BIRZEIT UNIVERSITY
Physics Department

Physics 112

Experiment No. 1

Linear and non-linear components

Student's Name: Mohammad Sheikh Student's No.: 1221541

Partner's Name: Mousa Suhaib Partners' No.: 1210143

Instructor: Shayma' Salama Section No.: 6

Date: 12-10-2023

– Abstract:

1) The aim of the experiment:

To check whether the (carbon resister , Si diode , Light bulb) are linear or non-linear conductors.

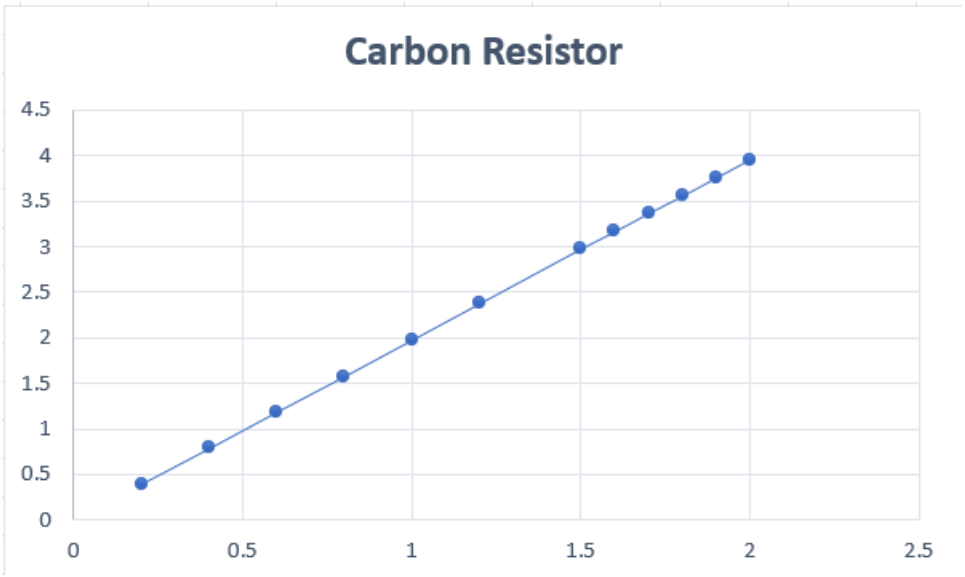
2) The method used:

is direct measurements of Voltage and electrical current through those components , then doing the proper calculations.

3) The main results are:

The resistor is linear component , whereas the diode and the light bulb aren't .

I



V

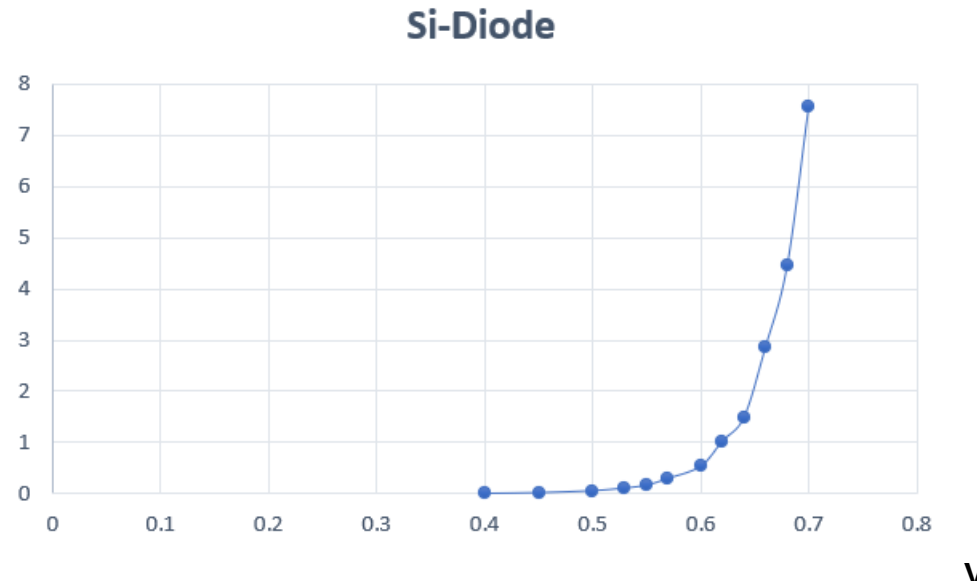
We conclude from the figure that the relationship is linear .

Calculation for Carbon Resistor:

The Slope (Resistance):

$$R = \frac{V_2 - V_1}{I_2 - I_1} = \frac{2 - 0.2}{3.96 * 10^{-3} - 0.40 * 10^{-3}} = 505.6$$

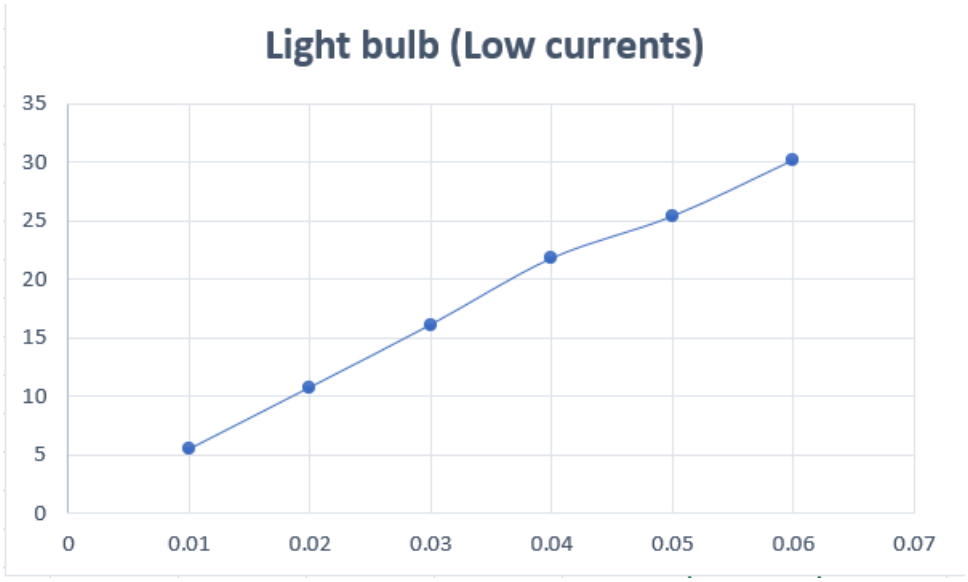
I



V

This is graph for Si diode . And we conclude from the figure that the relationship is non-linear .

I



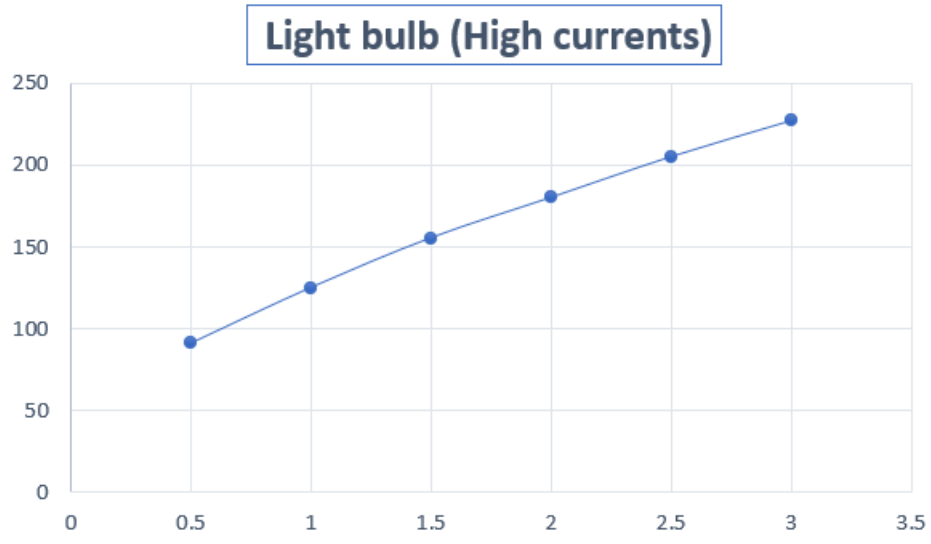
V

We conclude from the figure that the relationship is linear.

− Calculation for Light Bulbs (Low Currents):

$$R = \frac{V_2 - V_1}{I_2 - I_1} = \frac{0.05 - 0.01}{25.4 * 10^{-3} - 5.47 * 10^{-3}} = 2.007$$

I



V

We conclude from the figure that the relationship is non-linear.

− Calculation for Light Bulbs (High Currents):

$$R = \frac{V_2 - V_1}{I_2 - I_1} = \frac{3.0 - 0.5}{227 * 10^{-3} - 90.9 * 10^{-3}} = 18.36$$

– Calculation:

− The calculations for Temperature of the Lamp :

$$R = R0\,[1+\alpha\,(T-T0)]$$
$$18.36 = 2.007\,[1+(4.5 * 10^{-3}) * (T-20)]$$
$$T = 1827.24$$

And under each graph you find a calculation .

– Results and Conclusion:

- The value of the resistance that we got experimentally , is quite reasonable , since it comes within the range of value we obtained from the color code. R=510
- The carbon resistor is a linear component .
- The diode is non-linear.
- The light bulb with high current non-linear while starting to turn on because of the increase of temperature, and then obtains a linear resistance after a while , but light bulb with low current linear .

So , the Diode and the light bulb are non linear components , and don't obey Ohm's law.