac{V_i}{R_i} \qquad P_T = I * V_T \qquad P_i = P_T * \frac{R_i}{R_T} = \frac{V_i^2}{R_i} = I^2 * R_i$$

PART I: Resistance In Series Circuits

Given:



1. Calculate the Total Resistance (R_T) of R1, R2 and R3. (2 pts)

Calculated R_T = _____

2. Measure the resistance of each resistor using the Digital Multimeter and write them below. (2 pts ea.)

R1 = _____ R2 = _____ R3 = _____

3. Measure the Total Resistance (R_T) of the circuit. (2 pts)

Measured R_T = _____

4. What is the actual tolerance of the Total Resistance? (2 pts) _____

5. If it were desired to use **1** resistor instead of 3 to achieve the same R_T, what resistor could be used and why? (2 pts)

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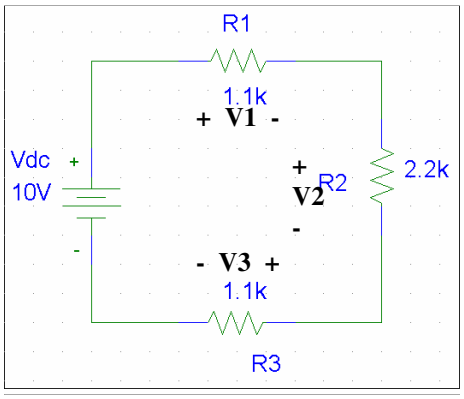
PART II: Voltage In Series Circuits

Given:



1. The Total Voltage (V_T) of this circuit is equal to the voltage of the power supply. What is the Expected Total Voltage? (2 pts)

Expected V_T = _____

2. Measure the voltages V1, V2 and V3 (This is done by placing the leads of the ANALOG Multimeter over the corresponding resistor). BE SURE TO OBSERVE THE POLARITY. Write your measurements in the spaces provided. (2 pts ea.)

Measured: V1 = _____ V2 = _____ V3 = _____

3. What is the Total Voltage found by summing V1, V2, & V3? (2 pts)

V_T = V1+V2+V3 = _____

4. Look at the measurements for V1 and V3. Write a sentence on the relationship of these voltages. (3 pts)

5. How do the resistances compare for the resistors corresponding to V1 and V3? (3 pts)

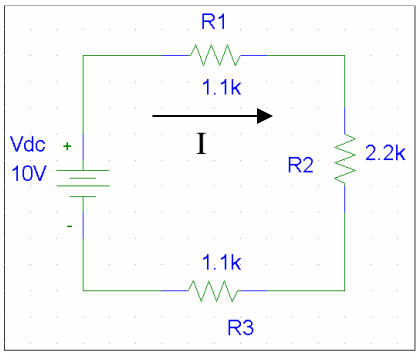
6. Now, look at the voltages V1 and V2. Write a sentence on what is observed about these voltages. (3 pts)

7. Again, what can be said about the resistances corresponding to V1 and V2. (3 pts)

8. What can be said about the voltage over a resistor (R_Y) and the voltage over a resistor twice its value (R_X)? (3 pts)

PART III: Current In Series Circuits

Given:



As can be seen in the circuit diagram there is only <u>one</u> current, I, that flows through the circuit.

This current can be found using various methods.

METHOD 1: FIND I USING V_T and R_T

1. Calculate the Total Resistance (R_T) (2 pts)
   R_T = _____

2. What is the Total Voltage (V_T) of the circuit? (2 pts)
   V_T = _____

3. <u>Calculate</u> the Expected Current (I) of the circuit using V_T and R_T. (2 pts)

   Calculated I = _____

4. <u>Measure</u> the current through the circuit using the Digital multimeter. (2 pts)

   Measured I = _____

5. Does your measured value reflect your calculated value? (2 pts) (Y/N) _____

METHOD 2: FIND I USING INDIVIDUAL VOLTAGE DROPS AND RESISTANCES

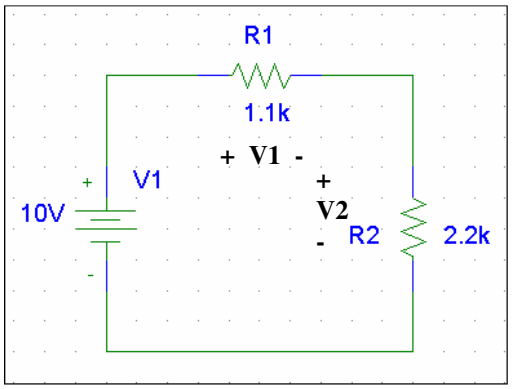
1. Calculate the current through each resistor. For V1, V2 and V3, use your measured values in PART II. (2 pts ea.)

V1 = I * R1	V2 = I * R2	V3 = I * R3
I = _____	I = _____	I = _____

2. From the currents you calculated, what can you say about the current through the circuit? (3 pts)

PART IV: Determining the Power in Series Circuits

Given the following circuit:



Initial Calculations: (2 pts ea.)

R_T = _____

I = _____

V1 = _____ *(use R1 and I)*

V2 = _____ *(use R2 and I)*

Power Calculations: (2 pts ea.)

Total Power: P_T = _____

The power of R1: P_1 = _____ *(Use the I and V1)*

The power of R2: P_2 = _____ *(Use the I and V2)*

Construct the circuit and take the following Measurements: (2 pts ea.)

I = _____ V_1 = _____ V_2 = _____

R_1 = _____ R_2 = _____

From these measurements, calculate the following quantities: (2 pts ea.)

P_T = _____ P_1 = _____ P_2 = _____

10. When adding P_1 and P_2, is the result P_T? (2 pts) (Y/N) _____

11. What does this say about the power of components in series and their relation to the total power? (3 pts)

QUESTIONS

When answering the questions, be sure to answer in **complete sentences** and as diligently as you possibly can.

1) What were the objectives of this lab? (4 pts)

2) List all of the equipment that was used in the lab today. (3 pts)