Aim :- To determine the refractive index of a prism by i-d curve method.

Appratus :-

Prism, drawing board, drawing pins, whitepapers Pins, Scale and protractor.

Description :- A prism is a transparent medium bounded by three planesurfaces. Two surfaces are well polished and are called refracting surfaces. The other face is called base of the prism. The angle between two refracting faces is called angle of prism (or) apex angle.

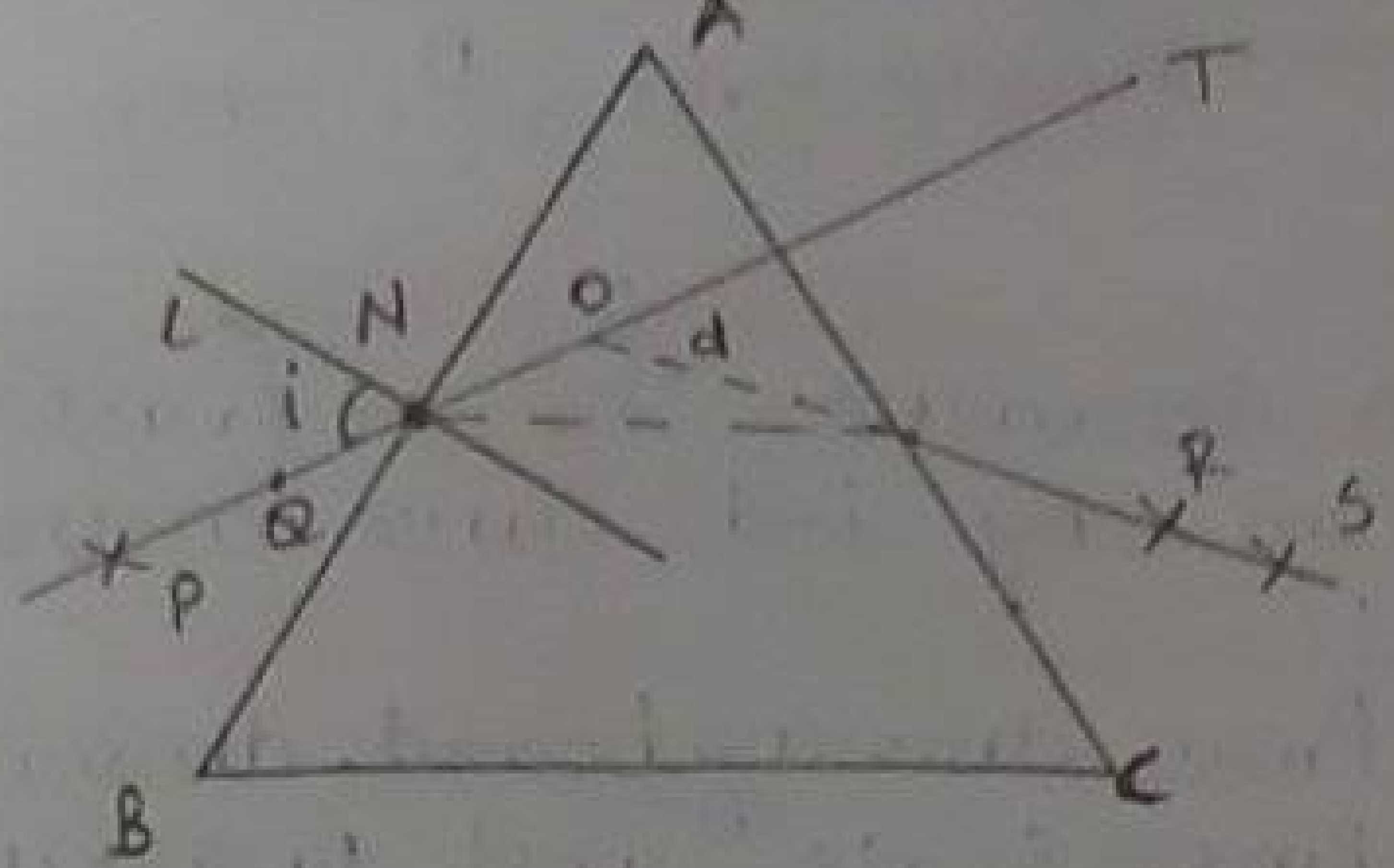
Theory :-

When a light ray passed through the prism, the emergent ray deviated through an angle from its original path. This angle between the emergent ray and the incident ray is called the angle of deviation. It first decreases and then increases with the angle of incidence.

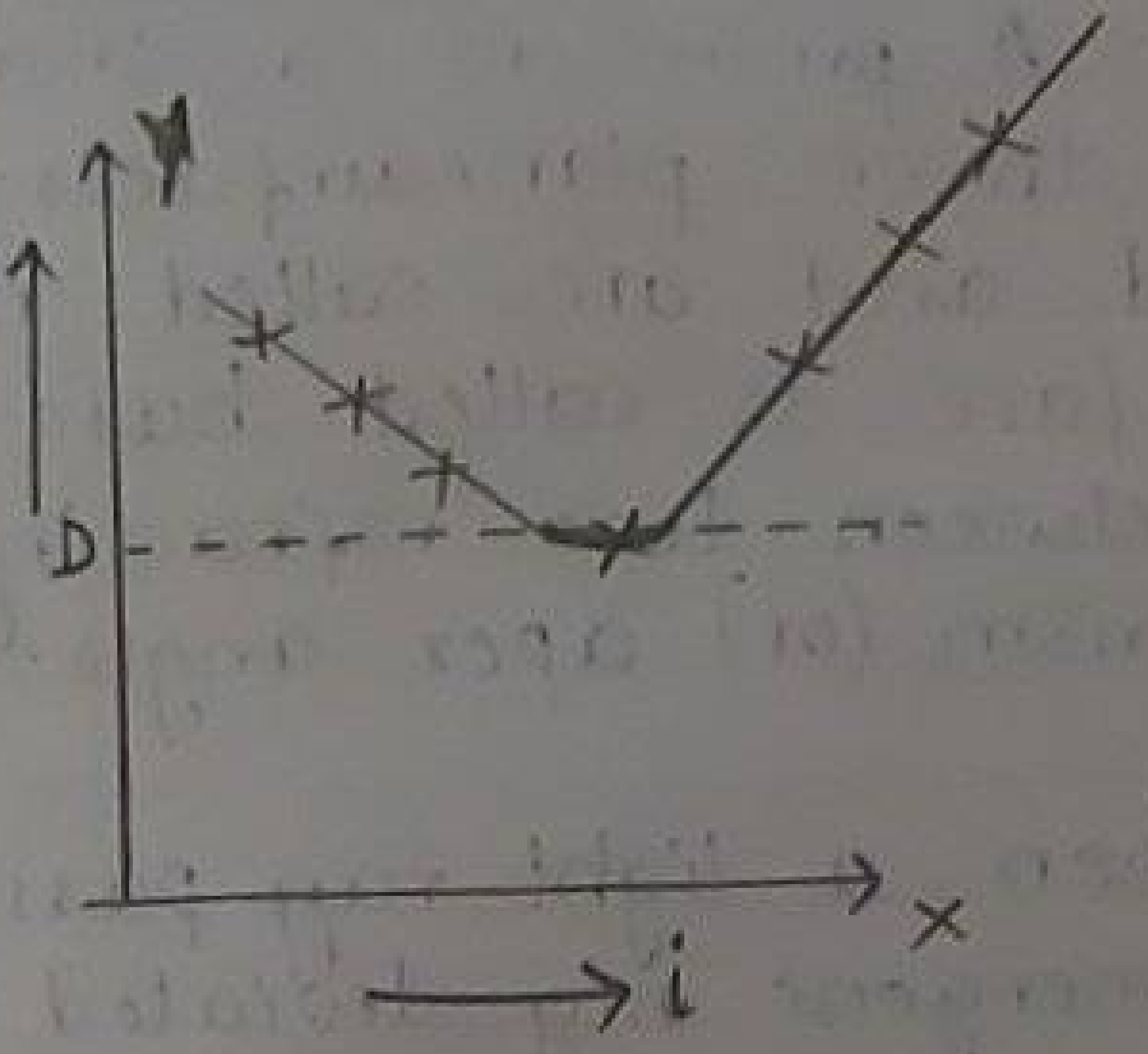
Formula :-

The refractive index of the glass of the prism $\mu = \frac{\sin\left(\frac{A+D}{2}\right)}{\sin\frac{A}{2}}$

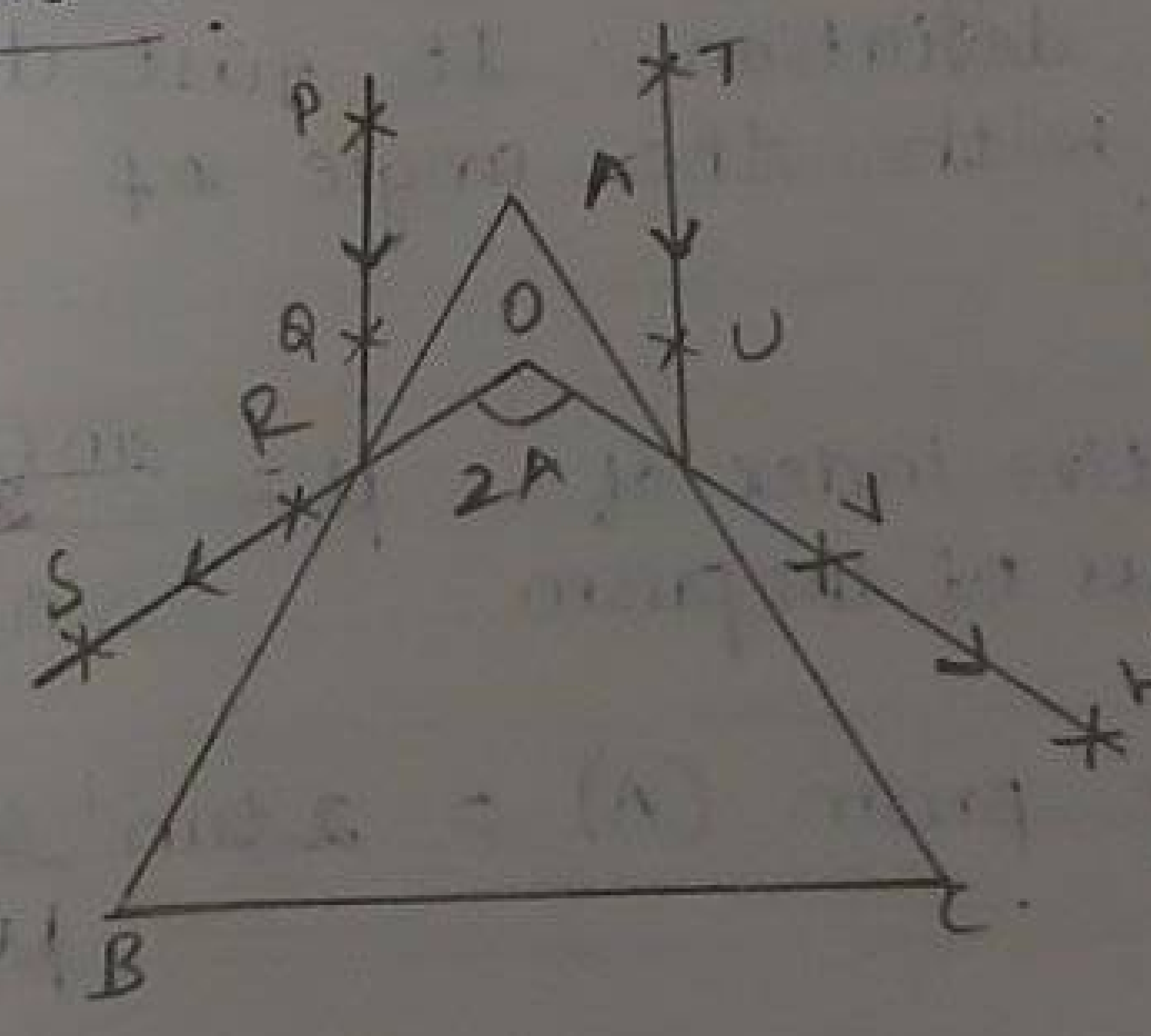
Angle of prism (A) $= 2\tan^{-1}\frac{\sin\frac{Dm}{2}}{\mu - \cos\frac{Dm}{2}}$



i-d curve



Angle of prism



Procedure :- To measure the angle of minimum deviation

A White paper is fixed on a drawing board with the help of drawing pins. the prism is placed on the white paper and its outline ABC is drawn with sharp pencil. The prism is removed and normal is drawn at a point N on the refracting surface AB. A straight line is drawn at 'N' making an angle say 30° with the Normal. Two points P and Q are fixed vertically on this line 2 cm apart. This is called incident ray.

The prism is placed in its positions the two points are viewed from the other refracting face AC. Viewing the two pins, two more pins R and S are fixed so that the pins R and S are in the line with the images of P and Q. The position of R and S are noted on the paper. The prism is removed and points R and S are joined with a straight line. This is called emergent ray. It is extended to meet the incident ray at 'O'. The angle b/w the incident ray and the emergent ray is called the angle of deviation. The experiment is repeated for different angle of incidences 35°, 40°, 45°, 50°, 55°. Everytime, the angle of deviation is measured.

Date :

Name of the Experiment :

i-d curve :- A graph is drawn with the angle of incidence on x-axis and the angle of deviation on y-axis. It is a curve as shown. When i is gradually increased the angle of deviation first decreases and reaches the minimum and the increases. The minimum angle is called angle of minimum deviation (D). The value of 'D' is obtained from i-d curve. The readings are tabulated as shown below. The Refractive index on the material of the prism can be obtained from the formula

$$\mu = \frac{\sin\left(\frac{A+Dm}{2}\right)}{\sin\frac{A}{2}}$$

(b) Angle of the prism :-

The trace ABC of the principal section of the prism is taken on a white paper fixed to a drawing board.

Two parallel line PA and TU are drawn one on either side of A very close to it. Two point pins P and Q are pinned vertically to the drawing board on one of these lines PQ. The reflected images are seen through the face AB and two more pins R and S are pinned vertically in line with the images. The lines RS gives the reflected ray corresponding to the incident ray PQ. Similarly the line VW that gives the reflected ray of TU is also traced. The angle ROV b/w the lines RS and VW at 'O' gives twice the angle of the prism.

S.NO	Angle of incidence (i)	Angle of deviation (d).
1	30°	45°
2	35°	42°
3	40°	38°
4	45°	40°
5	50°	43°

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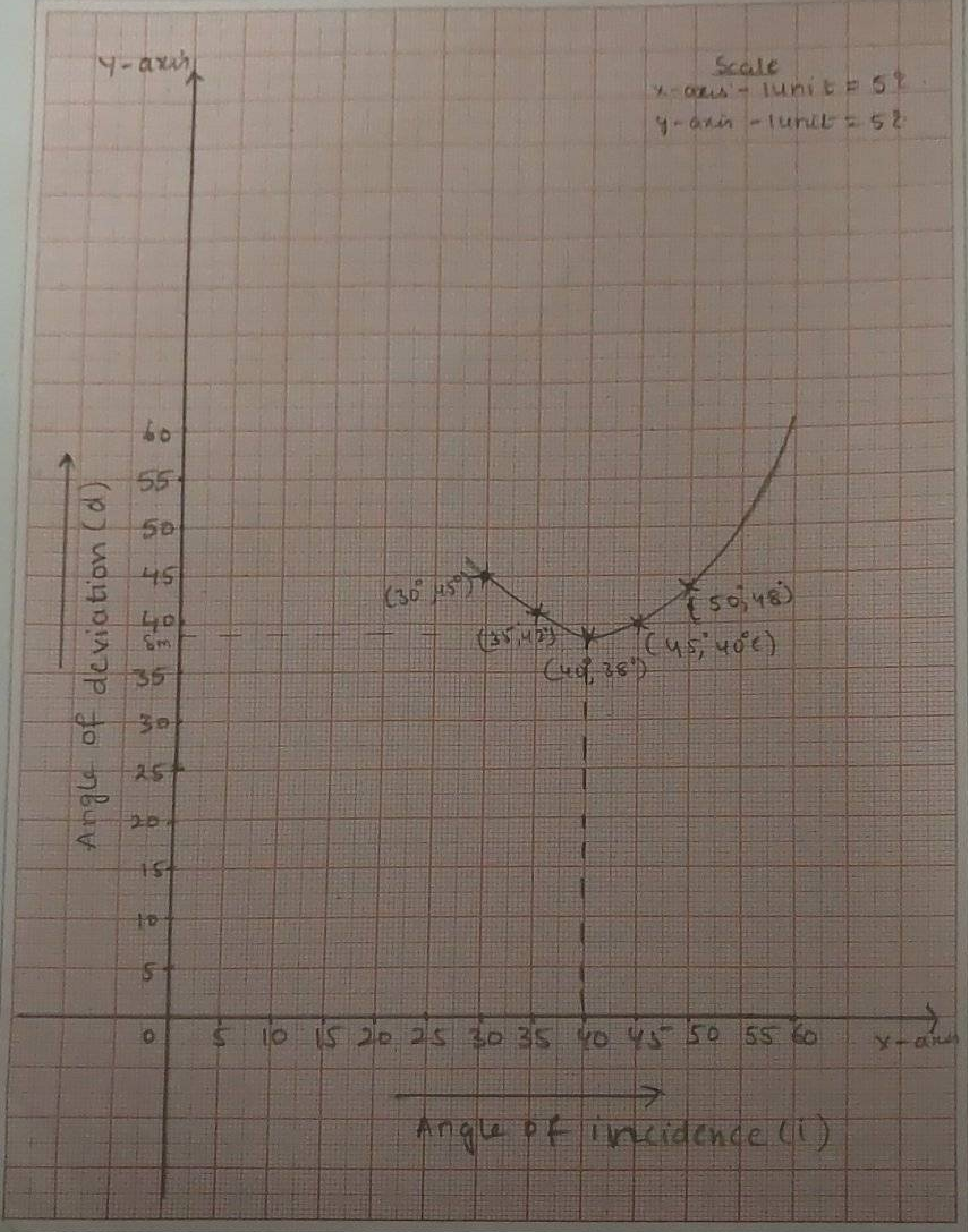

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Therefore, Angle of the prism = $\frac{\angle PQV}{2}$.

Observation :-

Angle of the prism A = 60°

Angle of minimum deviation from i-d curve Dm = 38°

Precautions :-

1. The pins must be fixed vertically
2. The distance between the pins P and Q must be about 2 cm apart
3. The positions of the prism should not be disturbed during the experiment.

Result :-

The refractive index of the material of the glass prism (μ) = ______

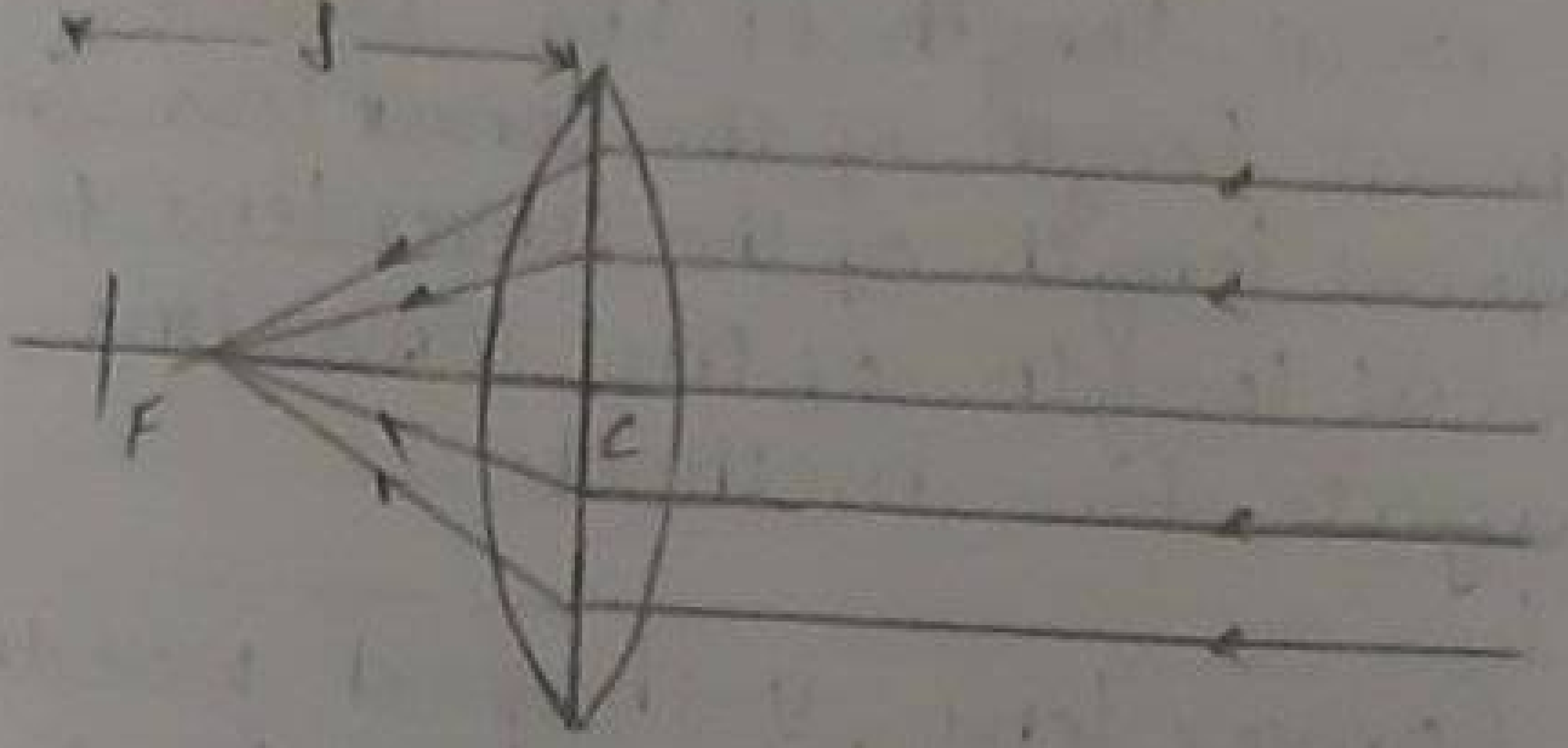
Convex Lens

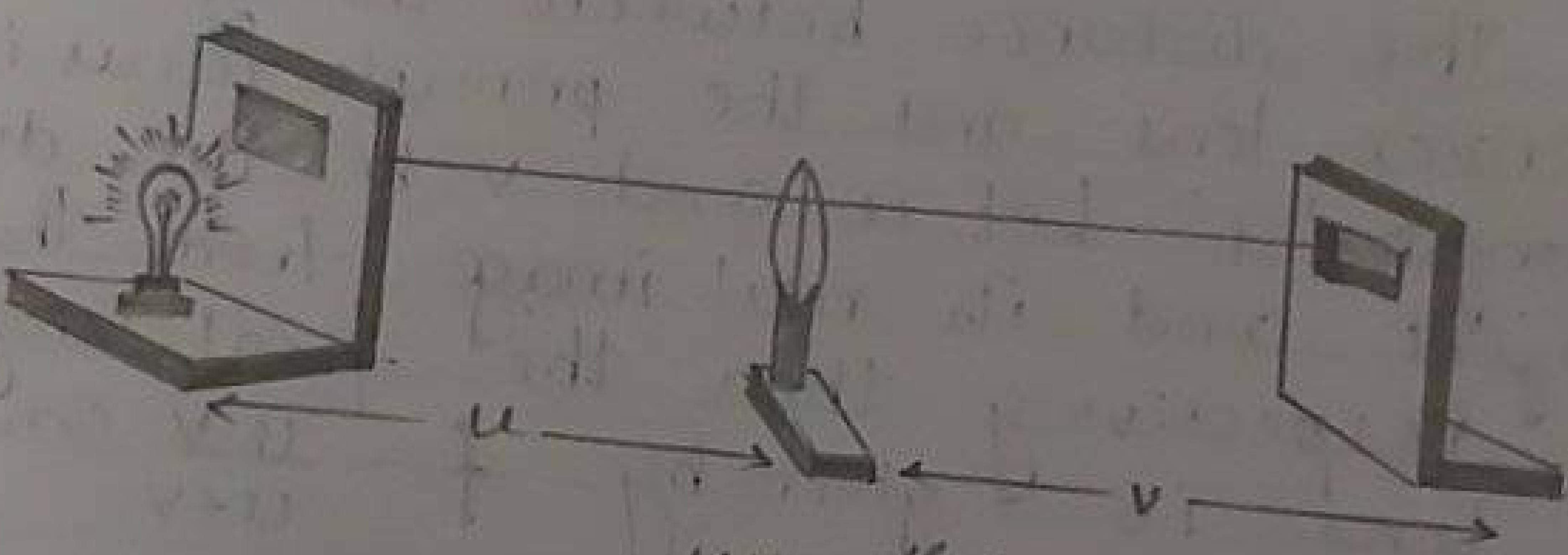
Aim :- To determine
(a) The focal length of the convex lens by u-v method
(b) The focal length of the convex lens from u-v graph
(c) The focal length of the convex lens from $\frac{1}{u}-\frac{1}{v}$ graph
(d) The focal length of the convex lens by Conjugate foci method.

Appratus :-
Convex lens, V-shaped wooden Stand, Screen, illuminated cross wires, optical bench and meter Scale

Principle :-
The distance between the optic centre of the convex lens and the principle focus is called focal length "f". Let u and v be the distance of the object and its real image from the optic Centre respectively then the focal length 'f' of the lens is given by $f = \frac{uv}{u+v}$ cm.

Procedure :-
Distant object method.
The Convex lens is mounted in the 'V' shaped groove of the lens Stand with its principle axis horizontially. The lens is focussed towards a distant object like a tall tree or electric pole through the window of the labaratory. The position of the Screen is adjusted on the other side of the lens until a clear image is formed on it. The distance between the lens and the Screen directly gives approximate focal length of the lens.





u,v method

U-V method

An illuminated wire mesh fitted to the lamp box is taken as an object. The lens arranged in the V-Stand is placed at Certain distance from the object. This distance should be greater than approximate focal length of the lens. The Screen which is on the other side of the lens is wire mesh is obtained on the Screen. The distance (u) between the object and the lens and the distance (v) between the Screen and the lens are measured parallel to the axis on the lens. The distance between the object and the lens is increased in the Steps of 5cm. Every time the screen is adjusted until a fine image is formed on it and each time 'v' values are noted. The focal length of the convex lens can be determined from the formula.

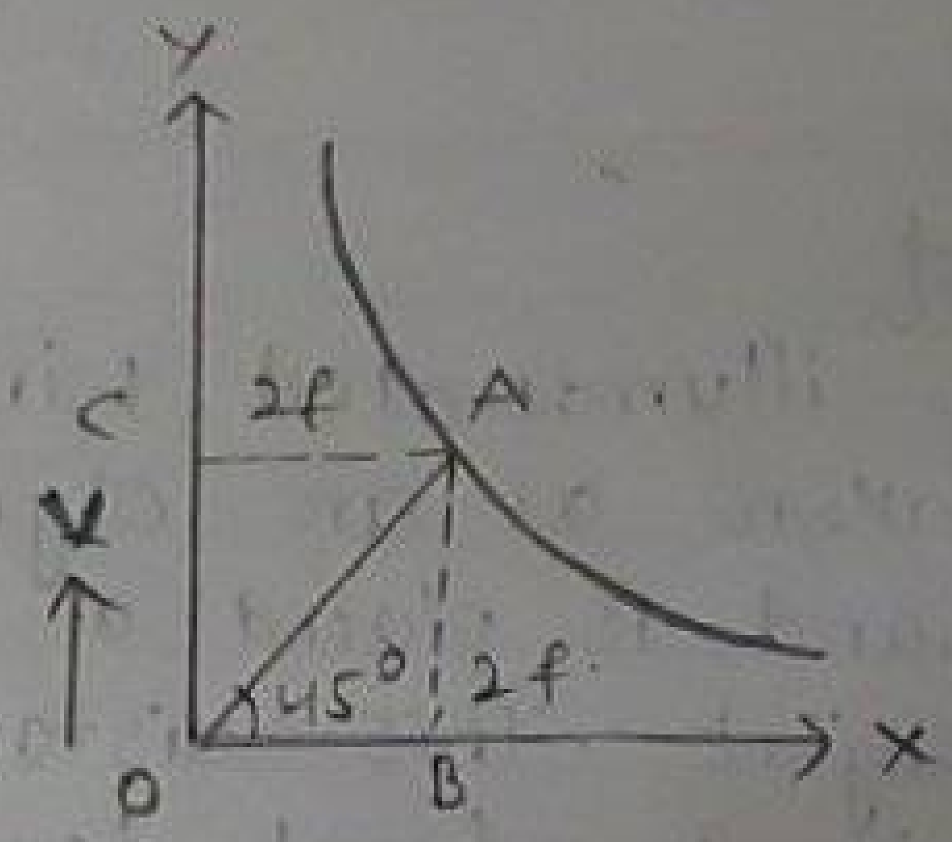
U-V Graph:-

A Graph is drawing taking 'u' values on X-axis and V values on Y-axis with Same Scale on both the axis. It will be a rectangular hyperbola. A straight line is drawn from the origin bisecting the angle between the axis.

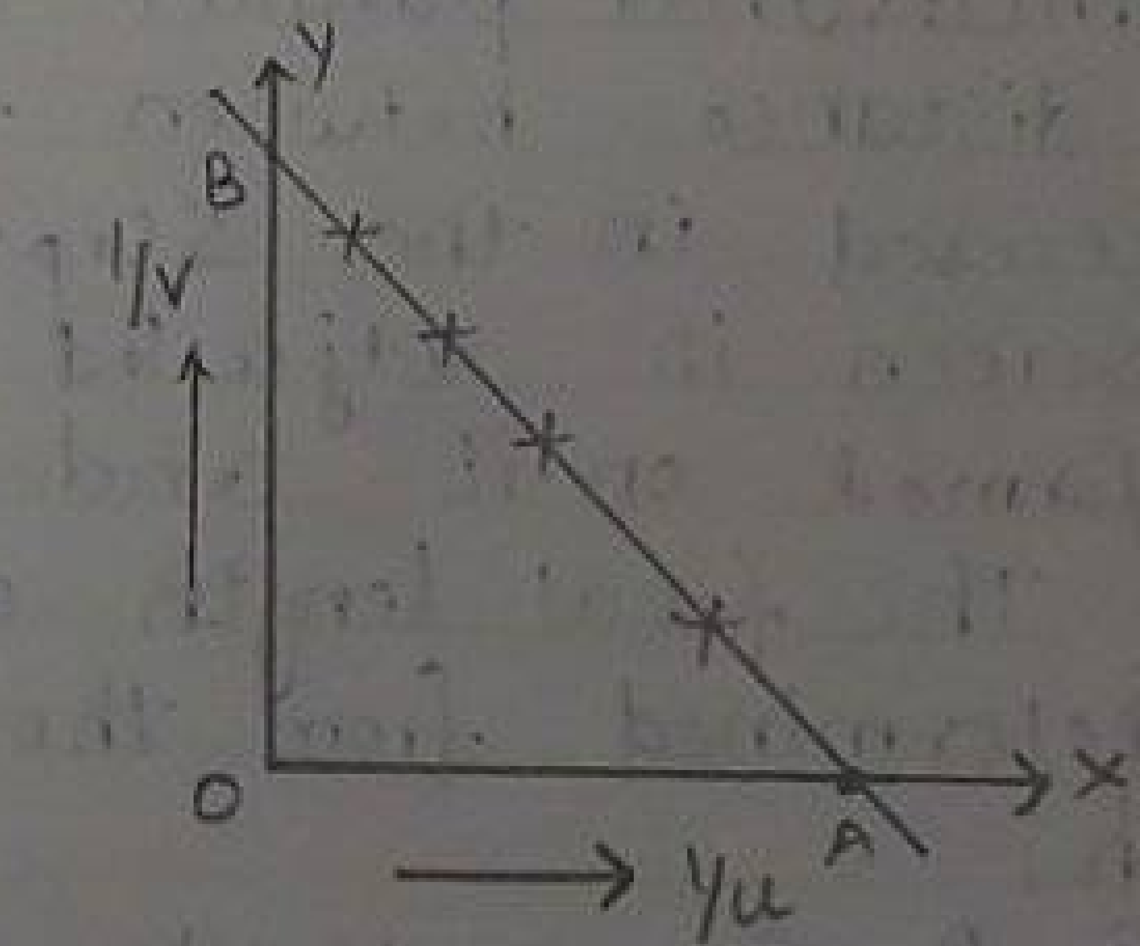
Let the straight line meet the curve A. From A drawn the perpendicular AB and AC towards the X and Y axis respectively. The 'X' and 'Y' coordinate of 'A' is equal to 2f according to Scale.

i.e $OA = OB = 2f$ (or) $f = \frac{OA+OB}{4}$ cm.

U-V Graph :-



$\frac{1}{u}-\frac{1}{v}$ Graph :-



$\frac{1}{u}$ - $\frac{1}{v}$ Graph :-

A Graph is drawn with $\frac{1}{u}$ values x-axis and $\frac{1}{v}$ values on y-axis with the Same Scale on both the axis. It will be Straight line making intercepts OA and OB on both axis as Shown in the graph. Then $f = \frac{2}{OA+OB}$ cm

Conjugate foci method (or) lens displacement method.

The Object stand O and Screen S are placed on the optical bench Seperated by a distance 'l' greater than 4f. The lens stand is first placed very close to the object and then slowly moved towards the screen. At a certain position a clear and magnified image forms on the Screen. After nothing this position, the lens is again slowly moved towards the screen other position (or) a real diminished and inverted image is obtained on the Screen, the position of Q of the lens is noted. The displacement of the lens $d = Q - p$ for the two images is obtained. The experiment is repeated for different values of 'l', everytime the displacement 'd' is noted and readings are tabulated.

Observation

Focal length of a lens in distant object method is 21 cm

S.NO	Object (u) distance cm	$\frac{1}{u}$ cm^{-1}	Image distance (v cm)	$\frac{1}{v}$ cm^{-1}	$f = \frac{u \cdot v}{u+v}$ cm
1	250	0.02	40	0.025	22.27
2	30	0.03	65.3	0.0153	20.56
3	35	0.028	52.4	0.0180	21.42
4	40	0.025	49.0	0.020	22.022
5	45	0.022	43.7	0.022	22.077

Average focal length 21.90 cm

The focal length of the convex lens from u, v Graph is 21.9 cm

The focal length of the convex lens from $\frac{1}{u}, \frac{1}{v}$ Graph is 22.22 cm

Radius of curvature of the convex lens R = 2f is 43.8 cm.

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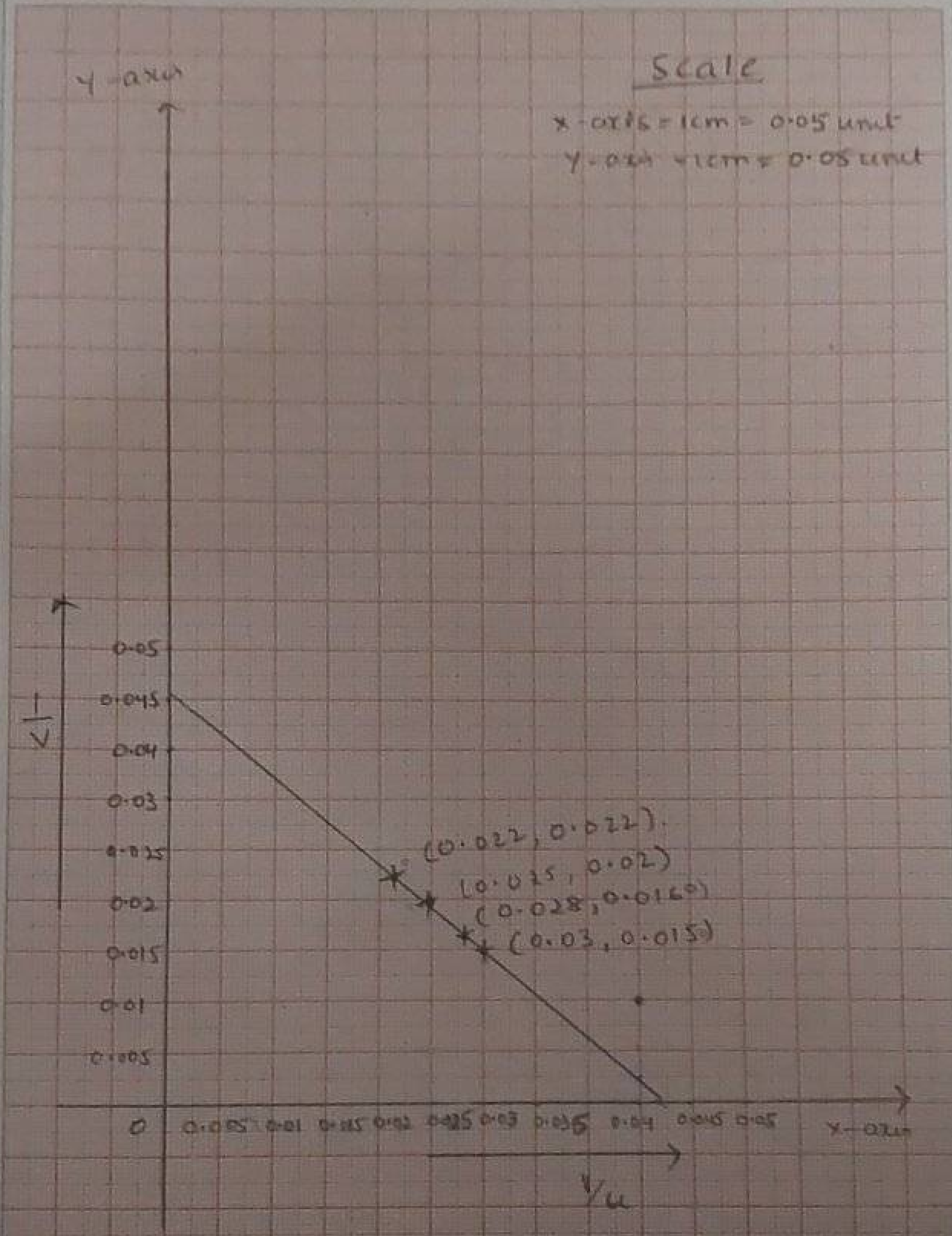

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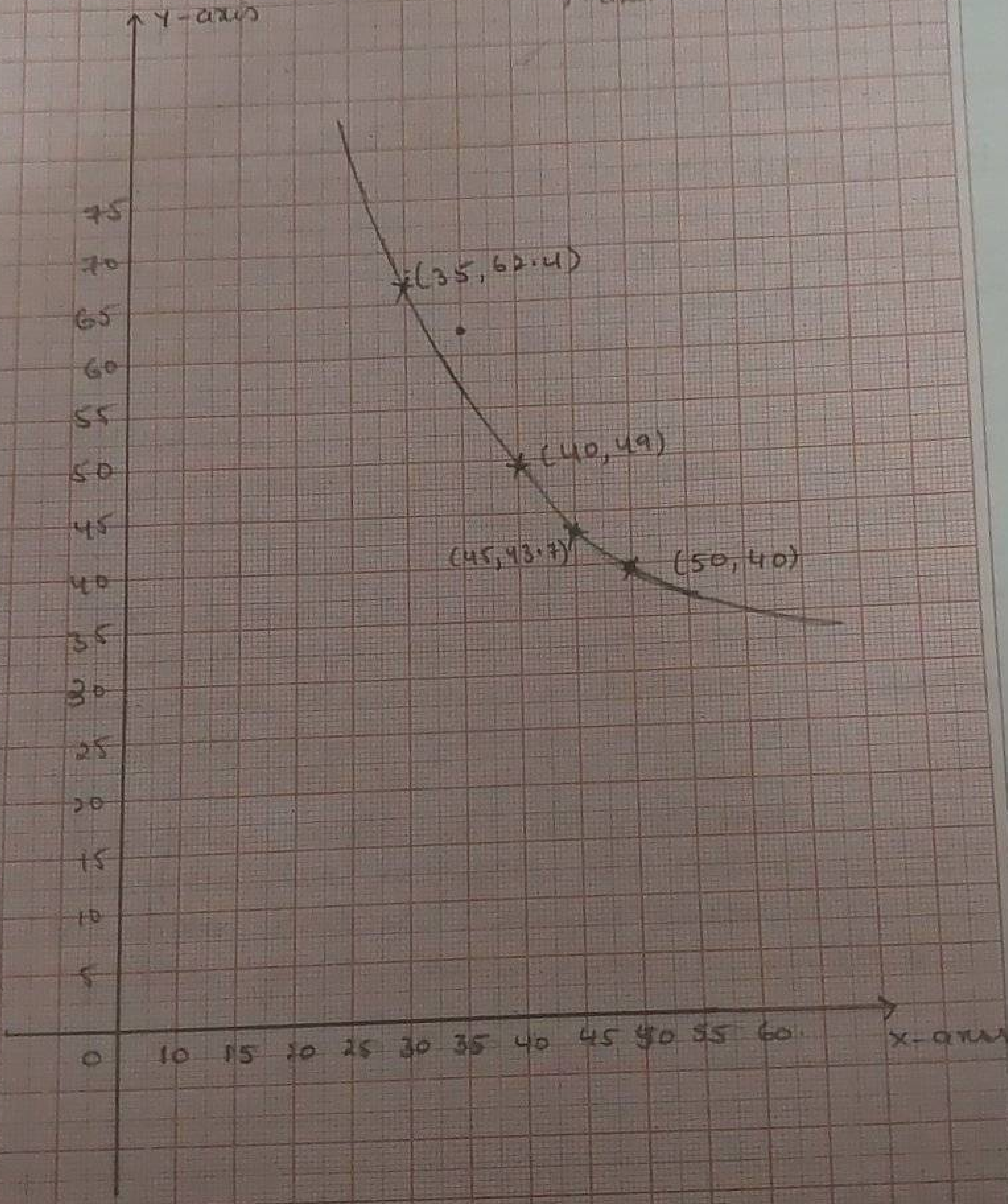
Scale
x-axis - 1cm = 10 units
y-axis - 1cm = 5 units



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Precautions :-

1. The distance are measured only after the formation of well defined image.
2. Always the distances are measured parallel to the lens axis
3. The readings are noted without parallax error.
4. Image distance is measured when clear and well defined image is formed on the Screen.

Result :-

1. The focal length of the given convex lens from distant object method = 22 cm
2. The focal length of the given Convex lens from the u-v method = 21.90 cm
3. The focal length of the given convex lens from the u-v graph method = 22.05 cm
4. The focal length of the given convex lens from 1/v - 1/u graph method = 22.22 cm
5. The focal length of the given Convex lens from the conjugate foci method = 22.94 cm
6. The ~~from~~ Radius of Curvature of the given Convex lens = 43.8 cm

Determination of focal length of the lens by conjugate foci-method

S.No.	Distance b/w object (l) and screen cm	First position of the lens (P) cm	Second position (Q) cm of the lens	$d = Q - P$ cm	$F = \frac{l^2 - d^2}{4l}$ cm
1	90	34	56.5	22.5	21.09
2	95	31.5	63	31.5	21.13
3	100	30	70	40	21.

Date :

Name of the Experiment : Concave Mirror

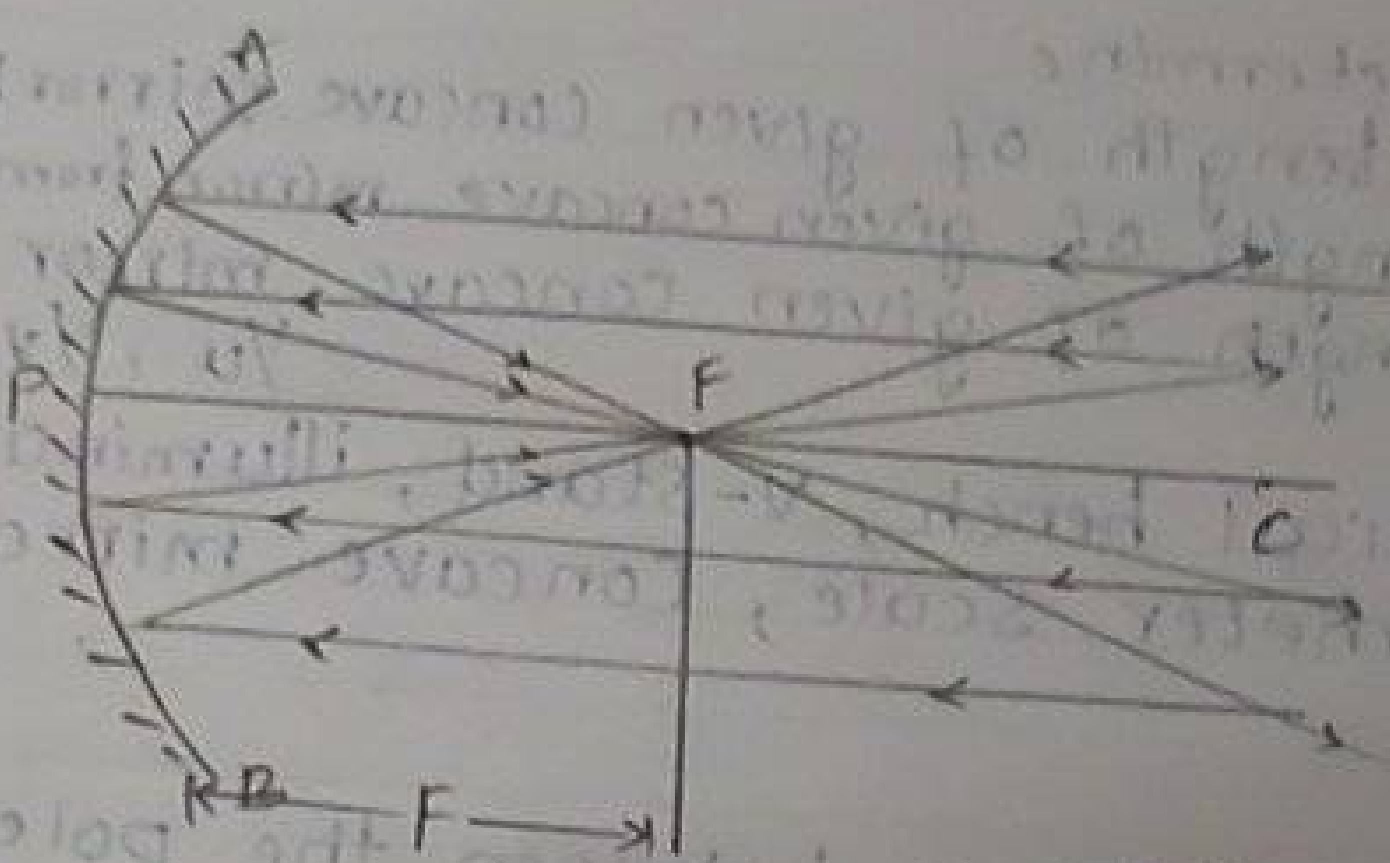
Aim :- To determine
(a) focal length of given concave mirror by u,v method
(b) focal length of given concave mirror from u,v graph
(c) focal length of given concave mirror from 1/u, 1/v graph.

Appratus :-
Optical bench, V-stand, illuminated cross wires, meter scale, concave mirror, and screen.

Principle :-
The distance between the pole of the mirror and the principal focus is called focal length 'f'. The focal length is determined by the following formula $f = \frac{uv}{u+v}$ cm.

Where
f = focal length of concave mirror.
u = distance of object from the pole of the mirror (object distance).
v = distance of image from pole of the mirror (Image distance).

Procedure :-
Distance Object method.
The given concave mirror is mounted vertically in the groove of V-stand. The reflecting surface of the mirror is directed towards a distant tree, building (or) iron pole (object). The white screen is adjusted infront of the concave mirror till the clear image of the object is seen on it. The distance b/w the pole of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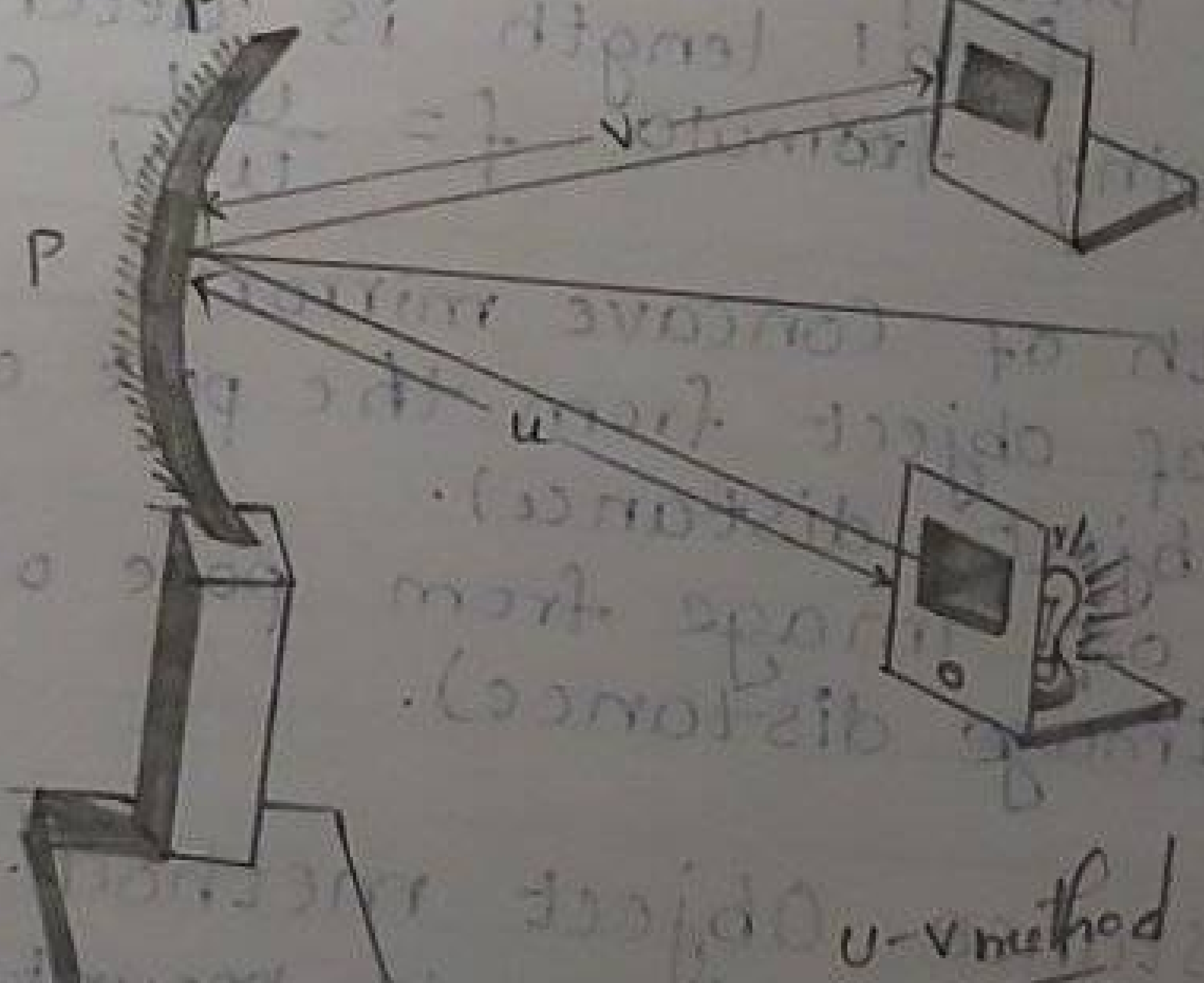
P
F
C
R
F


M
P
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u
U-V method

the mirror and the screen gives the focal length 'f' of the given concave mirror.

U-V method

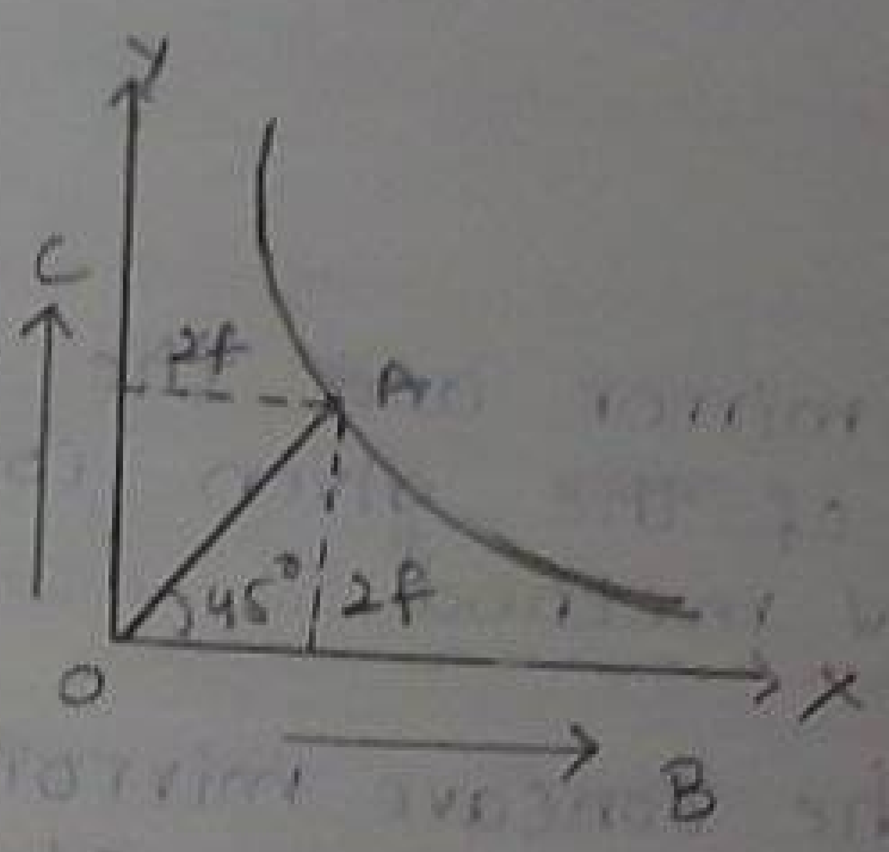
The concave mirror arranged vertically on V-shaped wooden stand is placed on the optical bench facing the illuminated wire-guage object and the pole of the mirror is adjusted to be greater than the focal length of the mirror. The cross wire 'o' and the white screen I are placed infront of the concave mirror on either side of its axis. The cross wires is placed at the distance 'U' (>f) from the centre of the mirror. The screen is adjusted until a clear well defined image of the cross wires is formed on it. The distance 'v' b/w the centre of the mirror and the screen is measured.

The experiment is repeated 5 or 6 times by increasing the object distance 'U' in steps of 5cm.

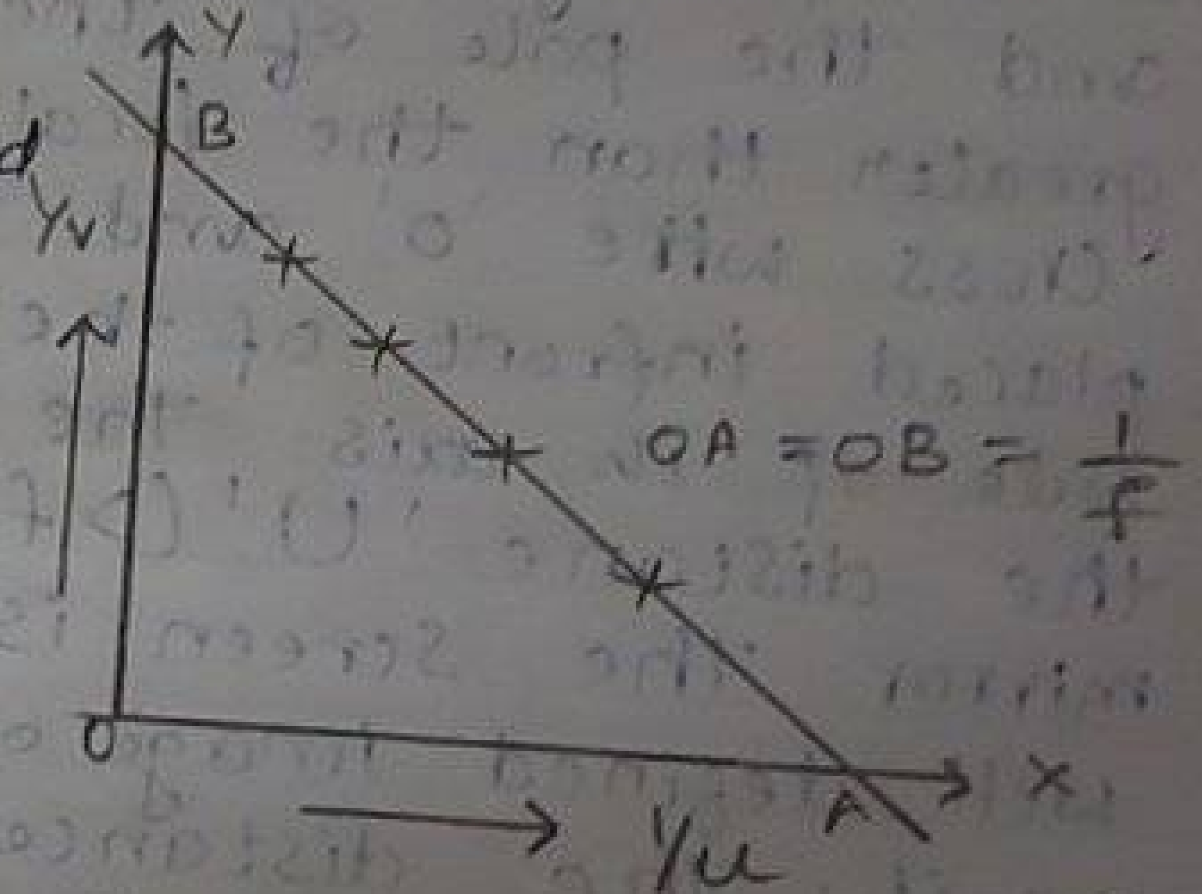
Every time the image distance 'V' is found. The focal length of the mirror is given by $f = \frac{UV}{U+V}$

The Radius of curvature of the concave mirror can be calculated from $R = 2f$.

u-v-graphical method.



$\frac{1}{u}-\frac{1}{v}$ graphical method



U-V graphical method

A-graph is drawn by taking the values on x-axis and V values on y-axis with the same scale on both the axes. It will be a rectangular hyperbola. A straight line is drawn from the origin bisecting the angle between the axes. Let the straight line meet the curve at 'A'. From the 'A' draw the perpendicular AB and AC to the X and Y axis respectively. The values of AB and AC are the same each being equal to 2f.

i.e $OA = OB = 2f$ (or) $f = \frac{OA+OB}{4}$

$\frac{1}{u} - \frac{1}{v}$ graphical method

A graph is drawn taking $\frac{1}{u}$ and $\frac{1}{v}$ on X and Y axes with the same scale on both the axes. It will be a straight line making intercepts. OA and OB on both the axes as shown in the diagram

Then $f = \frac{2}{OA+OB}$ cm

Observation

The focal length 'f' of the concave mirror by distant object method is ________ cm.

S.NO	Object distance (u) cm	$\frac{1}{u}$	Image distance (v) cm	$\frac{1}{v}$	$f = \frac{uv}{u+v}$ cm.

Precautions :-

1. The Centres of Cross-wires, the mirror the Same height and the Centre of the Screen Should lie at Should be at the Same height above the table.
2. The distances are measured from the pole of the mirror, parallel to its axis
3. The image distances is measured when Clean image is formed on the Screen.
4. The distances are measured without parallax error.

Result :-

1. The focal length of given Concave mirror from object distant method = ______ cm
2. The focal length of given Concave mirror from u-v method = ______ cm
3. The focal length of given concave mirror from u-v graph method = ______ cm
4. The focal length of given concave mirror from 1/u and 1/v graph method = ______ cm
5. The average focal length of given Concave mirror = ______ cm
6. The Radius of Curvature of given Concave mirror = ______ cm

Name of the Experiment: Verification of KCL and KVL (Kirchoff's Current And Kircohff's voltage Law). Page No: 13

7

Aim :- To verify the Kirchoff's current and voltage law.

Appratus :-

1. DC regulated power Supply of 0-5 V.
2. Four types of Wire wound resistances, each of 5 Watt (50Ω, 100Ω, 220Ω & 330Ω) are mounted on front panel.
3. Circuit for Kirchoff law is engraved on front panel.
4. Two meteres are provided on the front panel to measure Corresponding Voltage & current with Connections brought out on Sockets.

Theory :-

In Simple Circuits, the resistance and potential difference are caluculated with the help of ohms law. But in actual practise, we come across complicated circuits which contain a large no. of resistances alongwith Several Sources of emf in such cases, the effective resistance and the emf cannot be caluculated easily from ohm's law. In order to solve such networks. Kirchoff gave two laws which are Known as Kirchoff laws.

First law :-

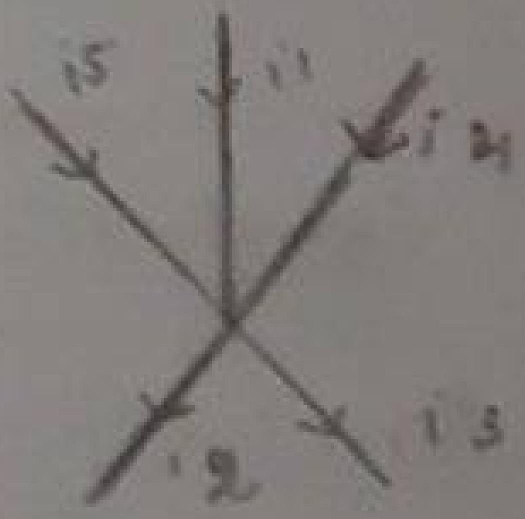
According to Kirchoff's first law. " The algebraic Sum of various Currents meeting at a junction in a closed electrical Circuit is zero

i.e $i_1 - i_2 - i_3 + i_4 + i_5 = 0 \Rightarrow i_1 + i_4 + i_5 = i_2 + i_3$.

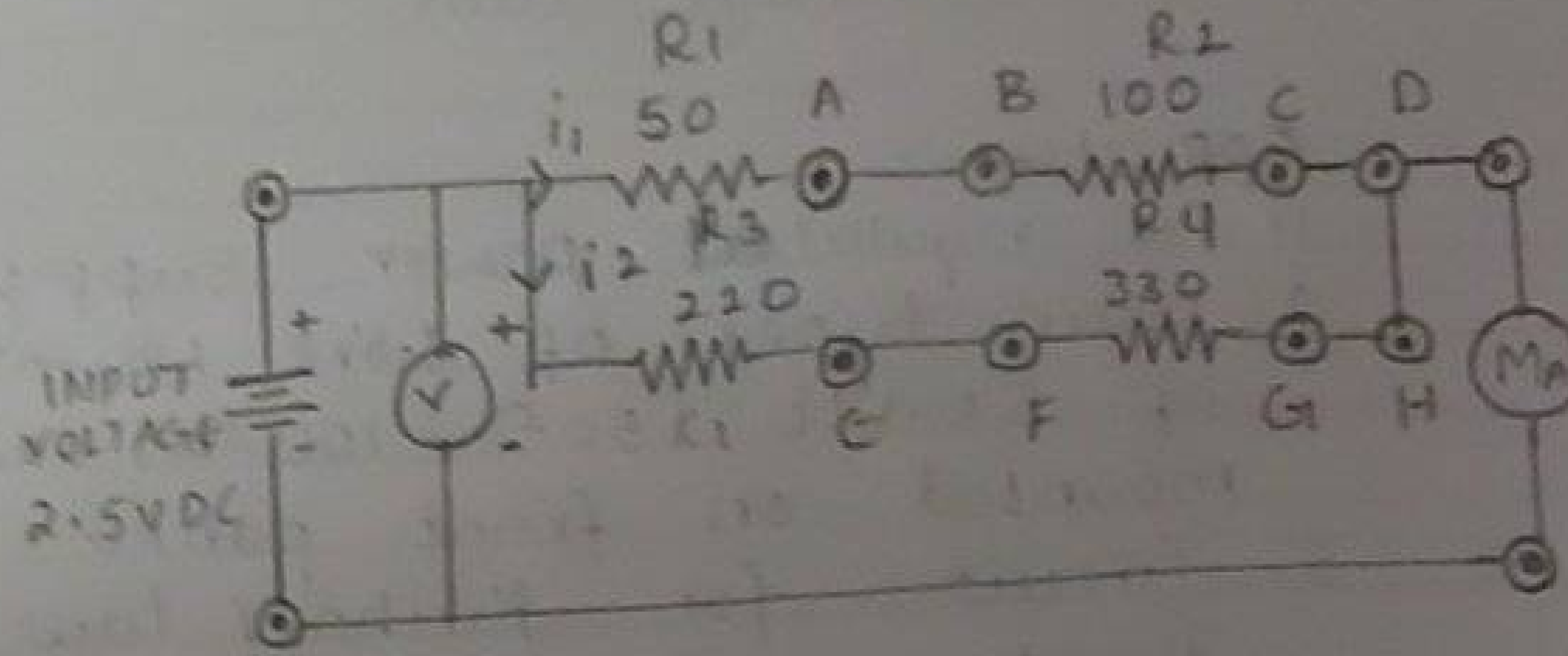
Kirchoff's first law :-

$i_1 - i_2 - i_3 + i_4 + i_5 = 0$

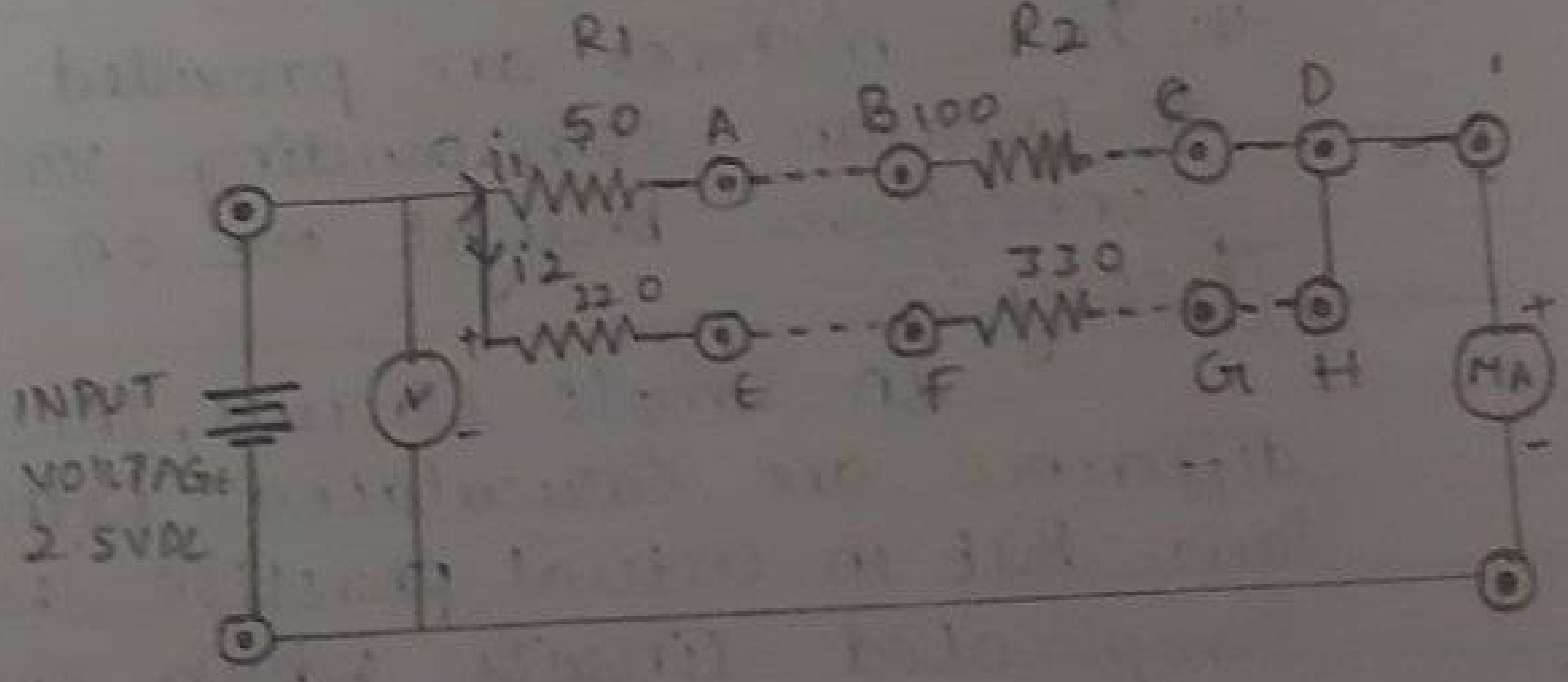
$i_1 + i_4 + i_5 = i_2 + i_3$



Second law :-



For calculation of i_1 current



Sign Convention :- The current flowing towards a junction are taken as positive while the currents flowing away from the junction are taken as negative. Let us consider a junction O. when a no. of currents meet i_1, i_2 are the currents flowing through them in the directions shown in Fig(1). Applying Kirchoff first law we get
Thus the total amount of current flowing into a junction must be equal to the total current flowing out of the junction. Clearly according to this law electric current cannot accumulate at any point. Unlike charge, current cannot be stored and must flow on.

Kirchoff Second law :-
According to second law, in a closed loop (closed circuit or mesh) the algebraic sum of the emfs is equal to the algebraic sum of the products of the resistances and the respective current flowing through them.
The distribution of currents in the circuit is shown in the diagram given below according to Kirchoff's first law.

Procedure :-
For Calculation of i_1 current.
1. Connect the circuit as shown in Fig 1(a) i.e Connect voltmeter across the positive to positive and negative to negative Current meter (mA) is connected to positive to positive and negative to negative

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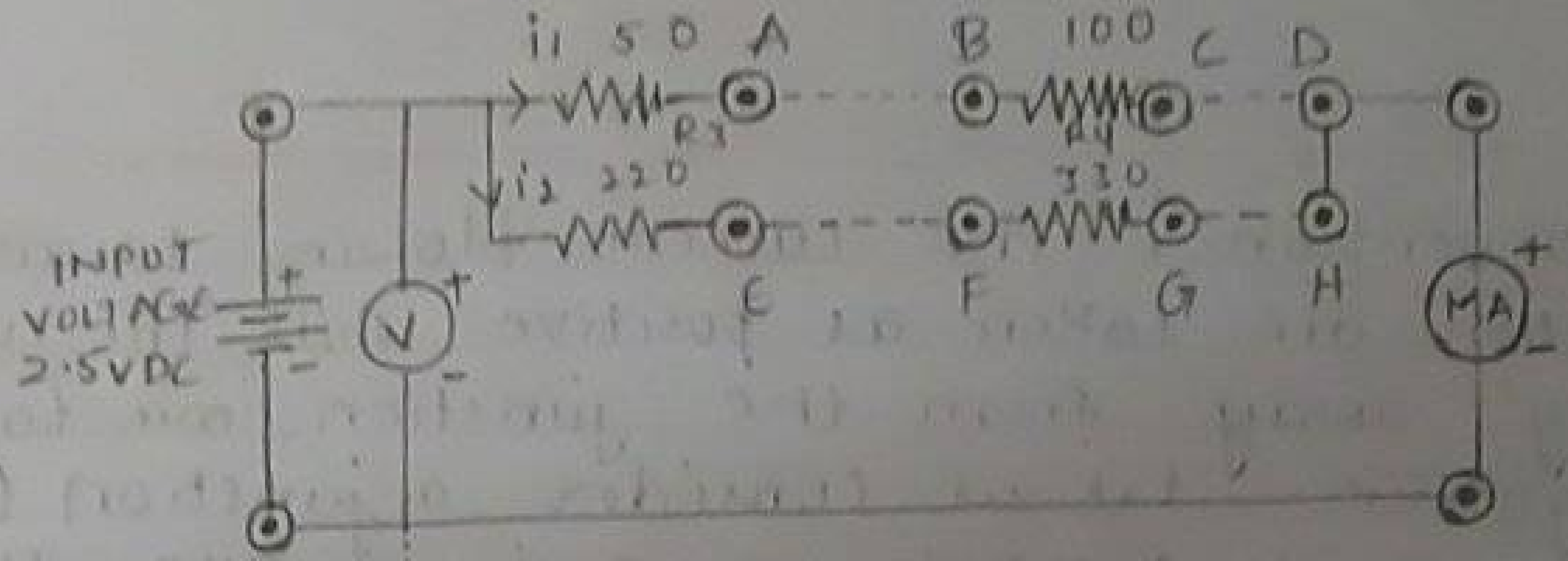
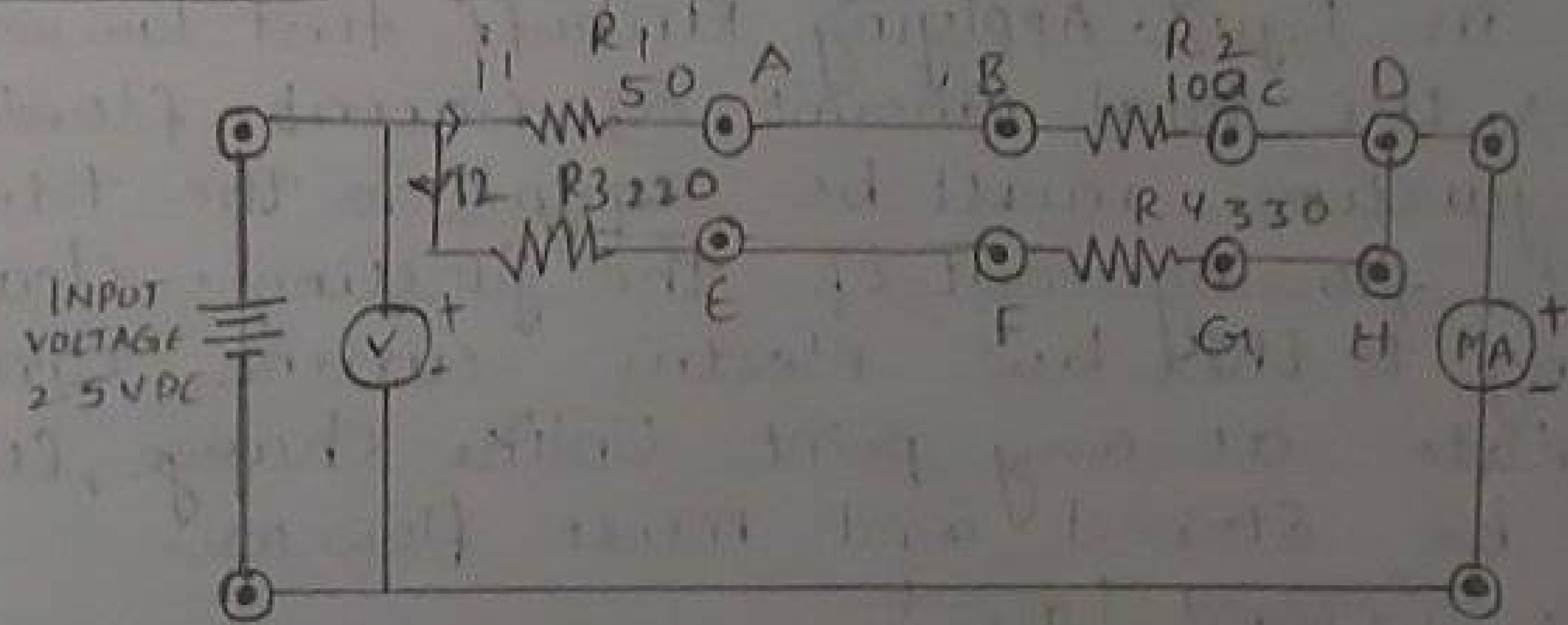
Calucuilation of i_2 current



Caluiculation of total current (i)



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2. Set output voltage 2.5 volts and connect the input through patch cord.
3. Short the A and B or C and D point through patchcord. E and F or G and H points will be open.
4. Switch on the instrument and note down the current in (ma).

Applying Kirchoff's second law tothe closed mesh ABCD, we get $R_1 i_1 + R_2 i_2$ = voltage.

$2R i_1$ = voltage

i_1 = $V/2R$ Amp

i_1 = ? Amp (convert tomilliamp) ($i_1 \times 1000 = mA$)

Compare this caluculated value to observed value at current meter.

Caluculation of i_2 current.

1. Connect the circuit as shown in fig 1b i.e connect voltmeter across positive to positive and negative to negative current (mA) is connected to positive to positive and negative to negative.
2. Set output voltage 2.5 volts and connect the input through patch cord.
3. Short the E and F or G and H point through patch cord. A and B or C and D point willbeopen
4. Switch ON the instrument and notedown the current in (mA). According Kirchoff's second law to closed mesh EFGH we get.

$R_3 i_2 + R_4 i_2$ = voltage

$2R i_2$ = voltage

For curren I_1.

S.No	Applied voltage (v)	V1 50 Ω	V2 100 Ω	I_1 exp (mA)	$I_{1th} = \frac{V}{R_1+R_2} = \frac{V}{RS_1}$ (mA)	% of differce $= \frac{\lvert I_{exp}-I_{th}\rvert}{\frac{(I_{exp}+I_{th})}{2}} \times 100$
	3	1	2	20	20	0
	4	1.3	2.6	26	26.6	2.28%
	5	1.6	3.3	34	3.33	2.08%

For curren I_2.

S.No	Applied voltage(v)	V3 220 Ω	V4 330 Ω	I_2exp	$I_{2th} = \frac{V}{R_3+R_4}$ (mA) $= \frac{V}{RS_2}$	% of differce $= \frac{\lvert I_{exp}-I_{th}\rvert}{\frac{(I_{exp}+I_{th})}{2}} \times 100$
	3	1.2	1.8	5	5.45	7.69%
	4	1.5	2.3	7	7.23	3.23%
	5	2	2.9	9	9.09	0.99%

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Date :

Name of the Experiment :

$i_2 = V/2R$ Amp

i_2 = ? Amp (Convert to milliamp)($i_1 \times 1000$ = mA).

Caluculation of total current i :

Connect the circuit as shown in fig 1(c) i.e connect voltmeter point A and B or C and D or E and F or G and H. Also connect current meter (mA) and voltmetere positive to positive and negative to negative

Total current = $i_1 + i_2$

Convert the milliampere ($i \times 1000$ = mA).

Formula:

$$I_{th} = I_1 + I_2$$

$$I_1 = \frac{V}{R_1+R_2} = \frac{V}{R_{S1}} \quad \left[\because \Sigma \varepsilon = 0 \quad V - IR_1 - IR_2 = 0 \quad V = \frac{I}{R_1+R_2} \right]$$

$$I_2 = \frac{V}{R_3+R_4} = \frac{V}{R_{S2}} = \frac{V(R_{S1} \times R_{S2})}{R_{S1}+R_{S2}}$$

Result: % of difference in I exp and I the is about 10 %. hence Kirchoff laws are verified.

For total current $I = I_1 + I_2$.

S.NO	Applied voltage(V)	I_{exp}	$I_{the} = \frac{V(R_{S1}+R_{S2})}{R_{S1} \times R_{S2}}$	% of difference $= \frac{\lvert I_{exp} - I_{the} \rvert}{\left(\frac{I_{exp}+I_{the}}{2}\right)} \times 100$
	2.5	20	$= \frac{2.5 \times (150+550)}{150 \times 550} = 21.2$	$= \frac{\lvert 21.2 - 20 \rvert}{\left(\frac{21.2+20}{2}\right)} \times 100 = 5.8\%$
	3	25	$= \frac{3(150+550)}{150 \times 550} = 25.4$	$= \frac{\lvert 25.4 - 25 \rvert}{\left(\frac{25.4+25}{2}\right)} \times 100 = 1.58\%$
	3.5	29	$= \frac{3.5(150 \times 550)}{150 \times 550} = 29.6$	$= \frac{\lvert 29.6 - 29 \rvert}{\left(\frac{29.5+29}{2}\right)} \times 100 = 2.04\%$

Date :

Name of the Experiment : P-N Junction Diode Characteristics. 17

Aim :- To find out the V-I characteristics of P-N diodes in Forward and Reverse bias configurations.

Appratus :-

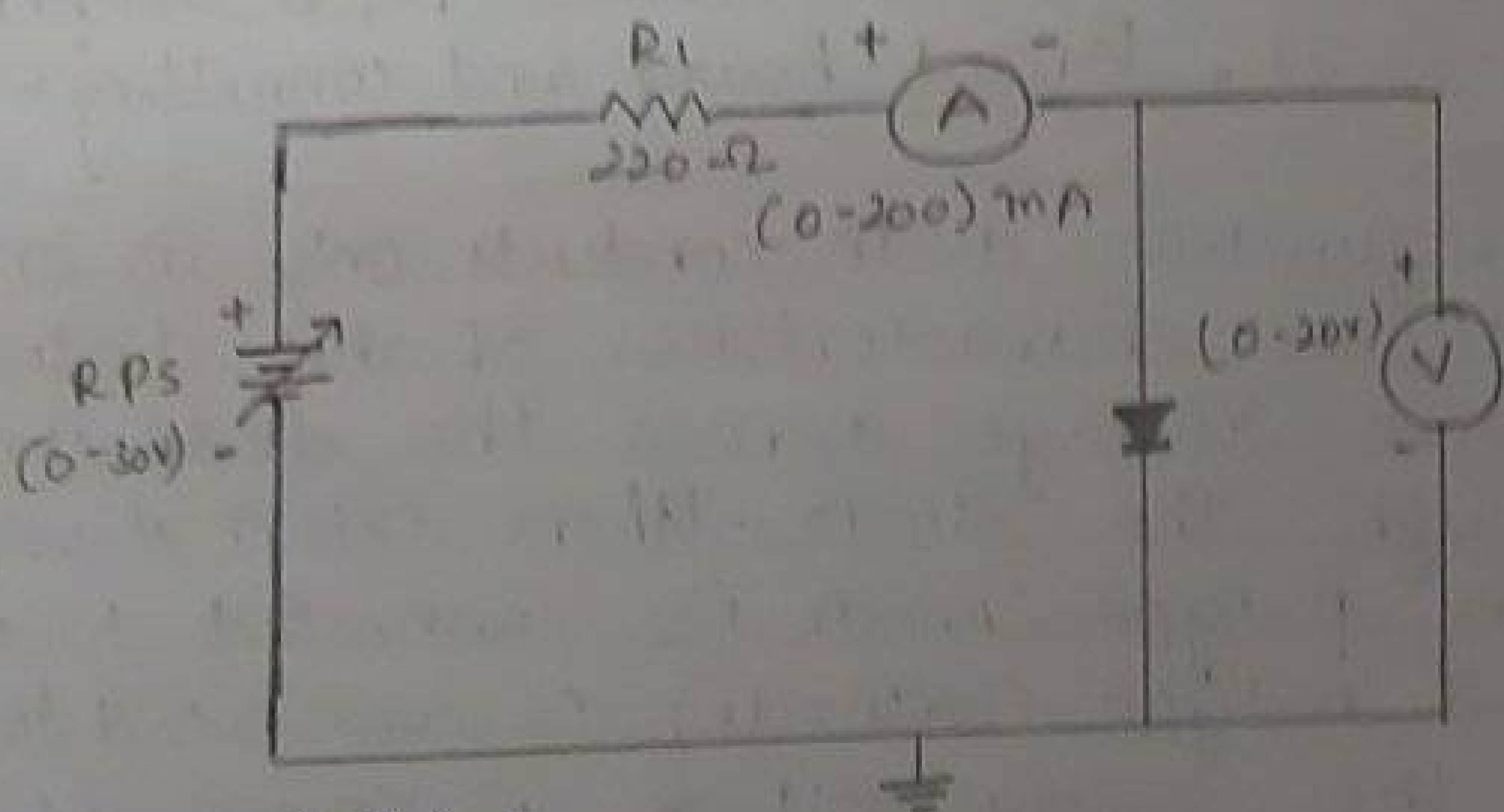
P-N Diodes, Regulated Power Supply (0-30V), Resistor 1KΩ, Ammeter (0-200mA, 0-200μA), Voltmeter (0-20V), Bread board and connecting wires

Theory :-

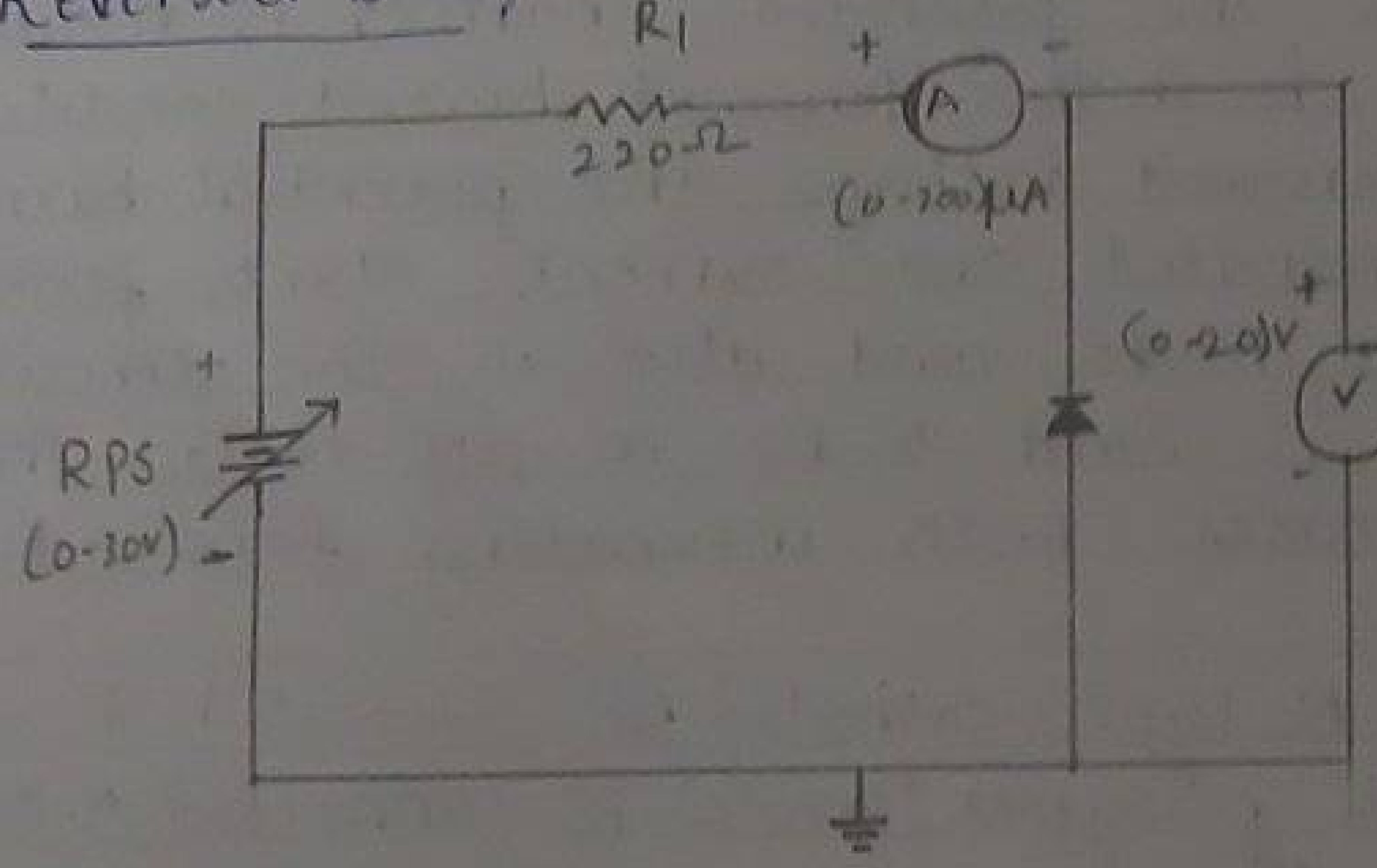
A p-n junction diode conducts only in one direction. The V-I characteristics of the diode are curve between voltage across the diode and current through the diode. When external voltage is zero. When p-type (Anode is connected to +ve terminal and n-type (cathode) is connected to -ve terminal of the supply voltage is known as forward bias. The potential barrier is reduced when diode is in the forward biased condition. At some forward voltage the potential barrier together eliminated and current starts flowing through the diode and also in the circuit. The diode is said to be in ON state. The current increases with increasing forward voltage.

When N-type (cathode) is connected to +ve terminal and p-types (Anode) is connected to the -ve terminal of the supply voltage is known as reverse bias. becomes very high and a very small current (reverse saturation current) flows

Forward Bias :



Reversed Bias :

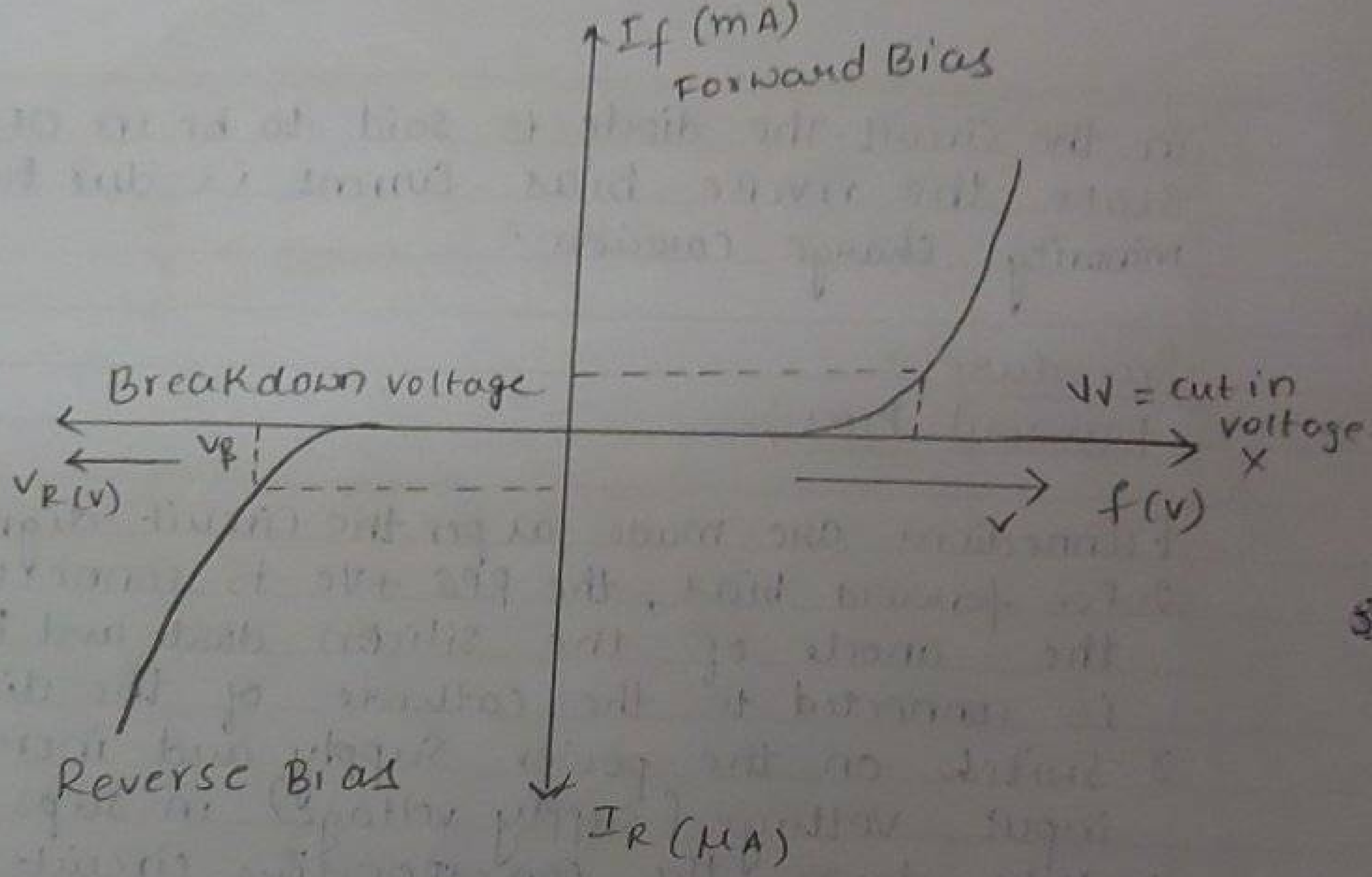


in the Circuit. The diode is said to be in OFF State the reverse bias Current is due to minority Charge carriers.

Procedure:-

Forward Bias:-

1. Connections are made as per the Circuit digram
2. For forward bias, the RPS +ve is connected to the anode of the silicon diode and RPS -ve is connected to the cathode of the diode.
3. Switch on the power supply and increase the input voltage (supply voltage) in steps.
4. Note down the corresponding circuit flowing through the diode and voltage across the diode for each step of the input voltage.
5. The readings of voltage and current are tabulated and a graph is plotted b/w current and voltage.
6. Repeat the above procedure for Germanium diode and also tabulate the results.



5

S.No	Applied Voltage(V)	Voltage across diode (V)	Diode current (mA)
1.	0.1		
	0.2		
	0.3		
	0.4		
	0.5		
	0.6		

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Date :

Name of the Experiment :

Procedure :- Reverse Bias

1. connections are made as per the circuit diagram
2. For reverse bias, the RPS +ve is connected to the cathode of the silicon diode and RPS -ve is connected to the anode of the diode
3. Switch on the power supply and increase the input voltage (supply change) in steps.
4. Note down the corresponding current flowing through the diode voltage across the diode for each and every steps of input voltage.
5. The reading of voltage and current are tabulated and graph is plotted b/w voltage and current.
6. Repeat the above procedure for the given Germanium diode and also tabulate the results obtained

Precautions

1. All the connections should be correct.
2. Parallax error should be avoided while taking the readings from the Analog meters.

i. current

S.No	Applied voltage (V)	Voltage across Diode (V)	Diode current (μA).

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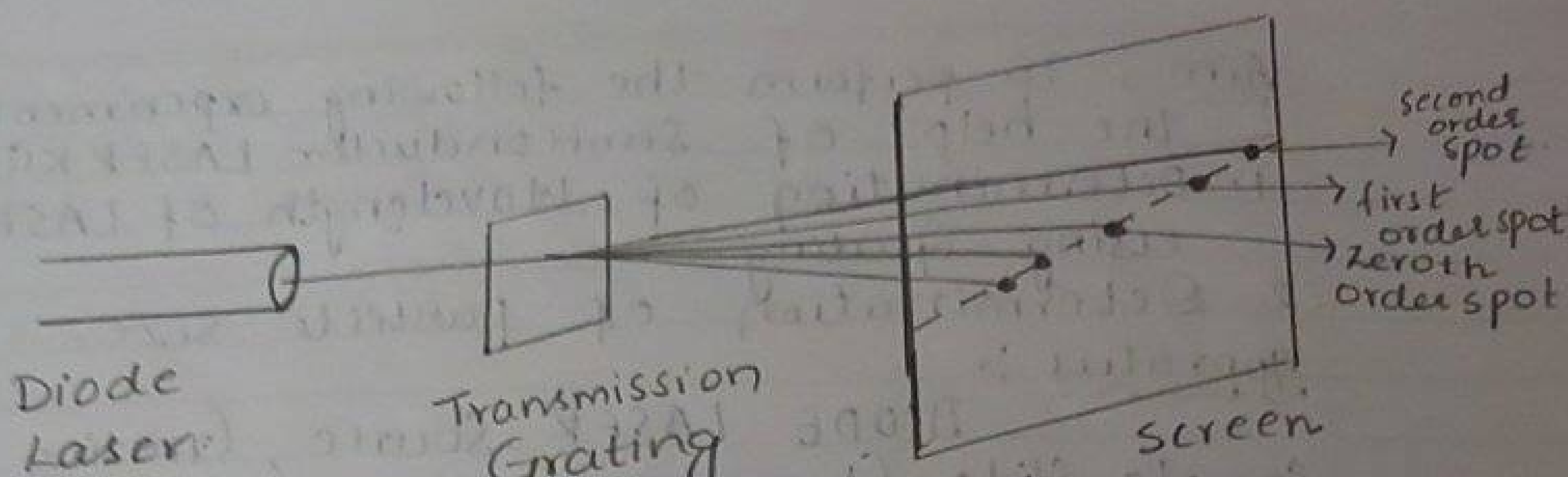
Aim :- To perform the following experiments with the help of Semiconductor LASER KIT (MKLD 05)
1. Determination of Wavelength of LASER Source using Grating.
2. Determination of particle size.

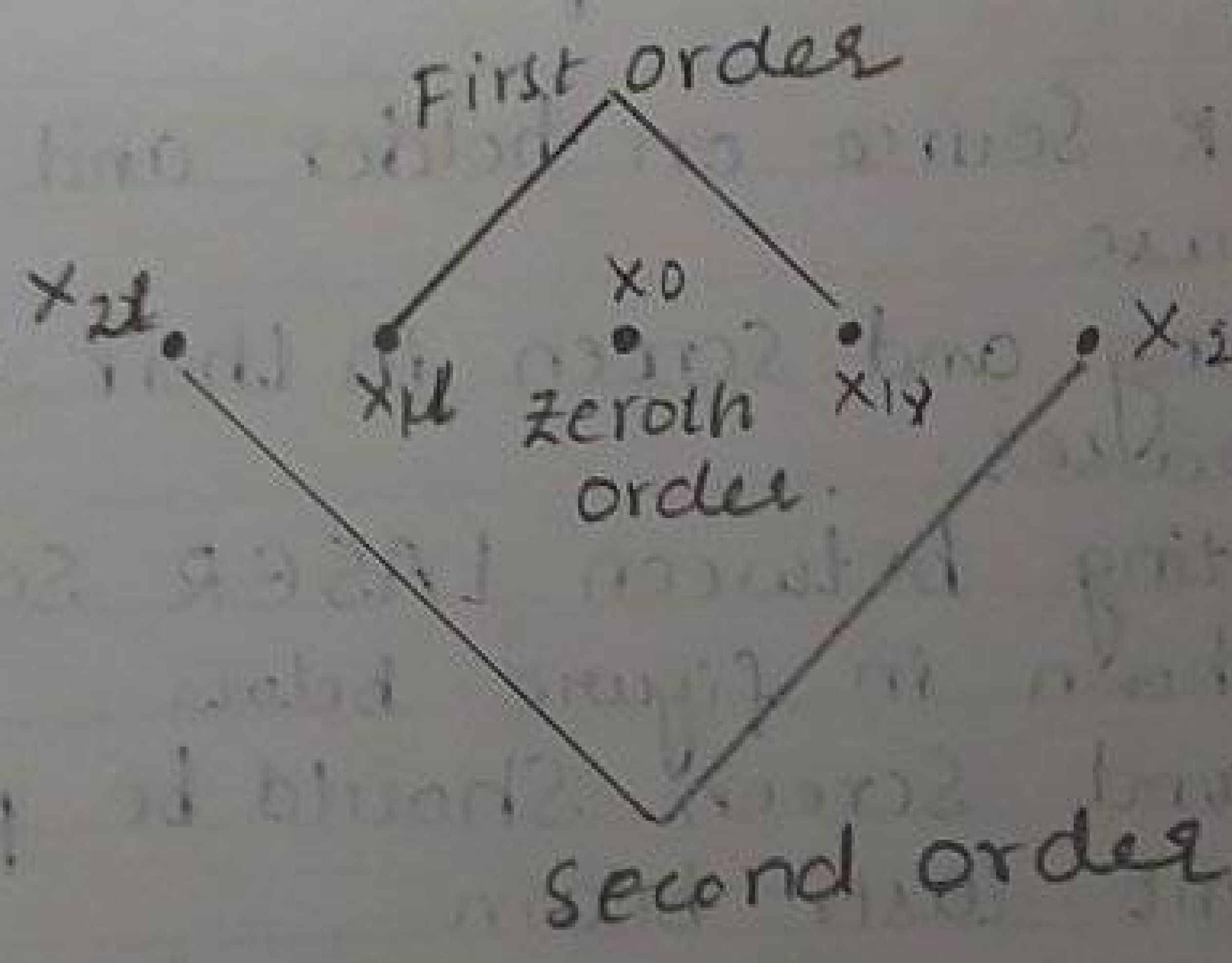
Appratus :-
DIODE LASER Source, Grating (15K LPI) Sample Slide (Lycopodium powder) for particle size determination, Holder Scale, Screen and base

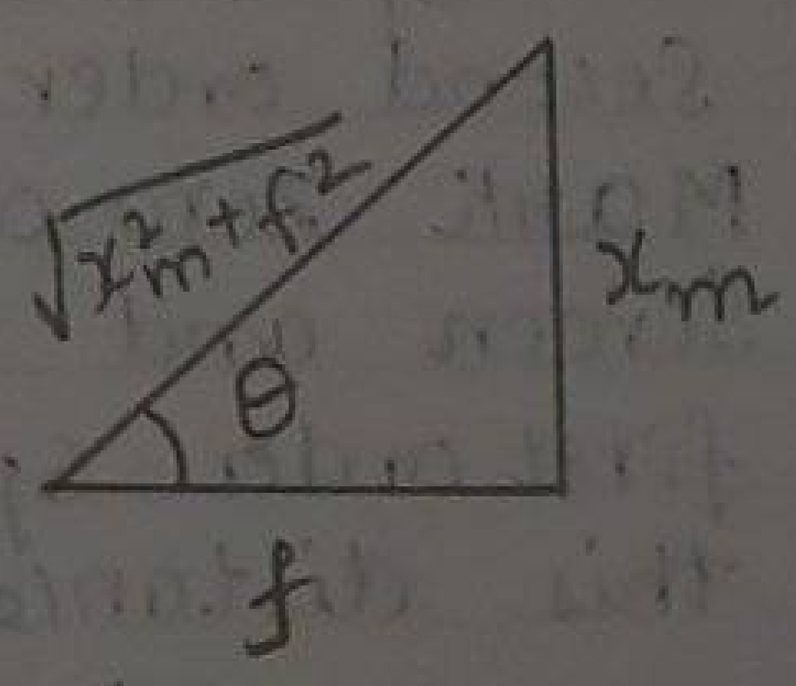
Experiment No. 01
To determine the wavelength of LASER.

1) place the LASER Source on holder and mount on the heavy base
2) Hold the grating and screen in their respective holders and bases.
3) place the grating between LASER Source and Screen as shown in figure below.
Note :- Grating and Screen Should be perpendicular to the incident laser beam
The LASER beam after passing through the grating will split into zero order, first order and Second order beam as shown in fig above.
4) Mark zero order and first order spots on Screen and measures the distance between first order spot & zeroth order spot & half of this distance i.e $x_m = \left| \frac{(x_{ml} - x_{mr})}{2} \right|$



Setup for determination of wavelength of laser source using grating





$$\sin\theta = \frac{x_m}{\sqrt{x_m^2+f^2}}$$

7) put sin θ_m in formula as below

$$m\lambda = d\sin\theta_m$$

$$\lambda = \frac{d x_m}{m\sqrt{x^2_m + f^2}}$$

Where

m = order of spots

λ = wavelength of LASER beam (nm)

d = Resolution of grafting (= 1/ grating of element)

x_m = Distance between zero order spot & First order spot (mm)

f^2 = Distance b/w screening & grating element (mm)

NOTE :-

Similarly if wavelength of source is known using relation (1), grating element can be calulculated.

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Caluculation;. Grating = 100 ; $f = 25\,cm = 25\times10^{-2}\,cm$

$$\lambda_m = \frac{d x_m}{m\sqrt{x_m^2 + f^2}}$$

$m=1$ ⇒ $$\lambda = \frac{10\times10^{-6} \times 1.7\times10^{-2}}{1\times\sqrt{(1.7\times10^{-2})^2 + (25\times10^{-2})^2}}$$

$= 0.678\times10^{-6}\,m = 678\times10^{-9}\,m$

$\lambda = 678\,nm$

$m=2$ $$\lambda = \frac{10\times10^{-6} \times 3.5\times10^{-2}}{2\times\sqrt{(3.5\times10^{-2})^2 + (25\times10^{-2})^2}}$$

$= 0.693\times10^{-6}\,m$

$= 693\times10^{-9}\,m$

$\lambda = 693\,nm$

Grating ; 300

$f = 19.5\,cm = 19.5\times10^{-2}\,cm$; $\lambda = \frac{d x m}{m\sqrt{x_m^2 + f^2}}$

$d = \frac{1}{300}\,mm = \frac{1}{300}\times10^{-3}\,m = 3.33\times10^{-6}\,m$

for $m=1$. $$\lambda = \frac{3.33\times10^{-6} \times 4\times10^{-2}}{1\times\sqrt{(4\times10^{-2})^2 + (19.5\times10^{-2})^2}}$$

$= 0.6698\times10^{-6}$

$= 670\times10^{-9}\,m$

$= 670\,nm$

for $m=2$;

$$\lambda = \frac{3.33\times10^{-6} \times 8.5\times10^{-2}}{2\times\sqrt{(8.5\times10^{-2})^2 + (19.5\times10^{-2})^2}}$$

$= 0.666\times10^{-6}$

$= 666\times10^{-9}$

$= 666\,nm$

Date:

Name of the Experiment:

Experiment NO-2:-

To determine the particle size using laser Source

(1) place the LASER Source on holder and mount on heavy base.

(2) Hold the Sample slide (mounted on the holder) and base) b/w LASER Source and Screen as Shown in figure below so as to obtain the good pattern on the Screen.

(3) calculate the particle size using the pattern obtained on the Screen using formula $D = \frac{1.22\lambda f}{\rho}$

Where

ρ = Diameter of the first circle.

Observations:-

Determination of wave length of LASER Source

S.NO	GRATING	ORDER	DISTANCE (f) cm	x_L (cm)	x_R (cm)	x_m (cm)	WAVE LENGTH
1.	100	1	25 cm	1.7	1.7	1.7	678 nm
		2	25 cm	3.5	3.5	3.5	693 nm
2.	300	1	19.5 cm	4	4	4	670 nm
		2	19.5 cm	8.5	8.5	8.5	666 nm
3.	600	1	17.5 cm	8	8	8	692 nm

Grating: 600

$f = 17.5 = 17.5 \times 10^{-2}\,m.$

$d = \frac{1}{600}\,mm = \frac{1}{600} \times 10^{-3}\,m$

$= 1.66 \times 10^{-6}\,m.$

$\lambda = \frac{d x_m}{m\sqrt{x_m^2 + f^2}}$

for m=1 : $\frac{1.66 \times 10^{-6} \times 8 \times 10^{-2}}{1 \cdot \sqrt{(8 \times 10^{-2})^2 + (17.5 \times 10^{-2})^2}}$

$= 0.692 \times 10^{-6}$

$= 692 \times 10^{-9}$

$= 692\,nm$