Index

S. No.	Name of the Experiment	Page No.	Date of Experiment	Date of Submission	Remarks
6.	Refractive index of glass slab using microscope.				
7.	V-I characteristics curve of p-n-junction in forward bias.				
8.	V-I characteristics curve of p-n junction in reverse bias.				
9.	characteristics curve of zener diode.				
10.	focal length of concave mirror for a different value of focal u.				
11.	focal length of convex lens by using value of convex lens u.				
12.	Focal length of concave lens using convex lens.				
1.	Activity - 1.				
2.	Activity - 2.				
3.	Activity - 3.				
4.	Activity - 4.				
5.	Activity - 5.				

Date

Expt. No. 01 EXPERIMENT - 01 Page No. 01

Aim :- To determine resistance of galvanometer by half deflection.

Apparatus :- A weston type galvanometer, a voltmeter battery, resistance box (10000 Ω & 200 Ω) keys, rheostat, a meter scale, ammeter, wire, sand paper.

Theory :- The resistance of the given galvanometer is given by

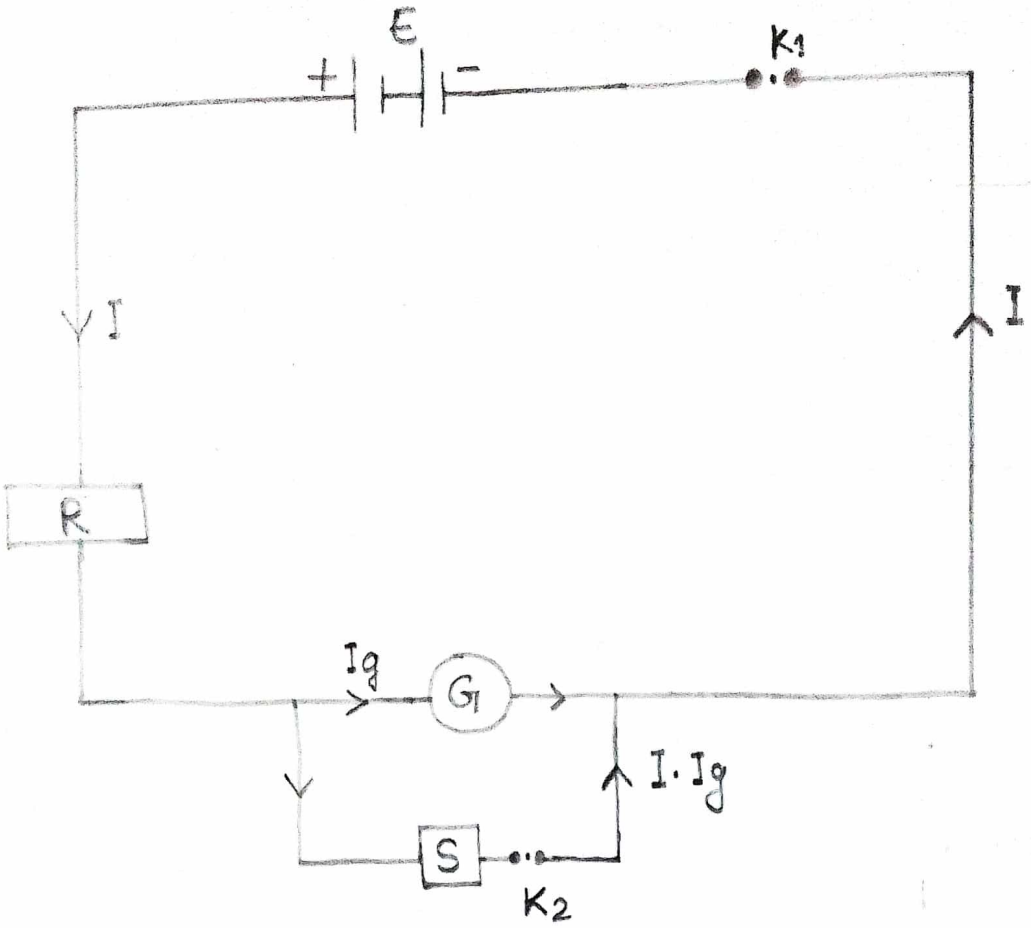
$$G = \frac{R \times S}{R - S}$$

where,

R = Resistance in Series.

S = Shunt Resistance.

Teacher's Signature



S.No.	Resistance (Ω)	Deflection in G	shunt resistor(S)	Half deflection	$G = \frac{R \times S}{R - S}$
1.	7000	22	47	11	47.2 Ω
2.	6000	26	47	13	47.2 Ω
3.	9000	18	47	9	47.2 Ω
4.	1000	16	47	8	47.2 Ω

Date _____

Expt. No. _____ Page No. 02

Result :- Resistance of the given galvanometer = 47.2 Ω.

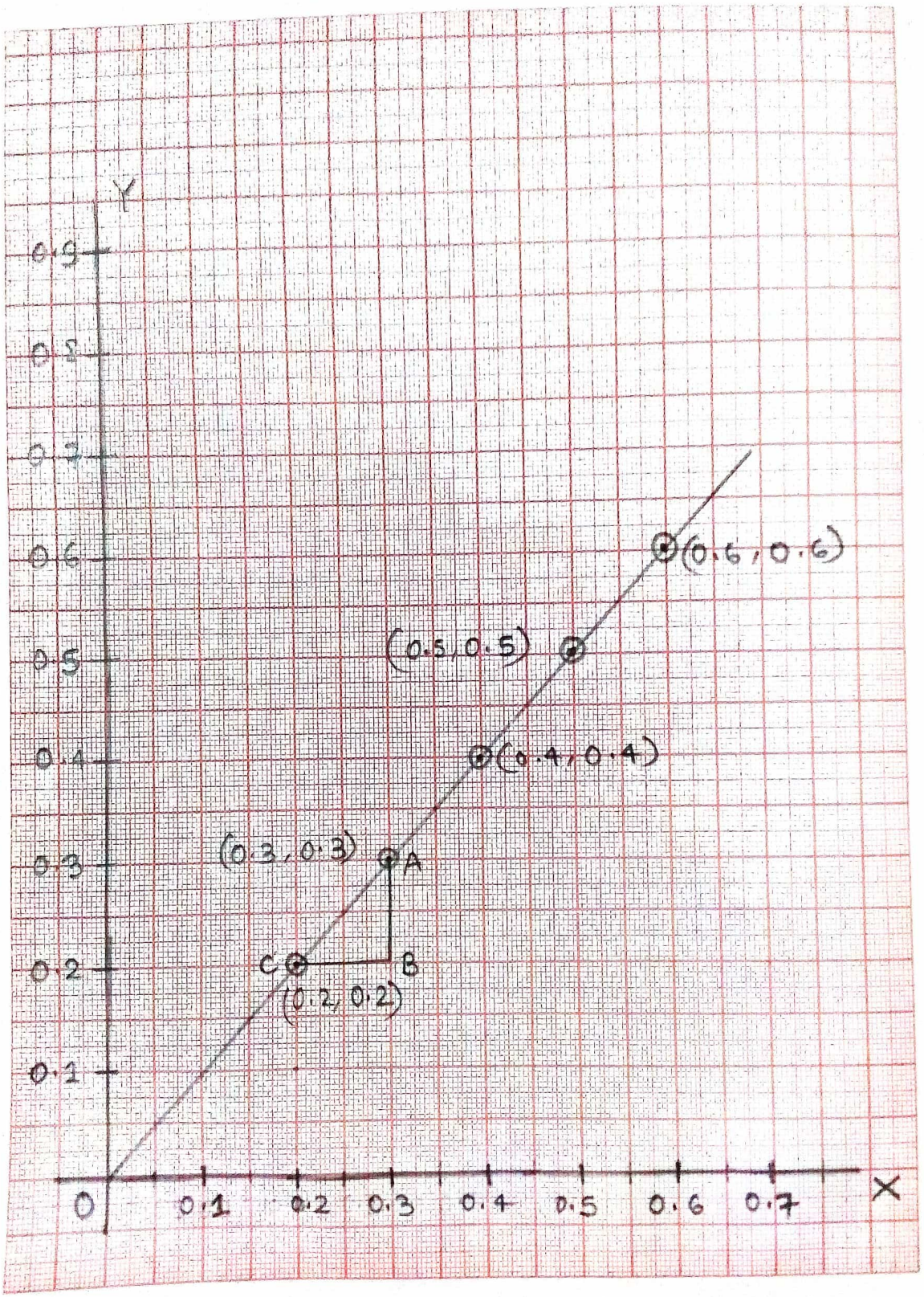
Precautions :-

1. All connection should be neat, clean and tight.
2. All types of plugs in resistance boxes must be tight.

Sources of error :-

1. The screw of the instrument may be loose.
2. The plugs of the resistance boxes may be not clean.

Teacher's Signature _____


Y
0.6
0.5
0.4
0.3
0.2
0.1
(0.6, 0.6)
(0.5, 0.5)
(0.4, 0.4)
(0.3, 0.3)
A
C
B
(0.2, 0.2)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
X

Date _____

Expt. No. 02 EXPERIMENT - 2 Page No. 03

Aim :- To determine resistance per unit length of a given wire by plotting a graph of potential difference vs current.

Apparatus :- A resistance wire, a voltmeter (0-3 V) and on ammeter (0-3 A) of appropriate range, a battery, rheostat, meter scale, connecting wire and a piece of sand paper.

Theory :- According to Ohm's law :-

$$V \propto I$$

$$V = IR$$

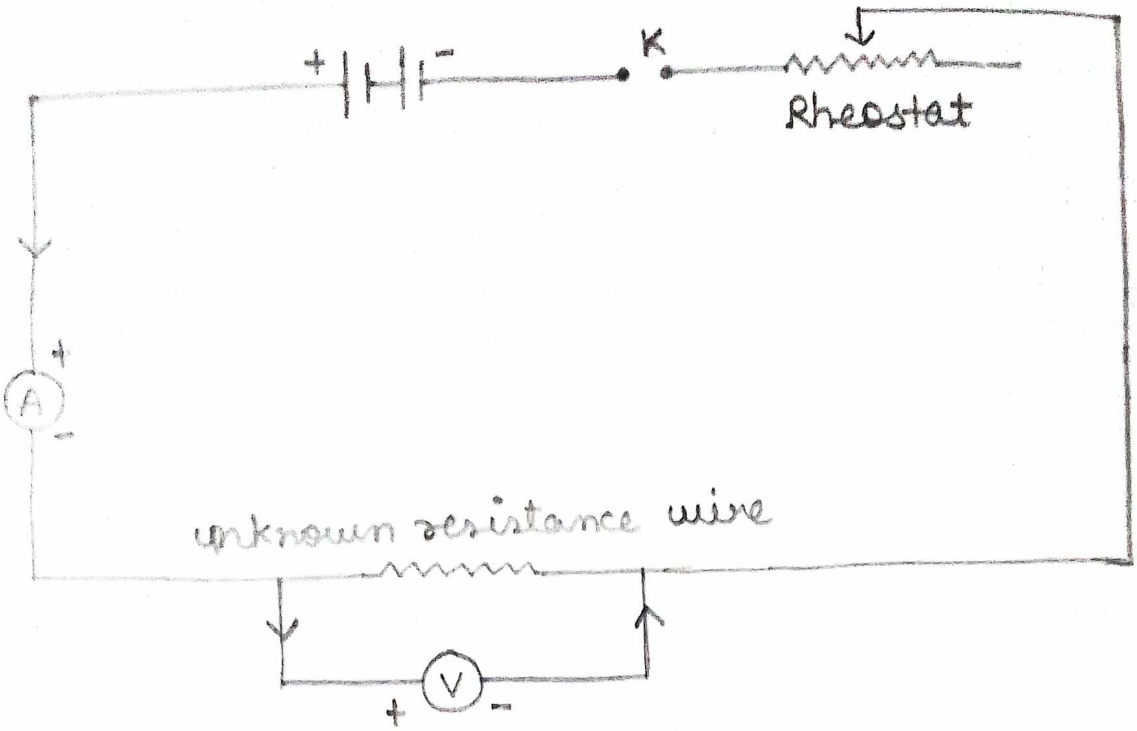
$$\boxed{\frac{V}{I} = R}$$

where,

V = Potential difference.
R = Resistance.
I = Current.

'R' depends on nature of material, temperature and dimension.

Teacher's Signature _____



OBSERVATION

1. length of wire = 36.5 cm
2. Range of ammeter = 0.3 A
3. Range of voltmeter =

least count = 0.05A
zero error = nil

S.NO.	Voltmeter reading	Ammeter reading	$\frac{V}{I} = R\,\Omega$
1.	0.3 V	0.35A	0.9 Ω
2.	0.4 V	0.40 A	1 Ω
3.	0.5 V	0.55 A	0.9 Ω
4.	0.7 V	0.70 A	1 Ω

Results :—

(i) Resistance per cm of the wire is $2.603 \times 10^{-2} \Omega$.

(ii) The graph between V & I is a straight line.

Precautions :—

(i) The connection should be neat, clean and tight.

(ii) Voltmeter and Ammeter should be of proper rang.

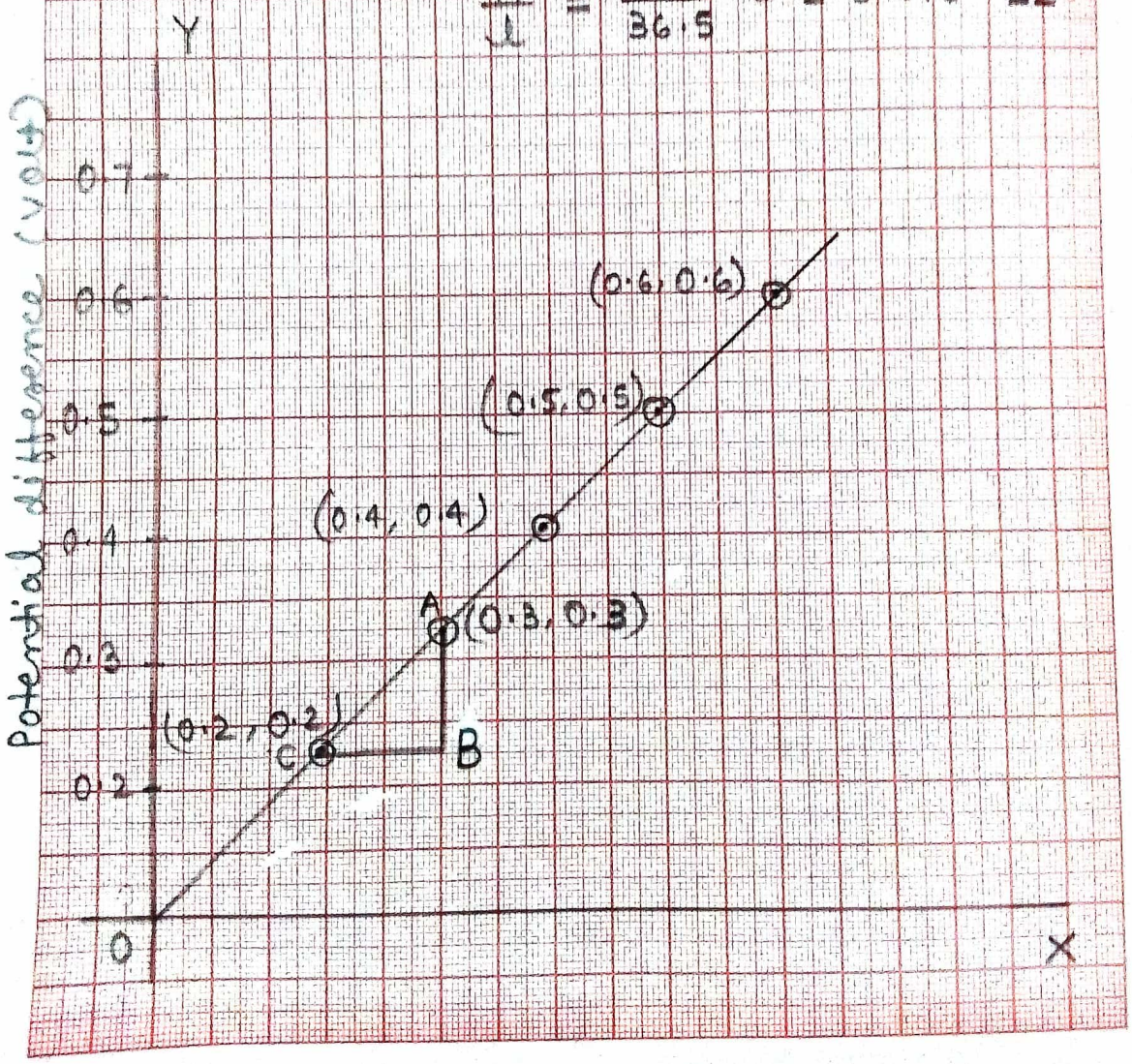
x axis 1 unit = 0.05 A

Y axis 2 unit = 0.1 V

$$\tan\theta = \frac{AB}{BC} = \frac{0.3 - 0.2}{0.3 - 0.02} = 1$$

Resistance from graph = 1 Ω

$$\frac{R}{l} = \frac{1}{36.5} = 2.6 \times 10^{-2}\ \Omega$$



Date _____

Expt. No. 03 EXPERIMENT - 3 Page No. 05

Aim :- To find resistance of a given wire using meter bridge and hence determine the specific resistance of its material.

Apparatus :- A meter bridge, Battery (G), resistance jockey, resistance wire, screw gauge, meter scale, connecting wires.

Theory :- formula used

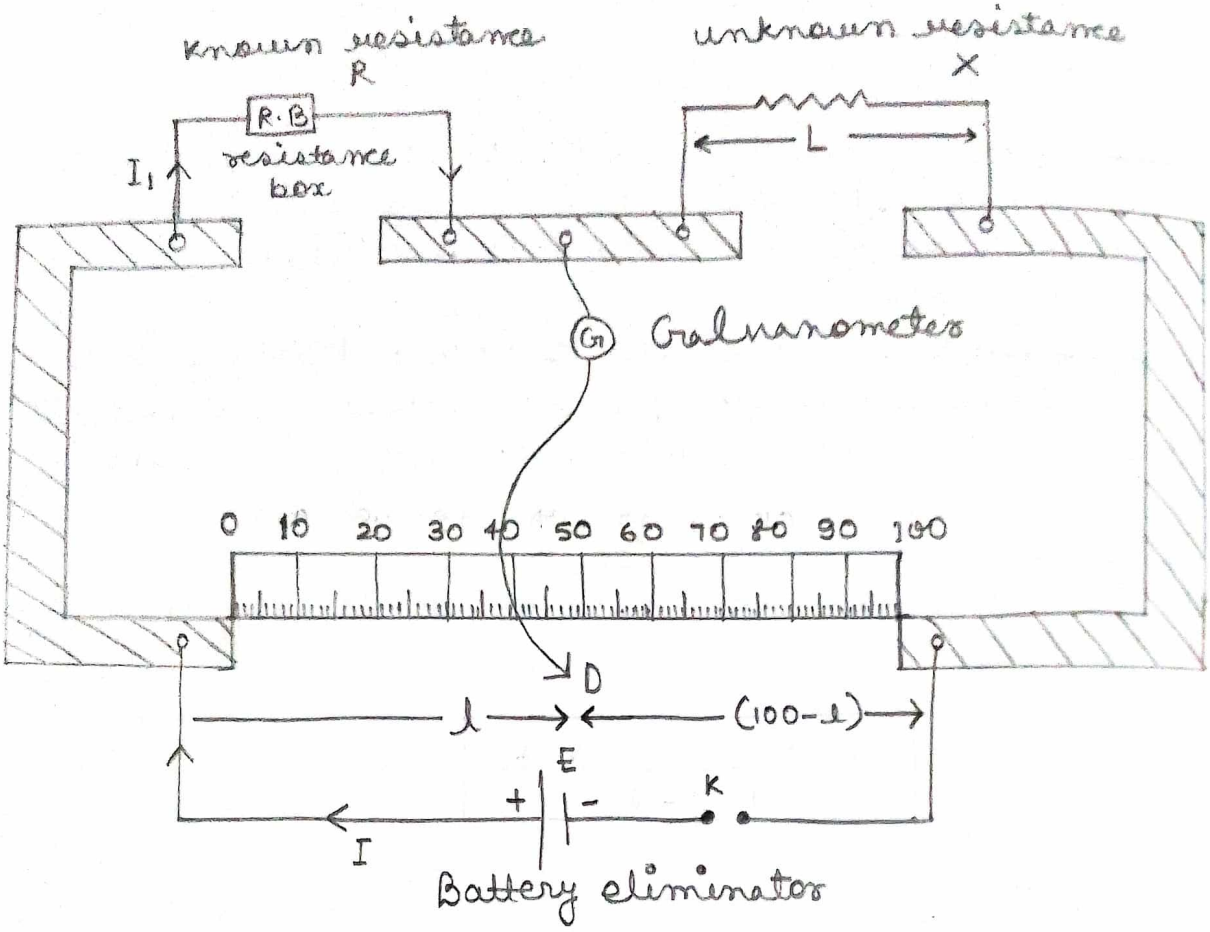
(i) unknown resistance 'X' is given by

$$X = \frac{l}{100 - l} \times R$$

(ii) Specific resistance is given by

$$\rho = \frac{X \pi D^2}{4L}$$

Teacher's Signature _____



OBSERVATION

i) length of wires = 300 m

ii) diameter of wires = 0.025 cm

S.No.	Resistance	l(cm)	(100-l) cm	$x = \frac{l}{100-l} \times R$
1.	2Ω	37.4 cm	62.6 cm	4.27 Ω
2.	5Ω	53.7 cm	46.3 cm	4.31 Ω
3.	10Ω	68.6 cm	31.4 cm	4.57 Ω

Date _____

Expt. No. _____ Page No. 06

Results :-

(i) The value of unknown resistance 'X' = 4.44 Ω

(ii) Specific resistance of the unknown wire = 7.26×10^{-7} Ωm.

Precautions :-

(i) All the connection should be neat, clean and tight.

(ii) All the plugs in the resistance box should be tight.

Source of error :-

(i) The instrument screw may be loose.

(ii) The plug may not be clean.

Teacher's Signature _____

Date _____

Expt. No. 04 EXPERIMENT - 4 Page No. 07

Aim :- To verify the laws of combination (series and parallel) of resistance using a meter-bridge.

Apparatus :- A meter-bridge, battery, a (G), resistance box, jockey resistance coil, connecting wires, sand paper.

Theory :- (i) unknown resistance,

$$\frac{100 - l}{l} \times R$$

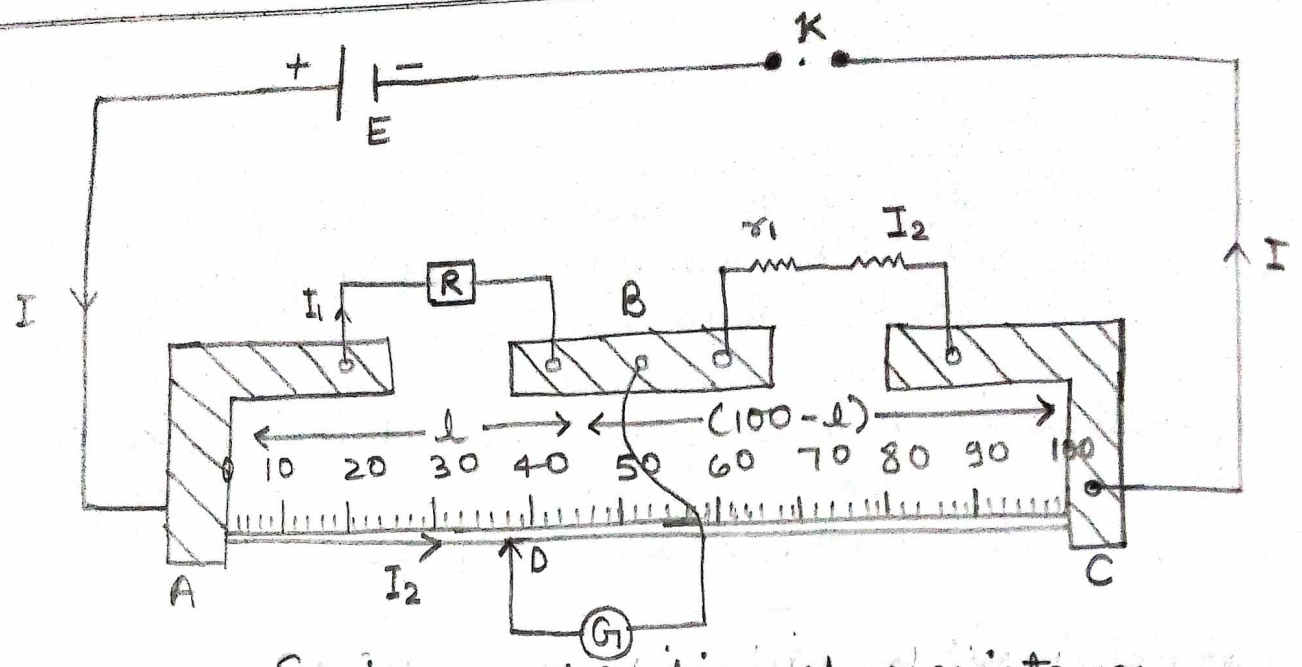
(ii) $R_S = r_1 + r_2 + \text{-----} + r_n$

(iii) $\frac{r_1 r_2}{r_1 + r_2} = R_p$

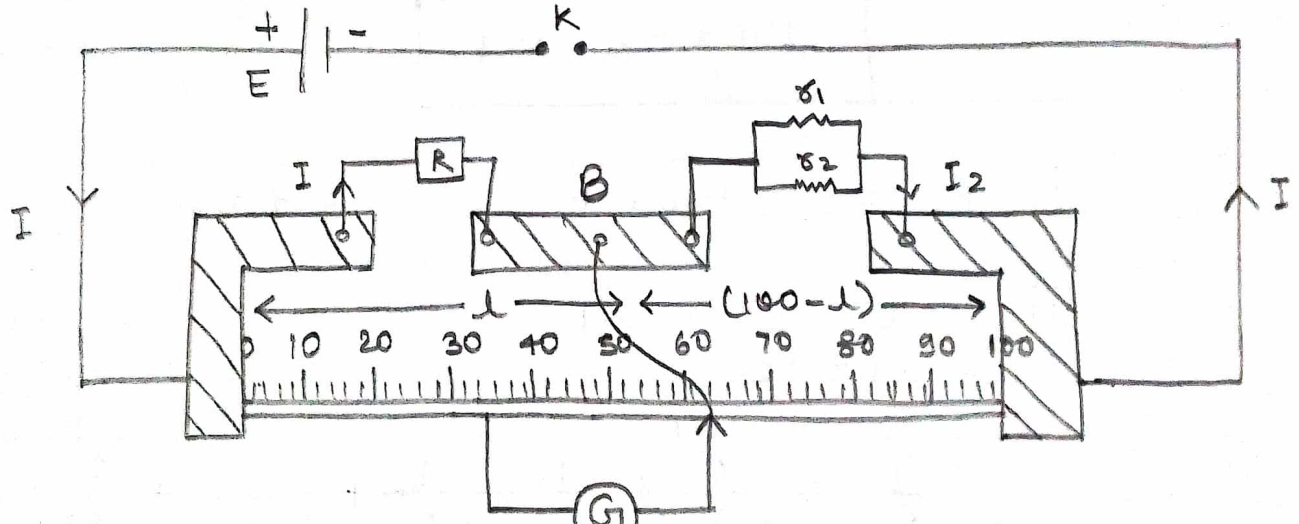
or

$$\frac{1}{R_p} = \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3} + \text{----} + \frac{1}{r_n}$$

Teacher's Signature _____



Series combination of resistance



Parallel combination of resistance

resistance coil	No. of obs.	R(Ω)	l (cm)	(100 − l) cm	$r = \frac{(100-l)}{l}$	mean value of resistance	mean resistance
r_1 only	1, 2, 3	(5, 5, 5) Ω	71 cm 71.5 cm 71.6 cm	29 cm 28.3 cm 28.4 cm	1.97 Ω 2 Ω 1.95 Ω	$r_1 = 1.98\,\Omega$	$r_1 = 2\Omega$
r_2 only	1, 2, 3	(3, 3, 3) Ω	75 cm 76.7 cm	25 cm 23.3 cm	0.9 Ω 1.1 Ω	$r_2 = 1\,\Omega$	$r_2 = 1\Omega$
$r_1 + r_2 = R_s$	1, 2, 3	(7, 7, 7) Ω					
$\frac{r_1 r_2}{r_1 + r_2} = R_p$	1, 2, 3						

Result :–

(i) Within the limit of experiment error, experimental and theoritical value of Rs are same hence, law of resistance in series is verified.

(ii) Within limits of experimental error, experimental and theoritical value of Rp are same hence, law of resistance in parallel is verified.

Precautions :–

(i) All connection should be clean, neat and tight.

(ii) All the plug in the resistance screw may be too tight.

Source of error :–

(i) The instrument screw may be loose.

(ii) The plugs may not be clean.

Date _____

Expt. No. 05 EXPERIMENT - 5 Page No. 09

Aim :- To determine angle of minimum deviation for a given prism by plotting a graph between angle of incidence and angle of minimum deviation.

Apparatus :- Drawing Board, White sheet of paper, prism, drawing prism, pencil, meter scale, office pins, graph paper.

Theory :- The Refractive index (μ) of a material is given by,

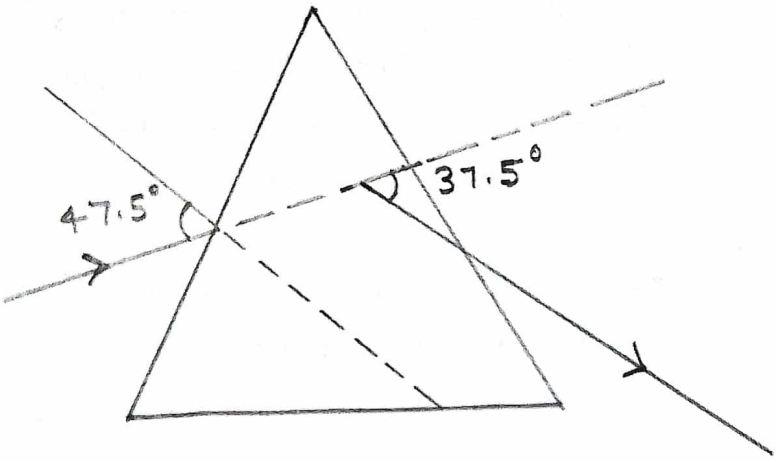
$$\mu = \frac{\sin\left(\frac{A + \delta m}{2}\right)}{\sin\left(A/2\right)}$$

where,

δm = Angle of minimum deviation.

A = Angle of Prism.

Teacher's Signature _____



S.NO	Angle of incidence	Angle of deviation
1.	35°	44°
2.	40°	37°
3.	45°	38°
4.	47.5°	37.5° — δ_m
5.	50°	38°
6.	55°	40°

Results :-

(i) $i - \delta$ graph that is angle of incidence increase, angle of deviation (Δ) first decrease, attain a minimum value (δm) & than start increase.

(ii) Angle of minimum deviation = 37.5°.

(iii) Refraction index of Prism (μ) = 1.567

Precautions :-

(i) Angle of incident lies between 35° - 60°.
(ii) The same angle of prism should be used for all observed.

Source of error :-

(i) Prism should be thick.

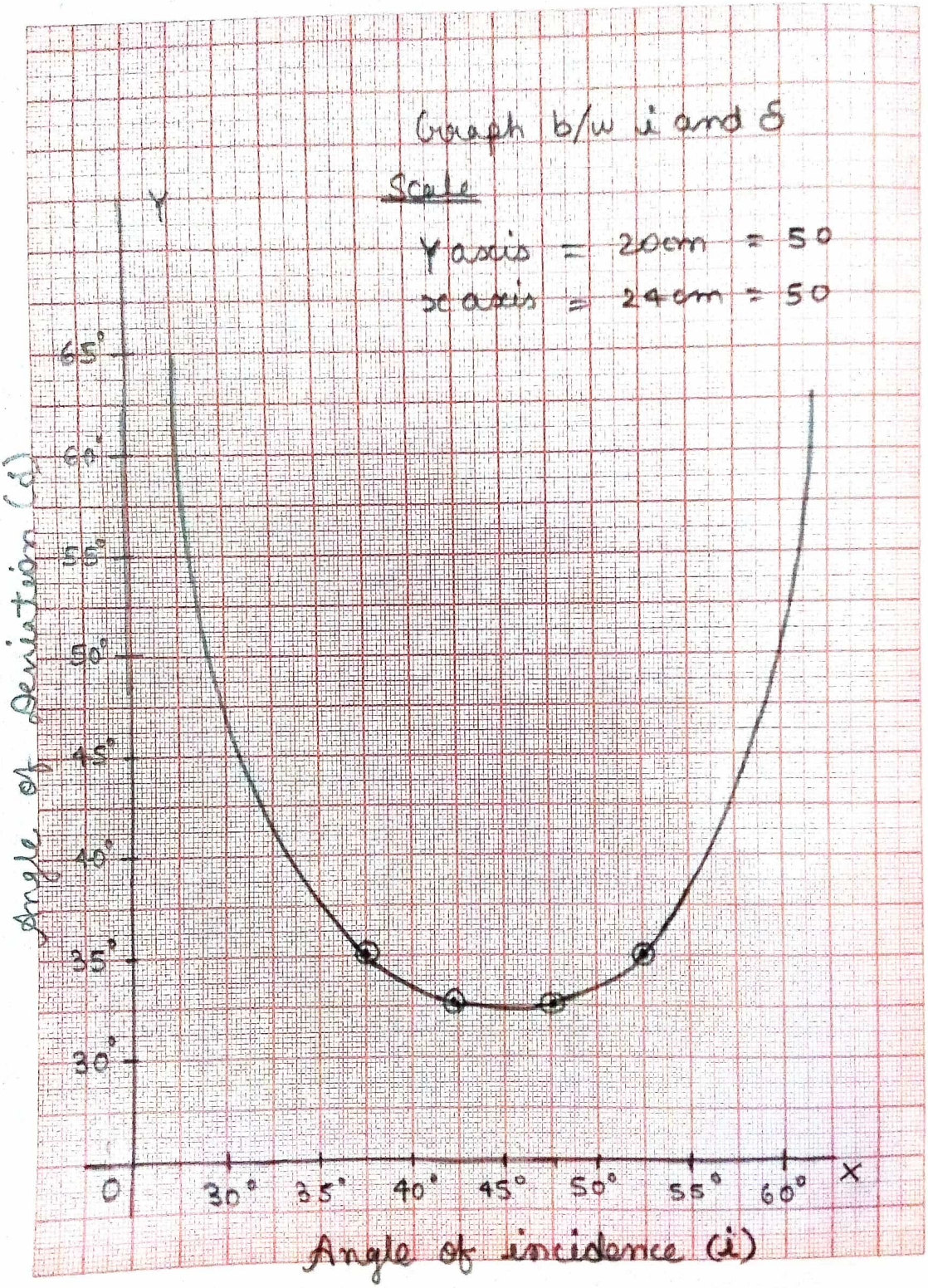
(ii) measurement of angle may be wrong.

Graph b/w i and δ

Scale

Y axis = 20cm = 5°

x axis = 24cm = 5°



Date _____

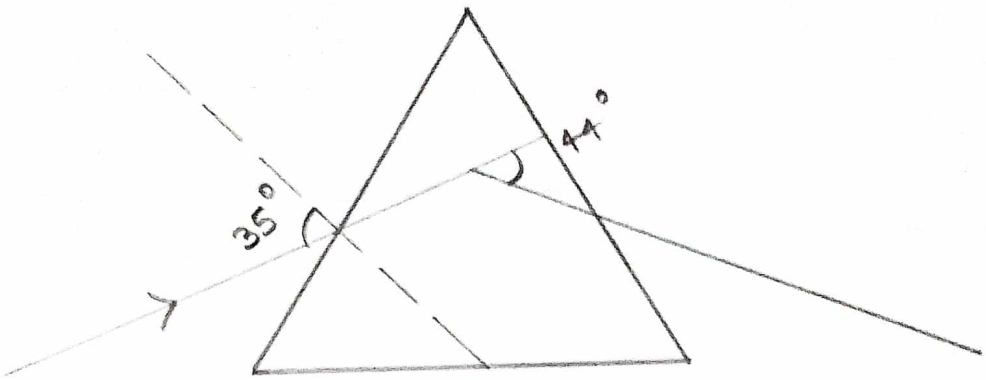
Expt. No. 06 EXPERIMENT-6 Page No. 11

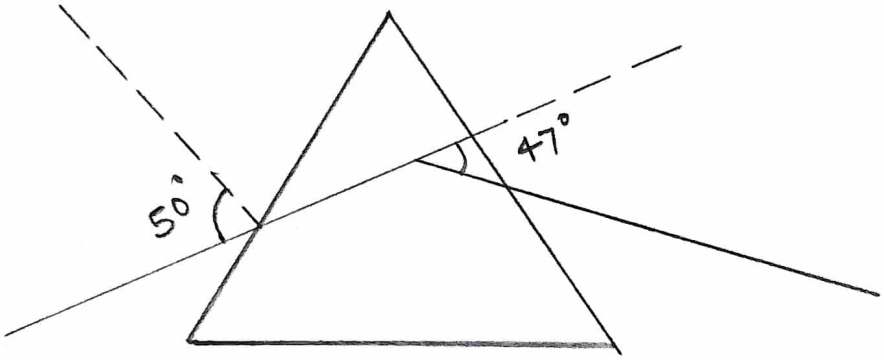
Aim :- To determine refraction index of a glass slab using microscope.

Apparatus :- Glass slab, a travelling microscope, lycopodium powder.

Theory :-

$$a\mu_g = \frac{\text{Real thickness of slab}}{\text{Apparent thickness of slab}}$$





$$\mu = \frac{\mu_1 + \mu_2 + \mu_3}{3}$$

$$= \frac{1.5 + 1.45 + 1.52}{3}$$

$$= \frac{4.5}{3} = 1.5$$

Date

Expt. No. Page No. 12

Result :-

The ratio of $\frac{R_3 - R_1}{R_3 - R_2}$ is constant.

It gives the refraction index glass slab.

The refractive indesc of glass slab is 1.5

Precautions :-

(i) In Microscope, the parallel should be properly removed.

(ii) The microscope should be moved in upper direction only to avoid back lash error.

Source of error :-

The microscope scale may be or may not be properly caliberated.

Teacher's Signature

Date

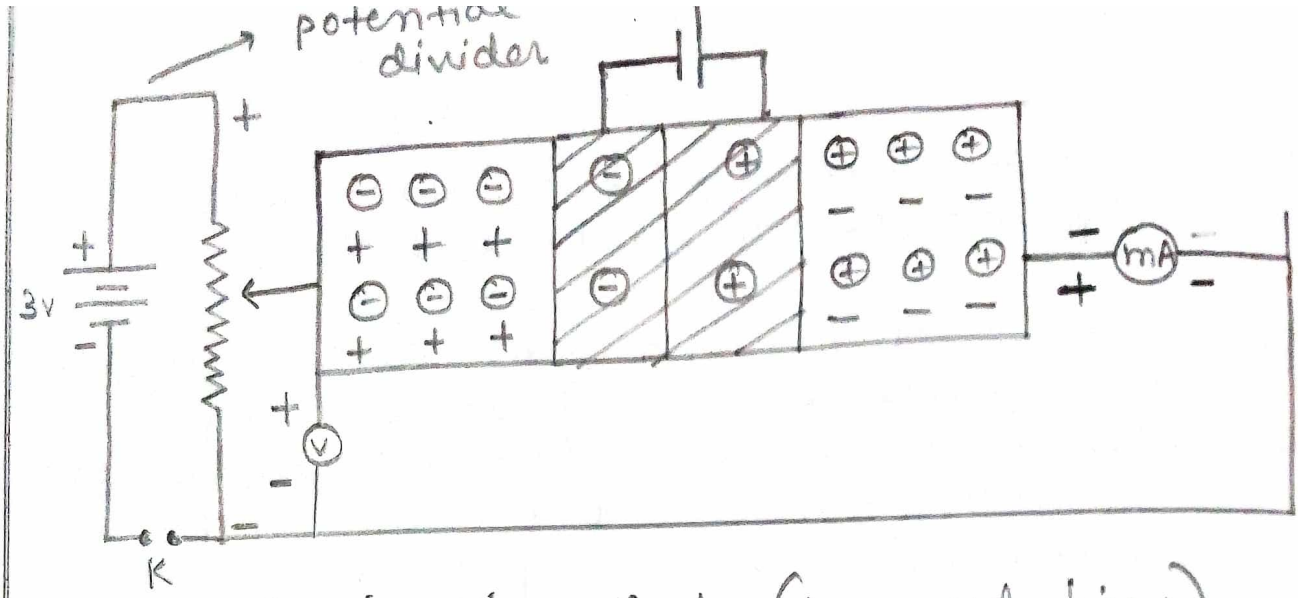
Expt. No. 07 EXPERIMENT-7 Page No. 13

Aim :- V-I characteristics curve of P-n junction in forward bias.

Apparatus :- A p-n junction diode, a 3-volt battery, a 50 volt battery high resistance, rheostat (0-3) V voltmeter, 0-100 mA ammeter one way key connecting wires, sand paper.

Theory :- **Forward bias characteristics** :-

When the p-section of the diode is connected to (+ve) terminal of a battery and n-section connected to (-ve) terminal of battery. it is said to be forward biased with increasing voltage the forward current increases slowly in the beginning & rapidly at 0.7 V for (Si-diode) current increases rapidly. This is called threshold voltage.



P-n junction diode (forward bias).

S.No.	voltage	current
1.	0.1 V	0.5 mA
2.	1.2 V	5 mA
3.	1.6 V	10 mA
4.	1.8 V	15 mA
5.	2 V	20 mA

$\Delta V_f = 0.4\ V \qquad \Delta I_f = 10\ mA$

$$R = \frac{V}{I} = \frac{\Delta V_f}{\Delta I_f} = \frac{0.4 \times 10^3}{10}$$

$$= 40\ \Omega.$$

Result :-

Junction resistance in forward bias = 40 Ω.

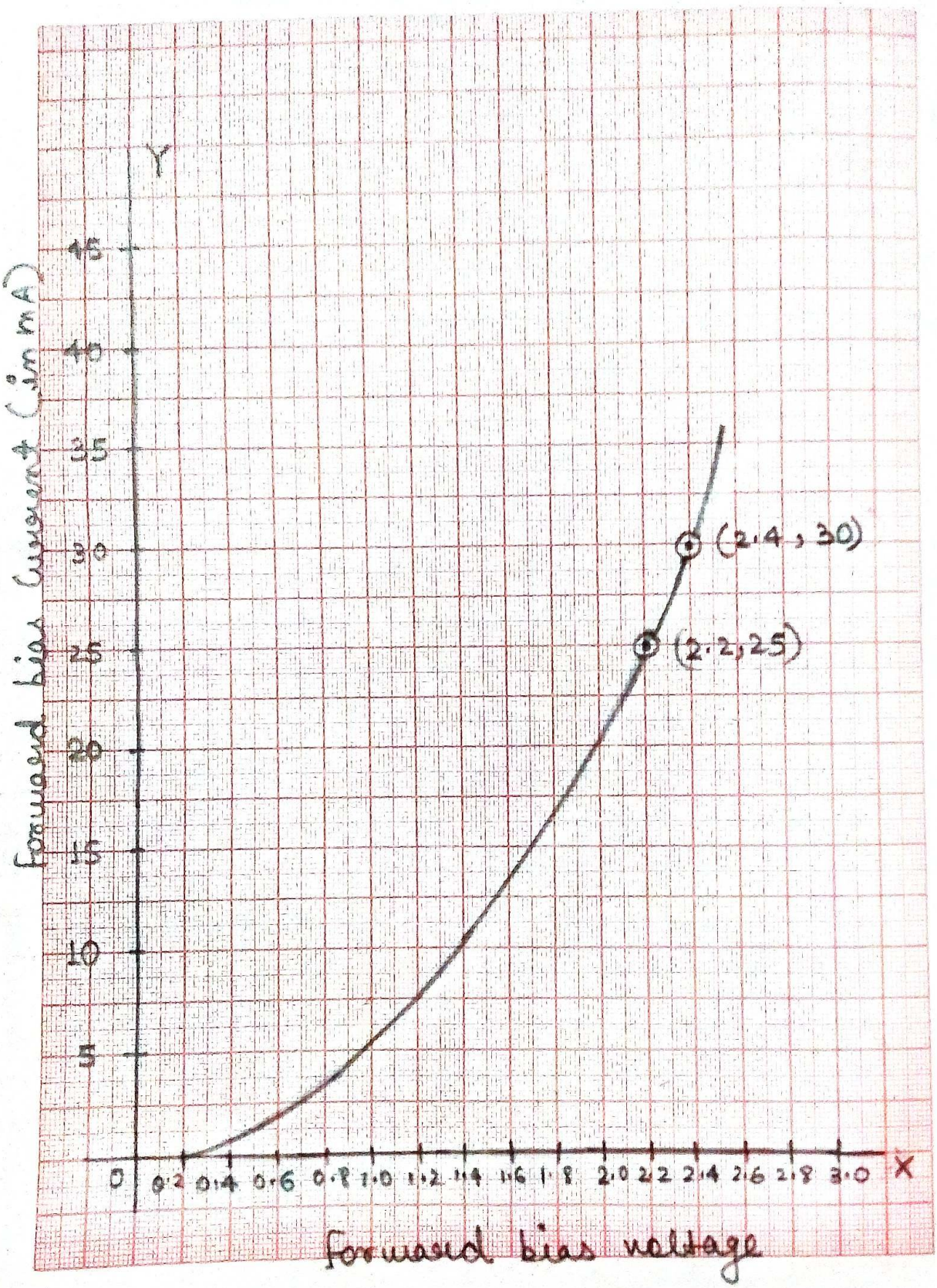
Precautions :-

(i) All connection should be neat, clean & tight.

(iii) Key should be used in ckt and opened when ckt is not used.

Source of error :-

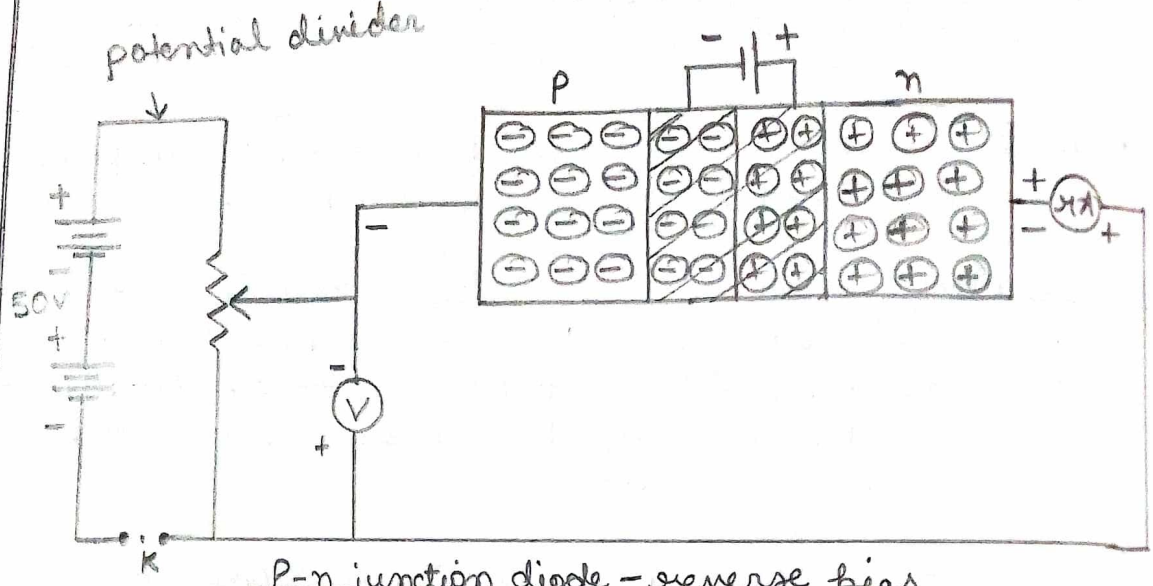
The junction supplied may be faulty.


Y
X
Forward bias current (in mA)
Forward bias voltage
45
40
35
30
25
20
15
10
5
0
0·2
0·4
0·6
0·8
1·0
1·2
1·4
1·6
1·8
2·0
2·2
2·4
2·6
2·8
3·0
(2·4, 30)
(2·2, 25)

Aim :– V–I characteristics curve of a p-n junctions is reverse bias.

Apparatus :– A p-n junction diode, 3 volt battery, 50 volt battery, high resistance rheostate, 0-50 volt voltmeter, 0-100 uA ammeter one-way key, sand paper, connecting wire.

Theory :– When p-n junction diode is connected to (-ve) terminal of battery and n-junction to (+ve) terminal, it said to be reverse biased. When reverse bias voltage increases, intially there is less increase in current, but when reverse bias voltage increases to sufficiently high value, reverse current increases to large value. This is zeros breakdown voltage.



P-n junction diode - reverse bias

S.No	voltage (volt)	current (μA)
1.	0	0
2.	5	1
3.	7	2
4.	15	7
5.	17	9
6.	19	11
7.	23	15

Expt. N

(i)

(ii)

(i)

(ii)

Date

Expt. No. Page No. 16

Result :- Junction resistance for reverse bias = $2 \times 10^6 \Omega$.

Precautions :-

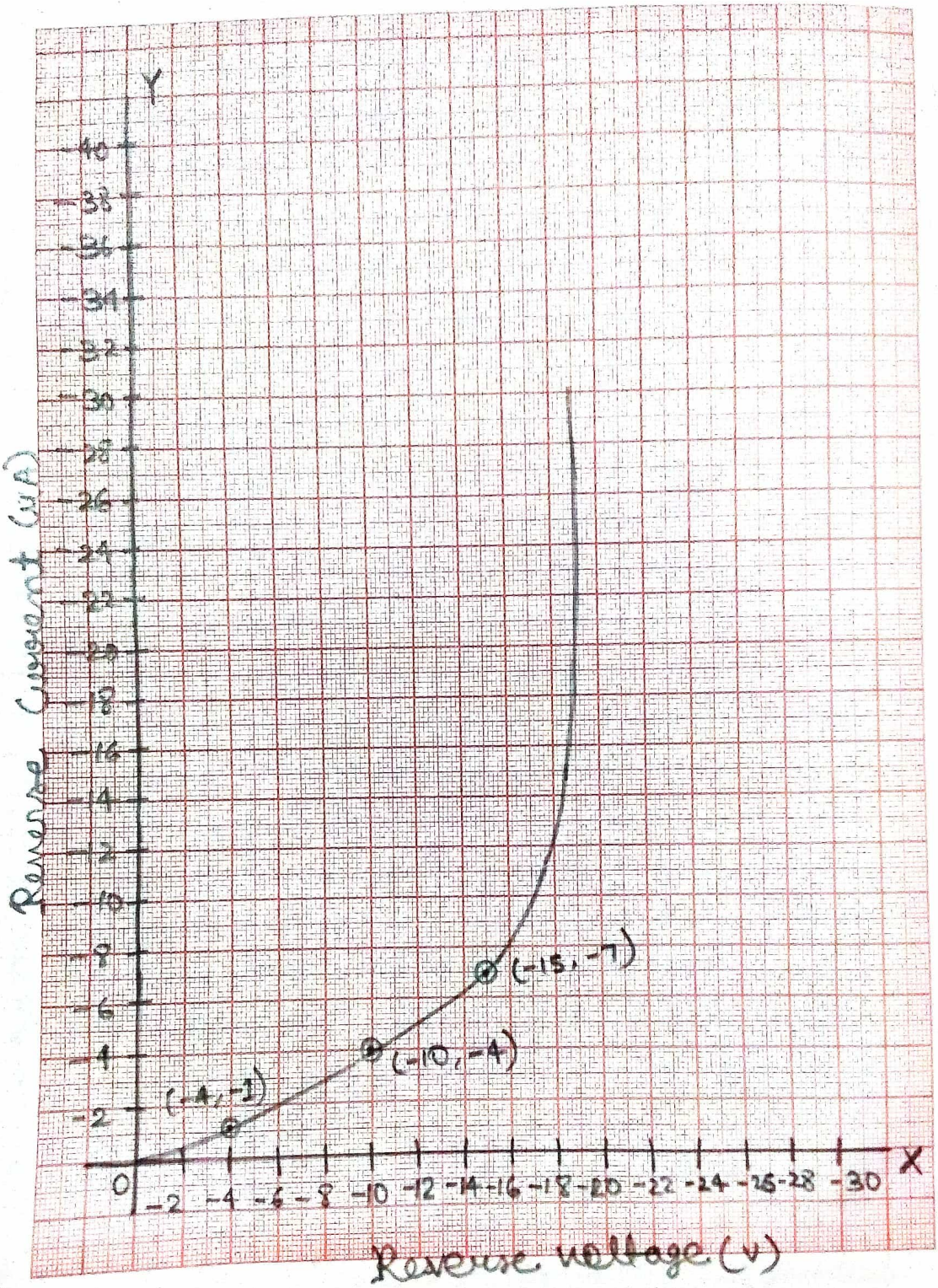
(i) All connection must be clean, neat & tight.

(ii) Reverse bias voltage beyond breakdown should not be applied.

Source of error :-

(i) Junction diode supplied may be faulty.

(ii) Room temperature.


Y
X
Reverse Current (μA)
Reverse voltage (V)
(-4, -2)
(-10, -4)
(-15, -7)
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30

Date _____

Expt. No. 09 EXPERIMENT-9 Page No. 17

Aim :- Characteristics curve of zener diode.

Apparatus :- The zener diode ($V_Z = 6V$), 10 V battery, high resistance rheostat, ammeter, voltmeter, one-way key connecting wires.

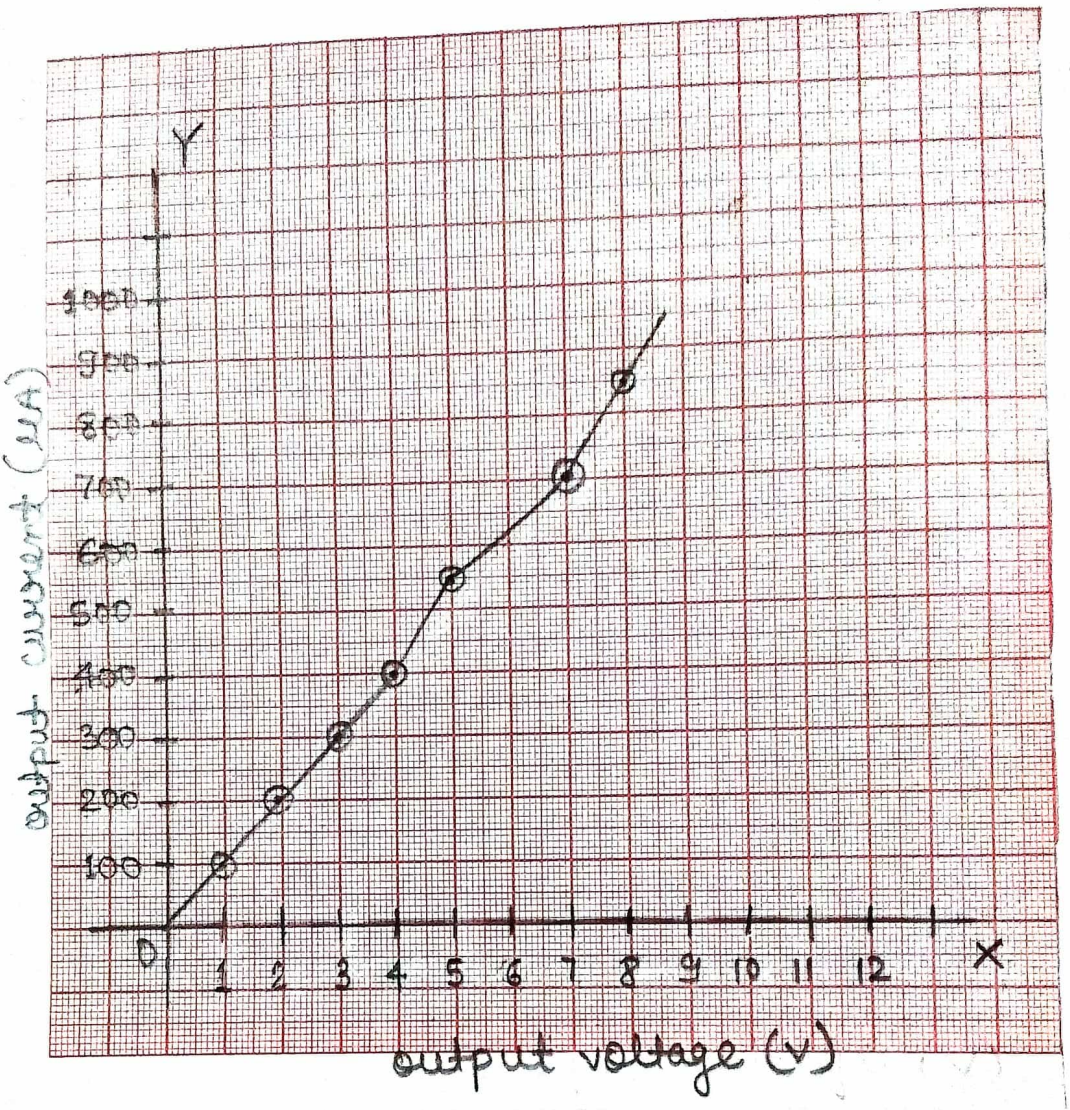
Theory :- It is a semiconductor diode in which n-type and p-type sections are the heavily dropped. This results in low value of reverse breakdown voltage (BVR). This is called zener voltage.

$$V_O = V_I - R_I V_I$$

where,

V_O = Output voltage.
V_I = Input voltage.
$R_I V_I$ = Input current.

Teacher's Signature _____



S.NO.	Output voltage	current (uA)
1.	1	100
2.	2	200
3.	3	300
4.	4	400
5.	5	500

Date _____

Expt. No. _____ Page No. 18

Result :-

The reverse breakdown voltage of zener diode is 8V.

Precaution :-

(i) All connection should be neat, clean and tight.

(ii) Key should be used in ckt.

Teacher's Signature _____

Date _____

Expt. No. 10 EXPERIMENT - 10 Page No. 19

Aim :- Focal length of concave mirror for different value of u.

Apparatus :- An optical bench along with 3 uprights, one mirror holder, 2 needles, concave mirror, a knitting needle, meter scale.

Theory :- Formula used ;

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u} = \boxed{f = \frac{uv}{u+v}}$$

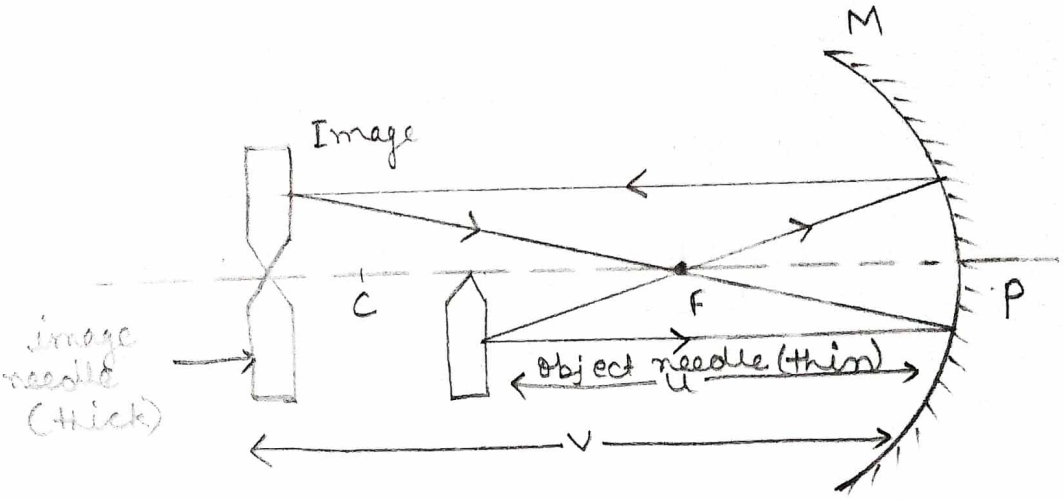
where,

f = focal length.
v = Image distance from mirror.
u = object distance from mirror.

(i) Plot graph between v and u.

(ii) Plot graph between 1/v and 1/u

Teacher's Signature _____



focal length of a concave mirror

S.No	u(cm)	v(cm)	$\frac{1}{u}$ cm^{-1}	$\frac{1}{v}$ cm^{-1}	$f = \frac{uv}{u+v}$
1.	-30	-33	-0.033	-0.030	-15.71
2.	-29	-35	-0.034	-0.028	-15.85
3.	-35	-28	-0.028	-0.035	-15.55
4.	-40	-26	-0.025	-0.038	-15.75
5.	-32	-29	-0.031	-0.034	-15.30
6	-31	-29	-0.032	-0.031	-15.21

Expt. No.

Result :-

The focal length of given concave mirror is −15.5 cm.

Precautions :-

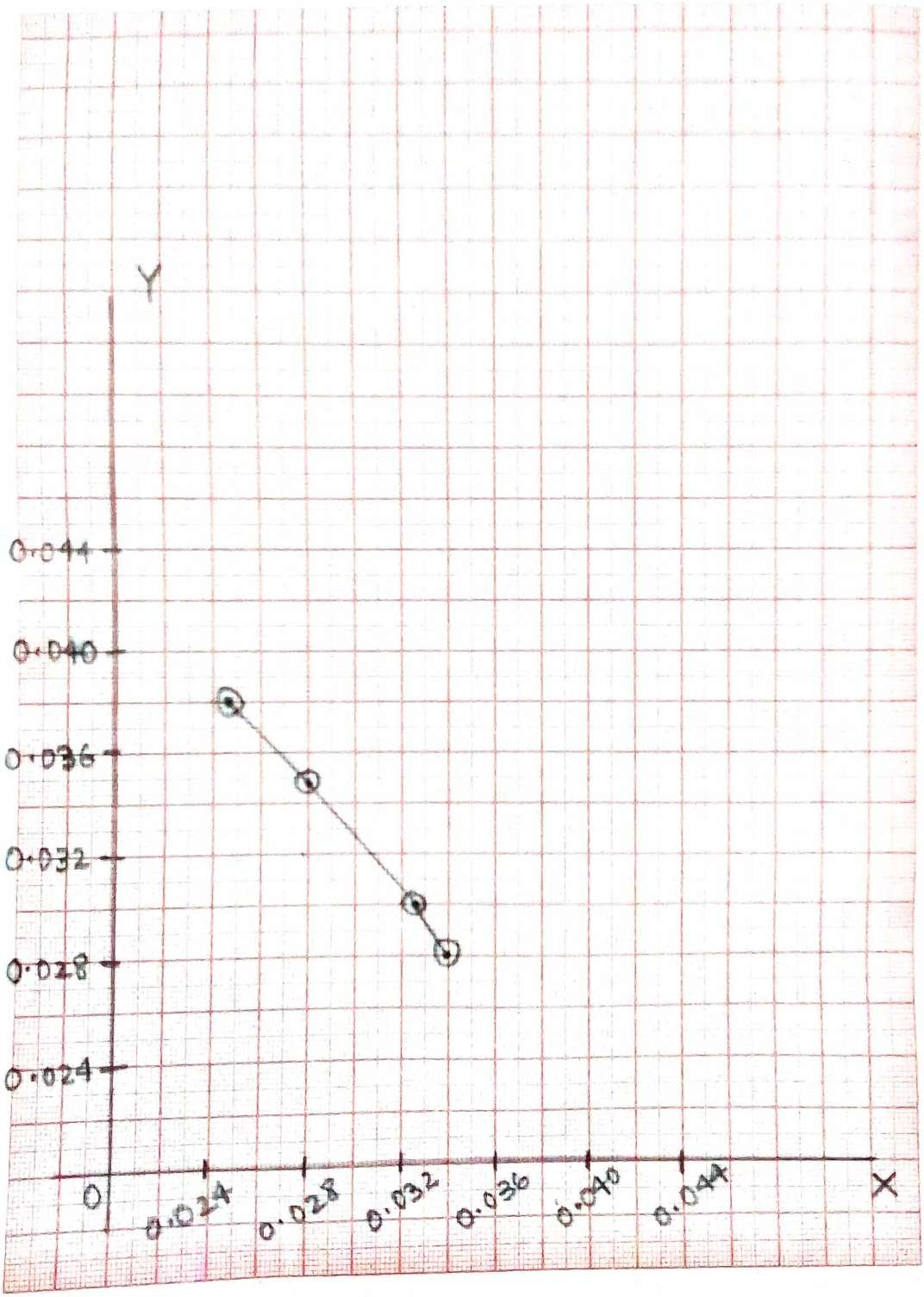
(i) The upright should be vertical.

(ii) Indesc corresponding for u and v must be applied.

Source of errors :-

(i) The upright may not be vertical.

(ii) Parallelx removed may not be perfect.


Y
0.044
0.040
0.036
0.032
0.028
0.024
0
0.024
0.028
0.032
0.036
0.040
0.044
X

PROJECT FILE

Expt. No. _____ Date _____

Page No. 25

Activity - 1.

Aim :- To determine a household circuit comprising the bulbs switches, fuse and a power sources.

Apparatus :- Bulbs, fuse, battery, fuse wire.

Theory :- Formula used for calculating power;

$$P = \frac{V^2}{R} = I^2R = VI$$

$$= P_1 + P_2 + \text{-----} P_n .$$

Procedure :-

(i) Connect the bulbs B_1, B_2 & B_3 in series with switches S_1, S_2 & S_3 respectively and connect each set of B-S in parallel with each other.

(ii) Connect main supply to a step-down transformer of required voltage 0-10 v.

(iii) Connect the main fuse Ms in series with the supply.

(iv) Connect A-C ammeter in series with the B-S set.

(v) Connect one end of power supply to one end of B-S set.

(vi) Check the circuit ones more to ensure that household circuit is complete.

(vii) Gradually increases the current to 0.75A, the fuse must burn off at 0.6A.

Teacher's Signature _____

Date _____

Expt. No. _____ Page No. 26

Activity - 2

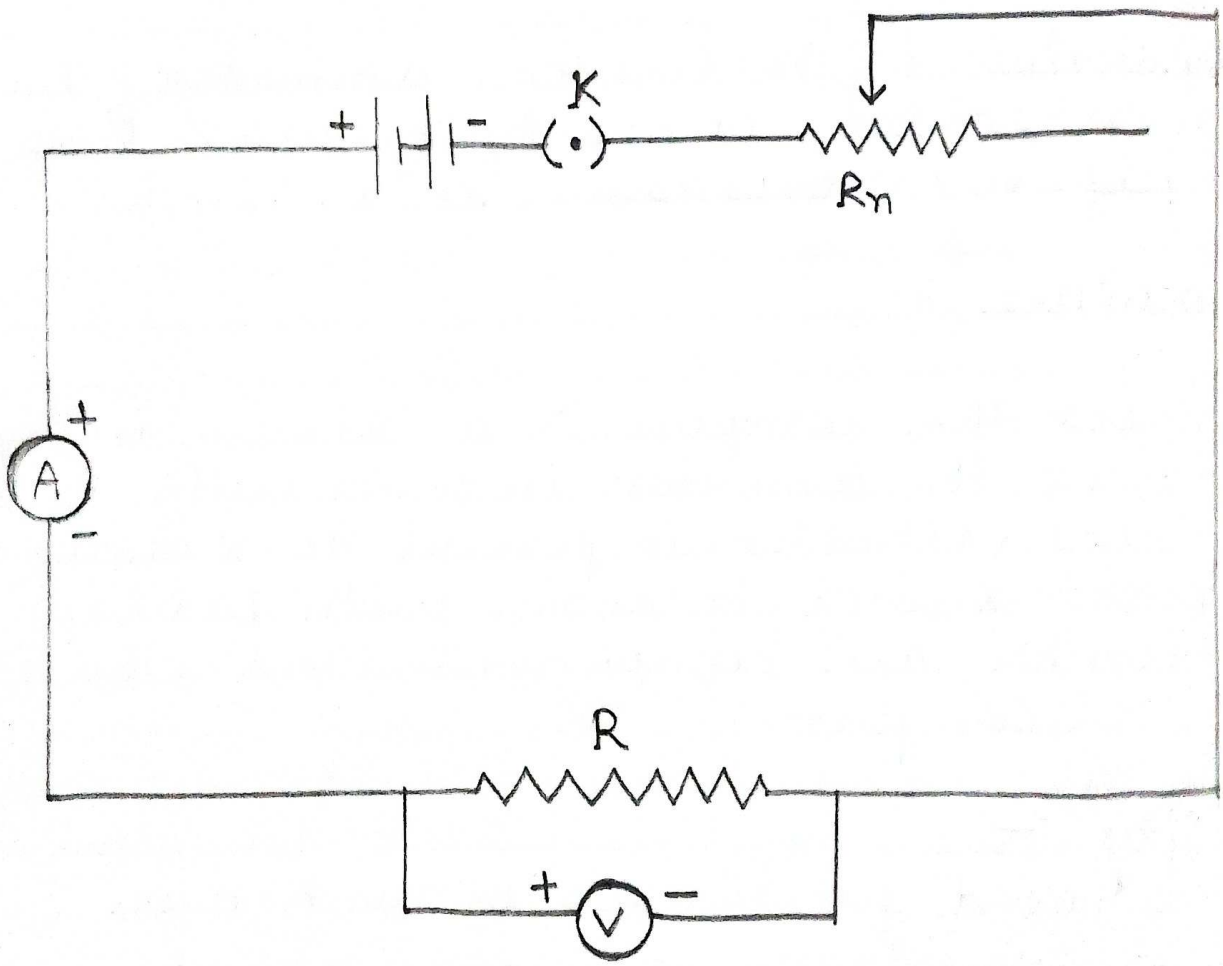
Aim :- To assemble the components of a given electric current.

Apparatus :- Voltmeter, ammeter, battery, a rheostat, connectivity wires, sand paper, resistance coil.

Procedure :-

(i) Connect the components as shown in fig.
(ii) Connect the ammeter in series with circuit.
(iii) Connect voltmeter in parallel to resistor.
(iv) Connect switch in series with battery.
(v) Assemble all components and circuit is complete.

Utility :-
It is used for measuring unknown resistance.


K
+
-
Rn
+
A
-
R
+
V
-

Activity - 3.

Aim :- To draw the diagram of a given open circuit comprising atleast a battery resistance key, ammeter and voltmeter.

Apparatus :- Battery eliminator, rheostat, resistance one-way key, ammeter.

Theory :- An open circuit is combination of primary component of electric circuit in such a manner that on closing the circuit no current is drawn from the battery.

Procedure :-

Ammeter - To be connected in series with the elements.

Voltmeter - To be connected in parallel to resistor.

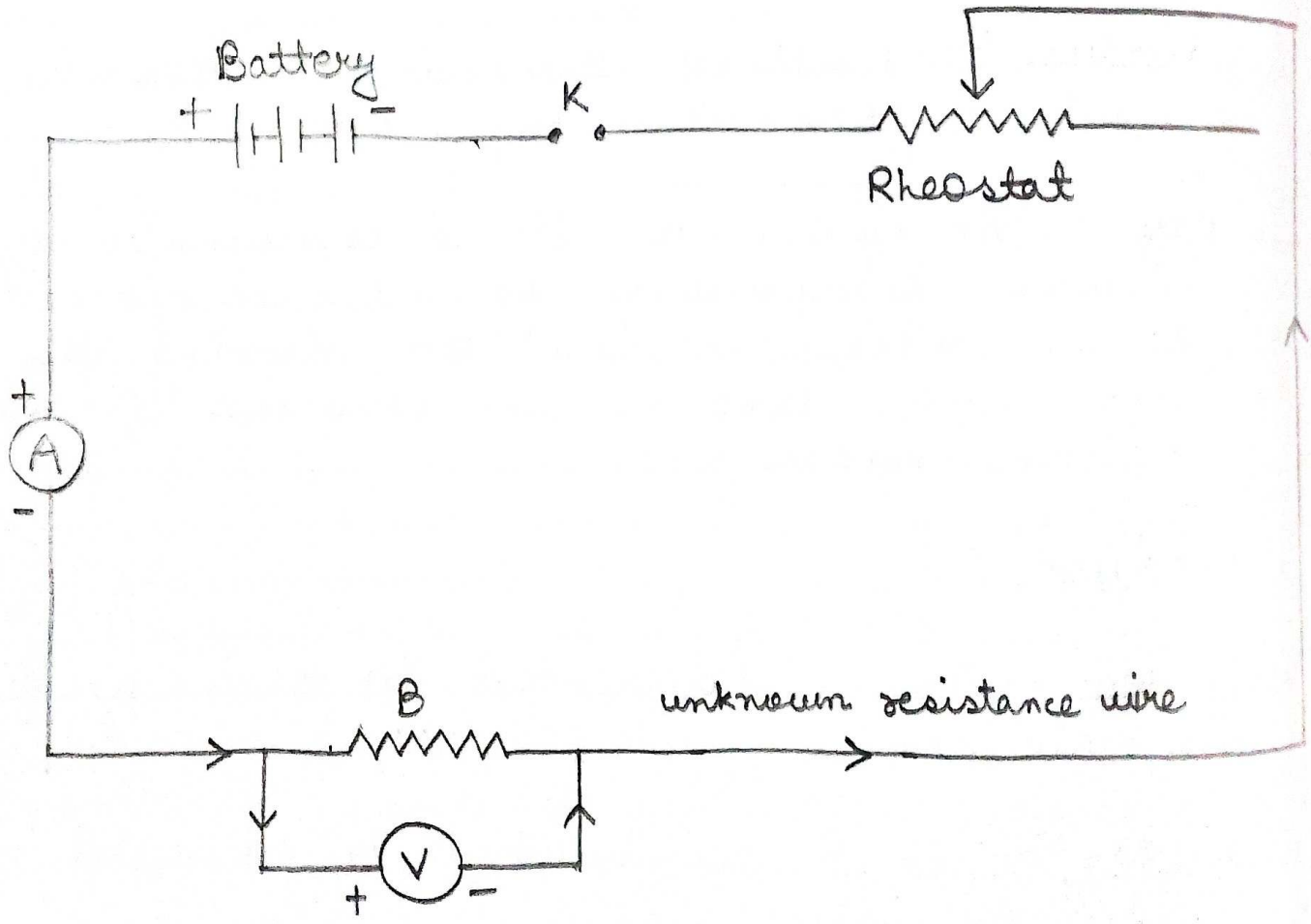
Rheostat - Connected in series with eliminator.

Resistance Coil - Connected in coil.

One way key - Connected in series to battery eliminator.

Connect Components correctly as per circuit diagram.

Teacher's Signature _____


Battery
+
−
K
Rheostat
+
A
−
B
unknown resistance wire
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Activity - 4

Aim :- To study the nature and size of the image formed by a concave mirror on a screen by using a candle and a screen.

Apparatus :- Optical Bench, 3 upright, concave mirror holder, candle, cardboard screen.

Theory :-

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

$u = \infty$	$v = f$
$u = f$	$v = f$
$u = f$	$v = \infty$

Procedure :- find rough focal length of a concave mirror by usual method.

(i) Mount the concave mirror, screen and candle.

(ii) Adjust the mirror to get inverted, exact image of candle on screen.

(iii) As the object is moving towards the mirror, the image gets enlarged slowly. Then, after reaching a distance equal to f, no image is seen.

Thus, the focal length can be measured.

Teacher's Signature

Activity - 5.

Aim :- To obtain a lens combination with the specified focal length by using 2 lenses from given set of lens.

Apparatus :- lenses, lens holder, stand, meter scale.

Theory :- $\frac{1}{F} = \frac{1}{F_1} + \frac{1}{F_2}$

where,

F = focal length.
P = Power.

Procedure :- Keep the white painted vertical wooden board to serve as a screen.

(i) The convex lens fixed into a holder is moved towards left of screen and then right to get sharp image.

(ii) The lens is moved towards and away from the screen till a sharp image is formed.

(iii) Then use second lens and findout focal length.

(iv) Calculate power using 'F'.

Teacher's Signature _____

Date

Expt. No. Page No. 30

Activity - 6.

Aim :- To observe polarisation slab, monochromatic of light using two polaroids.

Apparatus :- Thin glass slab, monochromatic light, polaroids.

Theory :- When an unpolarised is made to indience of interface of 2 transparent media at polarising angle refracted and reflected rays are at 90°.

Procedure :-

(i) Keep a thin glass sheet in a horizontal plane surface with a whole under sheet.

(ii) Take a beam of monochromatic light having parallel rays and make it incident ~~on~~ on paper.

(iii) Adjust the angle of incidence to 57.5°.

(iv) Observe reflected and refracted ray. They are one each other.