Series Circuits
PSI Physics

Name_____   Date:_____ Period:_____

Objectives:

- Measure and calculate voltage drops across any part of a series circuit
- Measure and calculate the current through any part of a series circuit
- Find the equivalent resistance for a series circuit
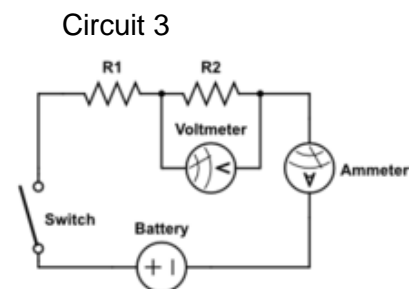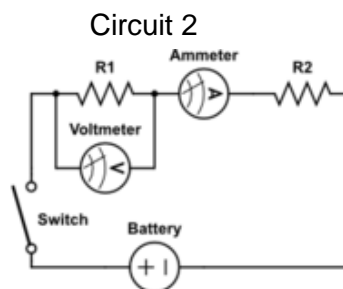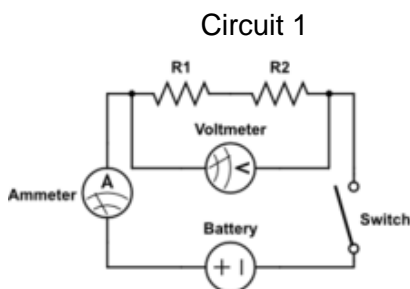
Materials:

- Battery (or DC Power Source)
- Connecting wires
- Two resistors
- Knife switch
- Ammeter
- Voltmeter

Series Circuits

Series circuits are circuits where all the resistors are along one path that has no branches.
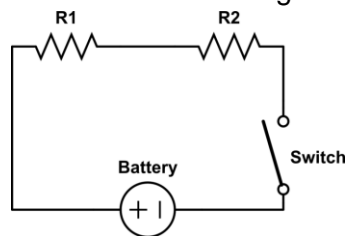
Procedure: For each of circuits 1, 2 and 3 below:

1. Construct the circuit. Make sure that the ammeter is in line with the resistors, and that the voltmeter is connected as shown.
2. Record the current and voltage drops.

Data:

Circuit 1		Circuit 2		Circuit 3	
I	V	I_1	V_1	I_2	V_2

Analysis:

Use Ohm's Law to calculate the resistance for each circuit.

Resistances		
Circuit 1	Circuit 2	Circuit 3
$R_{equivalent} = \dfrac{V}{I}$	$R_1 = \dfrac{V_1}{I_1}$	$R_2 = \dfrac{V_2}{I_2}$

Use the information in the Data Collection and Analysis Tables to answer the following questions:

1. How is the current, I, related to the other two currents, I_1 and I_2? Write an equation that describes the relationship.

2. How is the voltage, V, related to the other two voltage drops, V_1 and V_2? Write an equation that describes the relationship.

3. How is the equivalent resistance, $R_{equivalent}$, related to the two resistances, R_1 and R_2? Write an equation that describes the relationship.

4. A 9V battery is connected to two resistors in series ($R_1 = 12\ \Omega$ and $R_2 = 33\ \Omega$).
    a. What is the equivalent resistance, $R_{equivalent}$, for the circuit?

    b. What is the current, I, through the circuit? (use V = IR)

    c. What is the voltage drop, V_1, across resistor R_1? (use V = IR)

5. If you add a third resistor in series with the other two…

    a. Will $R_{equivalent}$, increase, decrease or stay the same? Why?

    b. Write the equation for $R_{equivalent}$ for three resistances (R_1, R_2, and R_3) in series.

    c. Does V, the voltage drop across all the resistors, increase, decrease or stay the same? Why?

    d. Does I, the current through the circuit, , increase, decrease or stay the same? Why?

    e. Does the voltage drop across R_1 , increase, decrease or stay the same? Why?