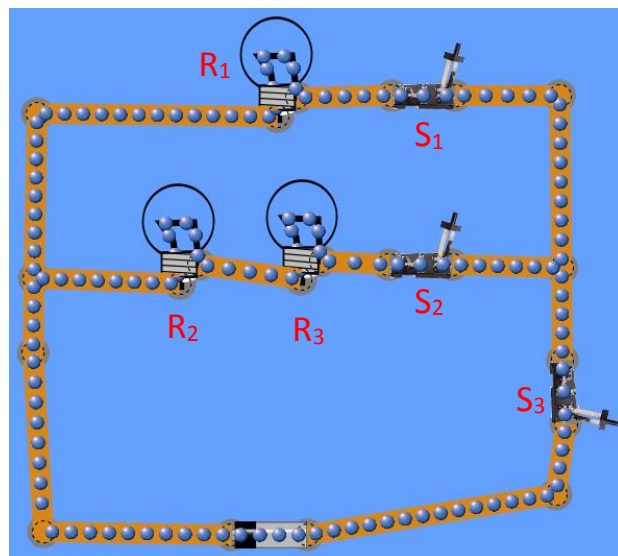


Combined Series and Parallel Lab

Instructions: Construct each of the circuits below using the PhET Circuit Simulation. **Each light bulb/resistor is $10\ \Omega$ by default. The battery has a potential difference of $9\ \text{V}$ by default.** Complete the RVIP charts mathematically and check your answers with the “Non-Contact Ammeter” and “Voltmeter.” Then answer the questions following each diagram.

A. Series Circuit in a Parallel Circuit

	R	I	V	P
1				
2				
3				
R of 2&3				
R eq				



1. Draw a schematic version of this circuit ($\text{---}\text{---}\text{---}$ and $\text{---}|||| \text{---}$) and then draw simplified versions to solve.

2. Explain which part of the circuit is in series. Explain which part of the circuit is in parallel.

3. Compare the current in the top branch to the current in the middle branch. Explain why.

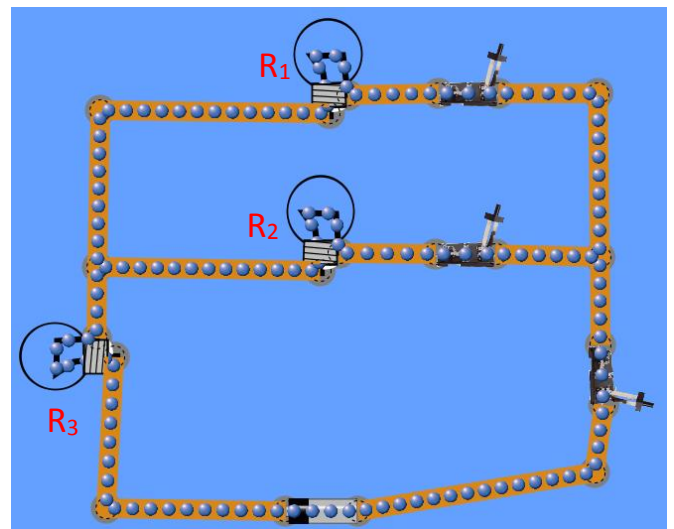
4. Rank the light bulbs in order of brightness. In terms of current flow and resistance, explain why.

5. If bulb R_2 were removed (right-click to remove), explain what happens to the other two bulbs and why.

6. Determine which bulbs are affected by each of the switches (S_1, S_2, S_3). Explain why.

B. Parallel Circuit in a Series Circuit

	R	I	V	P
1				
2				
3				
R of 1&2				
R eq				



7. Draw a schematic version of this circuit (— W — and —| | |—) and then draw simplified versions to solve.

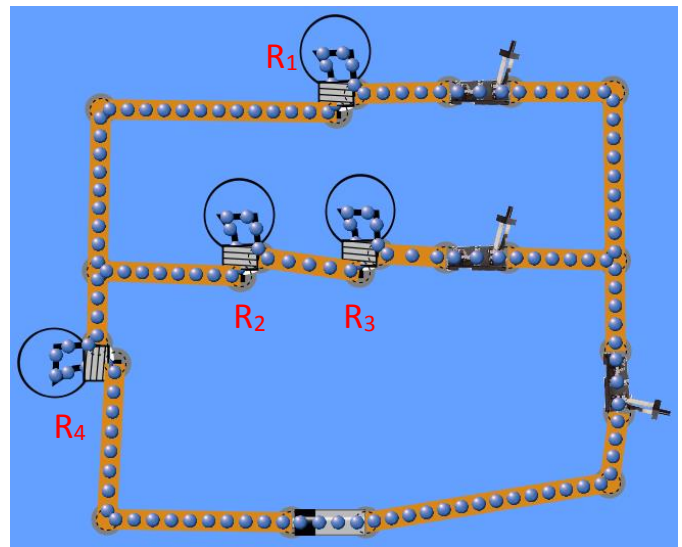
8. Explain which part of the circuit is in series. Explain which part of the circuit is in parallel.

9. Rank the light bulbs in order of brightness. In terms of current flow and resistance, explain why.
10. Compare the potential difference across R_3 to the potential difference across the other two bulbs. Explain why.
11. If R_3 were removed (right-click to remove), explain what happens to the other two bulbs and why.
12. If R_2 were removed, what kind of circuit does this become?
13. After R_2 is removed, determine what happens to the brightness of each bulb and explain why. (Hint: Complete the chart if you get stuck.)

	R	I	V	P
1				
3				
R eq				

C. Series Circuit in a Parallel Circuit in a Series Circuit (Bonus)

	R	I	V	P
1				
2				
3				
4				
R of 2&3				
R of 1&2&3				
R eq				



14. Draw a schematic version of this circuit ($\text{---}\text{W}\text{---}$ and $\text{---}||||\text{---}$) and then draw simplified versions to solve.

15. Explain which parts of the circuit are in series. Explain which part of the circuit is in parallel.

16. Rank the light bulbs in order of brightness. In terms of current flow and resistance, explain why.