

15 Electrical Circuits

Name _____

Lab C: SERIES CIRCUITS

AP Physics B

We will now use your new voltmeter and ammeter skills to discover how current, voltage, and resistance operate in any *series circuit*. A series circuit is one in which there is only one path for the current to follow. All of the circuits we have hooked up so far have been series circuits. You will be using a series circuit with a power supply **set at 3 V**, and three high-power resistors. Ammeter and voltmeter readings will be taken for each of the resistors and the power supply. **DON'T EXCEED 3 V ON THE POWER SUPPLY.**

MEASURING CURRENT

- 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.

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

MEASURING VOLTAGE

- 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.
- Step 6:** Move the voltmeter to measure the voltage drop across R_2 (diagram F). Enter the reading in the " R_2 " row.
- Step 7:** Move the voltmeter to measure the voltage drop across R_3 (diagram G). Enter the reading in the " R_3 " row.
- 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 "Measured 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.

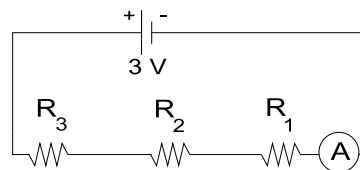


Diagram A

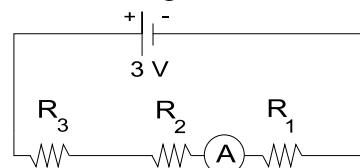


Diagram B

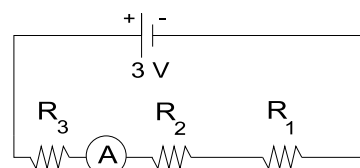


Diagram C

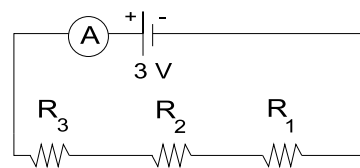


Diagram D

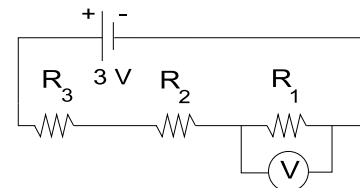


Diagram E

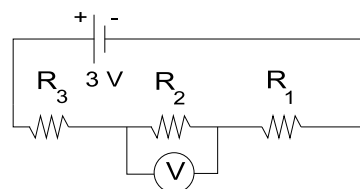


Diagram F

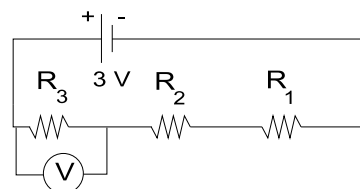


Diagram G

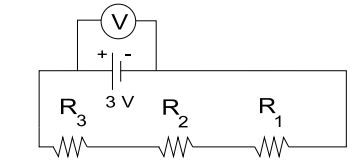


Diagram H

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 to the total voltage?

4. How would you compute the total voltage of a circuit like the one you just worked with if you only knew the values of the individual voltage "drops"?

Voltage is of course the same thing as potential difference. It is also sometimes called the "electromotive force" because it forces the electrons around the circuit. The voltage in a circuit is directly proportional to the energy of the circuit. (Remember that 1 volt = 1 joule/coulomb.)

5. How is the energy distributed in the circuit? Use the voltage data to guide your answer.

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: _____
