

15 Electrodynamics

Lab D: SERIES CIRCUITS

Name _____

Inquiry Physics

We will now use your new voltmeter and ammeter skills to discover how current, voltage, and resistance operate in any series circuit.

You will be using a series circuit with a power supply set at 3 V and three resistors. Ammeter and voltmeter readings will be taken for each of the resistors and the power supply. **DO NOT EXCEED 3 V ON THE POWER SUPPLY.**

Step 1: Set up the circuit with the ammeter positioned to measure the current entering resistor one (R_1). (See diagram A.) Enter the reading in the " R_1 " row of the table.

Step 2: Move the ammeter to measure the current entering R_2 (diagram B) and enter the reading in the " R_2 " row of the table.

Step 3: Move the ammeter to measure the current entering R_3 (diagram C) and enter the reading in the " R_3 " row of the table.

Step 4: Move the ammeter so that it measures the total current entering the power supply (diagram D) and enter that reading in the "**Measured Total**" row.

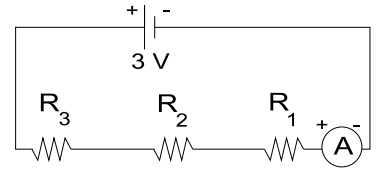


Diagram A

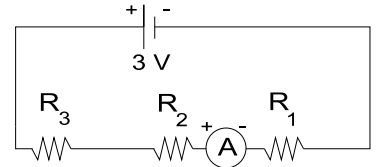


Diagram B

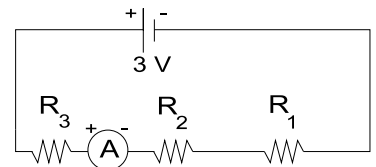


Diagram C

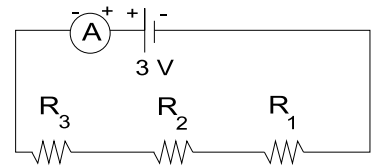


Diagram D

Resistor	Voltage (V)	Current (A)	Measured Resistance (Ω)
R_1			
R_2			
R_3			
Measured Total			

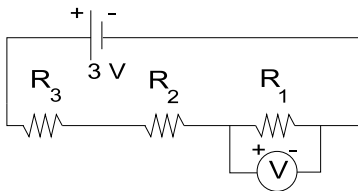


Diagram E

Step 5: Remove the ammeter from the circuit entirely. Now set the voltmeter across R_1 to measure how much voltage it is using or "dropping". (See diagram E.) You are measuring the *voltage drop* across R_1 . Enter the voltage drop in the " R_1 " row of the table.

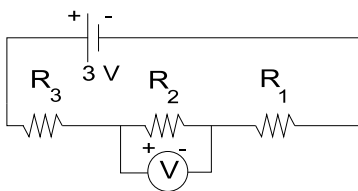


Diagram F

Step 6: Move the voltmeter to measure the voltage drop across R_2 (diagram F). Enter the reading in the " R_2 " row.

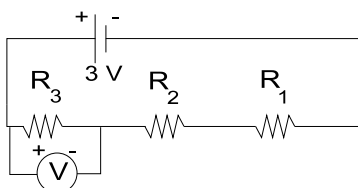


Diagram G

Step 7: Move the voltmeter to measure the voltage drop across R_3 (diagram G). Enter the reading in the " R_3 " row.

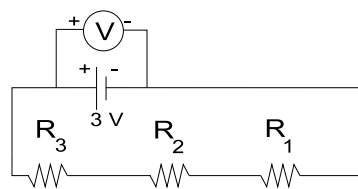


Diagram H

Step 8: Move the voltmeter so that it measures the total voltage provided by the power supply (diagram H). Enter the reading in the "**Measured Total**" row.

Use Ohm's Law to calculate the resistance for R_1 , R_2 , and R_3 . Then use the "Total" voltage and current values to calculate the total resistance of the circuit. Record all of your results in the "Resistance" column of the table.

ANSWER ALL QUESTIONS IN COMPLETE SENTENCES

1. How do the four current readings compare with each other?

2. What does this tell you about the current flowing through each part of the circuit?

3. How do the individual voltages compare with the total voltage?

4. How would you compute the total voltage of a series circuit if you only knew the values of the individual voltages? (Look at your data for a mathematical relationship.)

5. Voltage and energy are proportional. Look at the voltage data for the various individual resistors. Is energy distributed evenly? If not, what seems to make a particular resistor use more energy?

6. How would you compute the total resistance of a circuit like the one you just worked with for **any** number of resistors if you knew the values of the individual resistors? (Look at your data - see the pattern?)

PROPERTIES OF SERIES CIRCUITS

7. You can now formulate the relationships between the **total** and **individual** values for current, voltage, and resistance in any series circuit. Use your answers to questions 1-6 to guide you.

The current: _____

The resistance: _____

The voltage: _____
