Name: Tom Ralph
Class: Physics II AP
Period: 2
Group #: 6
Lab # and Title: #11- Voltage Divider and Variable Resistance

Laboratory Report

Purpose
To determine variable resistance using a voltage divider and a variable resistor

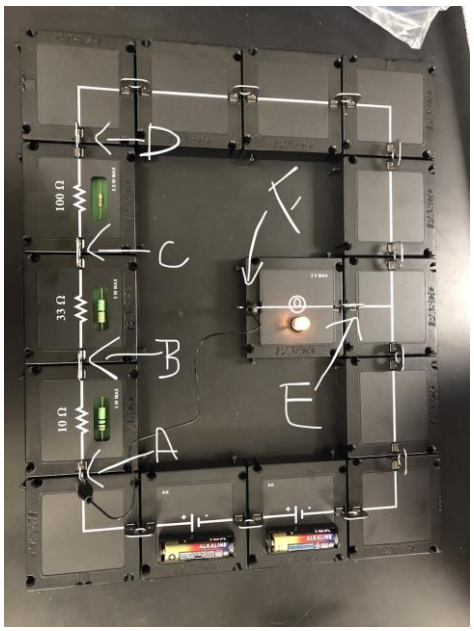
Equipment Used
PASCO Circuit board kit, PASCO Voltmeter, Sparkvue App, Red and Black Cables

Background
Common batteries provide voltages in 1.5 V increments. This is fine if you want voltages with values of 1.5 V, 3.0 V, 4.5 V, and so on, but what if you wanted a voltage in between those values? This can be done by varying the resistance in a circuit. In this investigation, you build circuits with variable resistances using a voltage divider and a variable resistor (potentiometer).

$\Delta V = IR$

Procedures
<u>Part 1: Voltage Divider</u>

1. Build the circuit depicted in the picture below



2. Use the jumper wire to connect the light bulb to point A and F. Observe the brightness of the bulb - repeat for B, C, D.
3. Then, remove the jumper wire and lightbulb from the circuit

4. Use the voltage sensor from the PASCO kit and the red and black cables - attach them to the voltage sensor
5. Open the Sparkvue app and connect the voltage sensor to it
6. Attach the black cable to point E and the red cable to point A on the circuit as indicated by the diagram below

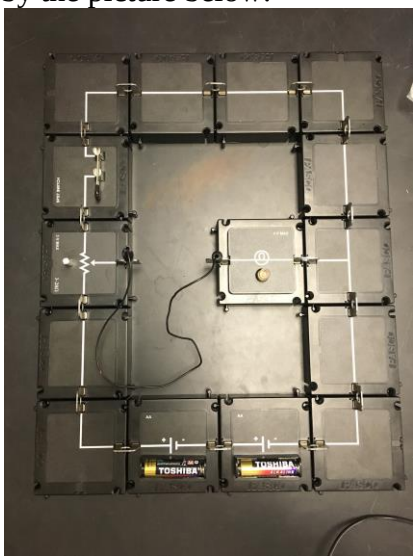
7. Connect the red probe to points A, B, C, and D on the circuit and record the voltage using the Sparkvue app (under templates, use “digits” to observe the voltage)

8. Record your data on the table below

Point	Voltage (V)
A	2.896
B	2.690
C	2.104
D	0.008

Part 2: Variable Resistor

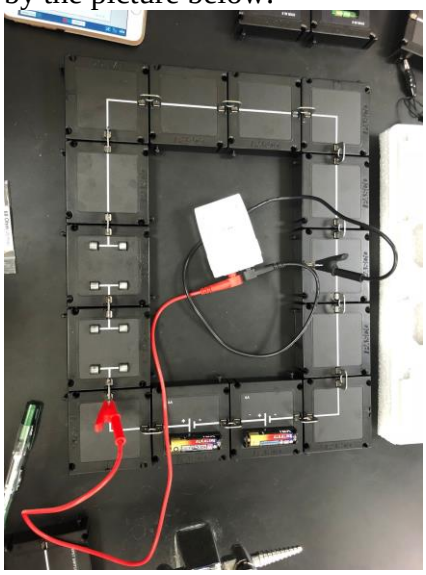
1. Build the circuit as depicted by the picture below:



2. Use the jumper wire and connect it from the end of the light bulb to the potentiometer (block with the arrow)
3. Begin turning the knob and observe the brightness of the bulb
4. Use observations found for the analysis questions

Part 3: Variable Resistance

1. Build the circuit as depicted by the picture below:



2. One of the resistors that we will give you is 68 Ohms.
3. Find one of us and ask us for a second resistor you would like to test out. Try to find the correct resistor that will give you a voltage difference of 2V. Your options are 33 Ohms, 470 Ohms, 150 Ohms, and 100 Ohms.
4. Use Sparkvue to determine if your answer is correct.
5. If not, keep testing different resistors.

Analysis Questions

Part 1 - Voltage Divider:

1. What relationship did you notice between the location of the jumper wire (or resistance value) and the voltage?

The more resistors in the circuit, the dimmer the bulb glows

Part 2 - Variable Resistor:

1. What happened to the brightness of the light bulb when you twist the voltage divider counter clockwise (towards the positive end of the battery)? How about clockwise (towards the negative end of the battery)?

Turning towards the batteries made the bulb brighter and turning away made it brighter.

2. What accounts for this difference in brightness? What real life application can be used for this scenario?

Turning the knob increased the voltage in the circuit, this could be used in a dimmer for an overhead light or for temperature of an oven

Part 3 - Variable Resistance:

1. According to the total resistance of the two resistors that you used during the experiment, what is the total current of the circuit, given that the voltage of the battery is 3V?

   3v / 100Ω = 0.03A

2. Find the ratio of R1 to R2 and V1 to V2. How do they compare?

   2:1

3. What would happen to the ratio of R1 to R2 be if the voltage drop across R1 is 2.5 V, assuming that you used two new resistors to achieve this voltage drop while keeping the total resistance the same?

   5:1