

VI-1

	Resistor A	Resistor B	Resistor C	Resistor D
V_R (volts)	2.984	3.161	3.357	3.520
I (mA)	20	14.5	9	3
R_{DMM} (k Ω)	0.148	0.210	0.384	0.979

$$\sigma_V = 0.001 \text{ V} \wedge \sigma_I = 0.5 \text{ mA}$$

$$R = \frac{V}{I}$$

and using equation P-9,
$$\sigma_R = \frac{(\sigma_V^2 I^2 + V^2 \sigma_I^2)^{1/2}}{I^2}$$

Here, V is in volts and I is in mA.

$$R_A = \frac{2.984}{20} = 0.149 \text{ k}\Omega$$

$$\sigma_{R_A} = 0.004 \text{ k}\Omega$$

$$R_A \pm \sigma_{R_A} = 0.149 \pm 0.004 \text{ k}\Omega$$

$$R_B = \frac{3.161}{14.5} = 0.218 \text{ k}\Omega$$

$$\sigma_{R_B} = 0.00395 \text{ k}\Omega$$

$$R_B \pm \sigma_{R_B} = 0.218 \pm 0.004 \text{ k}\Omega$$

$$R_C = \frac{3.357}{9} = 0.373 \text{ k}\Omega$$

$$\sigma_{R_C} = 0.00419 \text{ k}\Omega$$

$$R_C \pm \sigma_{R_C} = 0.373 \pm 0.004 \text{ k}\Omega$$

$$R_D = \frac{3.520}{3} = 1.173 \text{ k}\Omega$$

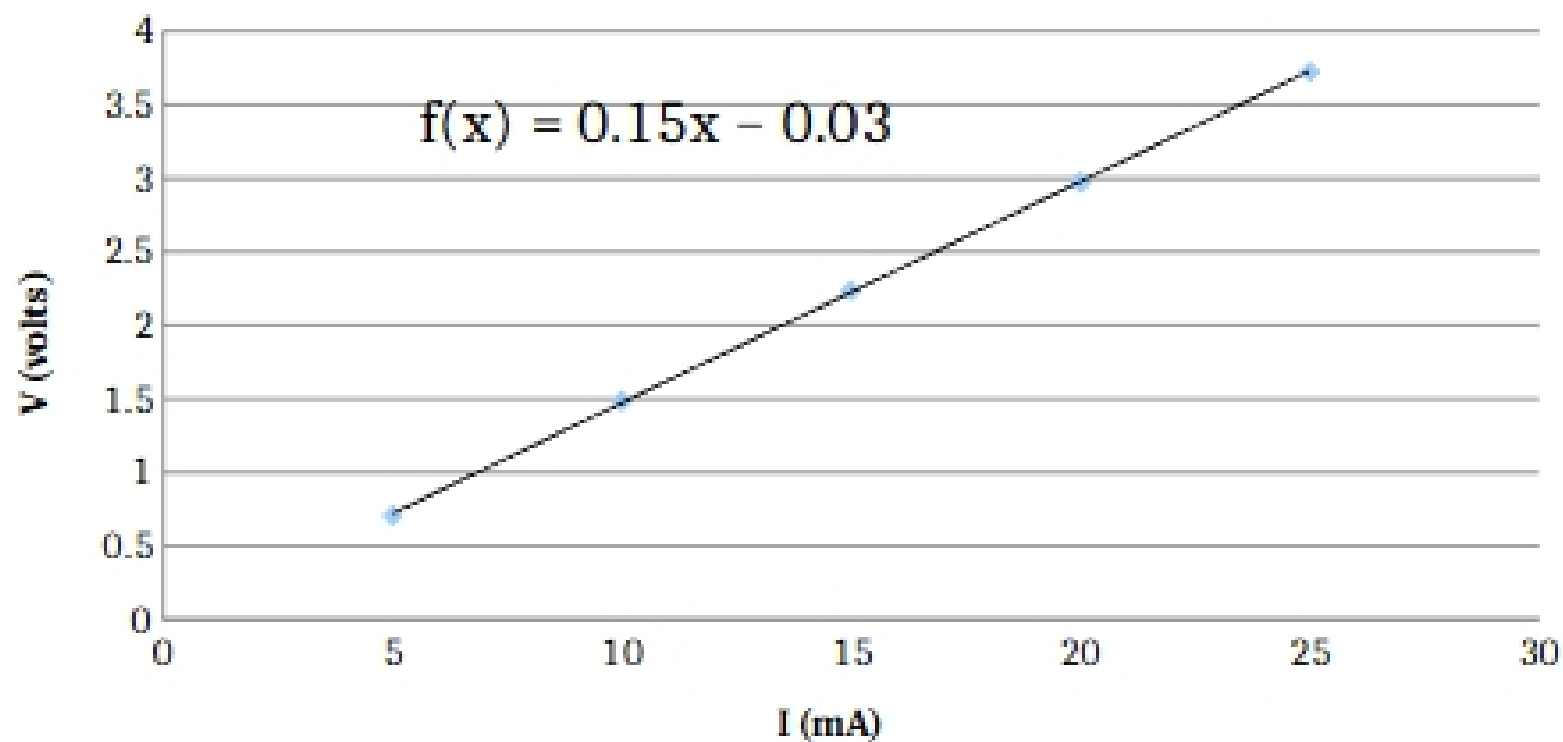
$$\sigma_{R_D} = 0.00044 \text{ k}\Omega$$

$$R_D \pm \sigma_{R_D} = 1.173 \pm 0.0004 \text{ k}\Omega$$

As we can see, the directly measured value of R **agrees** with the resistance determined by the values of V and I.

VI-2

V (volts)	I (mA)
0.706	5
1.486	10
2.236	15
2.974	20
3.724	25

V vs I

Using LINEST function in excel, I obtained the following data:

Slope, s ($k\Omega$)	0.15048	-0.032	Intercept, b (volts)
σ_s ($k\Omega$)	0.000854166	0.014164745	σ_b (volts)

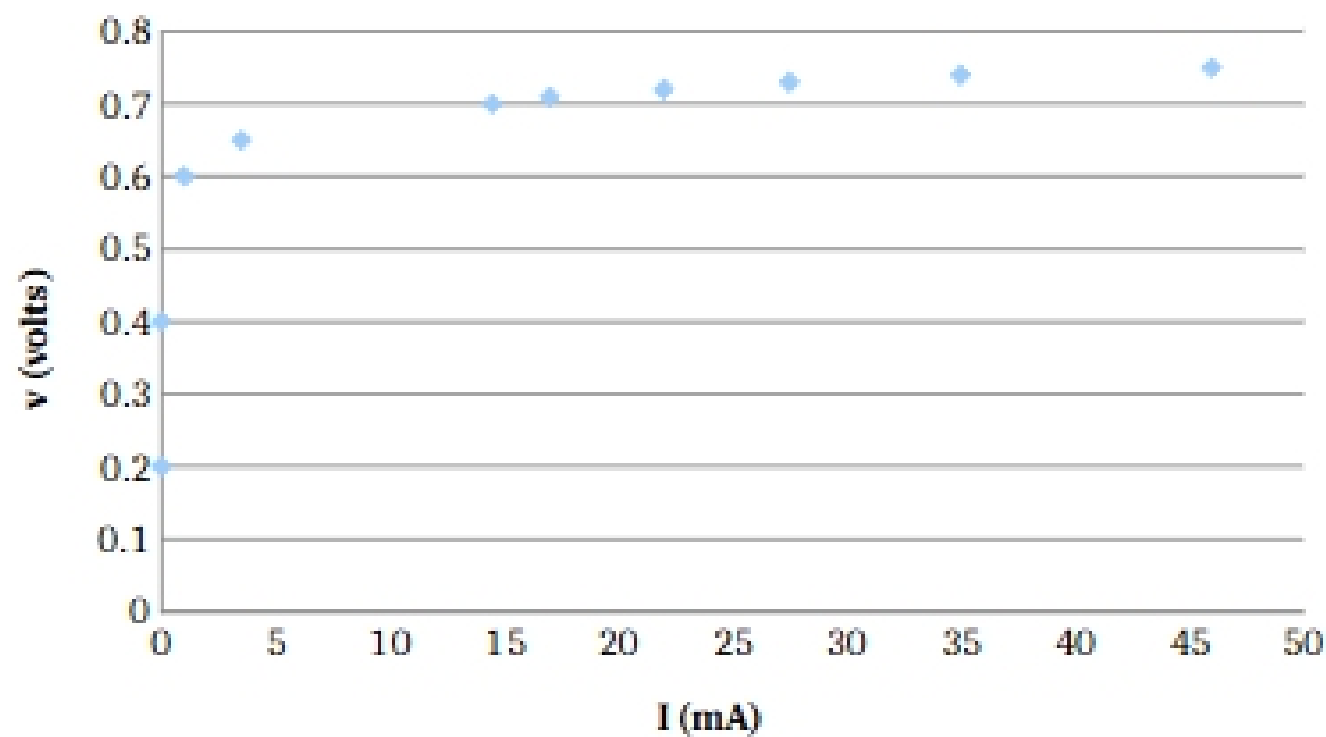
From Ohm's law, slope $s=R=0.15048\text{ k}\Omega$
 $\sigma_R = \sigma_s = 0.000854\text{ k}\Omega$

$$R \pm \sigma_R = 0.1505 \pm 0.0009\text{ k}\Omega$$

The graph of V vs I is a straight line with an intercept almost equal to zero and has a constant slope. Therefore, **the resistor clearly obeys Ohm's law and hence it is an Ohmic conductor.**

VI-3

V (volts)	I (mA)
0.2	0
0.4	0
0.6	1
0.65	3.5
0.7	14.5
0.71	17
0.72	22
0.73	27.5
0.74	35
0.75	46

V vs I

The graph of V vs I will have a slope=resistance and therefore, by using LINEST function in EXCEL, the slope (resistance) of the points is:

V (volts)	I (mA)	R (k Ω)
0.6	1	0.2
0.65	3.5	0.02
0.7	14.5	0.004545