*. Experiment · 01.

Find The volume of cylinder by vernier callipers.

Observations:

L·C = $\frac{\text{Small division on main scale}}{\text{Total no. of division on vernier scale}} = \frac{1}{10} = 0.1\text{mm}$

$= \underline{0.01}\text{ cm.}$

Z·E = ±nill cm.

Table

Quantity To be measured	No. of Obs.	Main scale reading M (cm)	Vernier scale reading N "Div"	Fraction To be added (cm) f = N(0.01)	Observed Reading (cm) R = M + f	Mean (cm)
Lenght	1	2.4	2	0.02	2.42	
	2	2.4	3	0.03	2.43	l = 2.43
	3	2.4	4	0.04	2.44	
Diameter	1	0.8	5	0.05	0.85	
	2	0.8	6	0.06	0.86	d = 0.86
	3	0.8	7	0.07	0.87	

Calculations:

Mean diameter of a cylinder = d = $\underline{0.86}$ cm.

Radius of cylinder = r = d/2 = $\underline{0.43}$ cm.

Mean lenght of cylinder = l = $\underline{2.43}$ cm.

Volume = V = $\pi r^2 l$.

= $\underline{1.41}$ cm^3

* Experiment : 02

Find volume of sphere using screw gauge.

Observations:

$$L.C = \frac{\text{Pitch of screw}}{\text{Total no. of divisions on circular scale}}$$

$$= \frac{0.5}{50} = \underline{0.01}\ mm = \underline{0.001}\ cm$$

$Z.E = \pm$ Nill mm.

Table:

Quality To be measured	No. of Obs.	Main scale reading M (mm)	Circular scale reading N (Div)	Fraction To be added f = N(0.01) mm	Observed reading (mm) R = M+f	Mean (mm)
Diameter	1	10.5	35	0.35	10.85	10.85
	2	10.5	36	0.36	10.86	
	3	10.5	35	0.35	10.85	

Calculations:

Mean diameter of sphere $= d = \underline{10.85}$ mm

Mean radius of sphere $= r = \frac{d}{2} = \frac{10.85}{2} = \underline{5.42}$ mm

Volume of sphere $= V = \frac{4}{3}\pi r^3 =$

Volume of sphere $= V = \frac{4}{3}(3.14)(5.42)^3 = \underline{666}\ mm^3$.

* Experiment: 03.

To find unknown weight of body by method of vector addition.

Observations

Scale selected (SS) $1\,cm = \frac{10}{1000} g \times 9.8\ m/s^2$

$= \underline{0.098}$ N.

Table:

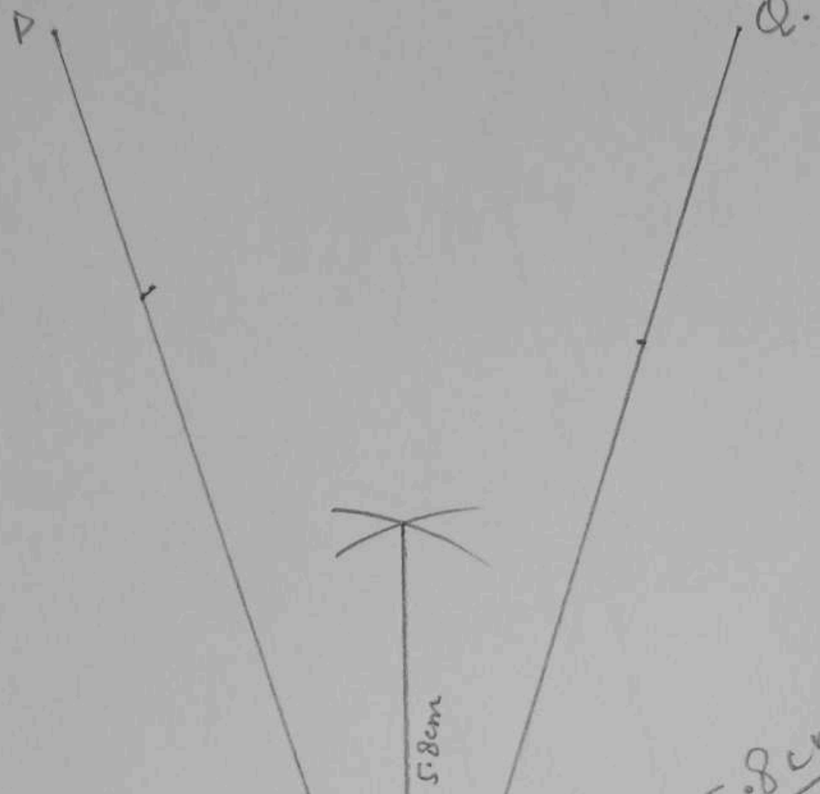
No. of Obs.	Weight hanging on P (N)	Weight hanging on Q (N)	Representative lenght of vector $\bar{P}$ $\overline{OA}$ (cm)	Representative lenght of vector Q $\overline{OB}$ (cm)	Representative lenght of Resultant vector $\bar{R}(\overline{OC})$ (cm)	Equivalent weight of $\bar{R} = \overline{OC} \times SS$ (N)
1	0.294	0.294	3	3	5.8	0.5684
2	0.294	0.294	3	3	5.8	0.5684
3	0.294	0.294	3	3	5.8	0.5684

Calculations:

Mean value of unknown weight = 0.5684 N.

Result:

Value of unknown weight is 0.5684 N.



5.8cm

Roll# 57

*. Experiment: 04.

To determine value of "g" by free fall using electronic timer.

Table

No. of Obs.	Height of free fall h (cm)	Time of free fall t_1 (sec)	Time of free fall t_2 (sec)	Mean time $t = \frac{t_1 + t_2}{2}$ (sec)	Value of g $g = \frac{2h}{t^2}$ (cm/sec^2)
1	70	0.38	0.38	0.38	972.2
2	80	0.40	0.40	0.40	1000
3	90	0.42	0.42	0.42	978.2

Calculations:

Mean value of g = 983.4 cm/sec^2.

* Experiment: 05.

Verificant of The laws of simple pendulum.

i) Time period is independent of amplitude.

For Amplitude Relation:

Observations:

Diameter of bob = d = 1.90 cm.

Radius of bob = $r = \frac{d}{2}$ = 0.95 cm.

Lenght of Thread including hook = l' = 99.1 cm.

Lenght of simple pendulum = $l = l' + r$

$= 99.1 + 0.95 = 100.05$ cm (constant).

Mass of pendulum bob = m = 10 g (constant).

Table:

No. of Obs.	Amplitude (cm)	Time for 20 vibrations t_1 (sec)	Time for 20 vibrations t_2 (sec)	Mean time $t = \frac{t_1 + t_2}{2}$ (sec)	Time period $T = \frac{t}{20}$ (sec)
1.	5	37	37	37	1.85
2.	10	37	37	37	1.85
3.	15	37	37	37	1.85

Result:

Time period of Pendulum is independent of amplitude".

*. Experiment: 05.

ii) Time period of different masses.

For Mass Relation:

Observations:

Diameter of 1^{st} bob = d_1 = 1.90 cm.

Diameter of 2^{nd} bob = d_2 = 2.90 cm.

Diameter of 3^{rd} bob = d_3 = 3.90 cm.

Radius of 1^{st} bob = r_1 = 0.95 cm.

Radius of 2^{nd} bob = r_2 = 1.45 cm.

Radius of 3^{rd} bob = r_3 = 1.95 cm.

Lenght of Thread including hook and radius = l = 100 cm (constant).

Amplitude of vibration 5 cm (constant).

Table:

No. of Obs.	Mass of bob m (gm)	Time for 20 vibrations (t_1) (sec)	Time for 20 vibrations (t_2) (sec)	Mean time $t = \frac{t_1 + t_2}{2}$ (sec)	Time period $T = \frac{t}{20}$ (sec)
1.	10	37	37	37	1.85
2.	20	37	37	37	1.85
3.	30	37	37	37	1.85

Result:

"Time period of pendulum is independent of mass."

Page N

*. Experiment: 05.

iii) Time period is directly proportional to square root of its lenght.

For lenght Relation:

Observations:

Diameter of bob = d = 1.90 cm.

Radius of bob = r = $\frac{d}{2}$ = 0.95 cm.

Amplitude of vibration = 5 cm (constant).

Mass of bob = m = 10 g (constant).

Table:

No. of Obs.	Lenght of hook + Thread l' (cm)	Lenght of Pendulum $l = l' + r$ (cm)	Time of 20 Vibrations t_1 (sec)	Time of 20 Vibrations t_2 (sec)	Mean Time $t = \frac{t_1 + t_2}{2}$ (sec)	Time period $T = \frac{t}{20}$ (sec)	Ratio $\frac{T}{\sqrt{l}}$ = constant
1.	60	60.95	31	31	31	1.55	0.19
2.	70	70.95	33	33	33	1.65	0.19
3.	80	80.95	36	36	36	1.85	0.20

Result:

"Time period of pendulum is directly Proportional to square root of its lenght."

*. Experiment : 06.

To determine the acceleration due to gravity by mass spring system.

Observations:

Initial position of pointer when weight of hanger is not acting on spring = 0 cm

Table:

No. of Obs.	Weight Hanged including hanger in gram	Extension x (cm)	Time for 20 vibration including hanger's weight		Mean Time $t = \frac{t_1+t_2}{2}$ (sec)	Time period $T = \frac{t}{20}$ (sec)	Value of g $g = \frac{4\pi^2 x}{T^2}$ cm/sec²
			t_1 (sec)	t_2 (sec)			
1.	200	12	14	14	14	0.7	966
2.	250	15	15	15	15	0.75	1052
3.	300	18	17	17	17	0.85	983

Calculations:

Mean value of $g = \underline{1000}$ cm/sec^2.

* Experiment: 19.

To determine refractive index of material of prism by critical angle method.

Table:

No. of Obs.	$\angle PQR$	$\theta_c = \frac{1}{2} \angle PQR$
1.	78	39
2.	78	39
3.	78	39

Calculations:

Mean value of θ_c = 39.

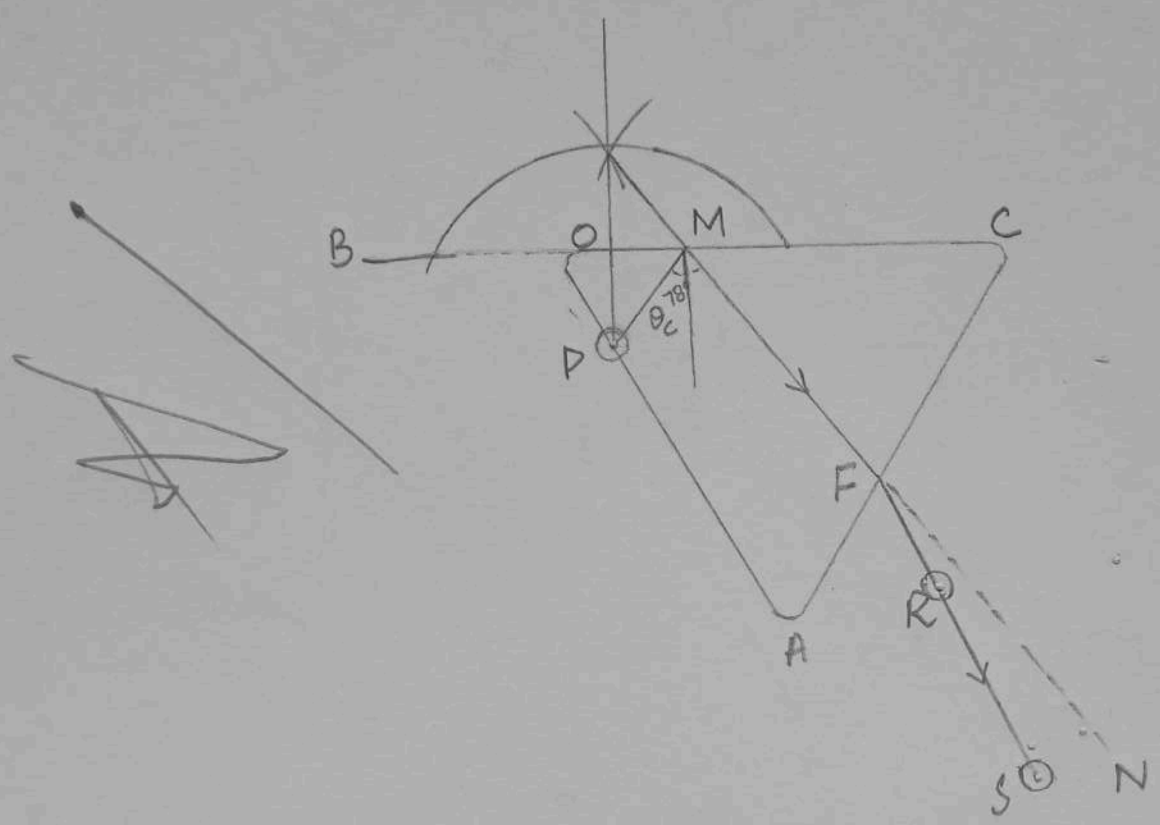
Refractive index of glass = $\mu = \frac{1}{\sin \theta_c}$

$= \frac{1}{\sin 39}$

$= \frac{1}{0.629} = 1.59.$

Result:

So refractive index of material is 1.59.


B
O
M
C
P
$78°$
θ_c
F
A
R
S
N

*. Experiment: 20.

To find refractive index of a liquid using a concave mirror

Observation:

Approximate focal lenght of a concave mirror = 10 cm.

Table:

No. of Obs.	Distance between the pole of mirror and the tip of the needle without liquid $\overline{AC}$ (cm)	Distance between the pole of mirror and the tip of the needle with liquid. $\overline{BC}$ (cm)	Refractive index. $\mu = \frac{\overline{AC}}{\overline{BC}}$
1.	20.5	15.4	1.3
2.	24	18	1.3
3.	30.5	23	1.3

Calculation:

Mean value of refractive index = 1.3.

*. Experiment: 01.

Determine resistance of given wire using slide wire bridge and calculate its specific resistance.

Circuit Diagram:

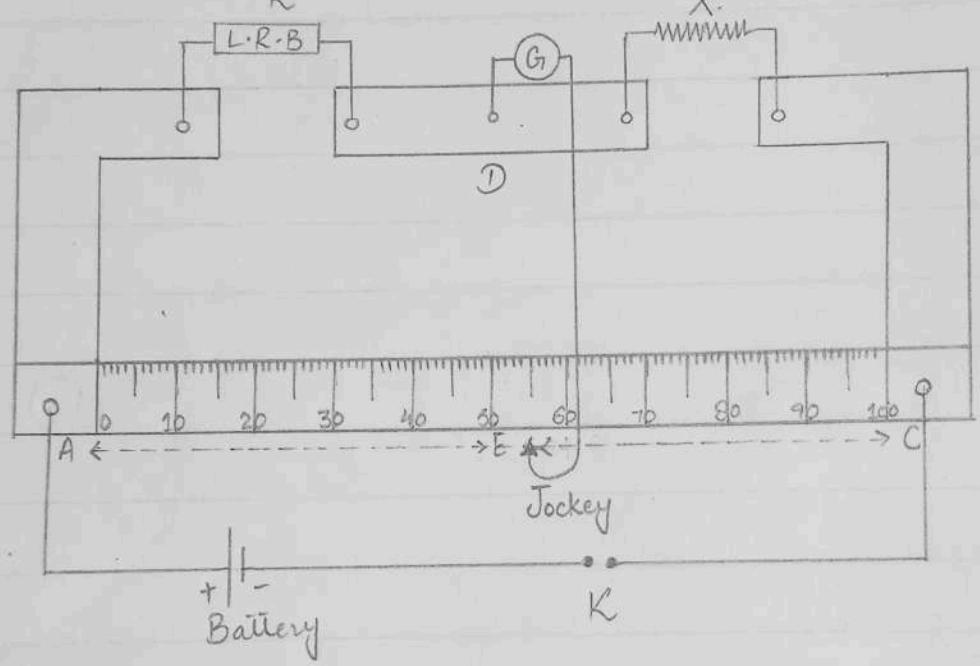


Table:

No. of Obs.	Resistance Taken from L.R.B $R(\Omega)$	Distance of Balance Point B from end A L_1 (cm)	Distance of Balance Point B from end A $L_2 = (100 - L_1)$ (cm)	Unknown Resistance $X = (L_2/L_1)R(\Omega)$
1.	5	41	59	7.2
2.	7	48	52	7.6
3.	9	53	47	7.9

Calculation:

Mean $X = \underline{7.6}\ \Omega$.

Resistivity

Lenght of unknown resistance wire = L = 100 cm.

Diameter of unknown resistance wire = D = 0.56 mm.

= 0.056 cm.

Radius of unknown resistance wire = r = 0.028 cm.

Resistivity or specific resistance = $\rho = \frac{\pi r^2 x}{L}$

$$= \frac{(3.14)(0.028)^2(7.6)}{100}$$

$$\rho = 1.87 \times 10^{-4} \text{ ohm cm.}$$

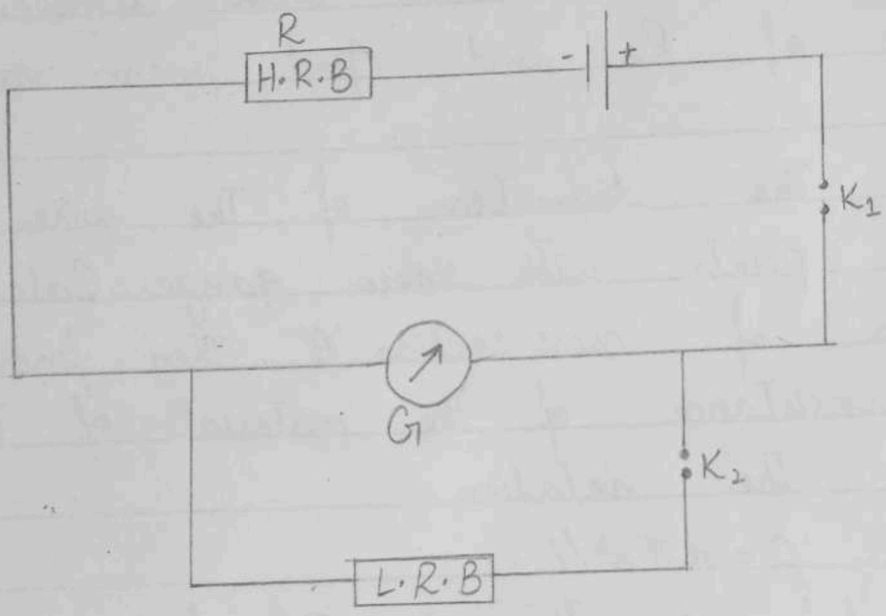
Result:-

Hence, resistivity is 1.87×10^{-4} ohm cm.

*. Experiment: 02.

Determine resistance of a galvanometer by half deflection method and To find current for full scale deflection.

Circuit Diagram.

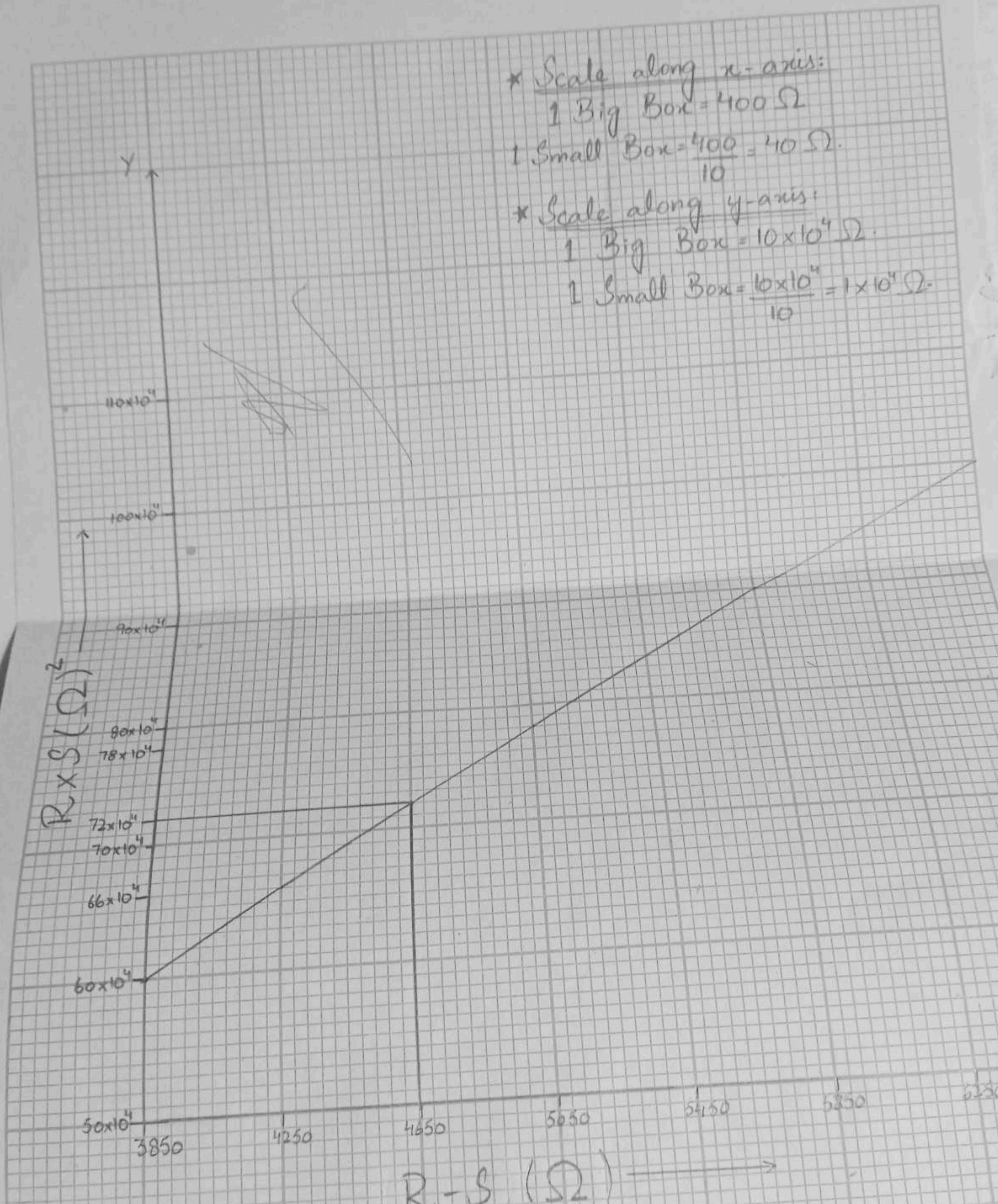


Table

No. of Obs.	Resistance Taken from H.R.B $R(\Omega)$	Deflection on galvanometer θ (div)	Half deflection $\theta/2$ (div)	Shunt resistance $S(\Omega)$	Galvanometer resistance $R_g = \frac{R \times S}{R - S}$ (Ω)
1.	6400	24	12	105	106
2.	7000	22	11	105	106
3.	8200	20	10	105	106

Calculation:

Mean value of $R_g = \underline{106}\ \Omega$.


* Scale along x-axis:
1 Big Box = 400 Ω
1 Small Box = 400/10 = 40 Ω.
* Scale along y-axis:
1 Big Box = 10×10⁴ Ω.
1 Small Box = 10×10⁴/10 = 1×10⁴ Ω.
Y
R×S (Ω)²
110×10⁴
100×10⁴
90×10⁴
80×10⁴
78×10⁴
72×10⁴
70×10⁴
66×10⁴
60×10⁴
50×10⁴
3850
4250
4650
5050
5450
5850
6250
R-S (Ω)

* Experiment: 03

Determine The resistance of a voltmeter by drawing graph between "R" and "1/V".

Circuit Diagram:

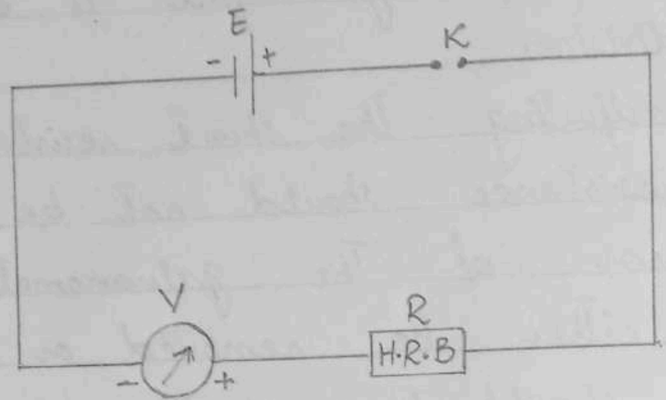


Table:

No. of Obs.	Resistance Taken from H.R.B $R(\Omega)$	Voltmeter reading V (volt)	$1/V = (volt)^{-1}$
1.	0	3.003	0.333
2.	550	2.604	0.384
3.	850	2.403	0.416
4.	1050	2.298	0.435
5.	1700	2	0.500
6.	2600	1.701	0.588

Calculation:

From graph value of $R_v = \underline{3000}\ \Omega$.

* Scale along x-axis:-

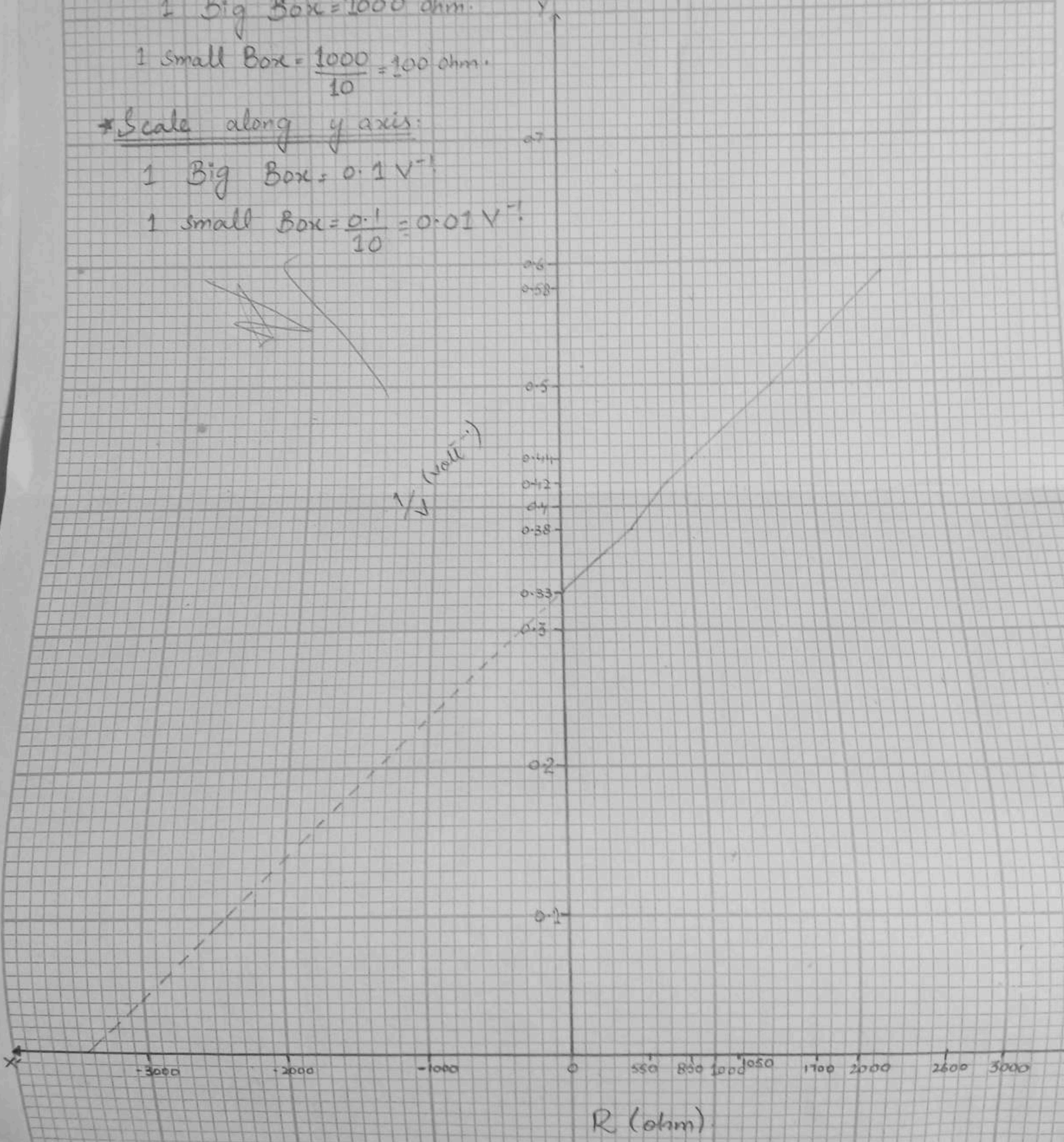
1 Big Box = 1000 ohm.

1 small Box = $\frac{1000}{10}$ = 100 ohm.

* Scale along y axis:

1 Big Box = 0.1 V^{-1}

1 small Box = $\frac{0.1}{10}$ = 0.01 V^{-1}



*. Experiment: 07.

To determine internal resistance of a cell using potentiometer.

Circuit Diagram:-

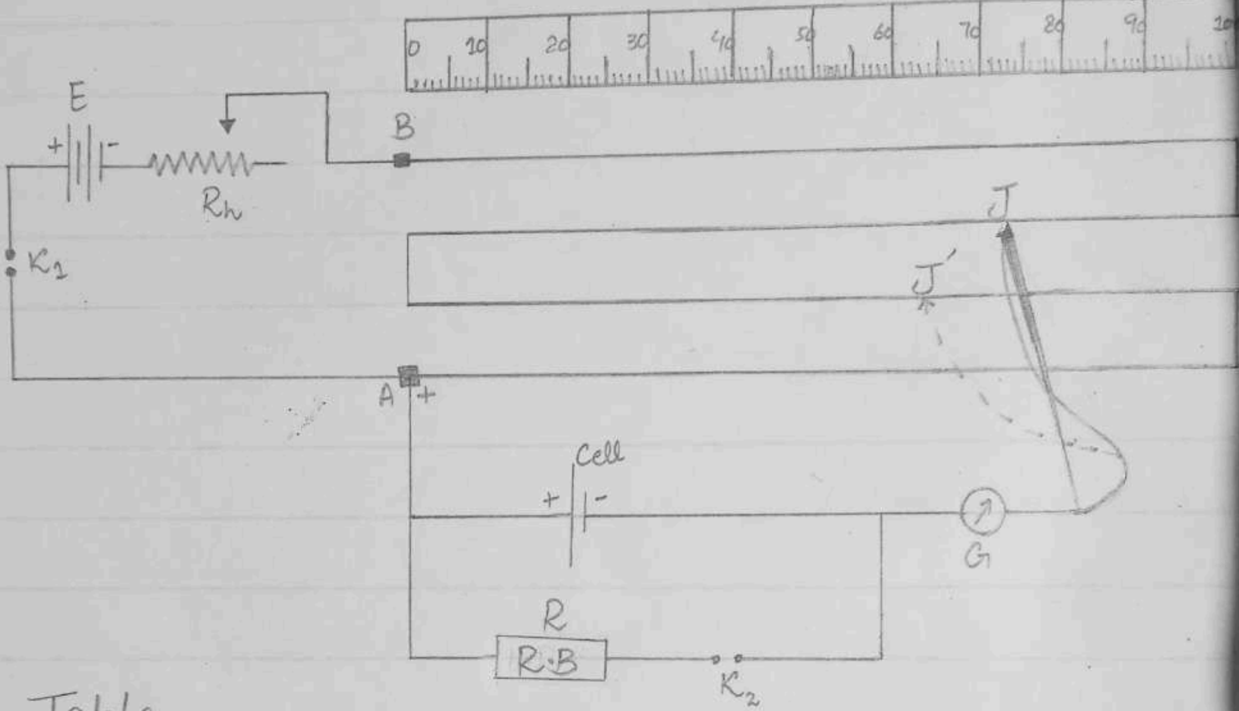


Table:

No. of Obs.	Balancing lenght when K_2 is open L_1 (cm)	Resistance Taken from L.R.B $R(\Omega)$	Balancing lenght when R is Taken out L_2(cm)	Internal resistance $r = \left(\frac{L_1 - L_2}{L_2}\right) R(\Omega)$
1.	213	5	178	0.98
2.	213	8	190	0.97
3.	213	10	194	0.98

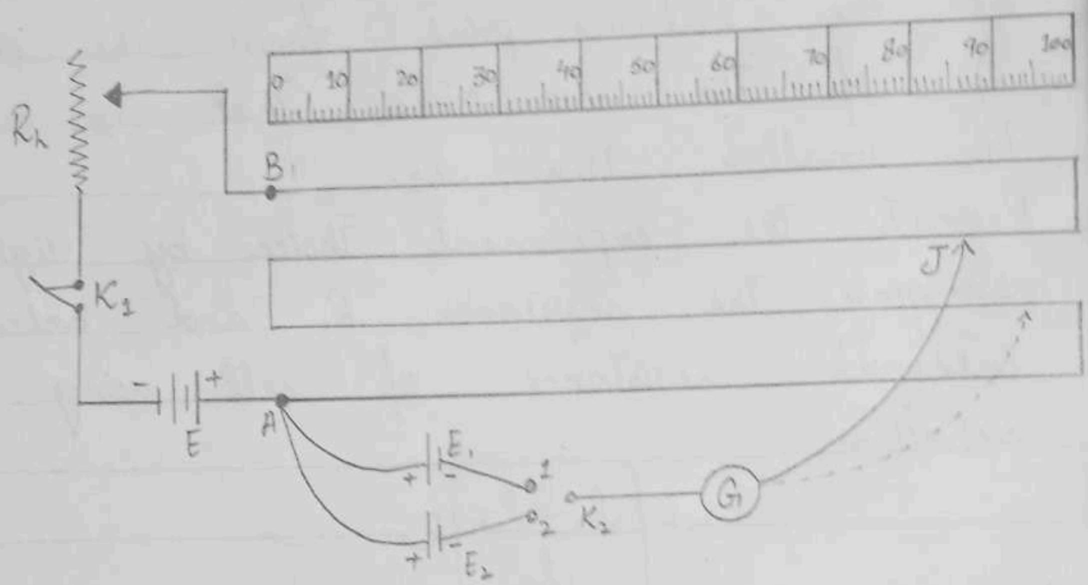
Calculation:

Mean value of $r = \underline{0.98}\ \Omega$.

* Experiment: 08.

To determine emf of a cell using Potentiometer.

Circuit Diagram:



Observations:

Measured emf of (unknown) required Cell = E_x = 1.3 volt

Measured emf of Known cell = E' = 1.3 volt.

Table:

No. of Obs.	Balancing lenght on potentiometer wire for cell E_x L_1 (cm)	Balancing lenght on potentiometer for cell E' L_2 (cm)	e.m.f of cell $E_x = E' \times \frac{L_1}{L_2}$ (volt)
1.	63	64	1.3
2.	96	97	1.3
3.	142	143	1.3

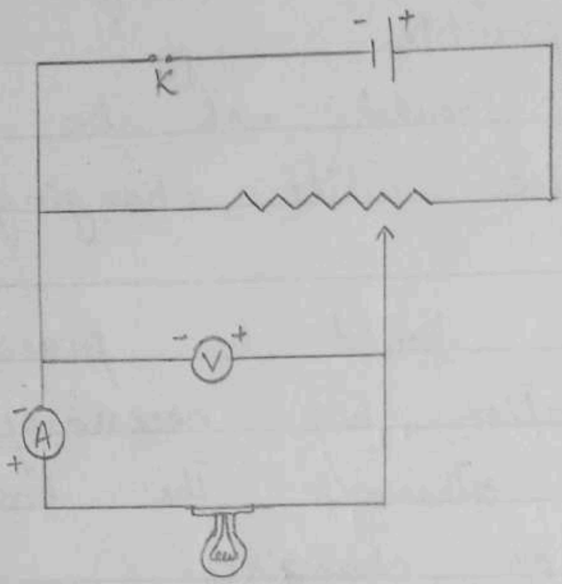
Calculation:

Mean value of E_x = 1.3 volt.

*. Experiment: 09.

To study relation between current through Tungshen filament lamp and potential difference across it

Circuit Diagram:



No. of Obs.	Voltmeter Reading V(volt)	Ammeter Reading I(A)	Ratio(R) = $\frac{V}{I}$ (Ω)
1.	0	0	0
2.	0.5	0.4	1.25
3.	1	0.52	1.92
4.	1.5	0.62	2.42
5.	2	0.72	2.77
6.	2.5	0.8	3.12
7.	3.5	0.92	3.80
8.	4.5	1.05	4.28

* Scale along x-axis:

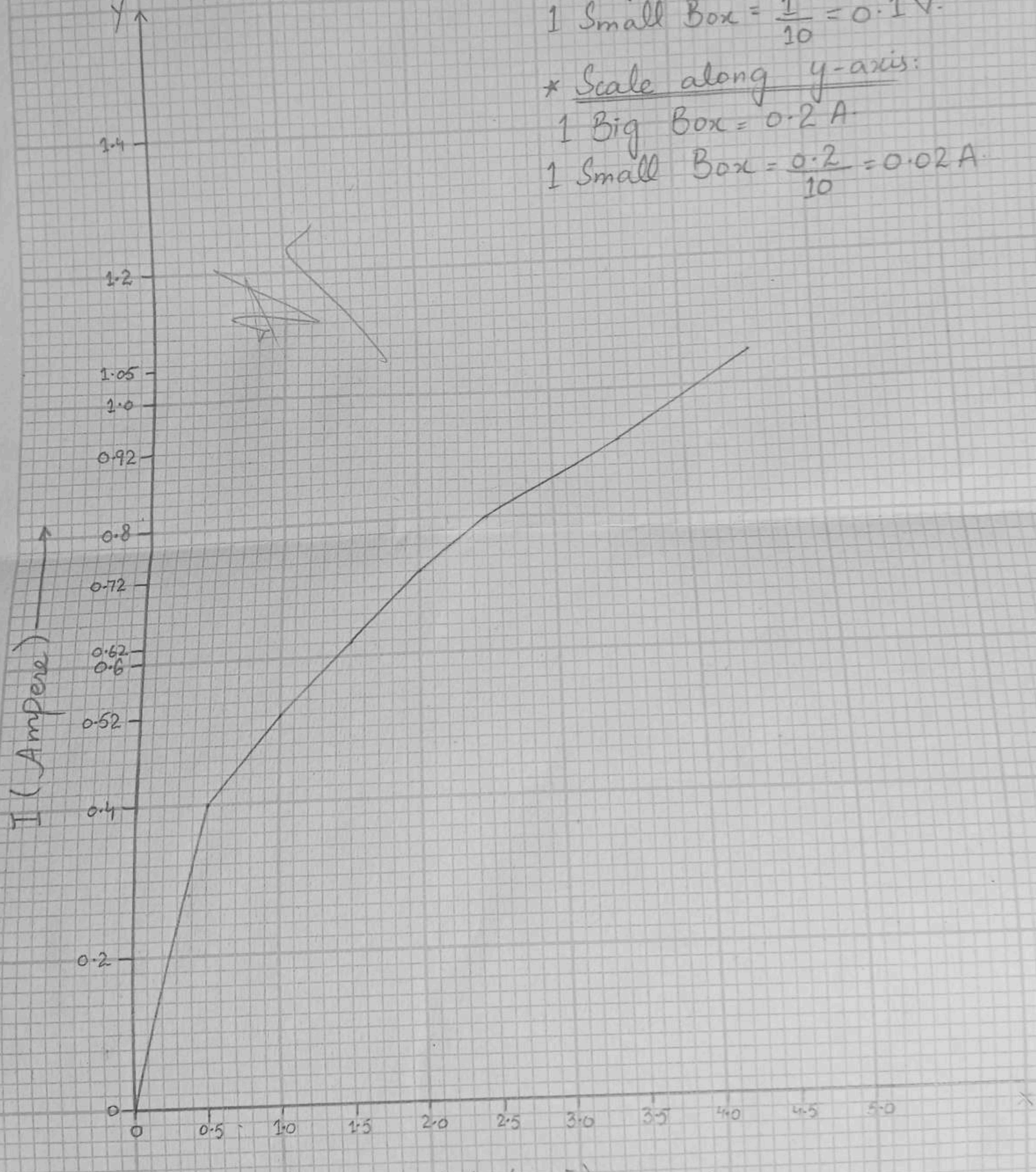
1 Big Box = 1 V.

1 Small Box = $\frac{1}{10}$ = 0.1 V.

* Scale along y-axis:

1 Big Box = 0.2 A.

1 Small Box = $\frac{0.2}{10}$ = 0.02 A.



*. Experiment : 12.

To study relation between current and capacitance Through a resistor and measure its time constant.

Circuit Diagram:

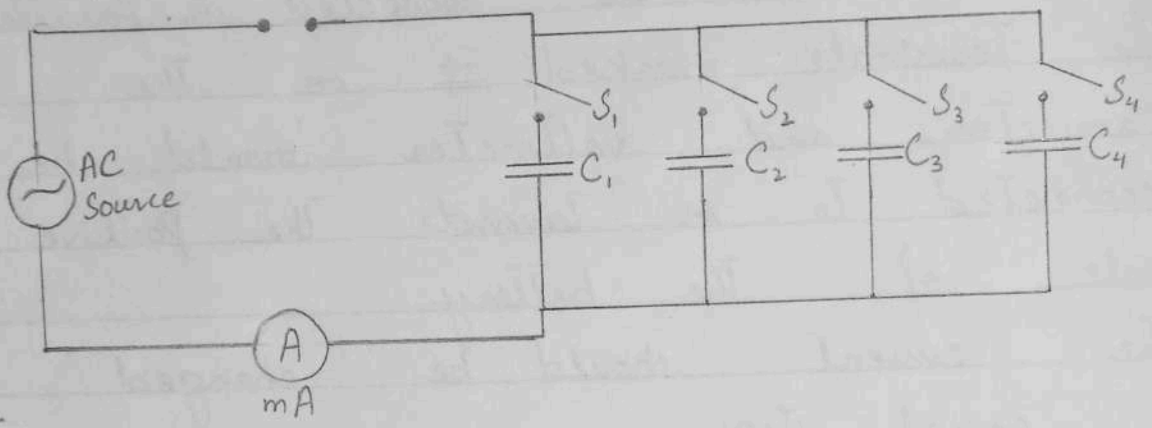


Table:

No. of Obs.	Capacitance in circuit C (μF)	AC ammeter reading I (mA)	I/C = constant
1.	2	25	12.5
2.	4	50	12.5
3.	6	75	12.5
4.	8	100	12.5
5.	10	125	12.5

Calculation:

Zero reading of Ammeter = 0 mA.

* Scale along x-axis:

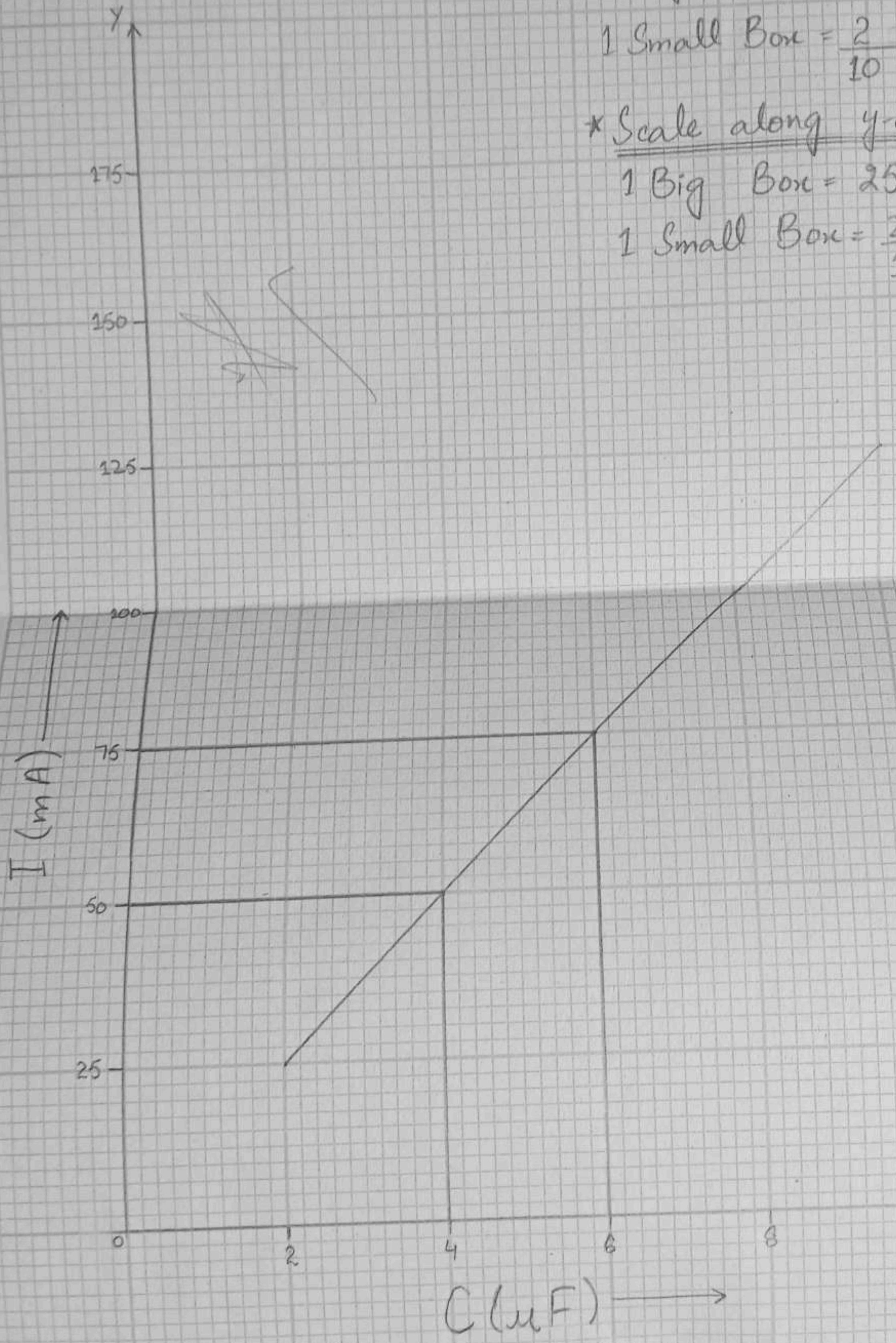
1 Big Box = 2 μF.

1 Small Box = $\frac{2}{10}$ = 0.2 μF.

* Scale along y-axis:

1 Big Box = 25 mA.

1 Small Box = $\frac{25}{10}$ = 2.5 mA.



For Forward Biasing.

Circuit Diagram:

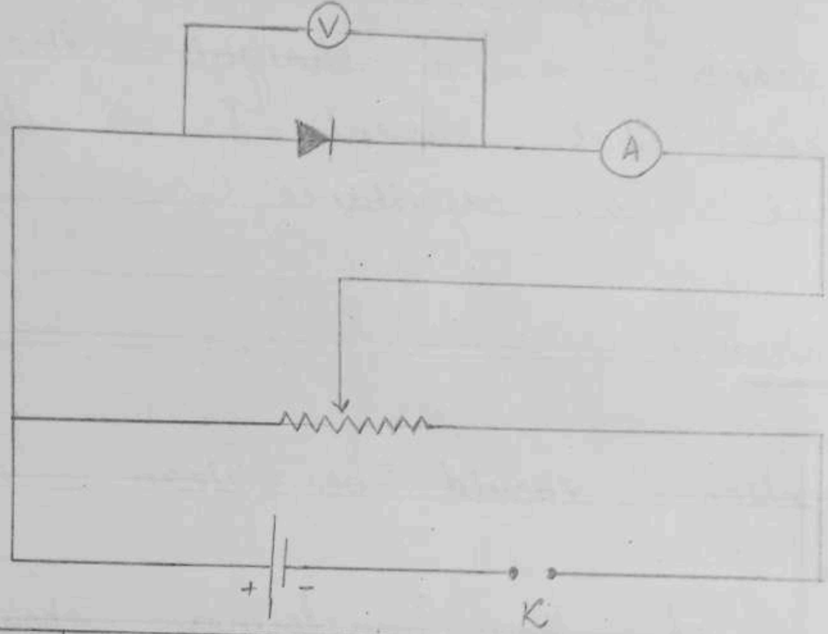


Table:

No. of Obs.	1.	2.	3.	4.	5.	6.
Forward voltage V (volt)	0.1	0.3	0.5	0.6	0.8	0.9
Forward current I (μA)	1	3	6	9.5	60	100

Calculations

From graph

R_F = Forward resistance $= \dfrac{\Delta V}{\Delta I}$.

$$= \frac{(0.8-0.5)V}{(60-6)A} = \frac{0.3}{54} = 0.791 \text{ or } 7.91\times10^{-}\ \Omega$$

* Scale along x-axis:

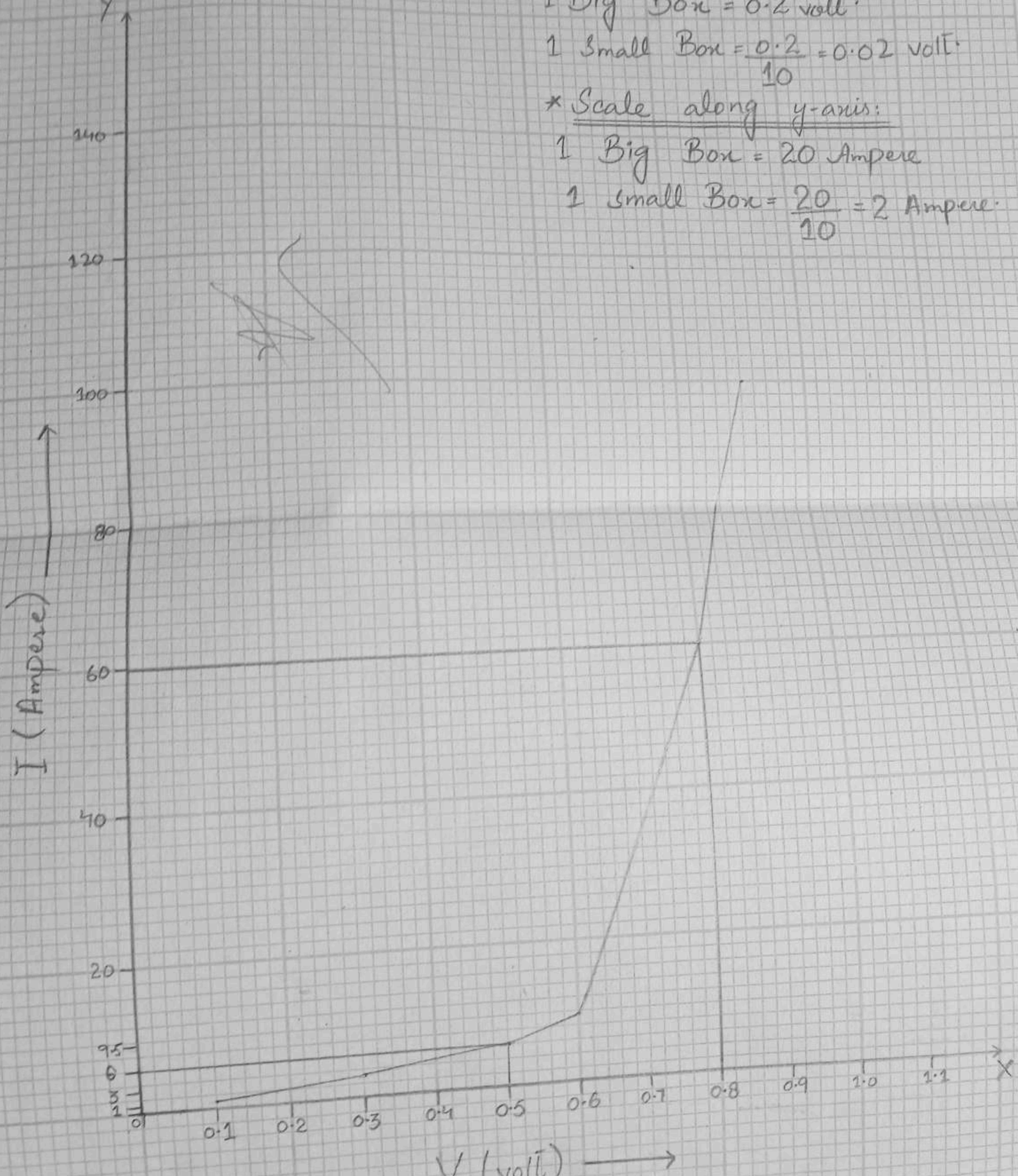
1 Big Box = 0.2 volt.

1 Small Box = $\frac{0.2}{10}$ = 0.02 volt.

* Scale along y-axis:

1 Big Box = 20 Ampere

1 Small Box = $\frac{20}{10}$ = 2 Ampere.



For Reverse Biasing.

ircuit Diagram:

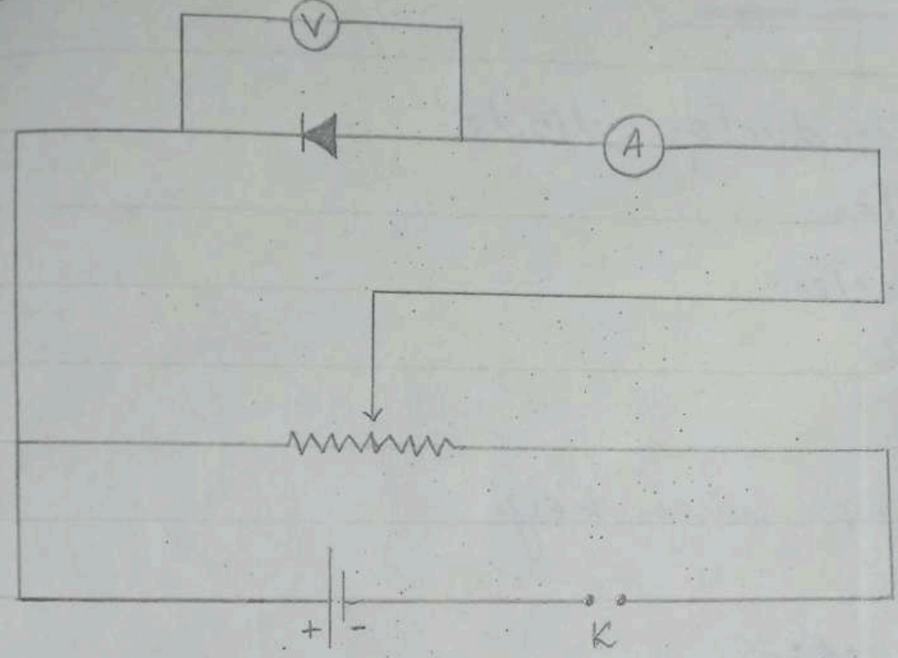


Table:

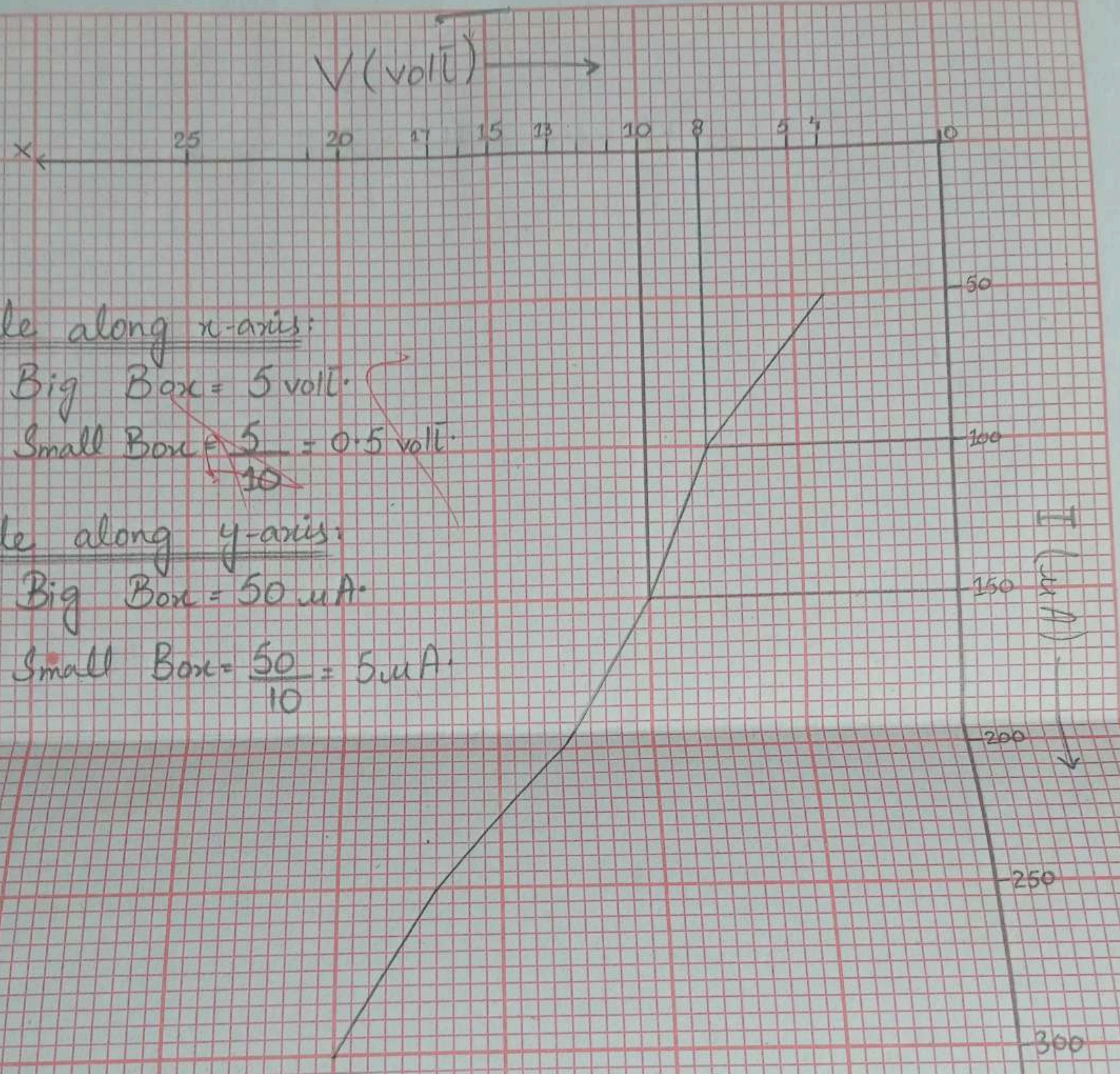
lo. of Obs.	1.	2.	3.	4.	5.	6.
Reverse Voltage V (volts)	4	8	10	13	17	20
Reverse Current I (μA)	50	100	150	200	250	300

Calculations:

From graph

R_r = Reverse resistance = $\frac{\Delta V}{\Delta I}$

$$= \frac{(10-8)\,V}{(150-100)\,\mu A} = \frac{2}{50\times10^{-6}\,A} = 40{,}000\,\Omega$$



* **Scale along x-axis:**

1 Big Box = 5 volt.

1 Small Box = $\frac{5}{10}$ = 0.5 volt.

* **Scale along y-axis:**

1 Big Box = 50 μA.

1 Small Box = $\frac{50}{10}$ = 5 μA.

* Experiment: 15.

To study varation of photo electic current with intensity of light using a photo cell.

Circuit Diagram:

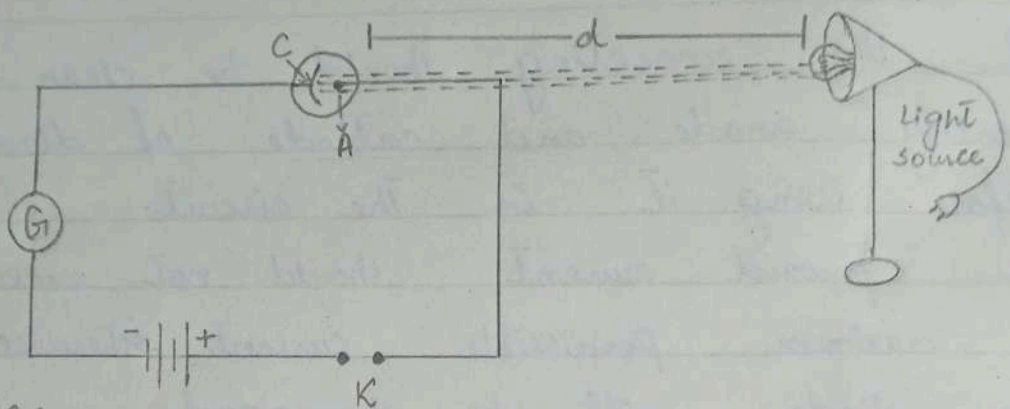


Table:

No. of Obs.	Distance of Photocell from The lamp filament d(cm)	Current or deflection in galvanometer θ (div)	d^2 (cm^2)	Intensity $I = \frac{1}{d^2}$ (cm^{-2})
1.	46.12	4	2127.65	4.7×10^{-4}
2.	37.01	6	1369.86	7.3×10^{-4}
3.	32.11	8	1030.92	9.7×10^{-4}
4.	28.98	10	840.336	11.9×10^{-4}
5.	26.53	12	704.225	14.2×10^{-4}
6.	24.69	14	609.756	16.4×10^{-4}

*Scale along x-axis:

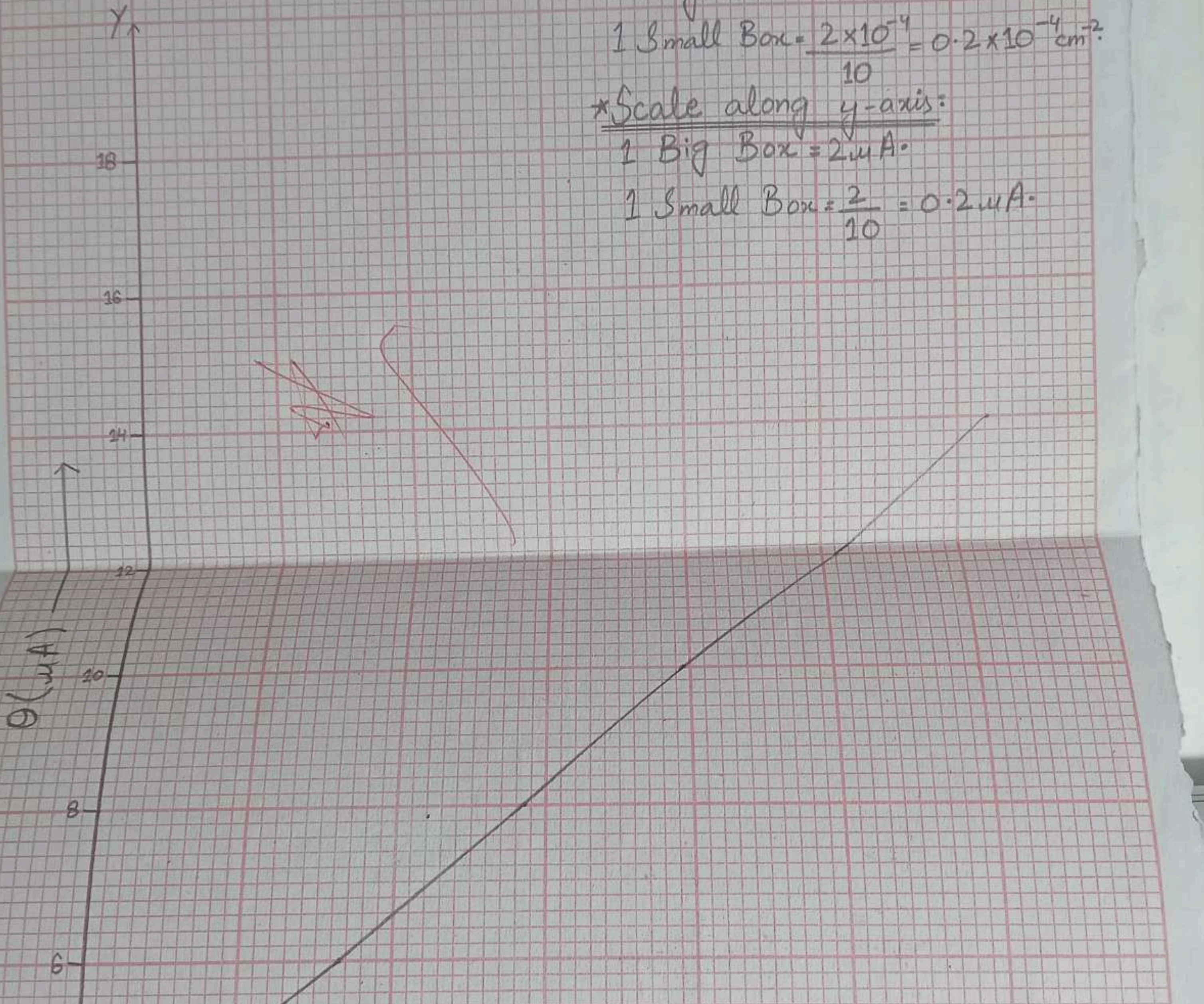
1 Big Box = 2×10^{-4} cm^{-2}.

1 Small Box = $\frac{2\times10^{-4}}{10}$ = 0.2×10^{-4} cm^{-2}.

*Scale along y-axis:

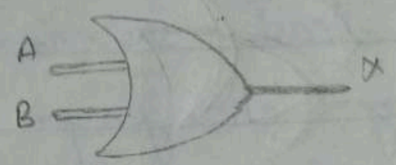
1 Big Box = 2 μA.

1 Small Box = $\frac{2}{10}$ = 0.2 μA.

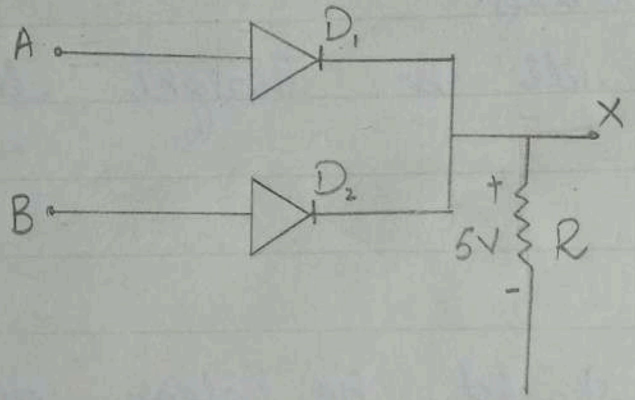


OR Gate

Logic Symbol:



Boolean Expression:

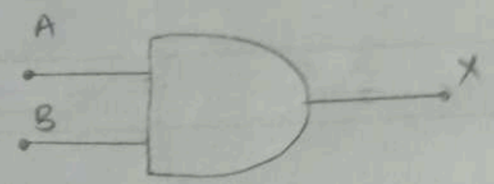


Truth Table:

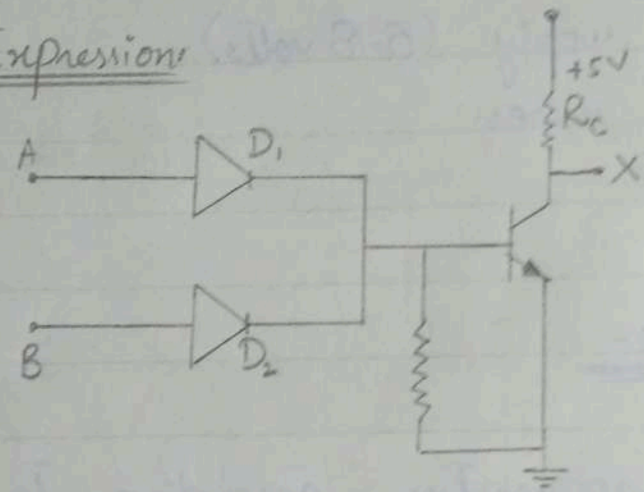
Inputs		Output
A	B	X
0	0	0
0	1	1
1	0	1
1	1	1

AND Gate

Logic Symbol:



Boolean Expression:

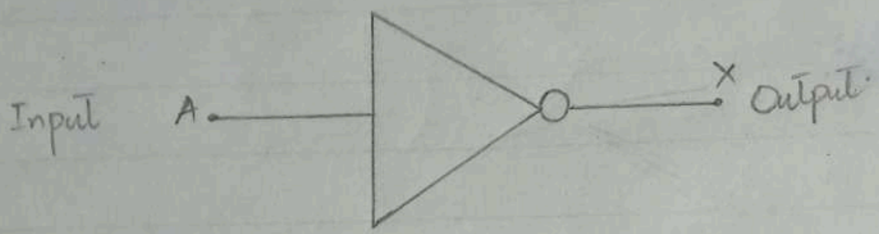


Truth Table:

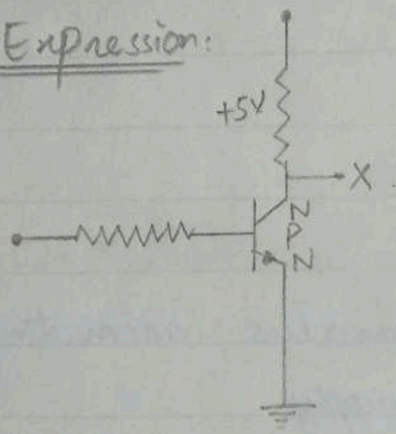
Inputs		Output
A	B	X
0	0	0
0	1	0
1	0	0
0	1	1

NOT Gate

Logic Symbol:



Boolean Expression:

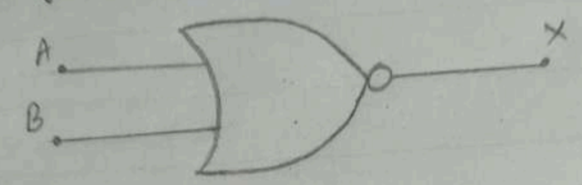


Truth Table:

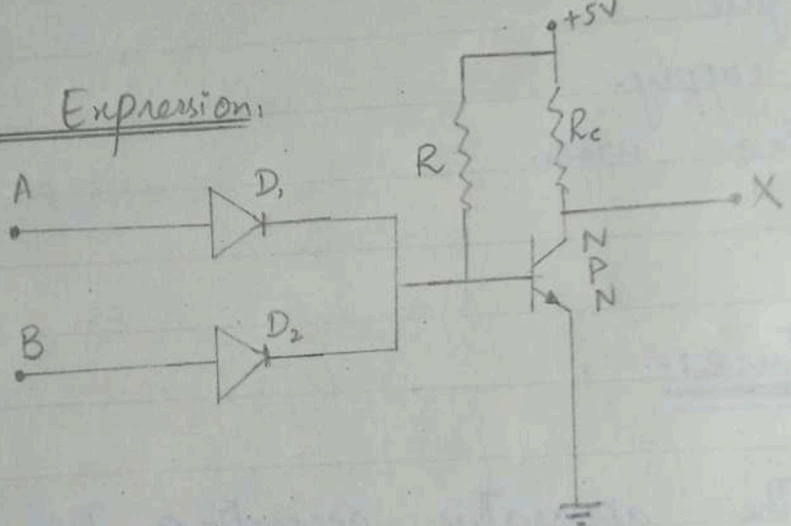
Inputs	Outputs
A	B
0	1
1	0

NOR Gate

Logic Symbol:



Boolean Expression:

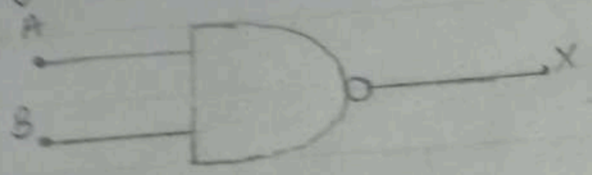


Truth Table

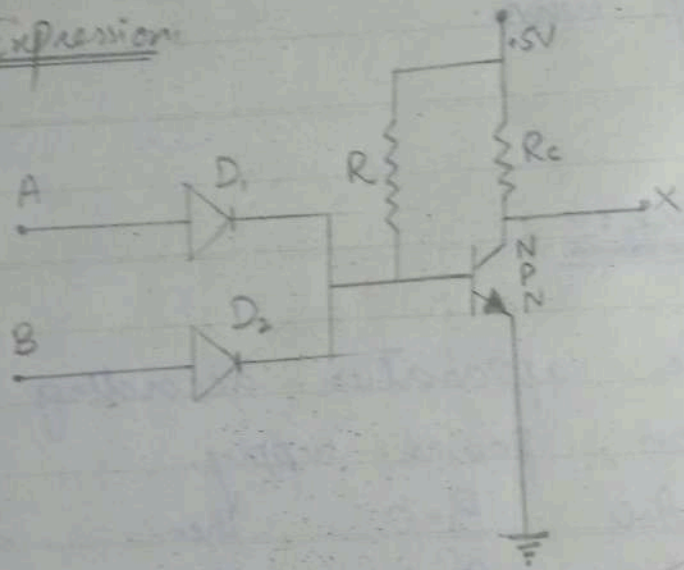
Inputs		Outputs
A	B	X
0	0	1
0	1	0
1	0	0
1	1	0

NAND Gate

Logic Symbol:



Boolean Expression



Truth Table:

Inputs		Outputs
A	B	X
0	0	1
0	1	1
1	0	1
1	1	0

A

* Experiment: 22.

To determine high resistance using neon flash bulb and a capacitor.

Circuit Diagram:

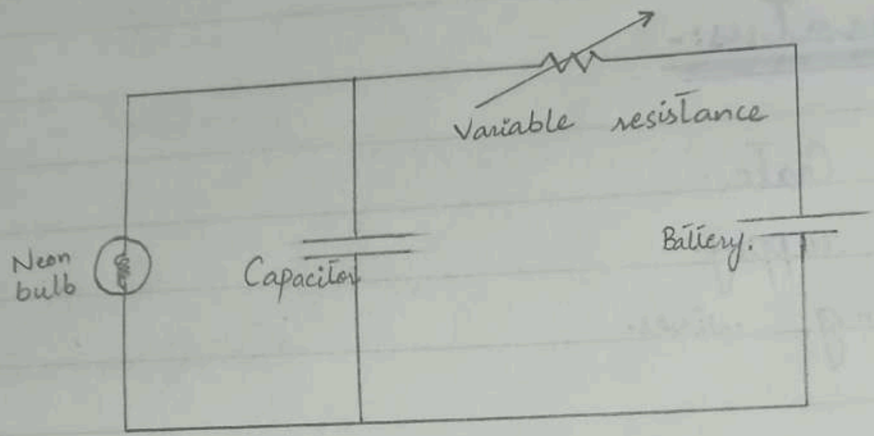


Table:

No. of Obs.	High resistance $R\ (M\Omega)$	Time for 20 flashes t_1 (sec)	Time for 20 flashes t_2 (sec)	Mean time for 20 flashes $t = \frac{t_1 + t_2}{2}$ (sec)	Time period $T = \frac{t}{20}$ (sec)
1.	1	10	10	10	0.5
2.	2	18	18	18	0.9
3.	3	26	26	26	1.3
4.	5	43	43	43	2.2
5.	6	52	52	52	2.6

Calculations:

Time for 20 flashes with unknown resistance $= t = \underline{35}$ sec

Time period with unknown resistance $= T = \frac{t}{20} = \underline{1.75}$ sec.

From graph value of R against time period $= \underline{4}\ M\Omega$

* Scale Along x-axis:

1 Big Box = 1 Ω.

1 Small Box = $\frac{1}{10}$ = 0.1 Ω.

* Scale along y-axis:

1 Big Box = 0.5 sec.

1 Small Box = $\frac{0.5}{10}$ = 0.05 sec.