Experiment 2.0

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Question

How does resistance affect current in series circuits?

Hypothesis

As more load is added, the resistance will increase.
As more load is added, the current will decrease.
As more load is added, the voltage will remain the same.

Materials

- 4 Leads (wire)
- 3 Lights (Holiday lights)
- 1 Power Source
- 1 Voltmeter/Ammeter

Experiment

1. Connect two leads to the Power Source.
2. Connect the leads to the Light.
3. Measure Voltage.
4. Measure Amperage.
5. Calculate Resistance.
6. Add two leads.
7. Connect the leads to the Light. There are now two Lights.
8. Measure Voltage.
9. Measure Amperage.
10. Calculate Resistance.
11. Add two leads.
12. Connect the leads to the Light. There are now three Lights.
13. Measure Voltage.
14. Measure Amperage.
15. Calculate Resistance.

Analysis

Physical Experiment

Physical Experiment	Voltage	Current (Amperage)	Resistance
One Lights	3.26 V	0.18 A	18.11 Ω
Two Lights	3.26 V	0.12 A	27.16 Ω
Three Lights	3.26 V	0.10 A	32.60 Ω

PHET Simulation

PHET Simulation	Voltage	Current (Amperage)	Resistance
One Lights	3.30 V	0.18 A	18.33 Ω
Two Lights	3.30 V	0.09 A	36.66 Ω
Three Lights	3.30 V	0.06 A	55.00 Ω

Percent Differences + Calculations

Percent Differences

Percent Differences	Physical Experiment	PHET Simulation	Difference %
One Lights	0.18 A	0.18 A	0%
Two Lights	0.12 A	0.09 A	29%
Three Lights	0.10 A	0.06 A	50%

One Light
0.18 and 0.18
= same
= 0% Difference

Two Lights
0.12   0.09
0.12 - 0.09 = 0.03
$\frac{0.12 + 0.09}{2}$
$= \frac{0.21}{2}$
$= 0.105$

$\frac{0.03}{0.105}$
$= 0.2857 \times 100$
$= 28.579\%$
$= 29\%$

Three Lights
0.10   0.06
① 0.10 - 0.06 = 0.04
② $\frac{0.10 + 0.06}{2}$
$= \frac{0.16}{2}$
$= 0.08$
③ $\frac{0.04}{0.08}$
$= 0.5 \times 100$
$= 50\%$

Conclusion

In conclusion my hypothesis was correct as the data clearly shows that as more lights (loads) are added the current decreases and the resistance increases. There was a 0% difference for one light bulb, 29% difference for two light bulbs and a 50% difference for the three light bulbs between the physical experiment and the PHET simulation. Resistance in series circuits causes the current to decrease as the resistance increases and vice-versa.