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# DC Circuits: Resistors in Series and Parallel

Night Lab 4

## Objective

I can describe the equivalent resistance in a circuit by calculating the voltage drop and current across each resistor in different circuit configurations such as series and parallel configurations.

## Pre-lab Questions

1. What is Ohm's Law?

   V=IR

2. How much current does it take to cause electrical burns if your skin is dry? What about if your skin is wet? (Be safe in the lab: leave the food/drinks at your desks while we work with circuits!) You can look this up.

.2 amps .002 amp

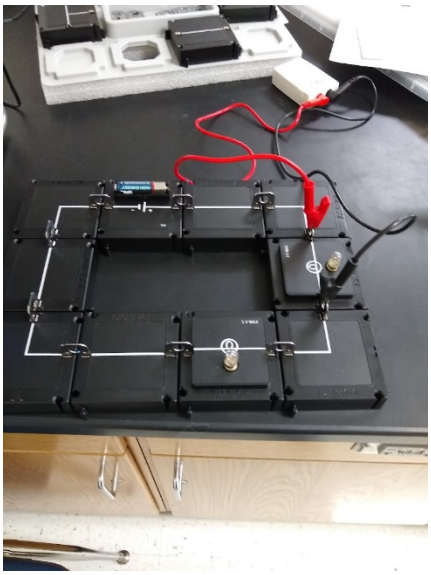
3. What are examples of resistors in everyday life?

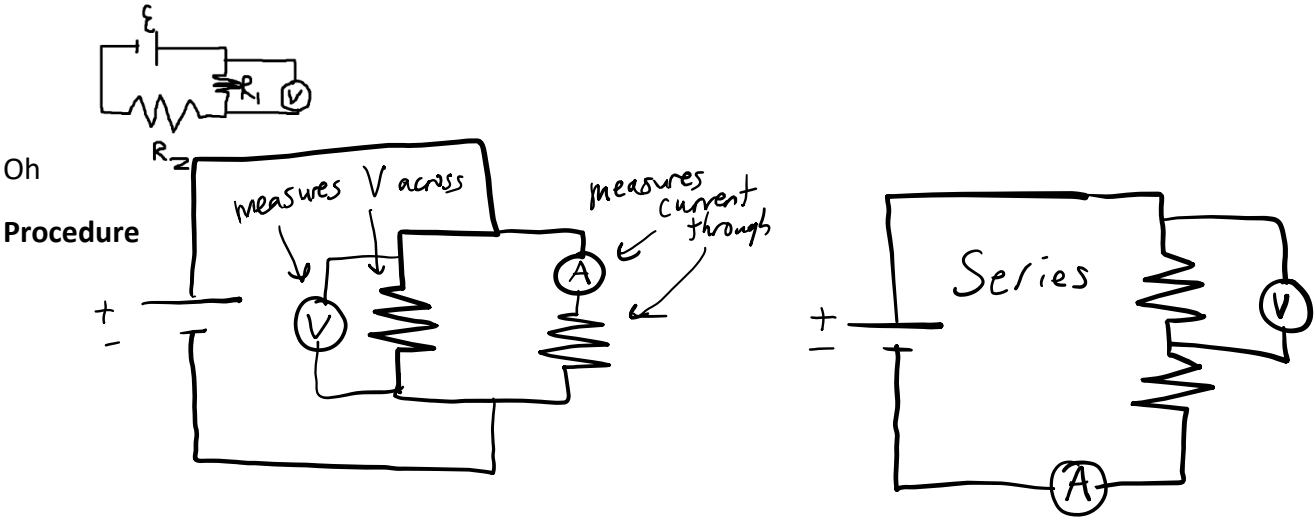
Incandescent light bulbs, almost every PCB

## Materials

- Circuits kit with voltmeter and ammeter
- PASCO Capstone

The circuit below corresponds to the drawn circuit diagram.



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**Procedure**

You will want at least one circuit with 3 resistors in series and one with 3 circuits in parallel. Circuit diagrams show examples for both (series on the right, parallel on the left) with 2 resistors each. Measure the voltage and current across each resistor and filling in the tables below.

The first time you use the voltmeter and the first time you use the ammeter, you will need to turn them on (hopefully obviously lol). When you are done with the lab, please turn off both sensors and remove the battery from its holder. We don't want leaky batteries in here…

**Results and Discussion**

Fill in the tables for your results and discuss them, comparing them with the theory. Describe possible sources of error that may be present in the lab. Which quantities are the same through each resistor compared to the total circuit (across the battery)? Why might this be?Current is a quantity that stays the same the reason why I think this is is because of the resistance. It stops

the flow of charge because all of the resistors are concurrent in the circuit. This is different that the parallel because they don't act in concurrence. Some errors could have been measurement and just the quality of the equipment For the series in parallel the currents about add up to the current of the ideal battery.

**Table 1.** Data for Series circuit.

| **Total Battery Voltage (ideal) (V)** | 1.44 | | |
|---|---|---|---|
| **Measured Current through battery (A)** | 0.0191 | | |
| | **Resistor 1** | **Resistor 2** | **Resistor 3** |
| **Given Resistance (ohms)** | 10 | 33 | 100 |
| **Measured current (A)** | 0.191 | 0.191 | 0.191 |
| **Measured voltage (V)** | 0.022 | 0.365 | 0.992 |
| **Loop Rule: $V_1+V_2+V_3=?$** | 0.191(10+33+100)=2.7313 | | |
| **Percent difference between Loop Rule and ideal battery voltage** | 89.67% | | |

**Table 2.** Data for Parallel circuit.

| **Total Battery Voltage (ideal) (V)** | 1.35 | | |
|---|---|---|---|
| **Measured Current through battery (A)** | .151 | | |
| | **Resistor 1** | **Resistor 2** | **Resistor 3** |
| **Given Resistance (ohms)** | 10 | 100 | |
| **Measured current (A)** | 0.127 | 0.018 | |
| **Measured voltage (V)** | 1.3 | 1.3 | |
| **Junction Rule: $I_1+I_2+I_3=?$** | 0.127+0.018=0.145 | | |

| | |
|---|---|
| **Percent difference between Junction Rule and current through battery** | 3.98% |

**Post-Lab Questions**

1. Which values contribute to the **resistivity** of an object (not resistance, they are two separate things)? Look this up. How might this contribute to sources of error in the lab?
   The temperature of the object, as the resistor dissipates power it's resistivity drops since the electrons get more excited.
2. Why might we want to have a resistor in a circuit when we want to charge a capacitor?
   To prevent short circuits since there is a component using power
3. Consider the circuit below. Which resistors have the same current across them? Which ones have the same voltage drop?
   R3/R4 have the same current, R2, R3, R4 have the same voltage