

V = voltage (units: volts, V)

I = current (units: amps, A)

R = resistance (units: ohms, Ω)

Physics
Building Series Circuits

Name _____
Date _____

Objective – *To investigate how current is affected when resistors are connected in series.*

Electric Circuit Sketch – *Draw the circuit you are to build by using the symbols for electric circuits.*

Conductor

Switch

Battery

Resistor



Ammeter

Voltmeter

Procedures

1. Build the first part of the circuit by connecting the power supply, ammeter*, switch and **1 light bulb**.
 - * If you are using a digital ammeter, the dial should be set at 200 mA.
 - * If you are using the analog ammeters, the connection should go into either the 1 A or 500 mA location.
2. Build the second part of the circuit by connecting the voltmeter in the appropriate locations according to the circuit sketch above. As you proceed through the lab this will move to different locations.
3. Adjust the dial on the power supply so that approximately 4 V is running through the circuit. **This is to be held constant at 4 V for the duration of the lab. Do not turn the dial after it is at 4V.**
4. Record the value of the current. Record your observations of the light produced from 1 light bulb in the data table provided. Move the voltmeter and determine the voltage at the 1st bulb.
5. Connect a 2nd light bulb immediately following the 1st bulb. Record the value of the current. Record your observations of the light produced in the data table. Using the voltmeter, determine the voltage at the 1st and 2nd bulbs.
6. Unscrew one of the light bulbs and record your observations in the data table. Re-screw the light bulb before proceeding.
7. Connect a 3rd light bulb immediately following the 2nd bulb. Record the value of the current. Record your observations of the light produced in the data table. Using the voltmeter, determine the voltage at the 1st, 2nd, and 3rd bulbs.
8. Unscrew one of the light bulbs and record your observations in the data table. Re-screw the light bulb before proceeding.
9. Answer the following post-lab questions.

Data tables & questions on the following page

Data Table & Observations

No. of Light Bulbs	Total Voltage (V) 4 V max	Total Current (A)	Voltage, Bulb 1 (V)	Voltage, Bulb 2 (V)	Voltage, Bulb 3 (V)	Light Observations <i>What do the lights look like?</i>	Result of Unscrewing a Light Bulb
1							
2							
3							

Post-lab Questions –

1. Why did the lights get dimmer as you added more light bulbs in series (one path)?
2. What happened to the current as more light bulbs (resistors) were added?
3. Why did all of the lights go out when you unscrewed one light bulb?
4. For each trial (1, 2, then 3 bulbs connected), compare the total voltage with the voltages at each bulb. What connections can you make?

Series Circuit Practice Problems

1. a) Draw a circuit diagram to include a 30.0-V battery, an ammeter, and a resistance of $10.0\ \Omega$ in series. Indicate the ammeter reading (calculate the current) and the direction of the current.

b) Using the same circuit diagram from above, add a second resistance of $20.0\ \Omega$ in series. Draw this circuit and calculate the new current in the circuit.
2. A $10\text{-}\Omega$ resistor, a $15\text{-}\Omega$ resistor, and a $5\text{-}\Omega$ resistor are connected in series across a 90-V battery.
 - a) Draw a circuit diagram (include an ammeter).
 - b) What is the equivalent (total) resistance of the circuit?
 - c) What is the current in the circuit?