Name: _____

Basic DC Lab - ELEC 101L

LAB #8a: Parallel Circuits

The focus of this lab is to learn about the properties of parallel circuits. Experiments will show how current flows through a parallel circuit, how total resistance is affected, and how power functions. Kirchhoff's Current Law, which states that the Total Current is the sum of all individual branch currents, will be applied in parallel circuits.

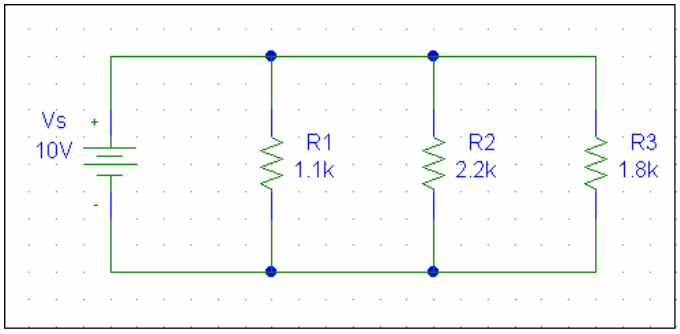
Kirchhoff's Current Law: $I_T = I_1 + I_2 + I_3 + \ldots$ (Branch Currents)

Total Resistance in Parallel Circuits: $RT = \dfrac{1}{\left(\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}+\mathrm{K}+\frac{1}{R_n}\right)}$

Remember to show all calculations and use complete sentences when answering questions.

PART I

Given:



1. Label the schematic with arrows to show where I_1, I_2, I_3, and I_T flow. (4 pts)
2. Use V_s and the resistances to calculate the following quantities: (8 pts)

I_1 = _____ I_2 = _____

I_3 = _____ I_T = _____

2. Make the following measurements: (12 pts)

(*remember to disconnect the power supply when measuring resistance*)

	R	V	I	P = VI
R1				
R2				
R3				
RT				

3. What statement can be made about the voltage across the resistors? (2 pt)

4. Does Kirchhoff's Current Law hold true? Explain why. (2 pts)

5. Is the measured value of I_T within 10% tolerance of the calculated value? (2 pts)

$$\text{Tolerance } (\%) = \left|1 - \left(\frac{Measured}{Calculated}\right)\right| * 100$$

6. What statement can be made about the relation between the individual branch powers and the total power? (2 pts)

7. Would I_T increase or decrease if a 680Ω resistor were added in parallel to the rest of the circuit? (2 pt)

8. Why does the largest current flow through R1? (2 pt)

9. Why does the smallest current flow through R2? (2 pt)

10. What is the actual tolerance of R_T? (2 pts)

$$\text{Actual Percent tolerance } (\%) = \left|1 - \left(\frac{Measured}{Calculated}\right)\right| * 100$$

Actual percent tolerance of R_T = _____

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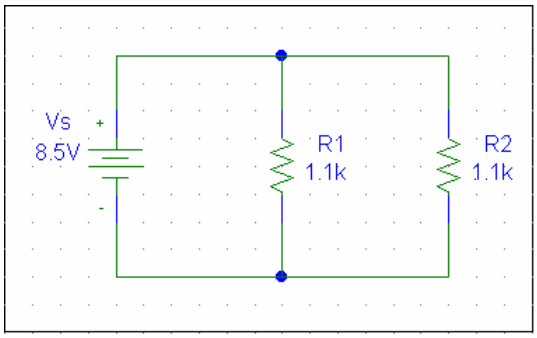
PART II

Given the circuit at right:



1. Calculate the values in the table below: (12 pts)

	R	V	I	$P = I^2R$
R1				
R2				
RT				

2. What do you notice about the currents through R1 and R2? (2 pt)

3. What can be said about the powers dissipated in R1 and R2? (2 pt)

4. If there were 4 – 1.1 kΩ resistors in parallel, what is a quick way to determine the total resistance, R_T? (2 pts)

5. What would be the total current of the 4 resistor parallel circuit? (2 pt)

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PART III: DESIGN (40 pts)

Design and build a parallel circuit that obeys the following constraints:

- Vs cannot exceed 12V
- One of the resistors has to be 1 kΩ
- The Total Resistance cannot be less than 500Ω.
- Use four (4) resistors that are not of equal value and are available in the lab.
- **Show all calculations for full credit.**

Draw the schematic by hand below.

Show the calculated results in the following table. (10 pts)

	R	V	I	P
R1				
R2				
R3				
R4				
RT				

What are the power ratings necessary for the resistors? (5 pts)

Simulate the circuit in Pspice, then copy and paste the results into your lab report. (10pts)

Do the simulation results meet the constraints? Explain. (5 pts)

If the calculations and simulation agree, build the circuit, take measurements, and complete the table below. (10 pts)

	R	V	I	P = VI
R1				
R2				
R3				
R4				
RT				

Complete this lab, turn it in, and then create a report on Lab 8. In the report create at least one table showing measurements made in the lab. Include schematics drawn using Pspice and copy and paste them.