

## How a filament light bulb effects current and voltage

### **Prediction:**

My prediction is that the first experiment I will do which is the fixed resistor will follow ohms laws correctly. In the second experiment I will change the fixed resistor with a filament light bulb, this experiment will not follow the rules of ohms law.

### **Back ground information:**

States that the steady electrical current in a metallic circuit is directly proportional to the constant total electromotive force in the circuit. If a current  $I$  flows between two points in a conductor across which the potential difference (voltage) is  $E$ , then  $E/I$  is a constant (which is know as the resistance,  $r$ , between the two points). Hence  $E/I=r$ . Equations relating  $E$ ,  $I$  and  $R$  are often quoted as ohm's law, but the term 'resistance' did not enter into the law as originally stated. *From the Hutchinson Encyclopedia.*

### **Equipment list:**

The equipment I used were these:

- Power pack
- Wires
- Voltmeter
- Ammeter
- Variable resistor (rheostat)
- Fixed resistor
- Filament light bulb

### **Diagrams:**

This is the first diagram of the first test,  
This has the fixed resistor in it, the  
diagram contains:

- Power Pack
- Fixed resistor
- Variable resistor (rheostat)
- Voltmeter
- Ammeter

This is the second diagram of the  
second test, this has the filament light  
bulb in, this contains:

- Power pack
- Filament light bulb
- Voltmeter
- Ammeter
- Variable resistor

### **Safety**

As always when conducting any experiments coats and excess equipment must be safety out of reach under tables or in cupboards away from the working area. Make sure that no water comes into contact with electrical equipment and hands are dry ro prevent possible electrocution.

### **Method:**

- 1Collect all the equipment- wires, power pack etc
- 2Set the equipment up shown in the diagrams
- 3Turn the power pack on and take the measurements of the
- 4voltmeter and the ammeter
- 5Turn the power pack off move the variable resistor
- 6Repeat this 7 times to make the experiment fair

7 Now swap the fixed resistor with a filament light bulb  
8 Take the readings as before and turning it on and off like before and repeat this 7 times.

**Fair Testing:**

To make this test fair I am going to repeat the test 2 times. This will show up any problems with the results. I will also move the arm on the rheostat the same distance each time on the each test I do e.g. 5cm. I will also make sure the rheostat doesn't get too hot because that will change the outcome of the results, I will stop this happening by turning off the power each time I am not taking a reading from the voltmeter or ammeter

**Obtaining Evidence:**

The way I will go about obtaining the evidence will be by waiting for the voltage and current to settle down so to be able to read the best possible result.

I was pleased to see my prediction was true, the fixed resistor did follow ohms law plus the filament light bulb broke ohms law like I said it would. In my group I had David turning the power on and off and moving the rheostat, Jamie reading the results and telling them to me and I wrote them down.

The table is an example that I will use:

Voltage (v)	Current (A)	Voltage/Current
0.5	0.5	3.92

**Results:**

Voltage	Current (A)	Resistance
0.5	0.1	5
1	0.2	5
2	0.4	5
3	0.6	5
5	1.0	5
7	1.6	5

The results for the fixed resistor were easy to find out and we had no problems with getting the results. As already stated, I said before my predictions were correct.

Voltage (V)	Current (A)	Resistance
0.5	0.1	5
1	0.2	5
2	0.38	5.3
3	0.44	6.8
5	0.49	10.2
7	0.51	13.7

The results for the filament light bulb were also easy to get as we had no problems with anything. My predictions were correct.



### **Conclusion:**

The tests went well we had no major problems with obtaining the results that we have. However setting up the equipment took longer than expected because of the different connections that have to be made and getting it ready to start the experiments, I am sure our equipment was set up correctly because we asked the teacher to check and we had no problems there.

Our quality of evidence is all fine there are no anomalies with it. I know this because we compared our results against others that were completed the same day. They were mostly the same

I could improve the experiment by changing the way in which things are carried out like: having a ruler to check how far to move the arm over the rheostat, e.g. 5cm each time. As some of the class had to take the same results over 1-2 lessons make sure each time they did the tests they used the exacted same equipment. E.g. ensure that equipment is in a named tray. These would ensure a fair test.

The things I have found are that ohms law can be broken by a filament light bulb but a fixed resistor will not break ohms law.

### **Evaluation:**

I think my results are accurate enough to be used as examples. This means they are good enough to go on the internet or in books supporting ohms law.

The procedure went well and there were no problems with the result gathering Which were accurate I think the experiment could

be made faire by measuring the length that the arm was moved on the rheostat each time and making sure that you use the same exact equipment each time as well if you had to record the results over 2 lessons.

The improvements I would make are to have more time collecting more evidence to make the test fair. This would include the improvements I have suggested measuring the distance you move the arm on the rheostat each time and having more time to complete the test but within the same day.