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NORTH SOUTH UNIVERSITY

Department of Mathematics & Physics

Experimental Physics

PHY-108L . 8

Name of the Experiment: **Ohm's Law**

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Serial No: 21

Group Member's Name: (i) **Mortaza Morshed** ID: **2212697643**

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Date: (i) Experiment Performed: 07.08.2023

(ii) Report Submitted: 14.08.2023

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Tasks and Questions:

#1: Comment on the measured current compared to calculated currents.

→ From the table we can state that in every case the measured current is slightly different than the calculated current. We know that because of some reason the theoritical value and practical value goes different. There are,

→ Human error.
→ Instrumental error
→ Difference in resistance
→ Loose Connection
→ Temparature is not constant

#2: Use the data obtained in Table 1 to plot $I_{measured}$ vs. $V_{measured}$ graph.

#3: What does the inverse of the slope of your graphs represent? Illustrate with an example. [Hint: Find slopes from each graph].

Taking α as the constant of propsitionality in Ohm's law, $I \propto V$, we get the equation, $I = eV$. This equation matches the equation for straight line $y = me$, so the graph of current (I) versus voltage(V) for Ohm's conductor is straight line with slop $m = \alpha$. From the graph there I-V graph we get the following value of (α) and inverse of slope ($\frac{1}{\alpha}$):

First I-V curve: $\alpha_1 = \frac{4.7 - 2.35}{10 - 5} = 0.47 = \frac{1}{\alpha_1} = 2.128\ k\Omega$

Second I-V " : $\alpha_2 = \frac{3 - 2 - 2.1}{15 - 10} = 0.22 = \frac{1}{\alpha_2} = 4.545 k\Omega$

Third I-V " : $\alpha_3 = \frac{2 - 1.5}{20 - 15} = 0.1 = 1/\alpha_3 = 10\ k\Omega$

These value of $\alpha = 1/\alpha_1, 1/\alpha_2, 1/\alpha_3$ we are very close to resistance value. So, we can say that inverses of the slopes of our graphs represents resistance.

Lab Report:

Date: 07.08.2023	
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Data Table:

	R_1			R_2			R_3		
	Nominal R: *2.2 kΩ*			Nominal R: *4.7 kΩ*			Nominal R: *10 kΩ*		
	Measured R: 2.157 KΩ			Measured R: 4.685 kΩ			Measured R: 9.926 kΩ		
	Measured Values		$I_{Calculated}$	Measured Values		$I_{Calculated}$	Measured Values		$I_{Calculated}$
$V_{Nominal}$	$V_{Measured}$	$I_{Measured}$		$V_{Measured}$	$I_{Measured}$		$V_{Measured}$	$I_{Measured}$	
1 V	1.091 V	0.505 mA	0.454 mA	1.033 V	0.233 mA	0.212 mA	1.112 V	0.109 mA	0.1 mA
2 V	2.122 V	0.983 mA	0.909 mA	2.06 V	0.424 mA	0.425 mA	2.072 V	0.208 mA	0.2 mA
5 V	5.06 V	2.35 mA	2.272 mA	5.103 V	1.047 mA	1.063 mA	5.039 V	0.509 mA	0.5 mA
10 V	10.134 V	4.706 mA	4.545 mA	10.118 V	2.153 mA	2.127 mA	10.079 V	1.017 mA	1 mA
15 V	15.11 V	7.021 mA	6.818 mA	15.06 V	3.225 mA	3.191 mA	15.055 V	1.518 mA	1.5 mA
20 V	20.118 V	9.42 mA	9.09 mA	20.096 V	4.315 mA	4.255 mA	20.079 V	2.024 mA	2 mA
25V	25.02 V	11.85 mA	11.364 mA	25.039 V	5.399 mA	5.139 mA	25.056 V	2.533 mA	2.5 mA

Table 1: Voltage and Current Measurement and Calculation

calculation - ?

#4: Using your graph, estimate the current that would flow through the resisters at $V = 12$ volts and compare it with the calculated value (12 V/ $R_{Nominal}$). Calculate the error.

For $E = 12$ V

Measured Resistance	Estimated Current from Graph	Calculated Current (12 V/ $R_{Nominal}$)	% of Error
R_1 = 2.157 kΩ	5.45 ~~3~~ mA	5.45 mA	3.54 %
R_2 = 4.685 kΩ	2.5 mA	2.55 mA	1.96 %
R_3 = 9.926 kΩ	1.2 ~~0~~ mA	1.2 mA	0 %

Table 2: Current Estimation and Calculation at V = 12V

calculation-?

% Error = $\frac{|\text{Theoritical value} - \text{Practical Value}|}{\text{Theoritical value}} \times 100\%$

Results: By building circuit we can verify current from our graph we can say our measured values are closer to our calculated value. Our experiment verifies ohms law. In the graph we gave voltage to current input. There are minor error due to some reasons which are mentioned in question part.

Discussion:

Our law was about ohm's law. We are working to verify ohm's law. We are using 2.2 kΩ, 4.7 kΩ, 10kΩ resistors, Dmm, De power supply, For different voltage values, we measured current. Then, we matched our current values with calculated values. We get closer values with calculated values. There were some of error because of some reasons. After calculating we can say, our experiment got verified

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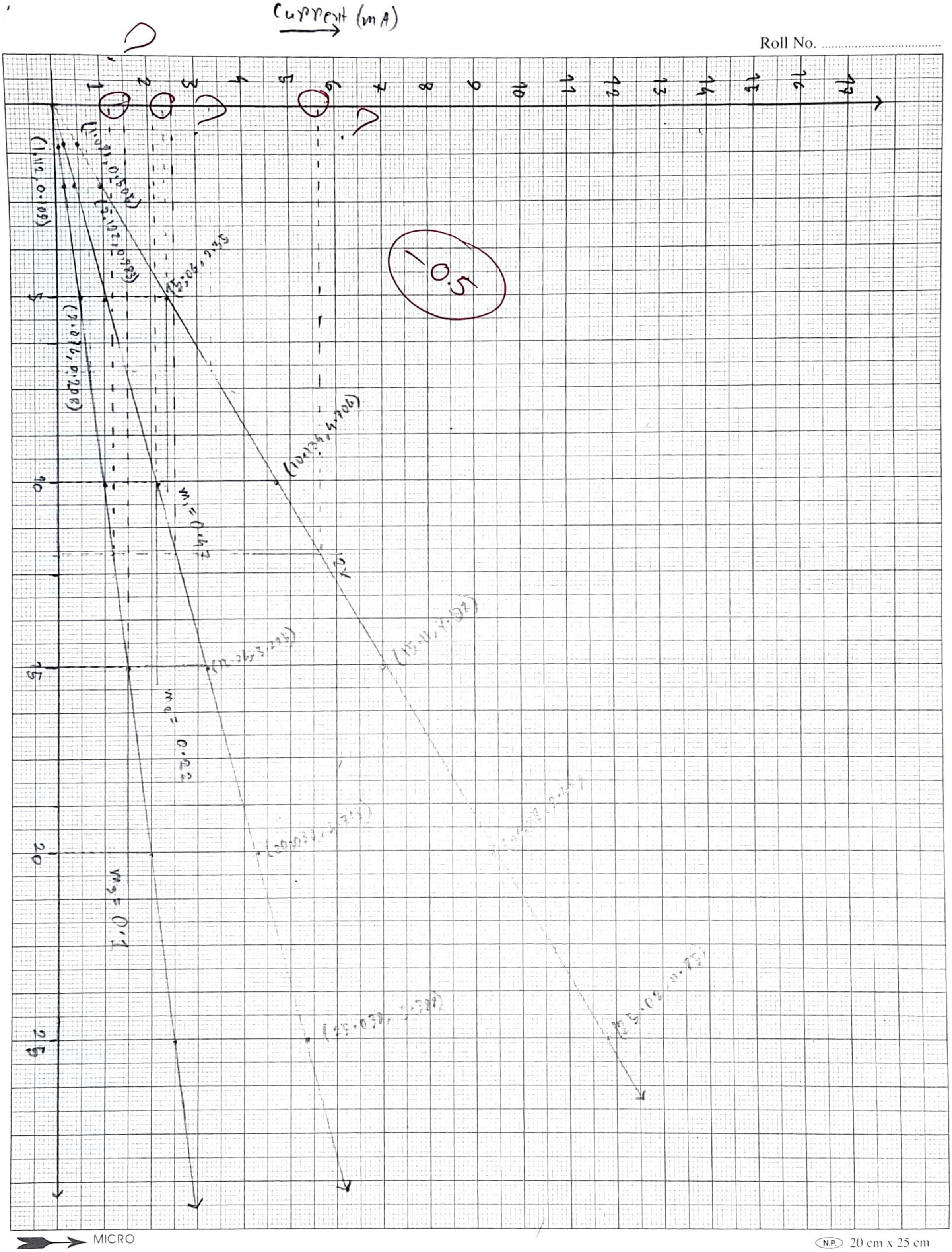

MICRO

N.P. 20 cm x 25 cm