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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? Does every object with resistance follow Ohm's Law?
   $$V = IR$$
   no
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.
   I couldn't find it sorry.
3. Prediction: If you add two resistors in series, what do you expect to happen to the total (equivalent) resistance of the circuit? Why?
   They add up to a total resistance because there is more resistance
4. Answer question 3 but for two resistors in parallel. Remember, this is just a prediction.
   Resistance would decrease
5. What are examples of resistors in everyday life?
   Light bulb

Materials

- Circuits kit with voltmeter and ammeter
- PASCO Capstone

The circuit below corresponds to the drawn circuit diagram.

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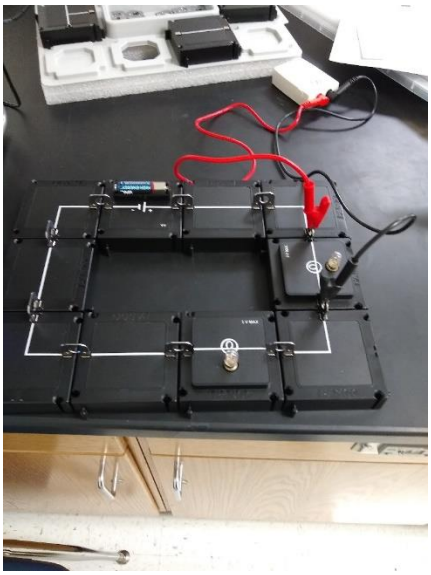
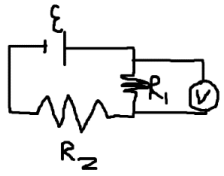
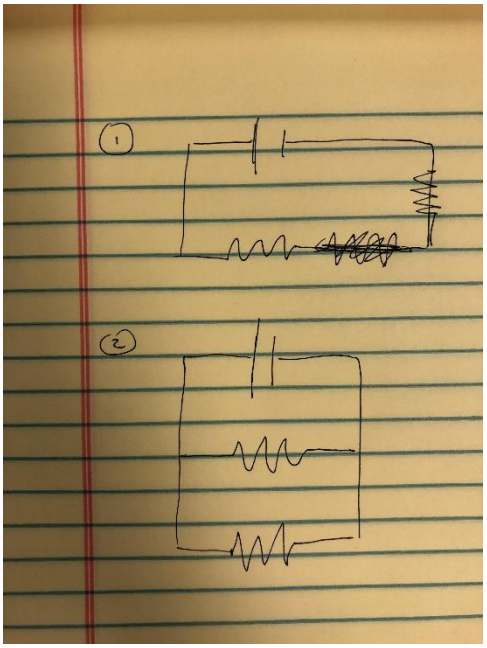




Procedure

Draw circuit diagrams and include them here (you can use paper and upload pictures). List any other important steps needed to reproduce your results.



For your results, you will want at least one circuit with 2 resistors in series and one with 2 circuits in parallel. You will determine how to connect your resistors in these ways and design your own circuits.

You will be measuring 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 and connect them to your laptop via Settings -> Devices and via Bluetooth. Then, you also have to connect them IN Capstone using the wireless device setup.

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?

Table 1. Data for Series circuit.

Total Battery Voltage (ideal) (V)	1.5	
Measured Current through battery (A)	.030	
	Resistor 1	**Resistor 2**
Given Resistance (ohms)	10	33
Measured current (A)	.031	.030
Measured voltage (V)	.297	.962
Loop Rule: $V_1+V_2=?$	1.259 V	
Percent difference between Loop Rule and ideal battery voltage	16.07%	

Table 2. Data for Parallel circuit.

Total Battery Voltage (ideal) (V)	1.5	
Measured Current through battery (A)	.195	
	Resistor 1	**Resistor 2**
Given Resistance (ohms)	10	33

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Measured current (A)	.120	.115
Measured voltage (V)	1.180	.035
Junction Rule: $I_1+I_2=?$	0.215 A	
Percent difference between Junction Rule and current through battery	10.2%	

Post-Lab Questions

1. Which values contribute to the **resistivity** of an object (not resistance, they are two separate things)? How might this contribute to sources of error in the lab?
   Material that the object is made of, temperature, age. This could effect the resistance of the resistors we used in the lab, changing the expected calculated values compared to the actual.
2. Speculate: can the resistance of objects change with temperature?
   Yes, increase temperature decreases resistance
3. Why might we want to have a resistor in a circuit when we want to charge a capacitor?
   If no resistor, capacitor will charge instantaneously!!!