LabQuest
23

Series and Parallel Circuits

PRELIMINARY QUESTIONS

1. What would you expect the effective resistance of two identical resistors in series to be, compared to the resistance of a single resistor?
2. What would you expect the effective resistance of two identical resistors in parallel to be, compared to the resistance of one alone?
3. Calculate the range of resistance values that fall in this tolerance range.

Labeled resistor value (Ω)	Tolerance (%)	Minimum resistance (Ω)	Maximum resistance (Ω)

PROCEDURE

24. Will they be the same or different?

DATA TABLE

Part I Series Circuits

Part I: Series circuits							
	R_1 (Ω)	R_2 (Ω)	I (A)	V_1 (V)	V_2 (V)	R_{eq} (Ω)	V_{TOT} (V)
1	10	10					
2	10	51					
3	51	51					

Part II: Parallel circuits							
	R_1 (Ω)	R_2 (Ω)	I (A)	V_1 (V)	V_2 (V)	R_{eq} (Ω)	V_{TOT} (V)
1	51	51					
2	51	68					
3	68	68					

Part III: Currents				
	R_1 (Ω)	R_2 (Ω)	I_1 (A)	I_2 (A)
1	10	51		
2	51	68		

DATA TABLE ANALYSIS

1. Examine the results of Part I. What is the relationship between the three voltage readings: V_1, V_2, and V_{TOT}?
2. Using the measurements you have made above and your knowledge of Ohm's law, calculate the equivalent resistance (R_{eq}) of the circuit for each of the three series circuits you tested.
3. Study the equivalent resistance readings for the series circuits. Can you come up with a rule for the equivalent resistance (R_{eq}) of a series circuit with two resistors?
4. For each of the three series circuits, compare the experimental results with the resistance calculated using your rule. In evaluating your results, consider the tolerance of each resistor by using the minimum and maximum values in your calculations.
5. Using the measurements you have made above and your knowledge of Ohm's law, calculate the equivalent resistance (R_{eq}) of the circuit for each of the three parallel circuits you tested.
6. Study the equivalent resistance readings for the parallel circuits. Devise a rule for the equivalent resistance of a parallel circuit of two resistors.
7. Examine the results of Part II. What do you notice about the relationship between the three voltage readings V_1, V_2, and V_{TOT} in parallel circuits.
8. What did you discover about the current flow in a series circuit in Part III?

   What did you discover about the current flow in a parallel circuit in Part III?

10. If the two measured currents in your parallel circuit were not the same, which resistor had the larger current going through it? Why?