Lap Physics2 Reports

POWERUNIT

LAB REPORT FOR EXPERIMENT 1

Date: ----------------------------

Name:--[redacted]

Partner's Name:--[redacted]

9.5

Registration No:-[redacted]

Registration No:-[redacted]

Physics Section:-------4-----------

Instructor's Name:--Dr. Yehya Ramadan

PHYSICS LAB EXPERIMENT 1: ELECTRIC FIELD MAPPING

1. PURPOSE

We'll plot several electrode configurations by determining the equipotential line and the drawing of the lines of forces

II. DATA AND DATA ANALYSIS

A. Mapping The Equipotential Lines

1- Enter your data in Table 1.1 below:

Table (1.1 a)

For one type of electrodes:

right Location of P (position of equipotential point)				
P_1	center P_2	left P_3	P_4	P_5
(-8.8, 5.9)	(1.4, -6.1)	(9.6, 1)		
(-8.9, -3)	(1.3, -3.4)	(9.6, -1.5)		
(-8.9, 2.5)	(1.4, -4)	(9.5, -4.6)		
(-8.8, 4.3)	(1.4, 3.1)	(9.6, -7)		
(-8.8, 7.3)	(1.6, 5.9)	(9.7, 4)		

ther type of electrodes:

Table (1.1 b)

Location of P (position of equipotential point)				
P_1	P_2	P_3	P_4	P_5
(-8.2, -7)	(3.2, -6.5)	(9.2, .4)		
(-8.1, -4.1)	(3.2, -3)	(9.4, -2.4)		
(-8.2, -1.2)	(3.1, -.5)	(11.3, -4.3)		
(-8.2, 2.5)	(3.1, 3.3)	(9.5, 2.4)		
(-8.1, 6)	(3.2, -6)	(11, 3.9)		

2- Use your data of Table (1.1a)and Table (1.1 b) to plot the equipotential points on two sheets of graph paper.

3- Connect the **eight points** corresponding to each location $\mathbf{P_i}$ with a line which is an **equipotential line**.

4- On the same graph , draw the lines of force. These are everywhere **perpendicular** to the equipotential lines, explain **why**.

$V = q \Delta x = 0 = F.x$

$= q E.x$

$0 = q E x \cos \theta$

then $\cos \theta = 0$

$\therefore \theta = 90$

easurement of The Electric Field

The data in Table (1.2) below are **V** in volts and **d** in centimeters.

Table 1.2

V(volt)	d(cm)
zero	zero
1	3.5
2	8
3	13.5
4	17
4.15	18

1. Plot **V** (as dependent variable) versus **d** .
   Find the slope of your graph.

Slope $= \frac{\Delta V}{\Delta d} = E = \frac{2-1}{8.5-4.3} = \frac{1}{4.2}$ v/c

2. How is the slope related to the electric field ?

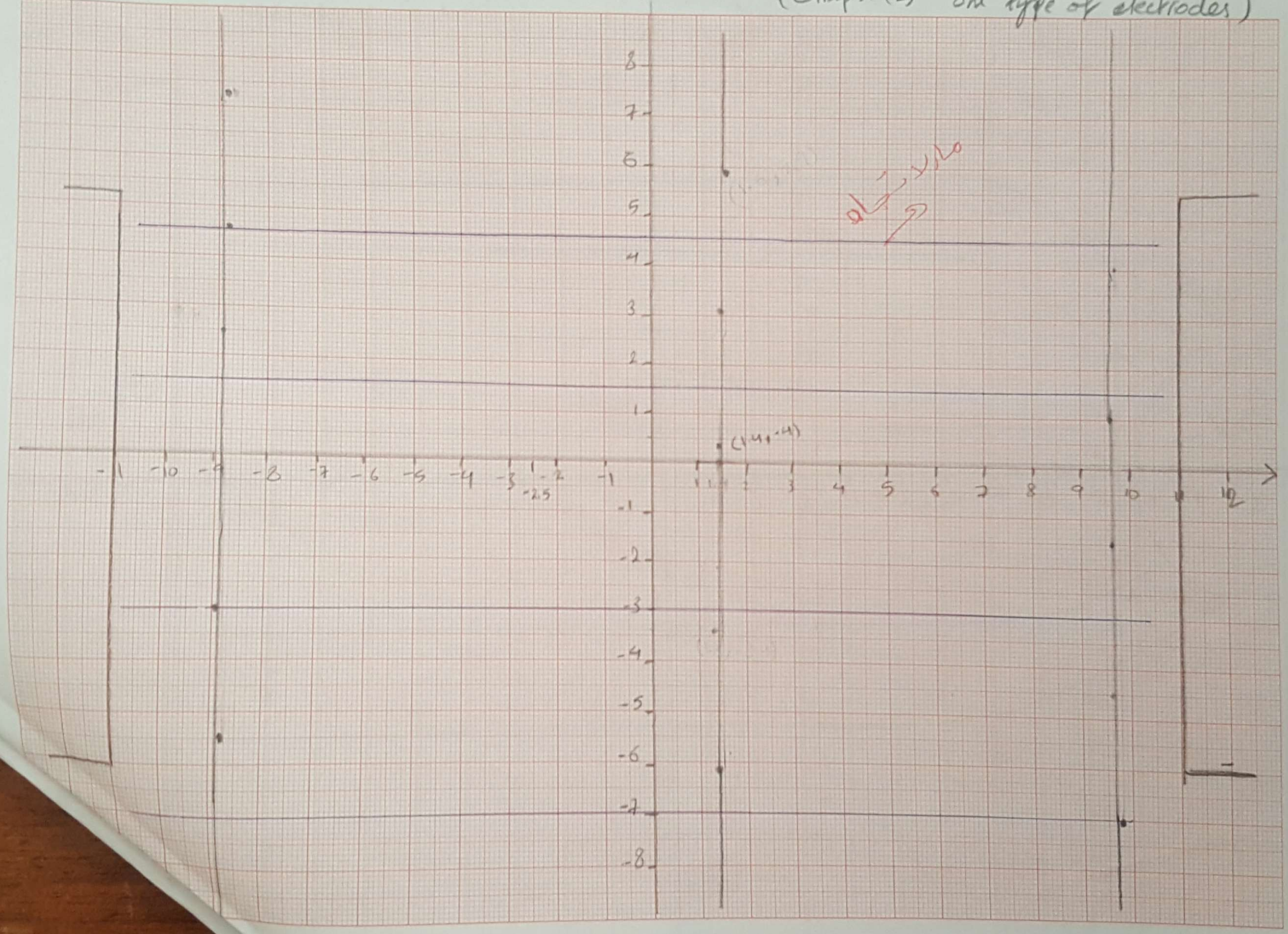
Slope = electric field and it's costant

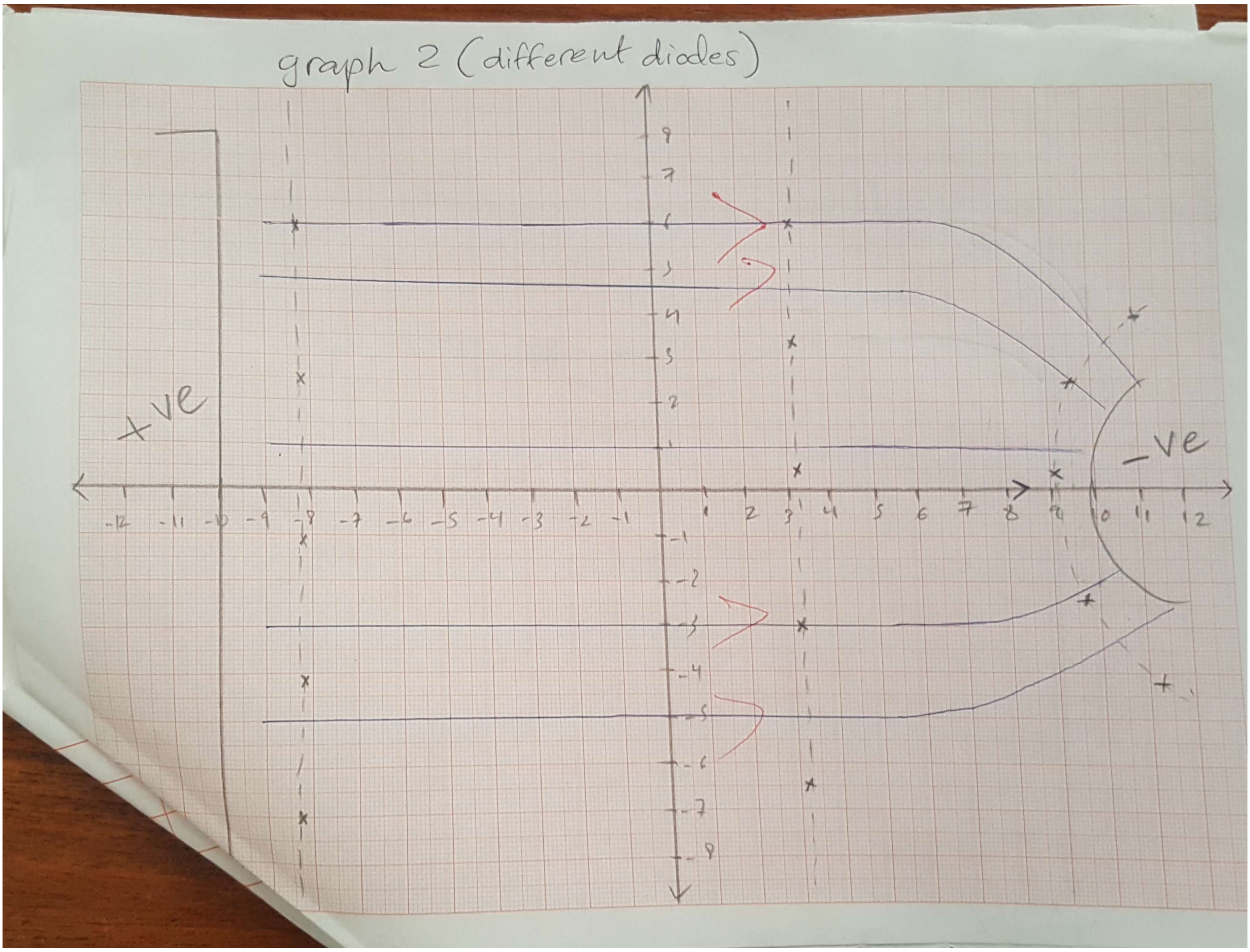
$E = \frac{\Delta V}{\Delta d} = \frac{1}{4.2}$ volt / cm $= 0.25$

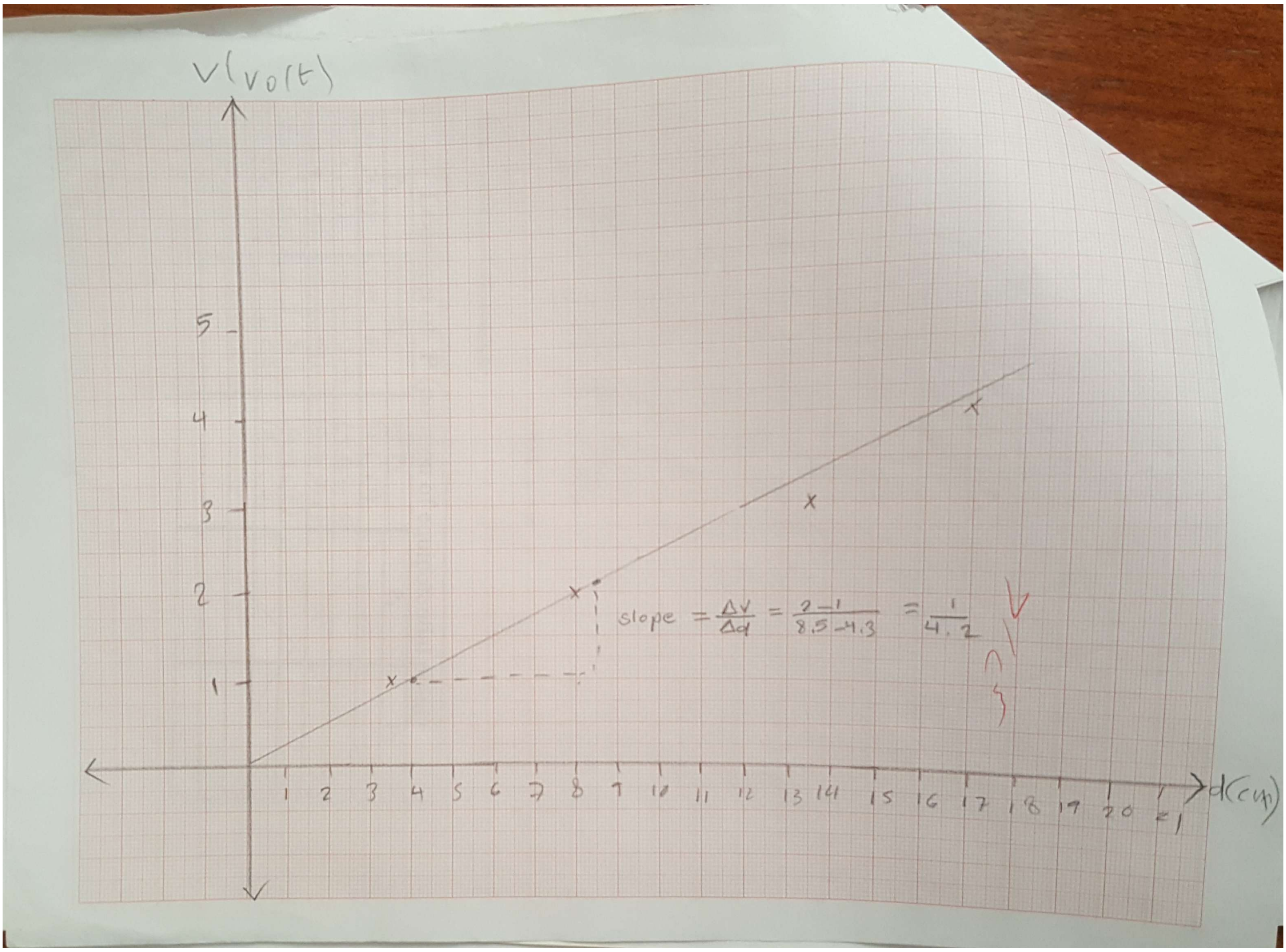
3. What conclusion can you draw about the electric field in the region between the electrodes near the center?

it is constant

(Graph (1) one type of electrodes)




graph 2 (different diodes)
+ve
-ve


V (volt)
d (cm)
slope = ΔV/Δd = (2−1)/(8.5−4.3) = 1/4.2

LAB REPORT FOR EXPERIMENT 2

Name:--[redacted]--

Registration No:--[redacted]--

Physics Section:------4------

Date: ----------------------------

Partner's Name:--[redacted] / [redacted]

Registration No:-[redacted] / [redacted]

Instructor's Name:--Dr. Yehya--

9/5

PHYSICS LAB EXPERIMENT 2: SPECIFIC CHARGE OF COPPER IONS

I. PURPOSE

Determine the specific charge k (col/kg) of copper ions also we calculated the charge of electrons.

II. DATA AND DATA ANALYSIS

1. Enter your data of the masses, m_1 and m_2 in **kg** as related to the current, **I**, in **Ampere** and time, **t**, in **minutes** in Table 2.1 below:

Table(2.1) electron

Current(I) (A)	Time (t) (min)	Amount of charge (It) (Coulomb)	m_1 (Kg)	m_2 (Kg)	Deposited mass $M_{cu} = (m_2 - m_1)$ (Kg)
0.6A .8	20 10 min	600 * .8 = 480	31.52 mkg	31.72 mkg	.2 mkg
0.3A .4	20 10	600 * .4 = 240	31.72 mkg	31.88 mkg	.16 mkg
0.3A .4	10 5	300 * .4 = 120	31.82 mkg	31.92 mkg	.1 mkg

2. Use the data in Table (2.1) to **plot** the amount of charge **(It)** versus **the mass of the deposited copper M_{cu}**.

3. What type of relationship do you see between M_{cu} and **It**?

linear and Direct relation ship

4. From your graph find the specific charge,**K**, of copper ions by calculating the slope.

$\text{Slope} = \frac{Q}{m} = \frac{400-0}{.175-0} = 2.3\times10^{6}$ c/kg

5. What are the units of K?

Col/kg

6. Estimate the error, ΔK, in your value and write the result as K ± ΔK.

$\frac{\Delta k}{k} = \sqrt{\left(\frac{\Delta I}{I}\right)^2 + \left(\frac{\Delta t}{t}\right)^2 + \left(\frac{\Delta M}{M}\right)^2} =$

$\frac{\Delta k}{2.3\times10^{6}} = \sqrt{\left(\frac{.01}{.8}\right)^2 + \left(\frac{.005}{600}\right)^2 + \left(\frac{.0075}{.2}\right)^2}$

$\Delta k = 9.92\times10^{4}$ c/kg ∴ $2.3\times10^{6} \pm 9.92\times10^{4}$

7. Calculate the **charge** carried by each **copper ion** in the solution.

$Q = k\, m_{cu} = 2.3\times10^{6} * 63.6 * 1.66\times10^{-27}$

$= 242.8\times10^{-21}$ Col

2.4×10^{-19} C

Colum

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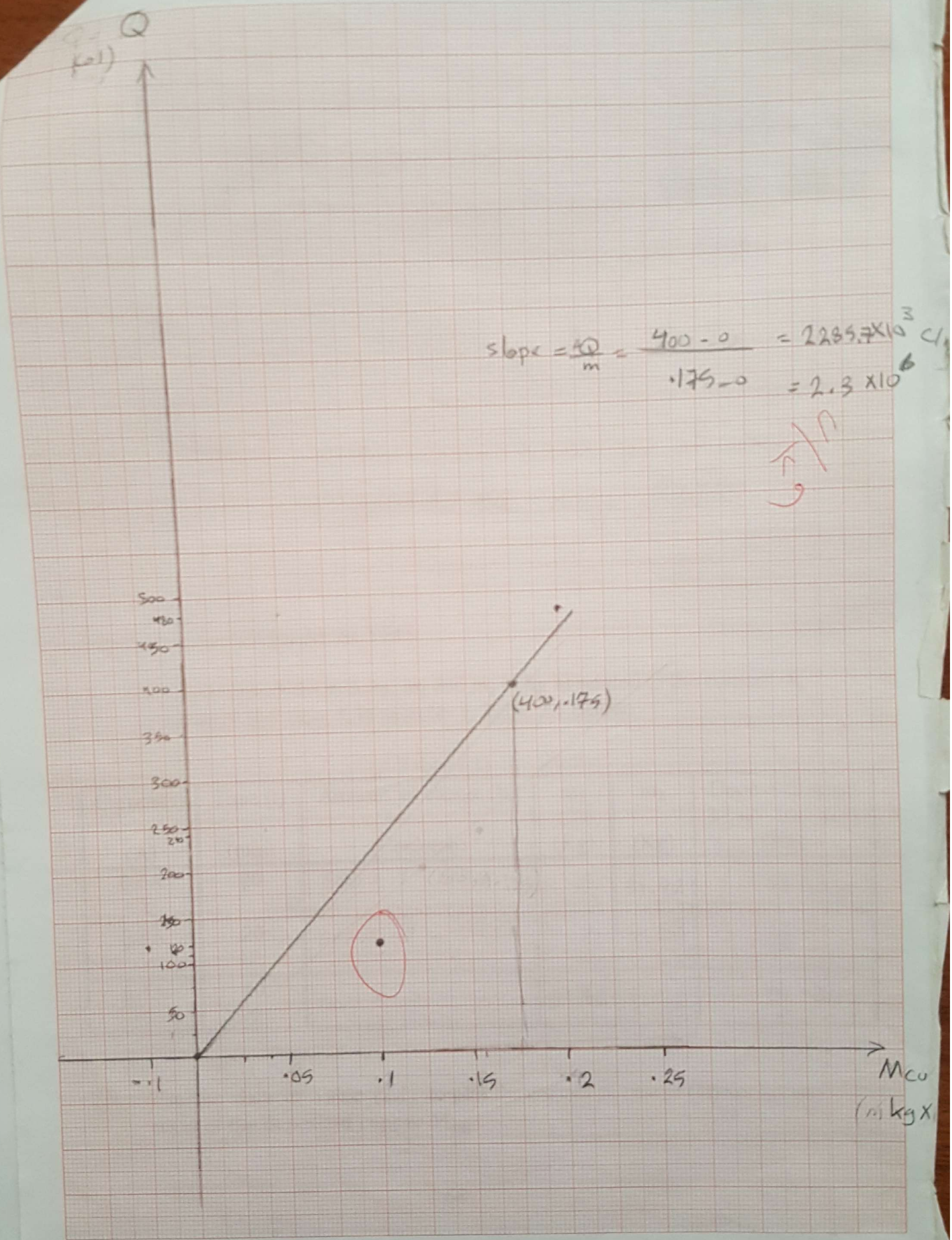
8. Use the result above to calculate the **charge of the electron e**. How does it compare with the **standard value**?

$Q_{Cu} = 2e$, $242.8 \times 10^{-21} \div 2 = 121.4 \times 10^{-21}$

$= 1.214 \times 10^{-19}$ col

$P.E = \left| \frac{e_A - e_E}{e_A} \right| \times 100\% = \left| \frac{1.6 \times 10^{-19} - 1.214 \times 10^{-19}}{1.6 \times 10^{-19}} \right| \times 100\%$

$= 24.12\%$



$slope = \frac{\Delta Q}{m} = \frac{400-0}{.175-0} = 2285.7 \times 10^{3}$ C/

$= 2.3 \times 10^{6}$

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LAB REPORT FOR EXPERIMENT 3

Date: ---------------?---------------

Name:-[redacted]------------ 4

Partner's Name:-[redacted]-----

Registration No:-[redacted]----- 20.5

Registration No:-[redacted]-----

Physics Section:------4------------

Instructor's Name:--Dr. Yehya Ramadan

PHYSICS LAB EXPERIMENT 3: OHM'S LAW

1. PURPOSE

to prove ohm's law which says if a conductor is kept at a constant temperature, the current flowing through it is directly proportional to voltage. V = IR

II. DATA AND DATA ANALYSIS

1- Enter your data in Table 3.1

Table 3.1

R_2 ~~Wire~~ resistance Carbon		R_1 ~~Carbon~~ resistance Wire		R_1 and R_2 in Series		R_1 and R_2 in Parallel	
V(Volt)	I(Amp.)	V(Volt)	I(Amp.)	V(Volt)	I(Amp.)	V(Volt)	I(Amp.)
1.2	.3	1.4	.3	1.8	.2	1	.5
1.6	.4	2	.4	2.8	.3	1.2	.6
2.4	.6	3	.6	3.8	.4	1.4	.7
3.2	.8	4	.8	4.6	.5	1.6	.8
4	1	5	1	5.4	.6	1.8	.9

2- Plot graphs of voltage **V** as a dependent variable versus current **I** .

3- Determine the values of **R** for each **unknown resistance** as well as for the series and parallel combinations by calculating the **slopes** of your graphs.

R_1 = $\frac{2-1}{.5-.25} = 4\Omega$

R_2 = $\frac{2.5-1.5}{.51-.31} = 5\Omega$

R equivalent of R_1 and R_2 in series= $\frac{5.5-1}{.6-.1} = 9\Omega$

R equivalent of R_1 and R_2 in parallel= $\frac{1.5-.6}{1-.3} = 1.3\Omega$

4- From the graph of **V** versus **I** for R_1 , estimate the error ΔR_1.

$\frac{\Delta R}{R_1} = \sqrt{\left(\frac{\Delta I}{I}\right)^2 + \left(\frac{\Delta V}{V}\right)^2} = \Delta R_1 = \left(\sqrt{\left(\frac{.01}{1}\right)^2 + \left(\frac{.1}{5}\right)^2}\right) * 5 = .112$

$R = 5 \pm .112\ \Omega$

5- Using the value of $\mathbf{R_1}$ obtained in (3) and the **length** and **diameter** of the wire used for R_1, calculate the resistivity of the wire ρ.

$R = \frac{\rho \ell}{A}$, $\rho = \frac{A R_1}{\ell} = \frac{(\frac{.45}{2})^2 * \pi * 5}{1.5} = .529\ (\Omega.m) \times 10^{-6}$

$7 \times 10^{-7}\ \Omega m$

$\ell = 1.5$, $D = .45$, radius $= .225$

6- Compare the calculated values with the experimental values you obtained for:

Combination of resistances in series:

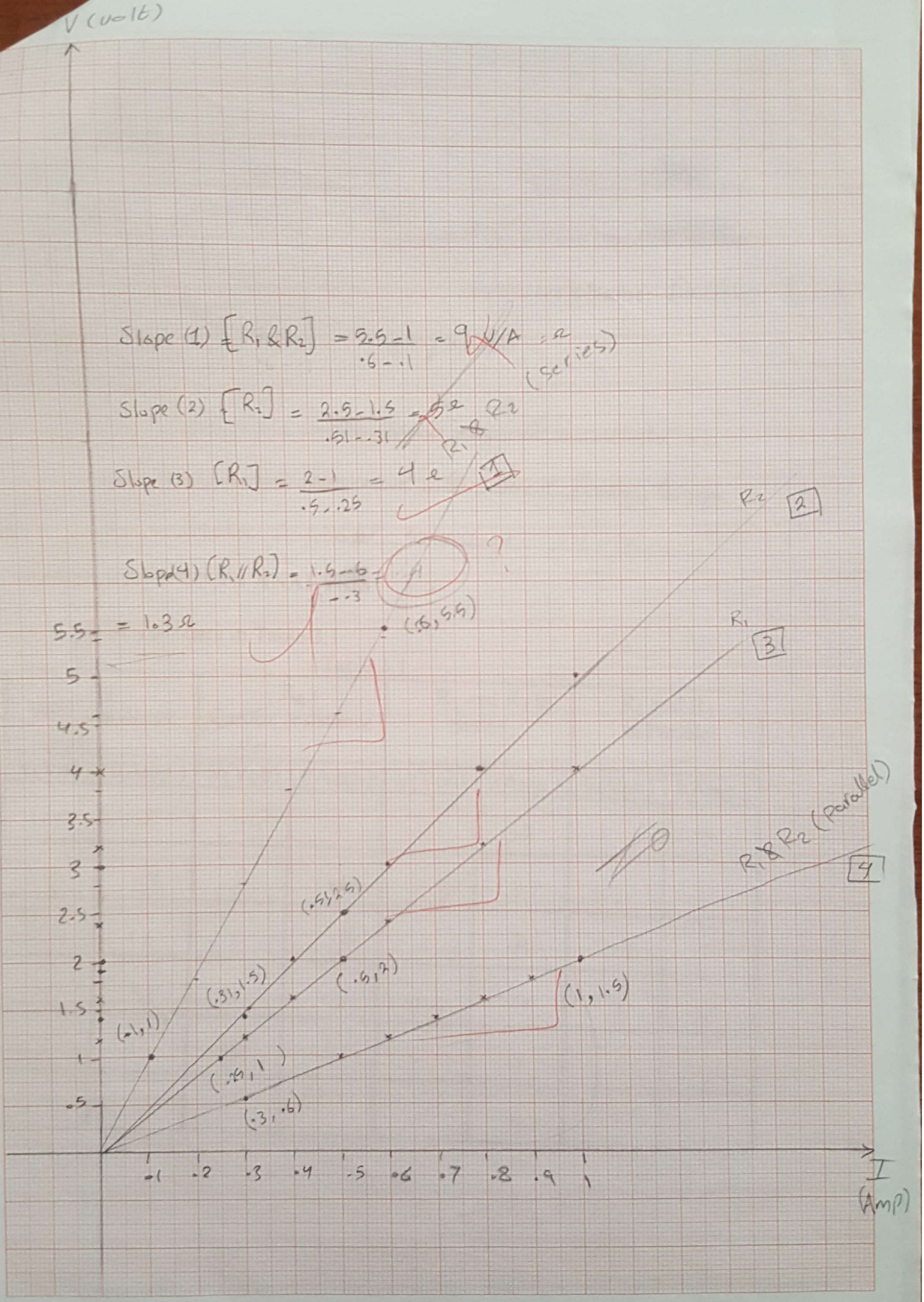
- experimental value: 9Ω

- calculated value: $R_1 + R_2 = 4 + 5 = 9\Omega$

Combination of resistances in parallel:

- experimental value: 1.3Ω

- calculated value: $\frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{4} + \frac{1}{5} = 2.2$



V (volt)
Slope (1) [R1 & R2] = 5.5 - 1 / .6 - .1 = 9 V/A = Ω
(series)
Slope (2) [R2] = 2.5 - 1.5 / .51 - .31 = 5 Ω
Slope (3) [R1] = 2 - 1 / .5 - .25 = 4 Ω
Slope (4) (R1 // R2) = 1.5 - .6 / 1 - .3
= 1.3 Ω
R2
2
R1
3
R1 & R2 (parallel)
4
1
(.6, 5.5)
(.5, 2.5)
(.31, 1.5)
(.1, 1)
(.5, 2)
(.25, 1)
(.3, .6)
(1, 1.5)
I (Amp)

LAB REPORT FOR EXPERIMENT 4

Date: 9-Nov-2015

Name: [redacted]

Partner's Name: [redacted]

10

Registration No: [redacted]

Registration No: [redacted]

Physics Section: 4

Instructor's Name: Dr. Yehya Ramadan

PHYSICS LAB EXPERIMENT 4: POWER TRANSFER

I. PURPOSE

To invistigate the condition in which maximum power is transferred to the load Resistor R_L

II. DATA AND DATA ANALYSIS:

1. Use the equation **P = VI to calculate P_L** the power dissipated by the load resistor $\mathbf{R_L}$ and enter the calculated values in Table (4.1) below:

Table 4.1

$R_s = 100\ \Omega$				
Reading	R_L (Ω)	I_L (mA)	V_L (V)	P_L (mW)
1	20	30	1	30
2	40	26	1.6	41.6
3	60	22	2.2	48.4
4	80	20	2.5	50
5	100	18	2.9	52.2
6	200	12	4	48
7	400	10	4.6	46
8	600	6	5	30
9	800	4	5.1	20.4

2. **Plot** on a graph paper the power $\mathbf{P_L}$ as dependent variable **versus** the load resistor $\mathbf{R_L}$. Find the value of the load resistor for which the power dissipated is **maximum**. How is this value related to the series resistance $\mathbf{R_s}$.

Maximum power at $R_L = 100\ \Omega$ where $R_s = R_L = 100\ \Omega$

3. For what value of the load resistance $\mathbf{R_L}$ was:

1) The load current a maximum? $R_L = 20\ \Omega$ $R_L \propto \frac{1}{I}$

2) The load voltage a maximum ? $R_L = 800\ \Omega$ $R_L \propto V_L$

4. Using the expression for $\mathbf{P_L}$ **power dissipated in the load resistance** as a function of the load resistance $\mathbf{R_L}$, determine the condition for the **maximum** power (differentiate P_L with respect to R_L and set $\frac{dp_L}{dR_L} = 0$)

$\mathcal{E}_s = I_L (R_s + R_L)$, $P = I_L V_L$

$P_L = \frac{\mathcal{E}_s^2 R_L}{(R_s + R_L)^2}$ now $\frac{dP_L}{dR_L} = 0 \rightarrow \frac{(R_s + R_L)^2 \times \mathcal{E}_s^2 - \mathcal{E}^2 R_L \times 2(R_s + R_L)}{(R_s + R_L)^4} = 0$

$(R_s + R_L)^2 - R_L 2(R_s + R_L) = 0$

$R_s^2 + 2R_sR_L + R_L^2 = 2R_sR_L + 2R_L^2$

$R_s^2 = R_L^2$ $R_L = R_s$

5- Compare the value of R_L at maximum power found in (2) with that found in (4) above.

$R_L = 100\ \Omega = R_s$, they're equal

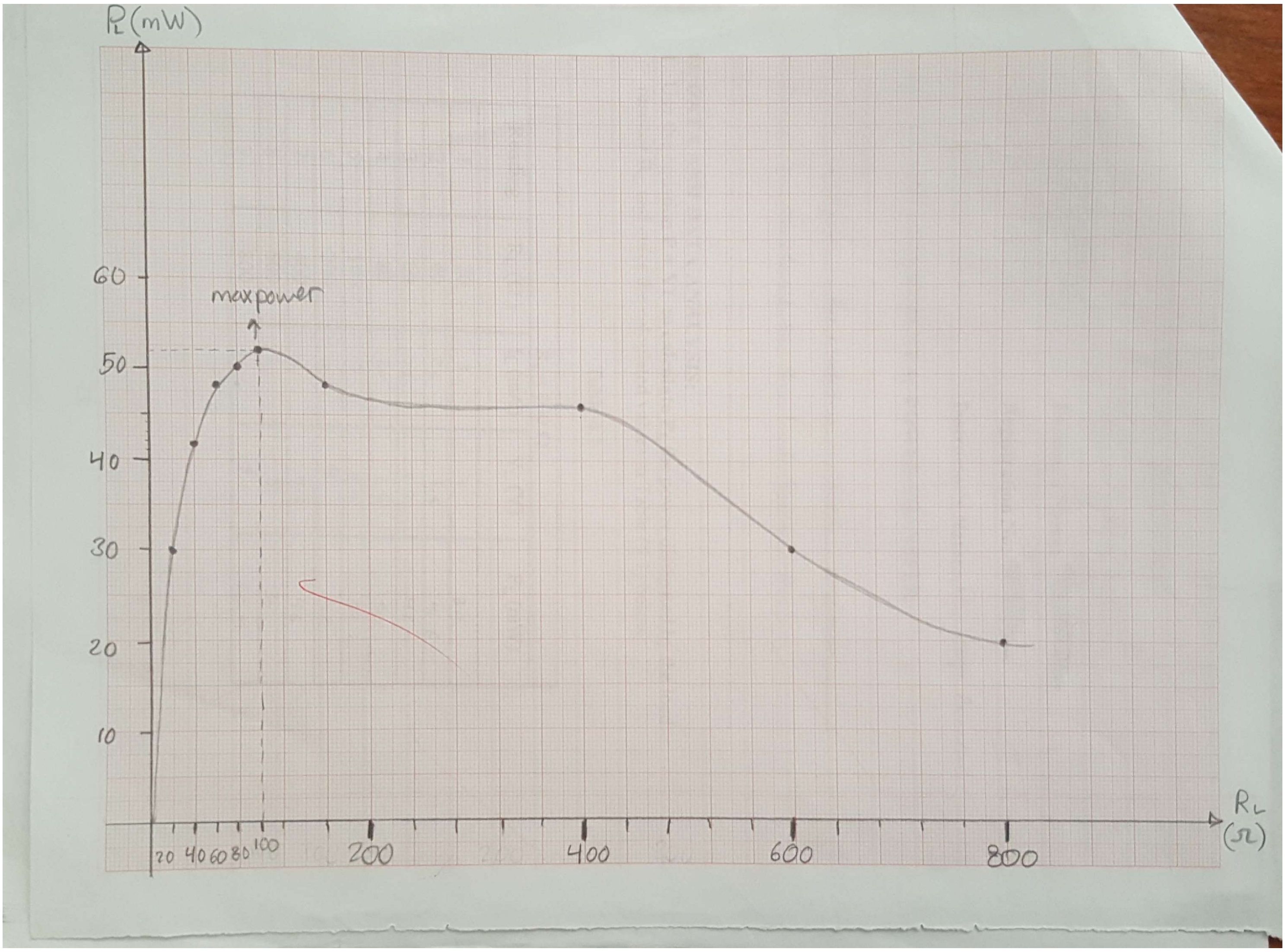
6- If the internal resistance, $\mathbf{R_s}$, is larger than the load resistance R_L, which resistance will dissipate more power?

R_s dissipate more Power according to the graph. ~~because~~ $P = I^2 R_L$ ~~than when~~

$I_L = I_s$

$R_s > R_L$

$\therefore P_s > P_L$



P_L(mW)
60
maxpower
50
40
30
20
10
20 40 60 80 100
200
400
600
800
R_L
(Ω)

LAB REPORT FOR EXPERIMENT 5

Date: 2-Nov

Name: [redacted] 9.5

Partner's Name: [redacted]

Registration No: [redacted]

Registration No: [redacted]

Physics Section: 4

Instructor's Name: Dr. Yehya Ramadeen

PHYSICS LAB EXPERIMENT 5: THE WHEATSTONE BRIDGE

1. PURPOSE

To find an unknown resistance using the wheatstone bridge ~~with~~ which is more accurate than Ohm's law.

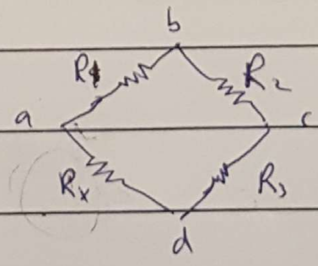
II. DATA AND DATA ANALYSIS :

1. Show that $\frac{R_s}{R_x} = \frac{L_1}{L_2}$

$V_{ab} = V_{ad}$, $R_1 R_3 = R_2 R_x$, $R_x = R_3 \left(\frac{R_1}{R_2}\right)$

but $R = \frac{\rho l}{A}$, ρ and A constant.

$R_x = R_3 \left(\frac{L_2}{L_1}\right)$



Resistance A

2. Record your data in Table (5.1) below:

Table 5.1

Reading	R_1 (Ω)	L_1 (cm)	L_2 (cm)	R_x (Ω)	$\Delta R_x / R_x$
1	10	13	87	66.9	3.89×10^{-3}
2	20	25	75	60	2.1×10^{-3}
3	30	34.5	65.5	56.9	1.63×10^{-3}
4	40	41.5	58.5	56.4	1.47×10^{-3}
5	50	47.5	52.5	55.3	1.41×10^{-3}
6	60	52	48	55.4	1.417×10^{-3}
7	70	56.5	43.5	53.8	1.45×10^{-3}
8	80	60	40	53.3	1.5×10^{-3}
9	90	63	37	52.8	1.56×10^{-3}
10					
$\bar{R}_x$ = 56.76 Ω					

87.5

3. Using the equation derived in **(1)**, calculate the value of the unknown resistance R_x. Repeat for the different values of R_1 and enter your calculation in table 5.1 above .

Example for one calculation:

$R_x = R_1\left(\frac{L_2}{L_1}\right) = 30 \times \left(\frac{65.5}{34.5}\right) = 56.9\,\Omega$

4. Calculate the relative error $\Delta R_x / R_x$ for the different values of R_1 using the equation:

$$\frac{\Delta R_x}{R_x} = \left[\left(\frac{\Delta L_1}{L_1}\right)^2 + \left(\frac{\Delta L_2}{L_2}\right)^2\right]^{\frac{1}{2}}$$

Example for one calculation:

$\frac{\Delta R_x}{66.9} = \sqrt{\left(\frac{.05}{34.5}\right)^2 + \left(\frac{.05}{65.5}\right)^2} = 1.63 \times 10^{-3}$

Is it essential that the battery supplies a constant current to the wire? Explain your answer.

No, because the galvanometer will read I=0 at all time.

Because the balance point DV=0 ∴ I=0

6. From the table, determine the values of L_1 and L_2 for which the error $\Delta R_x / R_x$ is a **minimum.**

L_1 = 47.5 cm

L_2 = 52.5 cm

LAB REPORT FOR EXPERIMENT 6

Date: ---------------------------

Name:--[redacted] Partner's Name:--[redacted]

Registration No:--[redacted] Registration No:--[redacted]

Physics Section:--4-------------- Instructor's Name:--Dr Yehya

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PHYSICS LAB EXPERIMENT 6: THE POTENTIOMETER

1. PURPOSE:

to Calibrate the potentiometer using a voltmeter instead of the Standard cell ε_B; then use it to measure an unknown emf ε_x

II. DATA AND DATA ANALYSIS :

A. Calibration of the Potentiometer

1- Record your measurements of the reading V_x of the voltmeter at any point on the wire and the corresponding distance L_x in Table (6.1)below:

Table (6.1)

Reading	V_x (V)	L_x (cm)
1	.5	17
2	.9	30
3	1.5	51
4	2.0	70
5	2.5	90
6		

Plot a graph of V_x versus L_x. State your conclusion.

V_x and l_x have direct and linear relationship.

3- If the wire is uniform derive a simple relation between the voltmeter reading V_x at any point on the wire and the corresponding distance L_x.

$I = \frac{V}{R} = \frac{E^\circ}{\frac{\rho l(total)}{A}}$

$V_x = I R_x$ $\qquad R_x = \frac{\rho l}{A}$

$V_x = \frac{E_s^\circ}{\frac{\rho l}{A}}$

$= E_s \frac{l_x}{l\ tot}$

B. Measurement of an Unknown EMF

1- Calculate and record $\bar{L}_x$, the average value of L_x.

Trial	L_x(cm)
1	51
2	51
3	51
$\bar{L}_x$ = 51	cm

2- Use your graph of **part A** to find the value of E_x corresponding to $\bar{L}_x$.

$E_x = m l_x = 0.028 \times 51 = 1.47$ V

or from the graph $E_x = V_x = 1.5$ V

What is the current flowing through $\mathbf{E_x}$ when pointer touches the potentiometer wire at the balance point?

Current = 0 , G = 0

4- What happens to the balance point when a small resistor is connected in series between $\mathbf{E_x}$ and the **galvanometer**? Explain the result you observe.

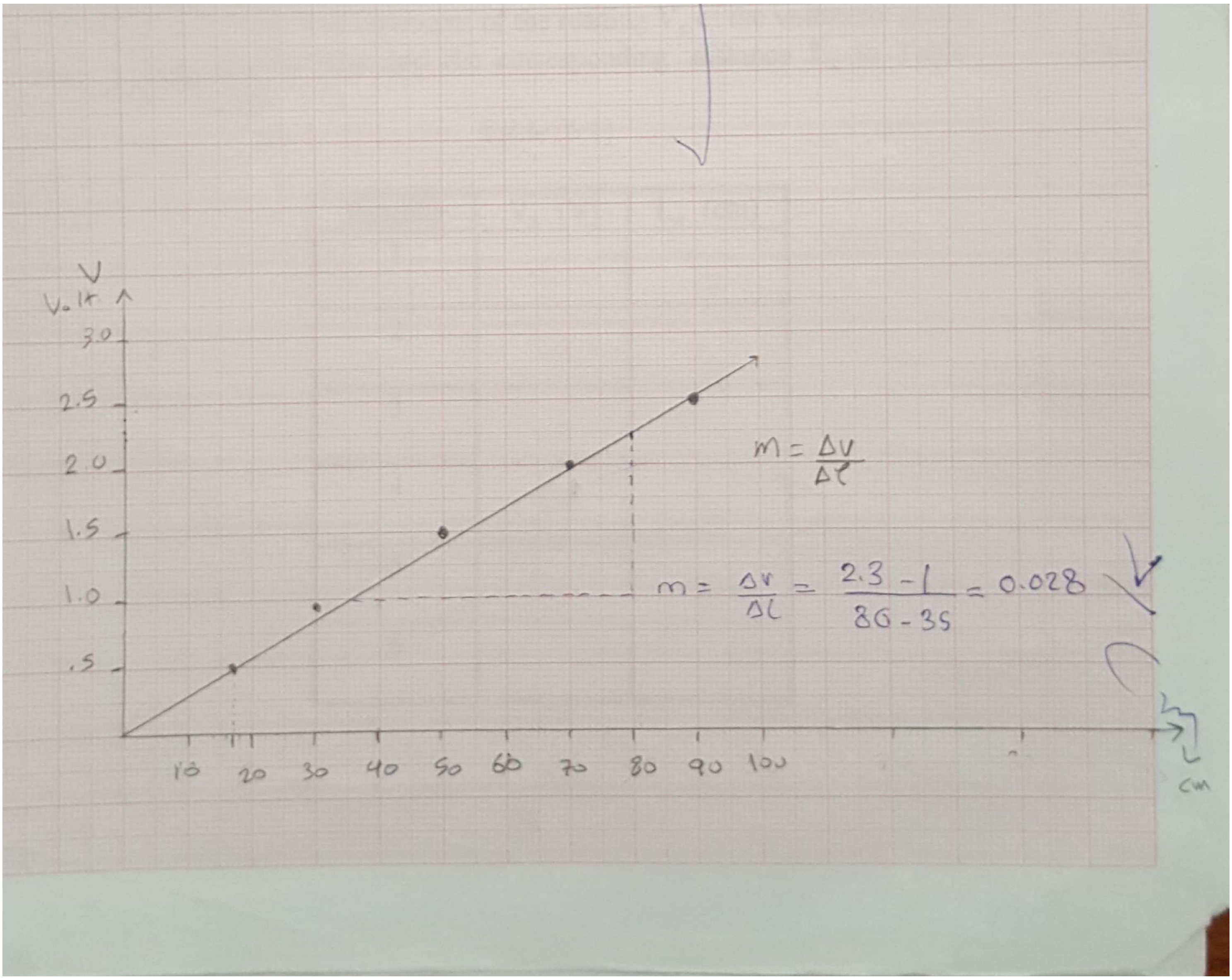
When G = 0 , I = 0

$V_x = E_x$

$m l_x = E_x$ if we added a resistor $V_x = E_x + IR$,

then $V_x = E_x$

(the current flowing is zero).


V
Volt
3.0
2.5
2.0
1.5
1.0
.5
10
20
30
40
50
60
70
80
90
100
cm
m = ΔV/Δl
m = ΔV/Δl = (2.3 - 1)/(80 - 35) = 0.028

LAB REPORT FOR EXPERIMENT 7

Date: 23 - Nov - 2015

Name: [redacted]

Partner's Name: [redacted]

10

Registration No: [redacted]

Registration No: [redacted]

Physics Section: 4

Instructor's Name: Dr. Yehya Ramadan

PHYSICS LAB EXPERIMENT 7 : THE RC TIME CONSTANT

1. PURPOSE

To determine the time constant for an RC circuit by measuring the charging current as a function of time.

IV. DATA AND DATA ANALYSIS:

1- Enter your data of the **charging current** , the corresponding **time** and the measured voltage source V_o in Table 7.1 below:

6.16eeee

Table 7.1

190 Case 1 61.6k				437 Case 2 61.6k			
C_1 = ~~200~~ µF , R = ~~60KΩ~~				C_2 = ~~500~~ µF , R = ~~60KΩ~~			
V_o = [crossed out] 6.16 Volts, I_o = 100 (µA)				V_o = [crossed out] 6.16 Volts, I_o = 100 (µA)			
Current (µA)	Time (s)	I / I_o	Ln (I / I_o)	Current (µA)	Time (s)	I / I_o	Ln (I / I_o)
100	0	1	0	100	0	1	0
70	5	.7	-.36	80	5	.8	-.22
56	10	.5	-0.69	68	10	.68	-.39
38	15	.38	-.97	58	15	.58	-.54
29	20	.29	-1.24	48	20	.48	-.73
19	25	.19	·1.7	42	25	.42	-.87
15	30	.15	-1.9	36	30	.36	-1.02
10	35	.1	-2.3	30	35	.3	-1.2
8	40	.08	-2.5	26	40	.26	-1.3
6	45	.06	-2.8	22	45	.22	-1.5
4	50	.04	.3.2	19	50	.19	-1.66
3	55	.03	-3.5	16	55	.16	-1.8
2	60	.02	-3.9	14	60	.14	-1.96
2	65	.02	-3.9	12	65	.12	-2.1
2	70	.01	-3.9	10	70	.1	-2.3
1	75	.01	-4.6	9	75	.09	-2.4
1	80	.01	-4.6	8	80	.08	-2.5
1	85	.01	-4.6	6	85	.06	-2.8
1	90	.01	-4.6	5	90	.05	-2.9
1	95	.01	-4.6	4.4	95	.04	-3.2
1	100	.01	-4.6	4	100	.04	-3.2
0	105	.01	-4.6	3.5	105	.035	-3.35
Slope = -.063 sec^{-1}, τ_1 = +15.78 sec				Slope = -.036 sec^{-1}, τ_2 = +27.78 sec			

2- Plot the **charging current** as dependent variable versus **time** as independent variable **for case 1**. Is the plot linear? What can you say about the shape of your graph?

It's not linear, it's exponential relationship. and it's decaying (decreasing).

3- From the data of charging current versus time, determine the value of the initial charging current I_o. This is the value of the current at $t = 0$. Record the value in table 7.1.

4- Plot $Ln(I/I_o)$ as the dependent variable versus time. Here, I is the charging current and I_o, the initial current determined in step (3) above. Is the plot linear?

Yes it's linear and it's ~~decaying~~. decreasing.

5- Draw the straight line that best fits the data and determine the slope of the line. Record the value of the slope in table 7.1.

6- Repeat steps 3,4 and 5 above for the second case.

7- Determine the time constant for each case from the equation:

$$\tau = \frac{-1}{\textbf{slope}}$$

and record it in table 7.1.

τ_1 (experimentally) = $slope_1 = -0.063\ sec^{-1}$ then $T_1 = \frac{-1}{slope} = \frac{1}{-0.063} = +15.87$ sec

τ_2 (experimentally) = $\frac{-1}{-0.036} = +27.78$ sec

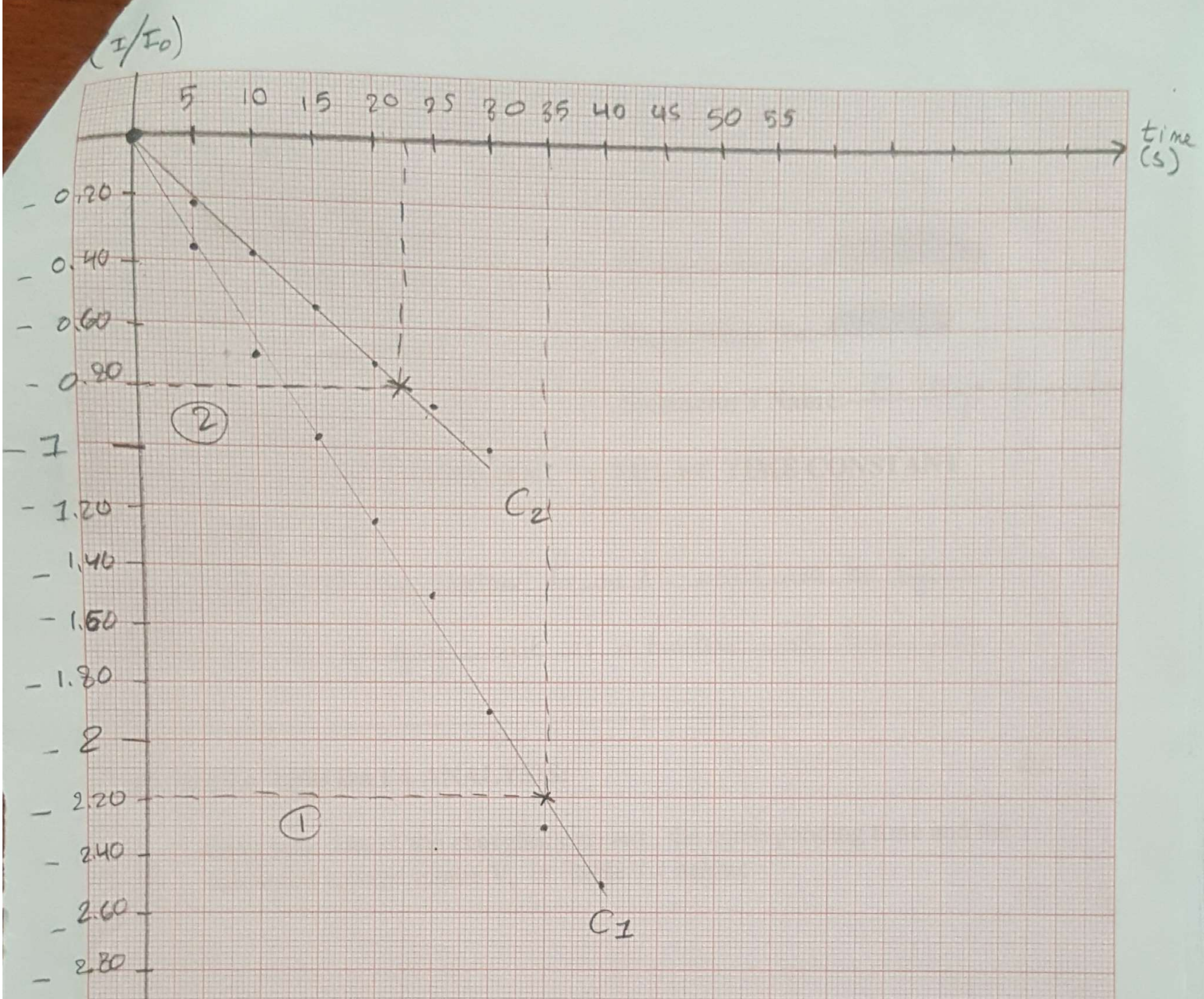
8- From the known values of C and R for each case, calculate $\tau_1 = RC_1$ and $\tau_2 = RC_2$ and compare these values with those obtained in step (6).

τ_1 (Calculated) = $RC_1 = 61.6 \times 10^3 * 190 * 10^{-6} = 11.704$ sec

τ_2 (Calculated) = $RC_2 = 61.6 \times 10^3 * 437 * 10^{-6} = 26.919$ sec

9- From the known values of V_o and R, , calculate $I_o = \frac{V_o}{R}$ which is the same for both cases. Compare this value with the one obtained in step (3) above.

I_o(calculated) = $\frac{6.6}{61.6 \times 10^3} = 1.07 \times 10^{-4} = 107\ \mu A$



$$\text{slope } 1 = \frac{(-2.2-0)}{35-0} = -0.063 \text{ sec}^{-1}$$

$$\text{slope } 2 = \frac{(-0.8-0)}{22.5-0} = -0.036 \text{ sec}^{-1}$$

LAB REPORT FOR EXPERIMENT 8

10

Name:--[redacted] | Date: ---16-11-2015---

Partner's Name:--[redacted]

Registration No:--[redacted] | Registration No:--[redacted]

Physics Section:---4--- | Instructor's Name:--Dr. Yehya Ramadeen

PHYSICS LAB EXPERIMENT 8: THE MAGNETIC FIELD OF A CURRENT

I. PURPOSE

To investigate the dependence of the direction & magnitude of the magnetic field (HE) on the current that produces it, & to find the reduction factor (k) of the galvanometer

II.DATA AND DATA ANALYSIS:

1. Enter your data in Table 8.1 below:

Table 8.1

	I(mA)	θ_1	θ_2	θ_3	θ_4	$\overline{\theta}$	$\tan \overline{\theta}$
1	20	21	20	19	22	20.5	.37
2	30	25	24	25	25	24.75°	.46
3	~~35~~ 40	35	35	36	34°	35°	.7
4	50	44°	43°	42°	40°	42.5	.91
5	60	49°	50°	50°	51°	50	1.19
6	70	53°	54°	54°	53°	53.5	1.35
7	80	55°	55°	55°	56°	55.25	1.44
8	90	56°	55°	60°	60°	57.75	1.583
radius of the coil = 7.25 cm				N=50 turns			

2- Using Table 8.1 plot a graph between the values of **I** as a dependent variable against the corresponding values of **tan** $\overline{\theta}$ as the independent variable.

3- Use your graph to find the value of the reduction factor **K** and the error **ΔK**.

$K = \frac{\Delta I}{\Delta \tan\theta} = \frac{(70-0)\times 10^{-3}}{1.25-0} = 56 \times 10^{-3}$ A

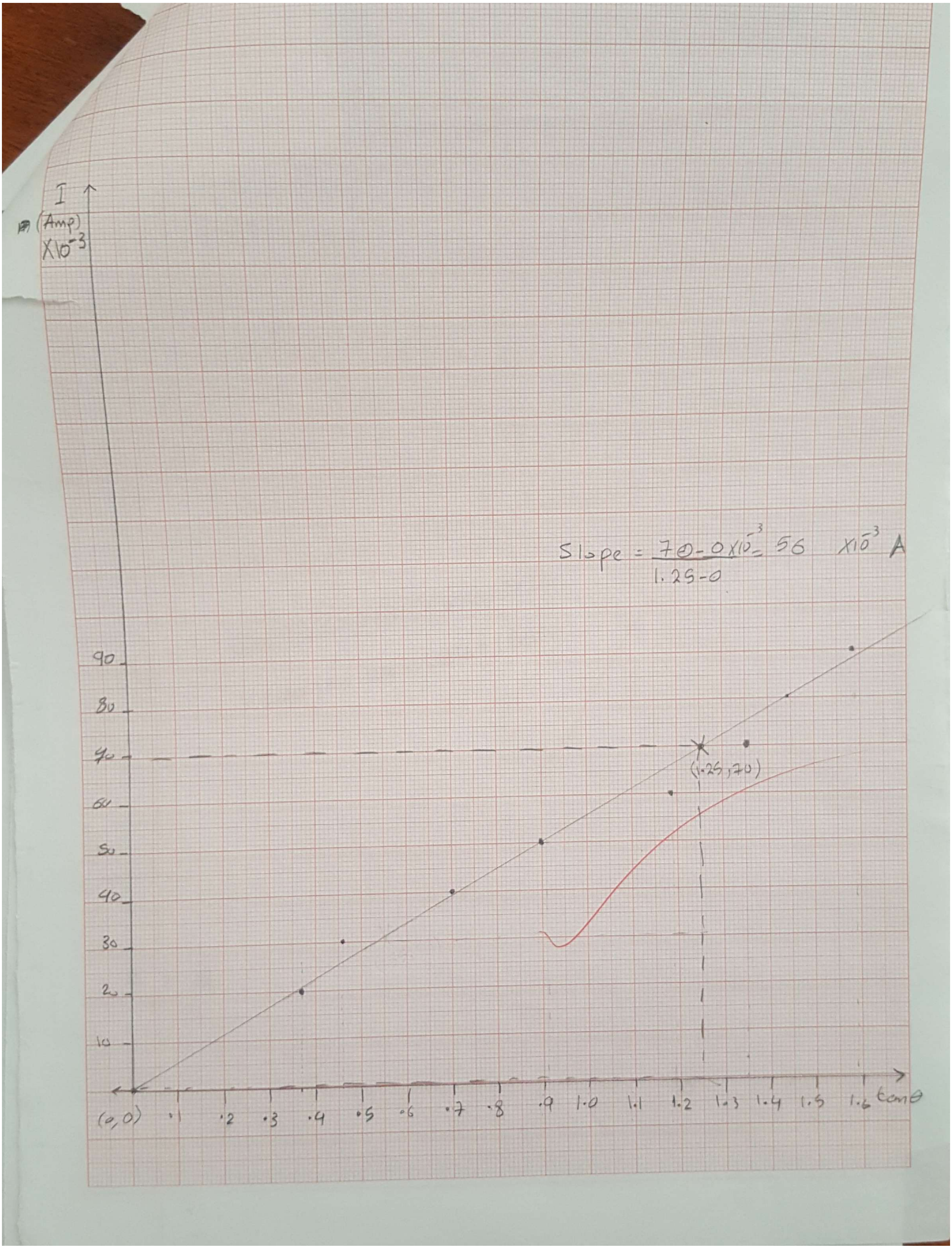
K ± **ΔK**. =

...ng the above value of $K \pm \Delta K$, find the value of $H_E \pm \Delta H_E$.

$k = \frac{10aH}{2\pi N}$

$56 \times 10^{-3} = \frac{10 * 7.25 * 10^{-2} H_E}{2 * 3.14 * 50}$, $H_E = 24.26$ Gauss

$H_E \pm \Delta H_E$ = 24.26 Gauss


I
(Amp)
X10⁻³
Slope = 70 - 0 X10⁻³ / 1.25-0 = 56 X10⁻³ A
90
80
70
60
50
40
30
20
10
(1.25,70)
(0,0)
·1
·2
·3
·4
·5
·6
·7
·8
·9
1.0
1.1
1.2
1.3
1.4
1.5
1.6
tanθ

LAB REPORT FOR EXPERIMENT 9
KIRCHHOFF'S LAWS

Date: ---14/12/2015---

10

Name:---[redacted]--- Partner's Name:--[redacted]

Registration No:-[redacted]--- Registration No:--[redacted]

Physics Section:----4------------ Instructor's Name:--Dr. Yehya Ramadan

PHYSICS LAB EXPERIMENT 9 : KIRCHHOFF'S LAWS

1. PURPOSE :

Apply Kirchoff's first and second laws to analyse the electric networks and compare the results with the experimental values.

II. DATA AND DATA ANALYSIS:

A. DATA:

1. Record the **measured values** of V_1 , V_2 , V_{R_1} , V_{R_2} and V_{R_3} and their **polarities** on digram 1 shown bellow.

2. Record the measured values of I_1, I_2, and I_3 and and their **direction** of flow on **diagram 1.**

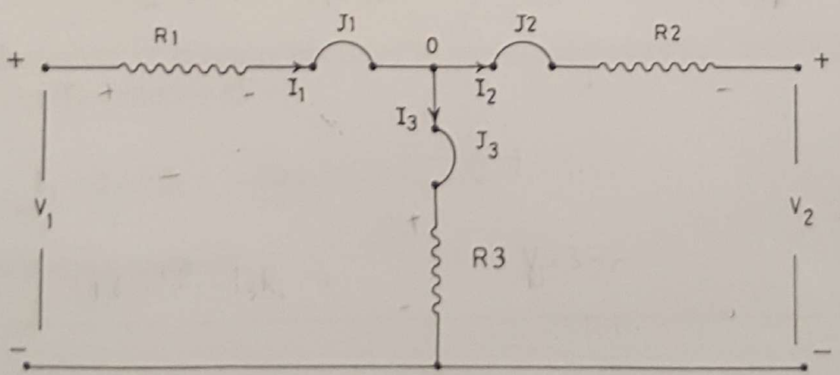
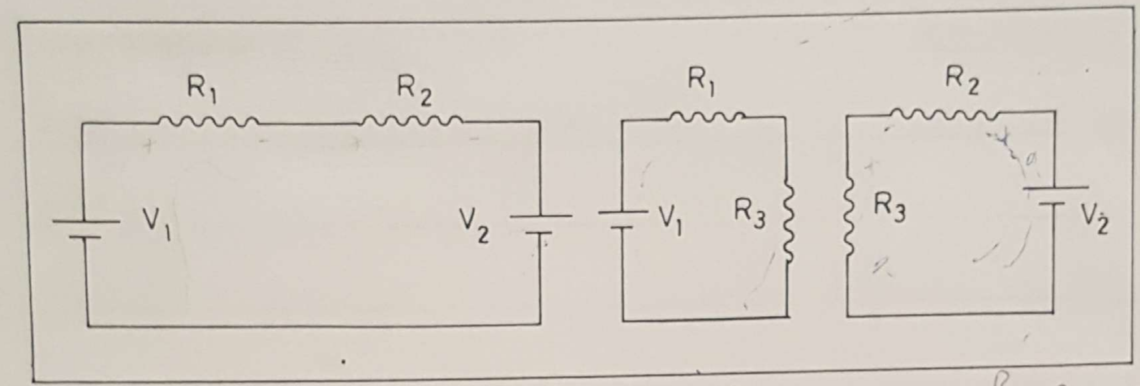


diagram 1

B. Using the values obtained in part A, calculate the sum of voltage drops around the three loops shown below:



$V_{R_1} = 2.2v$, $V_{R_2} = .7v$, $V_{R_3} = 2.6v$
$I_{R_1} = 6.2$, $I_2 = 1.2A$, $I_{R_3} = 5A$

$R_1 = 360\ \Omega$
$R_2 = 470\ \Omega$
$R_3 = 680\ \Omega$

$V_1 + V_{R_1} + V_{R_3}$ = 6 − 2.2 − 3.6 = .2 ≈ 0 volt

$V_2 + V_{R_2} + V_{R_3}$ = 3 + .7 − 3.6 = .1 ≈ 0 volt

$V_1 + V_{R_1} + V_{R_2} - V_2$ = 6 − 2.2 − .7 − 3 = .1 ≈ 0 volt

Are the sums shown above equal to zero?

Yes

C. Using the values of currents obtained in part A, calculate the total sum of currents at the junction O

$I_1 + I_2 + I_3 =$ 6.2 − 5 − 1.2 = 0

Is the sum equal to zero?

Yes

D. Using the values of V_1 and V_2 and the values of R_1, R_2, and R_3, set up the **loop** and **branch** equations, and solve them to determine the values of I_1, I_2 **and** I_3 and **compare** with the values obtained **experimentally** in part A.

Loop equations:

loop $+V_1 + -I_1R_1 - I_2R_2 - V_2 = 0$ — (1) $6 - 360I_1 - 470I_2 - 3 = 0$

loop $V_1 - I_1R_1 - I_3R_3 = 0$ — (2) $6 - 360I_1 - 680I_3 = 0$

loop $V_2 + I_2R_2 - I_3R_3 = 0$ — (3) $3 + 470I_2 - 680I_3 = 0$

$I_1 = I_2 + I_3$ $I_3 = 5.3\,mA$, $I_1 = 6.6\,mA$, $I_2 = 1.3\,mA$

Branch equations:

$I_1 = I_2 + I_3$ — (4) $6.6 = 1.3 + 5.3$ ✓

Calculated values:

I_1 = 6.6 m Ampere

I_2 = 1.3 m Ampere

I_3 = 5.3 m Ampere

Experimental values:

I_1 = 6.2 m Ampere

I_2 = 1.2 m Ampere

I_3 = 5 m Ampere

LAB REPORT FOR EXPERIMENT 10

Date: 14 December

Name: [redacted]

Partner's Name: [redacted]

Registration No: [redacted]

Registration No: [redacted]

Physics Section: 4

Instructor's Name: Dr. Yahya Ramadan

PHYSICS LAB EXPERIMENT 10: ELECTROMAGNETIC INDUCTION

I. PURPOSE:

To investigate the conditions required to produce an induced current.

II. DATA AND DATA ANALYSIS:

Enter, in Table 10.1 below your observations and deductions on the investigated cases of induced current production.

Table 10.1

Action	Direction of Current Primary	Secondary	Size of deflection and comments
(a)	C.W	C.C.W	small 4
(b)	C.W	C.W	4
(c)	C.W	C.C.W	2
(d)	C.W	C.W	2
(e)	C.W	C.W	4
(f)	C.W	C.C.W	4
(g)	C.W	C.C.W	4 → greater than 50
(h)	C.W	No change	No change
(i)		C.W	29
(j)		C.C.W	26
(k)		C.C.W	24
(L)		C.W	24

1- From the directions of the secondary current in case **a** and **b** determine whether **Lenz's law** is obeyed. Explain.

Case a:

Yes the Lenz's law is obeyed because when we turn on the switch with primary solenoid the secondary solenoid has an increasing in the magnetic flux so it will opposes this increase

Case b:

when the switch turns off the secondary solenoid will opposes this decreasing.

2- Explain the reason for the **difference in deflection** of the galvanometer in case g when a soft iron rod is inserted in the winding .

when we put an iron rod in the first solenoid the deflection will increase because the iron has magnetic properties (materials) that will increase ~~that~~ the change in magnetic flux.

3- Explain what happens to the **size of deflection** of the galvanometer when a brass rod is inserted in the windings.

It will not change the size of deflection because brass doesn't have magnetic properties. (paramagnetic)

LAB REPORT FOR EXPERIMENT 11

10

Date: 14/12/2015

Name: [redacted]

Partner's Name: [redacted]

Registration No: [redacted]

Registration No: [redacted]

Physics Section: 4

Instructor's Name: Dr Yahya Ramadan

PHYSICS LAB EXPERIMENT 11: THIN LENSES

1. PURPOSE :

to study the relation between the object distance, image distance and focal length of converging and diverging lenses.

II. DATA AND DATA ANALYSIS:

A. CONVERGING LENS (CONVEX):

1. Enter your data in Table 11.1 below:

Table 11.1

Trial No.	O (cm)	i (cm)	f (cm)	M	Characteristics of the image: Real or virtual	Erect or inverted
f_1	30	14	9.5	-.46	real	inverted
f_2	35	13	9.47	-.37	real	inverted
f_3	23	17	9.77	-.73	real	inverted
f_4						
f_5						
$\bar{f}$ = 9.58 (cm)				$\Delta \bar{f} = \pm$ .09 (cm)		

2- From the values of **O** and **i** calculate **f** the focal length of the lens in each case and then calculate $\bar{f}$ and enter the results in Table 11.1 .

example of one case: O = 30, I = 14, $\frac{1}{f} = \frac{1}{30} + \frac{1}{14} = \frac{11}{105}$

$f = 9.5$ cm

3- Calculate the error $\Delta \bar{f}$ using the standered deviation method .

$\Delta f = \pm \sqrt{\frac{\Sigma(f-\bar{f})^2}{n(n-1)}} = \pm \sqrt{\frac{(9.5 - 9.58)^2 + (9.47 - 9.58)^2 + (9.77 - 9.58)^2}{(3 \times 2)}}$

$\Delta f = .09$ Cm

4- Calculate the magnification **M,** using the height of the object and the height of the image, **or** using equation 11.2 and enter the results in Table 11.1 ..

example of one case: $M = -\frac{i}{o} = -\frac{14}{30} = -.466$

5- Compare the experimental value of $\bar{f}$ with the **actual value** of focal length printed on the lens.

Experimental value: $\bar{f}$ = ...9.58.....cm.

Actual value: f = ...10..........cm.

B. DIVERGING LENS (CONCAVE):

1. Enter the data in Table 11.2

Table 11.2

Trial No.	O' (cm)	i' (cm)	f (cm)	M	Characteristics of the image	
f_1	-18	26	-58.5	1.44	real	erect
f_2	-22	42	-46.2	1.41	real	erect
f_3	-14	21	-42	1.5	real	erect.
f_4					~~real~~	
f_5						
$\bar{f}$ =	-48.9	(cm)		$\Delta \bar{f} = \pm$	4.95	(cm)

2- From the recorded values of O' and i', calculate the focal length **f** of the diverging lens in each case. **Note that O' is negative** as it represents the distance of a virtual object and enter the results in Table 11.2.

example of one case: $\frac{1}{f} = \frac{1}{O'} + \frac{1}{I'} = \frac{-1}{18} + \frac{1}{26} =$ ~~-58.5~~

$-\frac{117}{2} = -58.5$ cm

3- Calculate $\bar{f}$ and enter the results in Table 11.2. Compare the experimental value of $\bar{f}$ with the actual value of the focal length printed on the lens.

$\bar{f} = \frac{-58.5 - 46.2 - 42}{3} = -48.9$ cm

Experimental value: $\bar{f}$ = -48.9 cm.

Actual value: f = -50 cm.

4. Calculate the error $\Delta\bar{f}$ using the standard deviaion method

~~$\Delta\bar{f} = \left|\frac{f_{actual} - f_{exp}}{f_{actual}}\right| \times 100\% = 2.2\%$~~

$\Delta\bar{f} = \sqrt{\frac{(-58.5+48.9)^2 + (-46.2+48.9)^2 + (-42+48.9)^2}{6}} = \pm 4.95$ cm

5- Calculate the magnification **M,** using the height of the object and the height of the image, **or** using equation 11.2 and enter the results in Table 11.2

example of one case: $M = -\frac{i'}{O'} = -\frac{(+26)}{-18} = 1.44$