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Phys111 Report

9,5

Experiment #4: DC Circuit

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Section:	3.		
Date:	27/4/2022.		

(1) Abstract:

- **Aim of the experiment:**

is to calculate the value of an unknown resistor. Finding if it is ohmic or non-ohmic. And also find the equivalent resistance in parallel and series ways.

- **The main results are:**

$R = (212 \pm 40)\ \Omega$.

$R_s = (312 \pm 50)\ \Omega$.

$R_p = (71 \pm 6)\ \Omega$.

(2) Data:

Part A: One resistor circuit

	1.	2.	3.	4.	5.	6.
$I\ (mA)$	2	4	7	9	11	14
$V\ (volts)$	0,5	1,0	1,5	2,0	2,5	3,0

I = 9

V = 1,8.

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$\Delta I = 1$ mA	$\Delta V = 0,1$ V

Part B: Two resistors in series

$I_s = 8$ mA	$V_s = 2,5$ V
$\Delta I_s = 1$ mA	$\Delta V_s = 0,1$ V

Part C: Two resistors in parallel

$I_p = 28$ mA	$V_p = 2.0$ V
$\Delta I_p = 1$ mA	$\Delta V_p = 0,1$ V

(3) Calculations:

Part A: One resistor circuit

From Graph	$R = 212\ \Omega$	**From Color code**	$R_1 = 200\ \Omega$
	$\Delta R = 40\ \Omega$		$\Delta R = 10\ \Omega$

Resistance form color code

A: Brown (1).	B: Black (0).	C: Brown (10¹).	D: Gold (5%).
$R_1 = (100 \pm 5)\ \Omega$.			

A: Red (2)	B: Black (0).	C: Brown (10¹).	D: Gold (5%).
$R_2 = (200 \pm 10)\ \Omega$.			

Part B: Two resistors in series

From Experiment	$R_s = \frac{V_s}{I_s} = \frac{2.5}{8.10^{-3}} = 312\ \Omega$	**From Color code**	$R_s = R_1 + R_2 = 300\ \Omega$.
	$\Delta R_s = R(\frac{\Delta V}{V} + \frac{\Delta I}{I}) = 50\ \Omega$		$\Delta R_s = \Delta R_1 + \Delta R_2 = 15\ \Omega$.

Part C: Two resistors in ~~series~~ Parallel

From Experiment	$R_p = \frac{V_p}{I_p} = \frac{2}{28.10^{-3}} = 71\ \Omega$	**From Color code**	$R_p = \frac{R_1 R_2}{R_1 + R_2} = 67\ \Omega$
	$\Delta R_p = R(\frac{\Delta V}{V} + \frac{\Delta I}{I}) = 6\ \Omega$		$\Delta R_p = R_p^2 \left(\frac{\Delta R_1}{R_1^2} + \frac{\Delta R_2}{R_2^2}\right) \approx 3\ \Omega$

(4) Results:

$R = (212 \pm 40)\ \Omega$.
$R_s = (312 \pm 50)\ \Omega$.
$R_p = (71 \pm 6)\ \Omega$.

(5)Conclusions:

First, let's Know if our results are accepted or not by applying the discrepancy test (rang test). Let's start with R. $[R_{exp} - \delta R, R_{exp} + \delta R]$ Compared with $[R_{true} - \delta R, (R_{true} + \delta R]$: $[172, 252]$ and $[190, 210]$. So the first result is accepted. Now let's take R_S : $[262, 362]$ and $[285, 315]$ another accepted. Finally R_P : $[65, 77]$ and $[64, 70]$. So all our values are accepted. These results Confirm that the carbonic resistors which We used in our experiment are indeed ohmic.

The error's sources:

1- the real current through the resistor is less than the measured current.

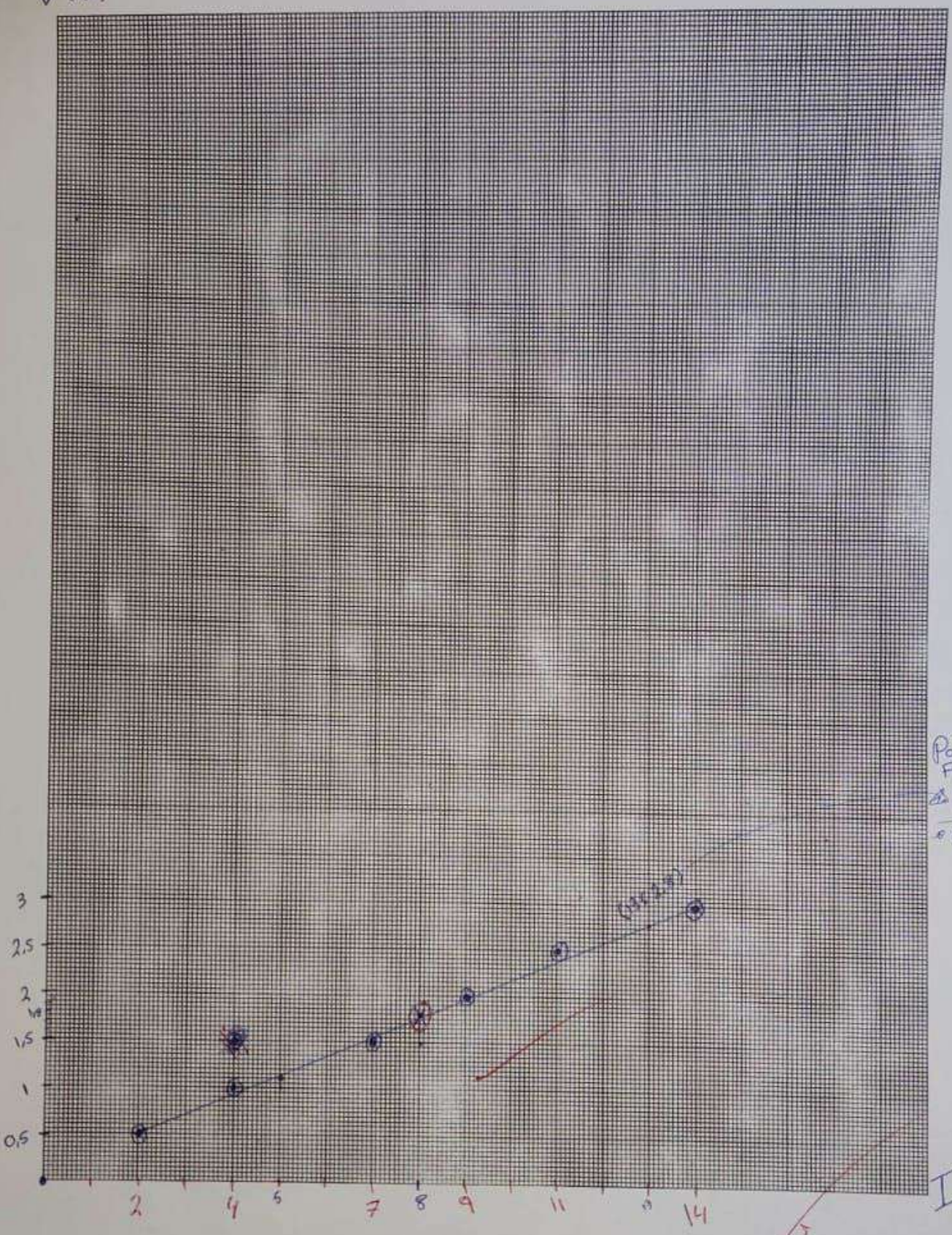
2- the temperature of the room: if the temperature of the surrounding deviated much from the room temperature, it might change the resistance significantly.

3- maybe Plug the wires in wrong Places, or read from wrong Place or wrong ways.

4- resistance Varies over time.

5- Also, we negleted the resistance of the Ammeter and Voltmeter which leads to an in-crease in the error rate.

($V_{(Volts)}$ VS $I_{(mA)}$)



the centroid Point is $(\bar{I}, \bar{V}) = ((8);(1,8))$.

$$\text{Slope} = R = \frac{\Delta V}{\Delta I} = \frac{2,8 - 1,1}{(13-5).10^{-3}} = 212\ \Omega.$$

$$\Delta R = \left(\frac{\Delta V}{\bar{V}} + \frac{\Delta I}{\bar{I}}\right) R = 212\left(\frac{0,1}{1,8} + \frac{1}{8}\right) = 38,27 \approx \boxed{40\ \Omega}$$