Lab 35-1: **Series Circuits**

Purpose:
1. To calculate the voltages and currents for individual resistors in a series circuit.
2. To calculate the equivalent resistance of a series circuit.
3. To determine what happens to voltage, current and resistance in a series circuit.

Equipment:

7 wires	6 alligator clips	one 5-Ω & two 2-Ω resistors
1 ammeter	1 voltmeter	1 power supply

Procedure:

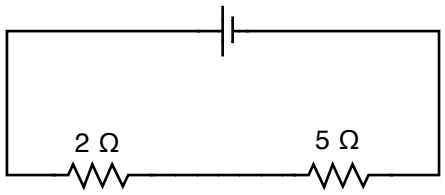
Circuit 1: Two resistors in series.
1. Hook up the circuit shown in the diagram below.
2. Set the power supply for 1 volt. DON'T CHANGE IT ONCE IT IS SET.
3. Measure the current and voltage for the 2 Ω resistor and record in the data table below the diagram.
4. Repeat measurements for the 5 Ω resistor.
5. Measure the total voltage and total current using your portable meters. (This makes sure you use the same devices to measure all the currents and voltages.)

Circuit 2: Three resistors in series.
1. Hook up the circuit shown in the diagram below.
2. Repeat your procedure from Part I, recording your results in the data table below the diagram.

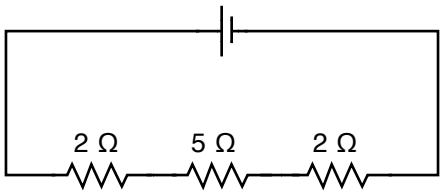
Remember: *Ammeters are connected in series.* *Voltmeters are connected in parallel.*

Diagrams:

Circuit 1



Circuit 2



Data:

Circuit 1		
R	**V**	**I**
2 Ω		
5 Ω		

$\mathbf{V}_{\text{power supply}}$	
$\mathbf{I}_{\text{power supply}}$	

Circuit 2		
R	**V**	**I**
2 Ω		
5 Ω		
2 Ω		

$\mathbf{V}_{\text{power supply}}$	
$\mathbf{I}_{\text{power supply}}$	

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Questions:

1. For each circuit, compare the current from the power supply to the current passing through the individual resistors.

2. For each circuit, compare the total voltage coming from the power supply to the voltages of each individual resistor.

3. Calculate the total equivalent resistance for each circuit by $R_{equivalent} = \frac{V_{power\ supply}}{I_{power\ supply}}$.

4. For each circuit, compare the equivalent resistance just calculated to the individual resistors.

5. In general, what happens to voltage, current, and resistance in a series circuit?

6. What is meant by the term *equivalent resistance*?

Follow Up:

1. A 5 Ω and a 3 Ω resistor are connected in series. There is a current of 2 A passing through the 5 Ω resistor.
   a. What is the total resistance?

   b. What is the current in the 3 Ω resistor?

   c. What is the voltage across each resistor?

2. The total resistance of two resistors is 15 Ω. If one of the resistors is 10 Ω, what is the second resistor?

3. A 20 Ω and a 30 Ω resistor are in series. There is a potential difference of 40 V across the 20 Ω resistor.
   a. What is the current through the 20 Ω resistor?

   b. What is the voltage across the 30 Ω resistor?