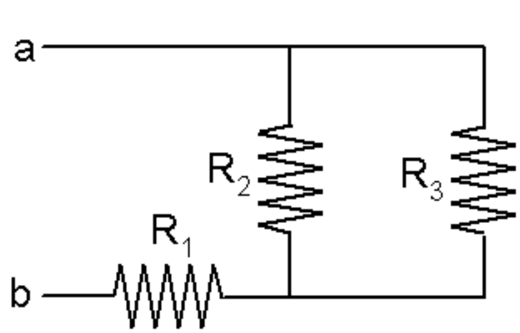
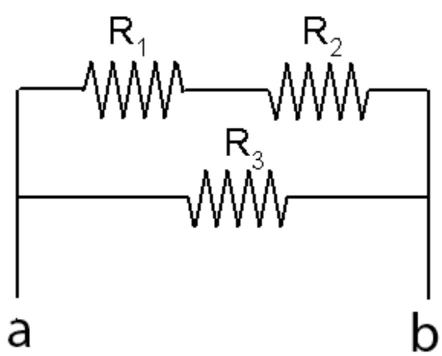
L165 Data and Analysis

<u>Each student must collect their own data. This is an individual activity</u>.

Accurate measurements are required. Do <u>not</u> round values that you read from the meter.

1. Use 4 batteries in series. Measure the combined voltage of the 4 batteries. Record the value in Table 1 on the next page.
2. Select resistors close to these values: R_1 = 1000 ohm, R_2 = 2700 ohm, R_3 = 470 ohm. Be sure to match the value with the number of the resistor. For example, R_1 rather than R_2 must be the 1000 ohm resistor. That's because the circuit diagrams for the A and B circuits specify particular placements of the resistors. See the diagrams below.
3. Measure the resistance of each resistor with your multimeter. <u>Do not have the battery pack connected for these measurements</u>. Record values in Table 1.
4. Using the 3 resistors, assemble the resistor arrangement assigned to you. This can be done with 4 hook up wires. See the photos linked to the lab instructions page to guide you. <u>Don't connect the battery pack yet</u>. Place your meter probes at points *a* and *b* of your circuit to measure the equivalent resistance. Record this in the Measured column of Table 2 on the next page.

Circuit A	Circuit B
	

5. Now connect your battery pack. Prepare your meter to measure voltage. Then measure the voltages across each of the three resistors. Enter the values in the Measured column of Table 2.
6. Turn off your meter and prepare it to measure current. Next measure the currents in the three resistors. Remember, you have to break the circuit and insert the meter to measure current. See example placements in the circuit photos linked to the lab instructions. Record your currents in the Measured column of Table 2.
7. Using your theoretical formulas from the prelab, calculate the equivalent resistance, the current in each resistor, and the voltage across each resistor, and enter the results in the Calculated column of Table 2.
8. Calculate the experimental errors using the calculated values as accepted. Enter all values in Table 2 to the nearest 0.1% for consistency.
9. Calculate the power dissipated by each resistor using the formula $P_i = V_i^2/R_i$ and your <u>measured</u> values of V_i and R_i. Enter the results in Table 3.
10. Calculate the power dissipated by the equivalent resistance of the circuit using the formula $P_{eq} = V_b^2/R_{eq}$ and your <u>measured</u> values of V_b and R_{eq}. Enter the result in Table 3.
11. The total power dissipated by the circuit should be given by $P_{tot} = P_1 + P_2 + P_3$. Calculate this sum and enter the value in Table 3.
12. By conservation of energy, P_{eq} should equal P_{tot}. Test this assertion by calculating the experimental error between these two values. Use P_{tot} as the accepted value. Record your result below Table 3.
13. Scan <u>page 2 only</u> and submit to BrainHoney with the name L165-lastnamefirstinitial.pdf.

L165 Data and Calculations

Your name_______________________________

Meter used (circle one): orange gray

Circuit studied (circle one): A B

Table 2				
	Unit	Measured	Calculated	Exp. Error
R_{eq}	Ω			
I_1	A			
I_2				
I_3				
V_1	V			
V_2				
V_3				

Table 1		
	Unit	Value
V_b	V	
R_1	Ω	
R_2		
R_3		

Table 3		
	Unit	Value
P_1	W	
P_2		
P_3		
P_{eq}		
P_{tot}		

Experimental error between P_{eq} and P_{tot} = _________