**Abstract:
\* The aim: is to examine the I-V characteristic for different elements (resistance, diode, light bulb) and determine whether they are linear or non linear circuit components.
\* The method used: by connect the circuit (Fig.4) then reading different measurements of the current passing through the circuit and the voltage difference between its terminals (by changing the variable resistance) and plotting the different measurements into a graph.
\* The main result :
R ( carbon resistor ) = 275
R ( diode ) =25
R ( bulb ) =5

Theory:
The I-V characteristic is the relation between the current passing through a circuit and the voltage difference between its terminals. Component which have strait line I-V are called linear and that the slope of that line is (1/R) and that this element obeys ohms law (V=I\*R).(example the carbon resistors) . in the other hand the component that haven’t process strait line I-V are called non-linear, we conclude that components of that circuit are linear If the plot of the I-V characteristic wasn’t a straight line then the components of that circuit are non linear components. And that resister doesn’t obey ohm’s law. (Example the diode, light bulb).
The diode
It consists of two pieces:
1- p-type piece of a semi conducting material. 2- n-type piece of the same material.**

 **Diodes are two terminal components that allow the current to pass through in one direction and if the diode parts were reversed there won’t be a passing current.
The ways to connect the diode
A) the forward-biased :by connecting the p-type terminal of the diode to the positive terminal of the battery.
The reverse-biased: by connecting the n-type of the diode to the positive terminal of the battery in this way the diode blocks the current so that parts of micro amperes pass through the circuit.
We can relate the current passing through a diode and the potential difference by the equation I=I0 (ev/k -1).
Light bulb
Is an example of an element that possesses linear components and non linear components.
The resistance of the light bulb depends on the temperature according to the equation:
R=R0 {1+α(T-T0 )}
R0 is the resistance at temperature T0. α is the coefficient of the resistivity.

Procedure:
1. we connected the circuit as in Fig .4
2. we have used the value of (Rv) and record the value of the current passed through it ,and we have the potential difference between its terminals.
3. we have repeated part 2 by using forward-bias diode once then we taken the required megarments.**

 **Data:
Data read from the resistor of 270 :
I(mA) 21.3 19.0 17.3 16.1 15.0 13.6 12.5 11.9
V(v) 5.6 5.0 4.5 4.2 3.9 3.6 3.3 3.1

Data read from the light bulb:
I(mA) 40.1 53.7 81.9 91.2 169.6 188.0 289.2
V(v) 0.04 0.06 0.11 0.15 0.79 0.91 2.47

Data read from the forward biased diode:
I(mA) 31 15.5 7.8 3.9 1.6 1.3 1.0 0.8 0.7 0.6 0.5 0.3 0.2
V(v) 0.73 0.7 0.66 0.63 0.58 0.57 0.56 0.56 0.55 0.54 0.53 0.51 0.49

Calculations:

• From the graph of the resistor :
Slope = ∆y /∆x = (21.3-17.3) \*10-3 /(5.6-4.5) =3.64\*10-3 -1
R = 1/slope = 274.72 275
IAverage = 15.84 mA , ∆I = 3.26mA
VAverage = 4.15V , ∆V = 0.86 V
∆R/R = ∆V/V + ∆I/I
∆R = R (∆V/V + ∆I/I) = 113.58 114

• From the Graph of the light bulb:
Slope(1) = 0.127 -1
R1 = 1/slope1 = 7.85**

 **Slope(2) = 0.68 -1
R2 = 1/slope2 = 1.47
Raverage = 4.66 5

• From the Graph of the forward biased diode :
Slope(1) = 0.31 -1
R1 = 1/slope1 = 3.26
Slope(2) = 0.13 -1
R2 = 1/slope2 = 7.69
Slope(3) = 0.016 -1
R3 = 64.3
Raverage = 25

Results & Conclusion:
From the graphs we conclude that
\* The carbon resistance acts as a linear function of I vs. V. And an accurate, reasonable result was obtained within the experiment, even thought it's not so precise.
\* It was also proved that the forward biased diode hasn’t a linear resistance, and the reverse biased diode passes just a very small amount of current in the opposite direction (negative)
\* The light bulb seemed to have a nonlinear resistance while starting to turn on because of the increase of temperature, and then obtains a linear resistance after a while.**