Siddharth Rane

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Course: Physics 208

Section: ST5

Lab #5: Currents

The purpose of this lab is to understand the resistance in wires and learn about the measurement tools such as the multimeter, oscilloscopes and function generators. Before going straight into resistance, there are some concepts that need to be introduced. The first concept is current. This is the amount of charge passing through a conductor in a given amount of time. Resistance is the measure of the degree to which a conductor opposes an electric current through that conductor. Voltage is the difference in potential between two conductors. These three concepts are all related to each other through one equation called Ohm’s law, V = IR.

Procedure:

In this lab, we are given an oscilloscope, signal generator, rheostat, long wire assembly, capacitor, multimeter, banana cables and a dc cable assembly. We first measured the voltage coming from the wall. We then measured the resistance of a rheostat using a multimeter to find out when there is no resistance and when there is a 10-ohm resistance. We then measured resistance of the wire on the track. We then set up a complicated circuit to find out the total resistance applied. We set the ammeter to measure current that was flowing through the entire circuit as well. We also set up another experiment to find out the voltage at certain points throughout the wire. We noticed over time that the voltage increased as we changed the position of the metal slider in 10cm increments. We then obtained a table of data.

For the first experiment, the voltage coming out of 3 prong DC wall plug was measured using the multimeter. A plug was inserted into the wall and the two ‘banana’ plugs coming out of the DC cable was inserted into the multimeter. The VDC symbol was selected on the multimeter which reads the voltages coming out of the cable. The reading was recorded making sure it gives a positive value.

5.221V

Next, to measure the resistance, the multimeter was set into the resistance measuring mood (Ω). Then, the ‘banana’ cables were used to measure resistance of the little resistor on the given board.

For the next part, resistance of a rheostat was measured. Rheostat is a type of resistor in which the internal resistance can be changed by turning the dial. This this part of the experiment, the banana plugs from multimeter were collected with the rheostat to measure the resistance. The knob was being turned to read the maximum and minimum resistance present in the rheostat.

For this part of the experiment, resistance of one metal wire on the long board was measured using the multimeter by placing banana plugs anywhere on that wire.

Ohm’s Law was used to measure current for the following questions.

* What will be the current if 5 volts applied across a resistor of 1 ohm?
* What will be the current if 5 volts applied across 0.1 ohm resistor?

For the next part of the experiment, a complicated circuit was made using one of the long metal wire, a switch, a rheostat and collection from the DC wall outlet. Connection between all the elements were made using the banana plugs doing from one object to another. For our experiment, plugs were connected going from one end of the wire to the switch. One plug from DC wall outlet connecting the switch, another the rheostat, and a plug going from the other end of the rheostat to the other end of the wire. the rheostat was set to maximum resistance. The multimeter was used to measure the resistance on this wire.

If 5 volt are applied to the total amount of resistance, the current expected should be:

Next the actual current present in the wire was measured by using the multimeter. First it was set to measure current, A. one banana cable was placed in the COM and the other one in 10 A socket. The switch was closed, and the current was measured

EXPERIMENT 2:

For this experiment, voltage drop along the rheostat and wire was calculated based on total current passing through the circuit and Ohm’s law.

Using the multimeter, voltage based on certain position along the wire was measured.

Questions and Data:

**Table 1: Position(m) vs. Voltage(V)**

|  |  |
| --- | --- |
| Position (m) | Voltage (v) |
| 0 | 0.016 |
| 10 | 0.104 |
| 20 | 0.192 |
| 30 | 0.281 |
| 40 | 0.368 |
| 50 | 0.457 |
| 60 | 0.545 |
| 70 | 0.633 |
| 80 | 0.72 |
| 90 | 0.806 |
| 100 | 0.895 |

**Graph 1: Position(m) vs. Voltage(V) Graph**

Physics 208 lab5  
Data for section XB2 bench 04  
Lab Partner 1: Siddharth Rane  
Lab Instructor: Cai  
Lab finished: Wednesday 6th of November 2019 05:40 PM  
DC Wall Voltage: 5.221 V  
Min Rheostat Res: 5.6 Ohms  
Max Rheostat Res: 5.6 Ohms  
Long wire Res: 3.0 Ohms  
Total Resistance of Your Circuit: 18.6 Ohms  
Predicted Current: .269 Amps  
Measured Current: 0.297  
Voltage Drop Rheostat: 4.633  
Voltage Drop Wire: 0.891

REPORT QUESTIONS:

1. What is that wire made of?

The wire is made of Carbon graphite because the density of the material is between

1. Why does the wire exist?

This wire exists because carbon graphite is a conductive material. I was unable to find what application exists for this type of wire, maybe because we calculate the material of this wire wring due to some error happened during the experiment.

Conclusion:

In this lab I learned how a multimeter works and how to use it effectively to measure resistance, voltage and current. I learned how a switch works in a circuit and that wrong connections can created a short circuit. I found it bizarre how there was resistance on the wire across the track. I assumed even if there was resistance, it should have been very minimal, but it was significantly large, a total of 3 ohms. One challenge was recording the exact value for certain things. Because the current from the outlet was not consistent, the values kept changing for the current and voltage. The faulty equipment also played a part into measuring accurate readings. The actual resistor was broken so we used the box that created resistance within itself. If we had new equipment, we would not run into these problems.