AP Physics: Lab #16

Analyzing DC Circuits

Name _____ Hour _____

Lab Partners _____

Purpose:

* Apply Ohm's Law to analyze complex DC circuits.
* Correctly use an ammeter and voltmeter to measure current and potential difference.

Equipment:

Multimeter
Power supply
Assorted lamps
Assorted connecting wires

Procedures:

Use the Voltmeter to measure the potential difference across the power supply. Record the potential difference in Data Table A. Construct a simple circuit, consisting of the power source and 1 lamp. Use the ammeter to measure the current in the circuit, and record this current in Data Table A. Repeat this procedure for the second and third lamps in separate simple circuits with the power supply.

Connect two of the lamps in a series circuit with the power supply. Use the voltmeter to measure the potential difference across the entire circuit and each lamp individually. Use the ammeter to measure the current through the entire circuit. Record all measurements in Data Table B.

Connect the same two lamps in a parallel circuit with the power supply. Use the voltmeter to measure the potential difference across the entire circuit. Use the ammeter to measure the current through the entire circuit and through each lamp individually. Record all measurements in Data Table C.

Connect all three lamps in a complex circuit with the power supply, as shown in Data Table D. Use the voltmeter and ammeter to measure the potential difference and current values for each quantity shown in Data Table D.

Connect all three lamps in a complex circuit with the power supply, as shown in Data Table E. Use the voltmeter and ammeter to measure the potential difference and current values for each quantity shown in Data Table E.

Calculations:

Calculate the resistance of each lamp from the quantities measured in the simple circuits. Use Ohm's Law to calculate the theoretical resistances, currents, and potential differences for all complex circuits. Calculate the percentage difference between any quantities that were both calculated and measured.

Analysis:

To summarize the lab report, answer the application questions below in complete sentences. In addition, include a brief statement of the overall results for the lab.

- Why was the current measured only once for the series circuit and through each individual resistor in the parallel circuit? Why was the potential difference measured only once for the parallel circuit and across each individual resistor in the series circuit?

Analysis: *(cont)*

- Draw and label a schematic, showing the positions of the power supply, resistors, ammeter, and voltmeter for the series circuit. What are the correct procedures for placing the meters in the circuit? Why could incorrect placement in the circuit cause inaccurate measurements?
- If a third lamp were added to the series circuit, would the bulbs burn brighter, dimmer, or the same? If a third lamp were added to the parallel circuit, would the bulbs burn brighter, dimmer, or the same? Use Ohm's Law to support your answers.
- Calculate the power dissipated in the first lamp when it is connected in the simple circuit. Does the power dissipated by this lamp increase, decrease, or remain the same when it is connected . . . to the series circuit? . . . to the parallel circuit? Justify your answers.

Lab Report:

Title Page, Objectives, & Overall Report – 5 pts
Procedures – 3 pts
Data Table – 7 pts
Calculations – 8 pts
Analysis – 11 pts

Data Table A: Single Resistors - Simple Circuits

	Potential Difference	Current	Resistance
Lamp #1			
Lamp #2			
Lamp #3			

Data Table B: Two Resistors - Series Circuit

	Calculated Quantities	Measured Quantities	Percent Difference
R_{EQ}		- - - - -	- - - - -
V_{EQ}	- - - - -		- - - - -
V_1			
V_2			
I_{EQ}			

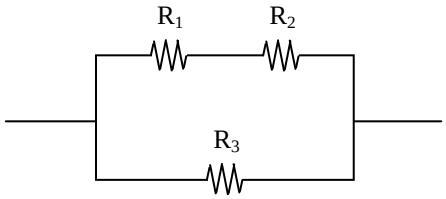
Data Table C: Two Resistors - Parallel Circuit

	Calculated Quantities	Measured Quantities	Percent Difference
R_{EQ}		- - - - -	- - - - -
V_{EQ}	- - - - -		- - - - -
I_{EQ}			
I_1			
I_2			

Data Table D:

Three Resistors - Complex Circuit

	Calculated Quantities	Measured Quantities	Percent Difference
R_{EQ}		- - - - -	- - - - -
V_{EQ}	- - - - -		- - - - -
V_1			
V_2			
I_{EQ}			
I_{12}			
I_3			



Data Table E:

Three Resistors - Complex Circuit

	Calculated Quantities	Measured Quantities	Percent Difference
R_{EQ}		- - - - -	- - - - -
V_{EQ}	- - - - -		- - - - -
V_{12}			
V_3			
I_{EQ}			
I_1			
I_2