PHYSICS

ELECTRIC CIRCUITS

ELECTRIC CIRCUITS

An electric circuit is a complete continuous path of electrons. An ***OPEN CIRCUIT*** is one where electrons ***are not*** flowing. A ***CLOSED CIRCUIT*** is one where electron ***are*** flowing.

Current Electricity

There are two types of current electricity: ***DIRECT CURRENT (DC)*** and ***ALTERNATING CURRENT (AC)***.

DIRECT CURRENT (DC):

ALTERNATING CURRENT (AC):

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Schematic Diagrams

A schematic diagram is a representation of an electric circuit. Symbols are used to describe the various ***elements*** of a circuit. In order for a circuit to be complete it needs at least the following three elements:

1.
2.
3.

Example of a Basic Circuit

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SERIES CIRCUIT

In a series circuit, electrons only have ***one path*** to follow. A series circuit is also known as a ***collapsible circuit*** due to the fact that if the circuit is open at any point, then current will cease to flow. Because of this, series circuits are rarely used in homes or other buildings.

PARALLEL CIRCUIT

In a Parallel circuit, electrons have ***many paths*** to follow. This allows for more flexibility in the creation of your circuits and maintains flow if there is a break in the circuit. Most modern homes use parallel circuitry. However, creating multiple paths for electrons to flow requires more conductors. Wiring your house this way will cost more money.

Parallel circuits are also more efficient at utilizing voltage (energy). In a parallel circuit, it would take 60 V to light up three 60 V light bulbs. In a series circuit, it would take 180 V to light up the same three 60 V light bulbs.

SERIES CIRCUIT **vs** **PARALLEL CIRCUIT**

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METERS

Amp Meter

An amp meter is used to measure current throughout a circuit. That is, it is measuring the number of electrons passing through a specific point in the circuit every second. In order to do this it has to be a part of the circuit itself. This means that an amp meter has to be connected ***in SERIES***.

Volt Meter

A volt meter is used to measure voltage throughout a circuit. This is also called ***potential difference*** or ***potential drop***. In order to do this the meter takes a reading of voltage before and after some point in the circuit. It then measures the change in energy of the electrons around that certain point. This means that a volt meter has to be connected outside of the circuit or in ***PARALLEL***.

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FUN WITH CIRCUITS

1. Build a ***SERIES*** circuit with 2 resistors.
   Turn it on to make sure it works. Then:
   - **(a)** Calculate the total resistance of the circuit.
   - **(b)** Based on your total resistance (R_T), and the voltage setting of the power source (V_T), calculate total current (I_T) using Ohm's Law
   - **(c)** What is the current (I_1) just behind R_1?
   - **(d)** What is the current (I_2) just behind R_2?
   - **(e)** How does I_1 and I_2 compare to I_T?
   - **(f)** What is the voltage (V_1) around R_1?
   - **(g)** What is the voltage (V_2) around R_2?
   - **(h)** How does V_1 and V_2 compare to V_T?

2. Build a ***PARALLEL*** circuit with 2 resistors.
   Turn it on to make sure it works. Then:
   - Repeat steps **(a)** to **(h)**

3. **Write a summary of all your findings comparing Current, Voltage, and Resistance in a series and parallel circuit and hand it in to Mr. Caslick for marks.**

4. **Make a super circuit to involve all groups.**

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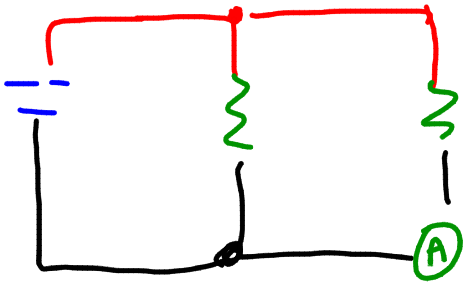
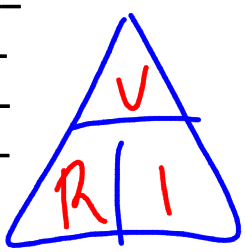
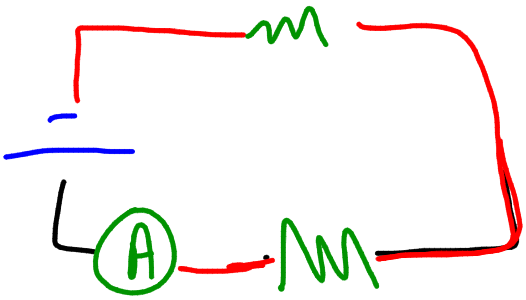
CIRCUITS LAB

Parallel Circuit



- The total voltage of the circuit is $V_T = 12V$
- The First resistor has a resistance of $R_1 =$ _____
- The second resistor has a resistance of $R_2 =$ _____
- The circuit has a resistance of $R_T =$ _____
- Figure out the Current using Ohm's Law $I_T =$ _____
- Convert Current to milliamps by X 1000 $I_T =$ _____





- Measure the current behind first resistor $I_1 =$ _____
- Measure the current behind second resistor $I_2 =$ _____
- How does I_1 and I_2 compare to I_T? _____
- Find the voltage around the first resistor $V_1 =$ _____
- Find the voltage around the second resistor $V_2 =$ _____
- How does V_1 and V_2 compare to V_T? _____

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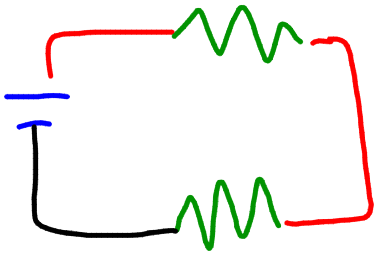
CIRCUITS LAB

Series Circuit



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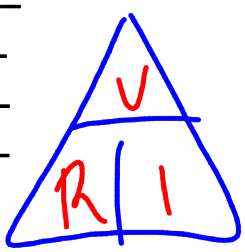

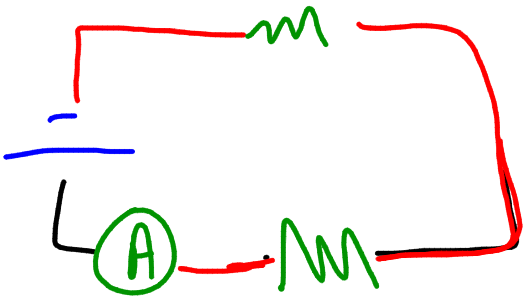

- Measure the current behind first resistor $I_1 =$ _____
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- Find the voltage around the first resistor $V_1 =$ _____
- Find the voltage around the second resistor $V_2 =$ _____
- How does V_1 and V_2 compare to V_T? _____