School Code: 10908

CBSE Affiliation No. : 1730578

BHAGAT PUBLIC SR. SEC. SCHOOL

ALANIYA, KOTA

PHYSICS PRACTICAL

MAJOR EXPERIMENT

2020-21

CLASS - XII

ADDRESS

CAMPUS : N.H. 12, JHALAWAR ROAD, ALANIYA, KOTA-325003, PH :0744-2832113, 9649991123

Email : bpssschool@gmail.com

Instruction for Major Experiment & Activities :

1. Diagram in front of theory (on blank paper).
2. Calculation in front of observation table. (on blank paper)
3. Use pencil for diagram and graph paper.
4. Draw the diagram from your file printed material.
5. Paste your original performed practical paper for Prism Practical.
6. Aim, Apparatus, Theory, Observation and Table, Result, precaution.
7. Diagram and Calculation on blank side paper.
8. Graph on graph paper attached in front of Observation Table.
9. Write activities on Classmate file (90 pages).
10. Draw the Diagram from your material for Activities.

FORMAT PROJECT

1. Title Page
2. Certificate
3. Acknowledgement
4. Index / Content
5. Introduction
6. Details
7. Bibiliography

The following are project given under option one of them

1. BIPOLAR JUNCTION TRANSISTOR
2. NOTE GATE
3. ATOM MASSES AND COMPOSITIION OF NUCLEAR
4. TRANSFORMERS
5. NUCLEAR ENERGY
6. LOGIC GATE
7. RECTIFIRE
8. OPTICS

You can make any project work which are related to the topic of XII NCERT Syllabus.

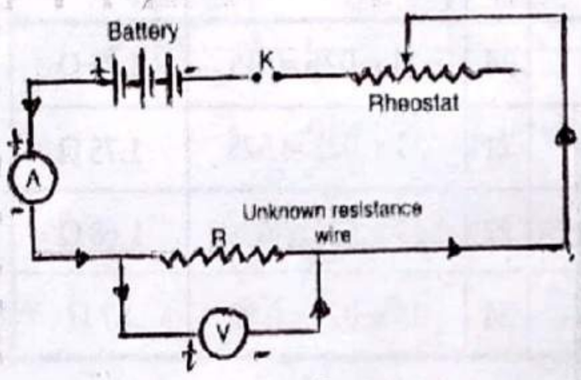
Aim :

To determine resistance per cm. of a given wire by plotting a graph of potential difference versus current.

Apparatus

Resistance wire, ammeter, voltmeter, key battery rheostat connecting wires.

Circuit Diagram :



Circuit diagram.

B	=	Battery
Rh	=	Rheostate
V	=	Voltmeter
A	=	Ammeter
K	=	Key
R	=	Resistance of given wire

Principle

According to ohm's law "Potential difference across its ends of the wire is directly proportional to flowing current when its temperature and physical states constant.

$V \alpha I$

$V = RI$ or $R = \frac{V}{I}$

R = Resistance of wire (conductor). (Ω)

V = Voltmeter reading (potential difference) (Volt)

I = Ammeter Reading (flowing current). (amp)

If Its length of resistance wire L cm.

$\therefore$ Resistance Per cm. $= \frac{R}{L}$ Ω/cm

Observation :

(i) Least count of ammeter $= \frac{\text{Range}}{\text{No. of Div.}} = \frac{1.5}{60} = 0.025$ amp.

(ii) Least count of voltmeter $= \frac{\text{Range}}{\text{No. of Div.}} = \frac{1.5}{60} = 0.025$ volt

(iii) Length of resistance wire L $= 27$ cm

Observation table :

S.No.	Ammeter Reading I (AMP)		Volt Meter Reading V (Volt)		Resistance R = V/I (Ω)	Mean R (Ω)
	n	n x I.C.	n	n x I.C.		
1	4	4 x .025 = 0.1	7	7 x .025 = 0.175	1.75 Ω	1.72 Ω
2	8	8 x .025 = 0.2	14	14 x .025 = 0.35	1.75 Ω	
3	12	12 x .025 = 0.3	21	21 x .025 = 0.525	1.75 Ω	
4	16	16 x .025 = 0.4	27	27 x .025 = .675	1.68 Ω	
5	20	20 x .025 = 0.5	34	34 x .025 = 0.85	1.7 Ω	

Calculation :

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

Ob. 1 : $V = 0.175$ volt $\quad I = 0.1$ amp.

$R = \frac{V}{I} = \frac{0.175}{0.1} = 1.75\,\Omega$

Ob. 2 : $V = 0.35$ volt $\quad I = 0.2$ amp.

$R = \frac{V}{I} = \frac{0.35}{0.2} = 1.75\,\Omega$

Ob. 3 : $V = 0.525$ volt $\quad I = 0.3$ amp.

$R = \frac{V}{I} = \frac{0.525}{0.3} = 1.75\,\Omega$

Ob. 4 : $V = 0.675$ volt $\quad I = 0.4$ amp.

$R = \frac{V}{I} = \frac{0.675}{0.4} = 1.68\,\Omega$

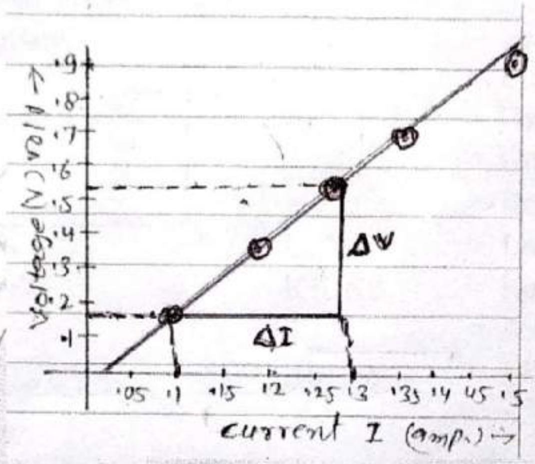
Ob. 5 : $V = 0.85$ volt $\quad I = 0.5$ amp.

$R = \frac{V}{I} = \frac{0.85}{0.5} = 1.7\,\Omega$

$$\text{Mean } R = \frac{1.75+1.75+1.75+1.68+1.7}{5} = \frac{8.63}{5} = 1.72\ \Omega$$

$$\text{Resistance Per cm } \frac{R}{L} = \frac{1.72}{27} = 0.063\ \Omega/cm$$

From Graph :



$$\text{Resistance } R = \frac{\Delta V}{\Delta I} = \frac{0.525-0.175}{0.3-0.1}$$

$$= \frac{0.35}{0.2} = 1.75\ \Omega$$

$$\text{Resistance Per cm } \frac{R}{L} = \frac{0.175}{27} = 0.064\ \Omega/cm$$

Result : Resistance of wire from graph = 1.75 Ω

Resistance per unit length $\frac{R}{L}$ = 0.064 ohm cm^{-1}

Precaution :

1. Voltmeter and ammeter should be proper range.
2. The connection should be proper and tight.
3. The ammeter should always be connected in series in the circuit will the voltmeter should be connected in parallel with the resistance wire.

EXPERIMENT - 2

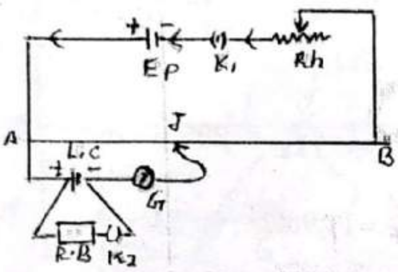
Aim :

To determine the internal resistance of Primary cell using potentiometer (5 Observations).

Apparatus

Potentiometer, Rehostate, Battery, Laclanche Cell, Keys, galvanometer, Jockey, Resistance box, connecting wire etc.

Circuit Diagram:



B	=	Battery (Secondary Cell)
AB	=	Potentiometer wire
G	=	Galvanometer
R.B.	=	Resistance Box
L.C.	=	Laclanche Cell
K1, K2	=	Keys
J	=	Jockey
Rh	=	Rheostate

Principle

Internal resistance of Primary cell (L.C. Cell)

$$r = \frac{\ell_1 - \ell_2}{\ell_2} \times R\Omega$$

r = Internal resistance of Primary Cell. (Ω)

ℓ_1 = Balancing length when cell in open ckt (cm)

ℓ_2 = Balancing length when cell in closed ckt (cm)

R = Resistance used in the Resistance Box. (Ω)

Observation Table :

S.No.	Balancing length of Wire when cell in Open CKT ℓ_1 (cm)	Balancing length of Wire when cell in Closed CKT ℓ_2 (cm)	Resistance take out Resistance Box R (Ω)	Internal Resistance $r = \frac{\ell_1 \times \ell_2}{\ell_2} \times R(\Omega)$
1	94 0 cm	92.5	1 Ω	9.16 Ω
2	94 0 cm	132.5	2 Ω	12.18 Ω
3	94 0 cm	188.0	3 Ω	12.0 Ω
4	94 0 cm	235.5	4 Ω	11.96 Ω
5	94 0 cm	272.0	5 Ω	12.27 Ω

Calculation :

Internal Resistance of primary cell $r = \left(\frac{\ell_1 - \ell_2}{\ell_2}\right) \times R$

Ob. 1 : R = 1Ω ℓ_1 = 940.0 cm ℓ_2 = 92.5 cm

$$r = \left(\frac{940.0-92.5}{92.5}\right)\times 1 = \frac{847.5}{92.5} = 9.16\Omega$$

Ob. 2 : R = 2Ω ℓ_1 = 940.0 cm ℓ_2 = 132.5 cm

$$r = \left(\frac{940.0-132.5}{132.5}\right)\times 2 = \frac{1615.5}{132.5} = 12.18\Omega$$

Ob. 3 : R = 3Ω ℓ_1 = 940.0 cm ℓ_2 = 188.0 cm

$$r = \left(\frac{940.0-72.5}{188.0}\right)\times 3 = \frac{75.2\times 3}{188.0} = 12\Omega$$

Ob. 4 : R = 4Ω ℓ_1 = 940.0 cm ℓ_2 = 235.5 cm

$$r = \left(\frac{940.0-235.5}{235.5}\right)\times 4 = \frac{704.5\times 4}{235.5} = 11.96\Omega$$

Ob. 5 : R = 5Ω ℓ_1 = 940.0 cm ℓ_2 = 272.0 cm

$$r = \left(\frac{940.0-272.0}{272.0}\right)\times 5 = \frac{668\times 5}{272.0} = 12.7\Omega$$

Result :

Internal resistance of given Primary Cell (L.C.) by potentiometer lie between 9.16Ω to 12.27Ω.

Precaution :

1. All connection should be neat, clean and tight.
2. R.B. connection (plug) should be tight.
3. The sliding contact of jockey should not be pressed to hard and rubbed alon the wire.
4. Secondary cell must be fully charged.
5. Cell should not disturb during experiment.

EXPERIMENT - 3

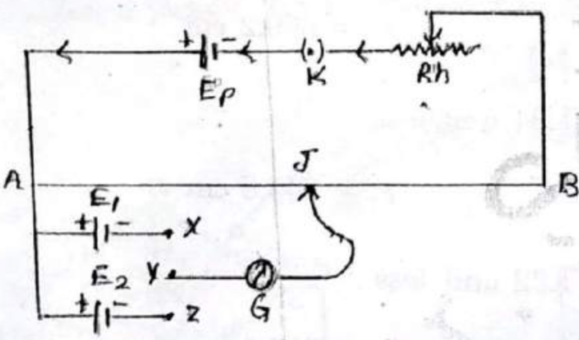
Aim :

To Campare the emf of two primary cell by using a potentiometer. (5 observations).

Apparatus

Potentiometer, Rheostat, Secondary Cell, Keys (one way, two way), two primary cell (L.C. cell, D Cell), Galvanometer, connecting wire etc.

Circuit Diagram :



X-Y-Z = Two way key
Ep = Secondary Cell (Battery)
E_1 = L.C. = Laclanche Cell
E_2 = D.C. = Denial Cell
G = Galvanometer
AB = Potentiometer
Rh = Rheostat

Principle

To compare the emf of two primary cells ratio by potentioment.

$$\frac{E_1}{E_2} = \frac{\ell_1}{\ell_2} \text{ (unit less)}$$

E_1 = emf of L.C. Cell (volt) E_2 = emf of D Cell (volt)

ℓ_1 = Balancing length L Cell ℓ_2 = Balancing length of D Cell

Observation Table :

S.No.	Balancing Length of Potentiometer Wire when E_1 (L.C.) in CKT ℓ_1 (cm)	Balancing Length of Potentiometer Wire when E_2 (D.C.) in CKT ℓ_2 (cm)	$\frac{E_1}{E_2} = \frac{\ell_1}{\ell_2}$ (unitless)	Mean $\frac{E_1}{E_2} = ...$
1	950 cm	714.2 cm	1.33	
2	920 cm	686.5 cm	1.34	
3	889.0 cm	659.2 cm	1.34	1.33
4	851.0 cm	643.8 cm	1.32	
5	830.0 cm	619.4 cm	1.34	

Calculation :

$$\frac{E_1}{E_2} = \frac{\ell_1}{\ell_2}$$

Calculation Ob. 1 : $\ell_1 = 950$ cm $\ell_2 = 714.2$ cm

$$\frac{E_1}{E_2} = \frac{950}{714.2} = 1.33 \text{ unit less}$$

Calculation Ob. 2 : $\ell_1 = 920$ cm $\ell_2 = 686.5$ cm

$$\frac{E_1}{E_2} = \frac{920}{686.5} = 1.34 \text{ unit less}$$

Calculation Ob. 3 : $\ell_1 = 889$ cm $\ell_2 = 659.2$ cm

$$\frac{E_1}{E_2} = \frac{889}{659.2} = 1.34 \text{ unit less}$$

Calculation Ob. 4 : $\ell_1 = 851$ cm $\ell_2 = 643.8$ cm

$$\frac{E_1}{E_2} = \frac{851}{643.8} = 1.32 \text{ unit less}$$

Calculation Ob. 5 : $\ell_1 = 830$ cm $\ell_2 = 619.4$ cm

$$\frac{E_1}{E_2} = \frac{830}{619.4} = 1.34 \text{ unit less}$$

Mean :

$$\frac{E_1}{E_2} = \frac{1.33+1.34+1.34+1.32+1.34}{5} = \frac{6.67}{5} = 1.33 \text{ unit less}$$

Result :

The ratio of emf two primary cell by potentiometer.

$$\frac{E_1}{E_2} = 1.33 \text{ unit less}$$

Precaution :

1. All connection should be neat, clean and tight.
2. The emf of the battery should be greater than the emf of the two primary cell.
3. The sliding contact of jockey should not be pressed to hard and rubbed alon the wire.
4. Plug in key introduced only when the observation are to taken.

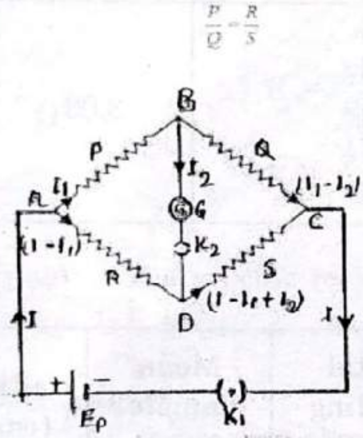
EXPERIMENT - 4

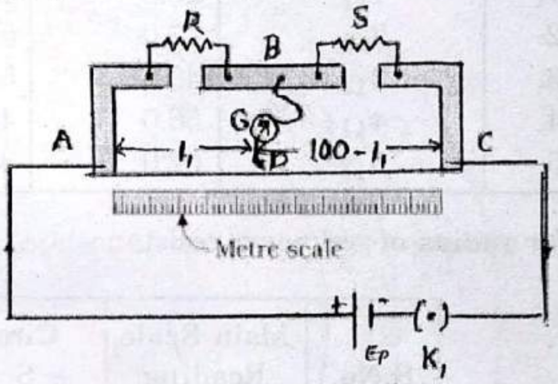
Aim :

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

Apparatus

A meter bridge, a galvanometer, a resistance box, Laclanche cell or a battery eliminator, a jockey, key resistance wire, screw guage and connecting wire.





Principle

According to the principle of wheatstone bridge four resistance are arranged so that the deflaction in glavanometer in the circuit is zero.

i.e. bridge is balanced

$$\boxed{\frac{P}{Q} = \frac{R}{S}}$$

or $S = \frac{Q}{P} \times R = \frac{\text{Resistance of wire length BC}}{\text{Resistance of wire length AB}} \times R$

$$= \frac{\ell_2 K}{\ell_1 K} \times R = \frac{100 - \ell}{\ell} \times R$$

If L is the length and r the radius of the resistance wires then specific resistance. $K = \frac{S\pi r^2}{L}$

Where K= specific resistance of the material of the wire.

Observation : Length of wire L = 40cm = 40×10^{-2} meter

Least count of screwguage = $\frac{0.1}{100}$ = 0.001 cm.

Observation Table :

For unknown resistance (S)

S.No.	Resistance from the resistance box R (ohm)	Balancing Length AB = ℓ cm	Balancing Length BC=(100−ℓ)cm	Unknown Resistrance $S=(\frac{100-\ell}{\ell})\times R$ Ω	Mean (S) Ω
1.	1Ω	26.8	73.2 cm	2.8	
2.	2Ω	40.0	60.0 cm	3.0	
3.	3Ω	48.5	51.5 cm	3.19	3.03Ω
4.	4Ω	56.0	44.0 cm	3.14	
5.	5Ω	62.0	38.0 cm	3.06	

For radius of unknown resistance -

S.No.	Main Scale Reading (cm)	Circular Scale reading (cm)	Total reading (cm)	Mean diameter (cm)	Radius (cm)
1	0.0	50 x .001 = 0.050	0.050		
2	0.0	48 x .001 = 0.048	0.048	0.050	0.025
3	0.0	52 x .001 = 0.052	0.052		

Calculation :

Unknown resistance $S = \frac{100-\ell}{\ell}\times R$

1. ℓ = 26.8 cm R = 1Ω

$$S = \frac{100-26.8}{26.8}\times1 = \frac{73.2}{26.8} = 2.8\Omega$$

2. ℓ = 40.0 cm R = 2Ω

$$S = \frac{100-40}{40}\times2 = \frac{60}{40}\times2 = 3.0\Omega$$

3. ℓ = 48.5 cm R = 3Ω

$$S = \frac{100-48.5}{48.5}\times3 = \frac{51.5}{48.5}\times3 = \frac{154.5}{48.5} = 3.19\Omega$$

4. ℓ = 56.0cm R = 4Ω

$$S = \frac{100-56.0}{56.0}\times4 = \frac{44}{56}\times4 = \frac{176}{56} = 3.14\Omega$$

5. ℓ = 62.0cm R = 5Ω

$$S = \frac{100-62}{62}\times 5 = \frac{38}{62}\times 5 = \frac{190}{62} = 3.06\,\Omega$$

$$\text{Means } S = \frac{2.8+3.0+3.19+3.14+3.06}{5} = \frac{15.19}{5} = 3.03\,\Omega$$

Specific Resistance

$$K = \frac{S\pi r^2}{L}$$

S = 3.03Ω

r = 0.025×10^{-2} meter

L = 40×10^{-2} meter

$$K = \frac{3.03\times 3.14\times(0.025\times 10^{-2})^2}{40\times 10^{-2}}$$

$$K = \frac{9.51\times .000625\times 10^{-4}}{40\times 10^{-2}} = 14.85\times 10^{-7}\,\Omega m$$

Result : The specific resistance of the material of the given wire by using meter bridge $14.85\times 10^{-7}\,\Omega\times m$

Precautions :

1. All connection should be neat and tight.
2. Plug in key should be insered only taken observation.
3. All the plugs of the resistance box should tight.

EXPERIMENT - 5

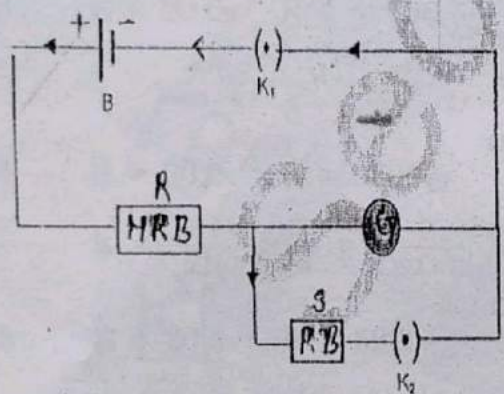
Aim :

To determine the resistance of a galvanometer (G) by half deflation method and to find figure of merit.

Apparatus

Galvanometer (G), High Resistance box (HRB), Resistance Box (R.B.), Key battery, connecting wire etc.

Circuit Diagram :



B = Battery
HRB = High Resistance Box
R.B. = Resistance Box
G = Galvanometer
K_1K_2 = Key

Principle

Resistance of Galvanometer by half deflation method.

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

R = Resistance of HRB (Ω)

S = Resistance of R.B. (Ω)

θ = n = No. of deflation in G

E = emf of cell

$$K = \frac{I}{\theta}$$

$$K = \frac{E}{R+G} \times \frac{1}{\theta} \text{ amp/div}$$

Observation :

emf of cell E = 2.0 volt

Observation Table :

S.No	When K_2 Open		When K_2 Close		Resistance in Galvanometer $G=\frac{R\times S}{R-S}\Omega$	Mean G Ω	Figure of Merit $K=\frac{E}{R+G}\times\frac{1}{\theta}$ Amp/div.
	Resistance of HRB R Ω	No. of Division Galvanometer $n=\theta$	Resistance of RB S Ω	No. of Division Galvanometer $\theta/2$			
1	4000	30	90	15	92.07		1.6×10^{-5}
2	4400	28	90	14	91.8		1.59×10^{-5}
3	4900	26	90	13	91.7	91.7	1.54×10^{-5}
4	5300	24	90	12	91.5		1.54×10^{-5}
5	5900	22	90	11	91.4		1.51×10^{-5}

Calculation : Resistance of Galvanometer $G=\frac{R\times S}{R-S}\Omega$

Ob. 1 $R = 4000\Omega$ $S = 90.0\Omega$

$$G = \frac{4000\times 90}{4000-90} = \frac{3,60,000\times 90}{3910} = 92.07\Omega$$

Ob. 2 $R = 4400\Omega$ $S = 90\Omega$

$$G = \frac{4400\times 90}{4400-90} = \frac{3,96,000\times 90}{4310} = 91.08\Omega$$

Ob. 3 $R = 4900\Omega$ $S = 90\Omega$

$$G = \frac{4900\times 90}{4900-90} = \frac{4,41,000\times 90}{4810} = 91.7\Omega$$

Ob. 4 $R = 5300\Omega$ $S = 90\Omega$

$$G = \frac{5300\times 90}{5300-90} = \frac{4,77,000\times 90}{5210} = 91.5\Omega$$

Ob. 5 $R = 5900\Omega$ $S = 90\Omega$

$$G = \frac{5900\times 90}{5900-90} = \frac{5,31,000\times 90}{5810} = 91.4\Omega$$

$$\text{Mean } G = \frac{92.07+91.8+91.7+91.5+91.4}{5} = \frac{458.47}{5} = 91.7\Omega$$

Calculation : Resistance of Galvanometer $G = \frac{R \times S}{R - S}\Omega$

1 $E = 20.0v \quad R = 4000\,\Omega \qquad G = 92\,\Omega \qquad \theta = 30$

$K = \frac{2.0}{4000+92} \times \frac{1}{30} = \frac{1}{4092 \times 15} = \frac{1}{62755.4} = 1.6 \times 10^{-5}$ amp/div

2 $E = 20.0v \quad R = 4400\,\Omega \qquad G = 92\,\Omega \qquad \theta = 28$

$K = \frac{2.0}{4400+92} \times \frac{1}{28} = \frac{1}{4492 \times 14} = \frac{1}{62888} = 1.59 \times 10^{-5}$ amp/div

3 $E = 20.0v \quad R = 4900\,\Omega \qquad G = 92\,\Omega \qquad \theta = 26$

$K = \frac{2.0}{4900+92} \times \frac{1}{26} = \frac{1}{4992 \times 13} = \frac{1}{64896} = 1.54 \times 10^{-5}$ amp/div

4 $E = 20.0v \quad R = 5300\,\Omega \qquad G = 92\,\Omega \qquad \theta = 24$

$K = \frac{2.0}{5300+92} \times \frac{1}{24} = \frac{1}{5392 \times 12} = \frac{1}{64704} = 1.54 \times 10^{-5}$ amp/div

5 $E = 20.0v \quad R = 5900\,\Omega \qquad G = 92\,\Omega \qquad \theta = 22$

$K = \frac{2.0}{5900+92} \times \frac{1}{22} = \frac{1}{5992 \times 11} = \frac{1}{65912} = 1.51 \times 10^{-5}$ amp/div

Means $K = \frac{[1.6+1.59+1.54+1.54+1.51] \times 10^{-5}}{5} = \frac{7.78}{5} \times 10^{-5} = 1.55 \times 10^{-5}$ amp/div

Result : Resistance of Galvanometer by half deflation method G = 91.7 and figure of merit $K = 1.55 \times 10^{-5}$ amp/div.

Precautions :

1. All connection should be neat and tight.
2. Plug of HRB and R.B. must be tight.
3. Pointer of galvanometer always be zero.
4. Observation take eye should be front galvanometer.

EXPERIMENT - 6

Aim :

To determine the angle of minimu deviation for a given glass prism by plotting a graph between the angle of incidence and angle of deviation.

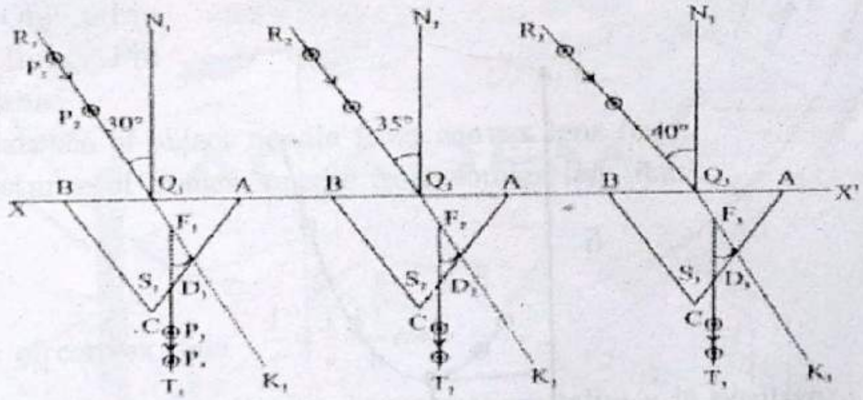
Apparatus

Glass prison, drawing board, pins, drawing pins, white paper sheet, pencil, meter scale and protractor.

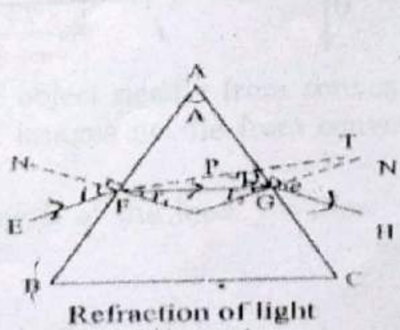
Principle

The path of à light ray through, a glass prism is as shows, due to refrection, the ray bends towards. The base of the prism, through an angle δ, called the angle of deviation for a prism, δ depends on i and varies as shown in the graph, for small values of angle of incidence i, the angle of deviation δ a large As i increases δ first decreases to δm (the angle of minium deviation) and there after it again increases. The refractive index of the material of the prism by -

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



Refraction through prism at different angles



Refraction of light through a prism.

Observation :

$$\text{Angle of prism} = \frac{60+60+60}{3} = \frac{180}{3} = 60^0$$

Observation Table :

S.No.	Angle of Incidence (i)	Angle of Deviation
1	35^0	
2	40^0	
3	45^0	
4	50^0	
5	45^0	

Result :

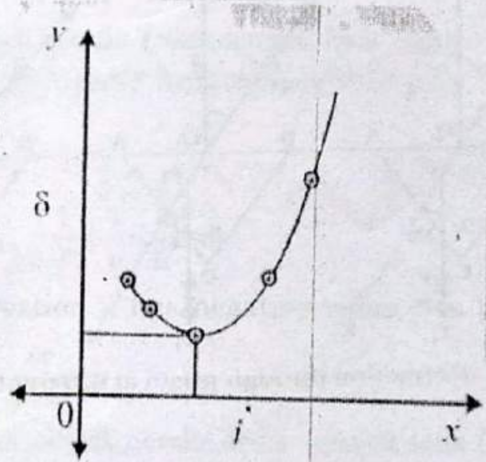
1. Angle of min. deviation δm
2. Refractive index of the material of prism $\mu = 1.50$ unit less

Precautions :

1. The angle of incidence must lie between = $30^0 - 60^0$
2. The distance between the two pins should not be less than 2cm.

Sources of Error :

1. Pins may be thick.
2. Measurement of angle may be wrong.



EXPERIMENT - 7

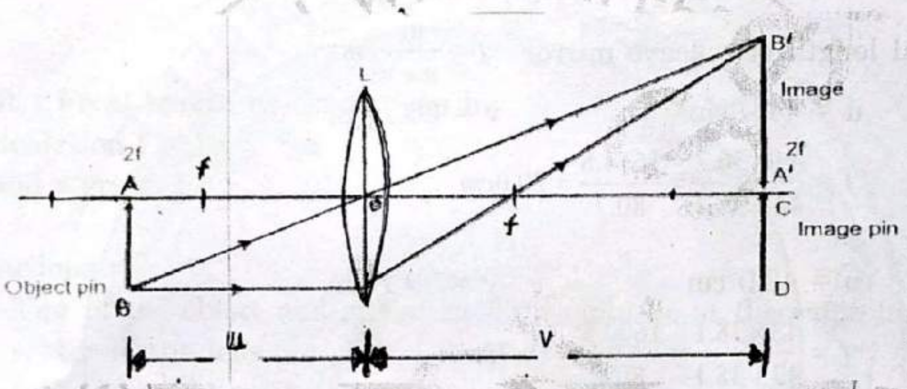
Aim :

To find the value of v for different value of u in case of a convex lens and to find its focal length by ploting graphs between 1/u and 1/v.

Apparatus :

An opitcal bench with three uprights, convex lense, lens holder, two optical pin, etc.

Ray Diagram :



AB = Object Pin

CD = Image Pin

L = Lense

u = distance of object needle from convex lens (cm).

v = distance of images needle from convex lens (cm).

Principle

Focal length of convex lens $\frac{1}{f}=\frac{1}{v}-\frac{1}{u} cm$

According sign convextion u has negative value v is positive.

Therefore $f=\frac{uv}{u+v} cm$

u = distance of object needle from convex lens (cm).

v = distance of images needle from convex lens (cm).

Observation :

Approximate focal length of the lens $f = 20 cm$

Observation Table :

S.N.	Position of object needle A (cm)	Position of lens O (cm)	Position of image needle C (cm)	Observed distance u = O-A (cm)	Observed distance v = C-O (cm)	Focal length = $\frac{uv}{u+v}$ (cm)	Mean f (cm)
1	6	50	86.7	44	36.7	20.0	19.95
2	8	50	88.1	42	38.1	19.98	
3	10	50	89.6	40	39.6	19.90	
4	12	50	92	38	42	19.95	
5	14	50	94.8	36	44.8	19.9	

Calculation :

focal length of concave mirror $f = \frac{uv}{u+v} cm$

Ob. 1 u = 44.0 cm v = 36.7 cm

$$f = \frac{44 \times 36.7}{44 + 36.7} = \frac{1614.8}{80.7} = 20.0 cm$$

Ob. 2 u = 42.0 cm v = 38.1 cm

$$f = \frac{42 \times 38.1}{42 + 38.1} = \frac{1600.2}{80.1} = 19.98 cm$$

Ob. 3 u = 40.0 cm v = 39.6 cm

$$f = \frac{40 \times 39.6}{40 + 39.6} = \frac{1584}{79.6} = 19.90 cm$$

Ob. 4 u = 38.0 cm v = 42 cm

$$f = \frac{38.0 \times 42}{38.0 + 42} = \frac{1596}{80} = 19.95 cm$$

Ob. 5 u = 36.0 cm v = 44.8 cm

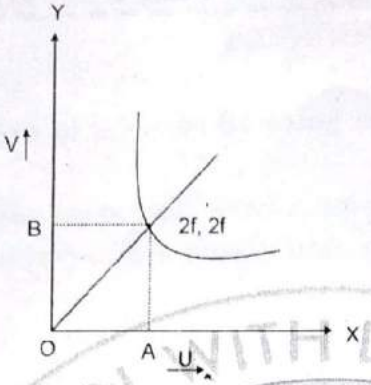
$$f = \frac{36.0 \times 44.8}{36.0 + 44.8} = \frac{1612.8}{80.8} = 19.96 cm$$

Mean $f = \frac{20.0 + 19.98 + 19.90 + 19.95 + 19.96}{5} = \frac{99.79}{5} = 19.95 cm$

After draw the graph u and v
Calculation focal length by graph.

$$f_1 = \frac{OA}{2} =$$

$$f_2 = \frac{OB}{2} =$$



Result : Focal length of convex lens by

1. Calculation f = 19.95 cm
2. u and v graph f = ...

Precautions :

1. Tips of the object and image needle should lie at the same hight as the center of the lens.
2. Lense must be neat and clean.
3. Parallex should be removed from lip to lip.
4. The object needle should be pleased at such a distance that only real, inverted image.

EXPERIMENT - 8

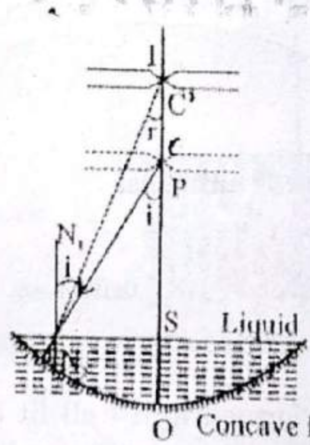
Aim :

To find refractive of a liquid by using concave mirror.

Apparatus :

A concave mirror an optical needle, an iron stand with clamp a meter scale, the given liquid (water) and a plumb line, rod.

Diagram :



Refractive index of liquid

Principle : When an object is placed at the center of curvature of a concave mirror, its real image is also formed at the some point.

The radius of curvature of a concave mirror changes on putting a liquid in the mirror the refractive index of the liquid is given by -

$$\mu = \frac{\text{real radius curvature}}{\text{apparent radius of curvature}} = \frac{OC}{OC'}$$

Observation Table :

S.N.	Real Radius of Curvature OC (cm)	Apparent Radius of Curvature OC' (cm)	Refractive index u = OC / OC' (unit less)
1	27.2 cm	20.6 cm	1.32
2	24.2 cm	18.3 cm	1.33
3	22.4 cm	17.2 cm	1.30

Calculation : Refractive index of water

$$\mu = \frac{OC}{OC'} \quad \text{unit less}$$

$$\mu = \frac{OC}{OC'} = \frac{27.2}{20.6} = 1.32 \text{ unit less}$$

$$\mu = \frac{OC}{OC'} = \frac{24.2}{18.3} = 1.33 \text{ unit less}$$

$$\mu = \frac{OC}{OC'} = \frac{22.4}{17.2} = 1.30 \text{ unit less}$$

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

$$\frac{1.32+1.33+1.30}{3} = 1.31 \text{ unit less}$$

Result : Refractive index of water = 1.31 unit less

Precautions :

1. The experiment must be performed in a well lit form.
2. The tip of the needle and pole of the mirror should be on the same vertical line.

EXPERIMENT - 9

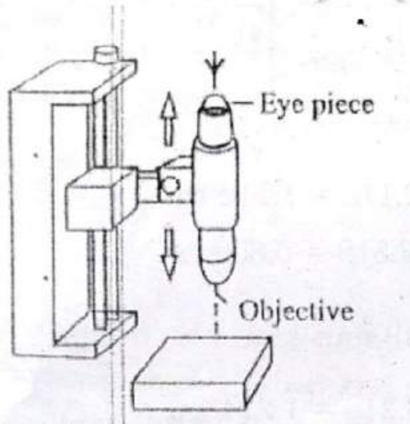
Aim :

To determine the refractive index of a glass using a travelling microscope.

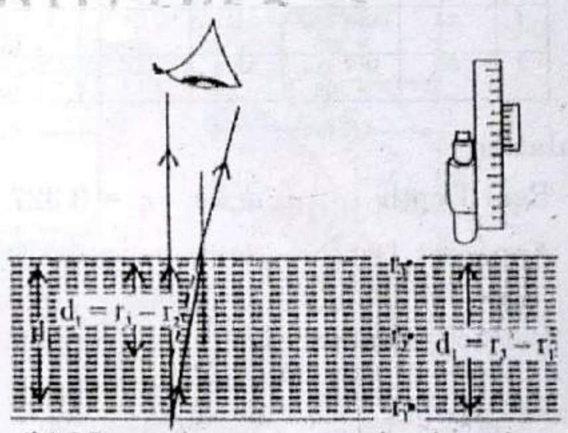
Apparatus :

A marker, glass slab, travelling microscope, lycopodium powder.

Diagram :



14(a) Travelling microscope



(b) Measuring apparent depth and real depth.

Principle : Refractive Index $\mu = \frac{\text{real depth}}{\text{apparent depth}}$

For accurate measurements of depths, a travelling microscope is used.

If reading of real depth at the bottom of the slab is r_1, if reading at cross due to refraction is r_2 and at the top of slab if reading is r_3, then

Real Depth = r_3-r_1 and

Apparent Depth = r_3-r_2

Therefore, refractive index of glass (material of slab)

$$\mu = \frac{r_3 - r_1}{r_3 - r_2}$$

Observation : Least count of travelling microscope = 0.001 cm

Observation Table :

No. of Ob.	Reading of Microscope Focused on								
	Cross mark without slab			Cross mark without slab placed on it			Powder sprinkled on top of slab		
	M.S.R. (M) cm	V. Div. Coinciding n x l.C. (cm)	Reading M+n r1 (cm)	M.S.R. (M) cm	V. Div. Coinciding n x l.C. (cm)	Reading M+n r2 (cm)	M.S.R. (M) cm	V. Div. Coinciding n x l.C. (cm)	Reading M+n r3 (cm)
1	2	3	4	5	6	7	8	9	10
1	2.1	15 x .001 = .015	2.115	2.5	18 x .001 = .018	2.518	3.3	27 x .001 = .027	3.327
2	3.2	18 x .001 = .018	3.218	3.6	27 x .001 = .027	3.627	4.4	32 x .001 = .032	4.432

Calculation :

(i) Real Depth $dr = r_3 - r_1$ = 3.327 - 2.115 = 1.212 cm

Apparent Depth $da = r_3 - r_2$ = 3.327 - 2.518 = 0.809 cm

Refractive index $\mu = \frac{dr}{da} = \frac{1.212}{0.809}$ = 1.49 unit less

(ii) Real Depth $dr = r_3 - r_1$ = 4.432 - 3.218 = 1.214 cm

Apparent Depth $da = r_3 - r_2$ = 4.432 - 3.624 = 0.805 cm

Refractive index $\mu = \frac{dr}{da} = \frac{1.214}{0.805}$ = 1.50 unit less

Mean $\mu = \frac{1.49 + 1.50}{2}$ = 1.495 unit less

Result : Refractive index of the material of the slab $\mu = 1.495$ unit less

Precautions :

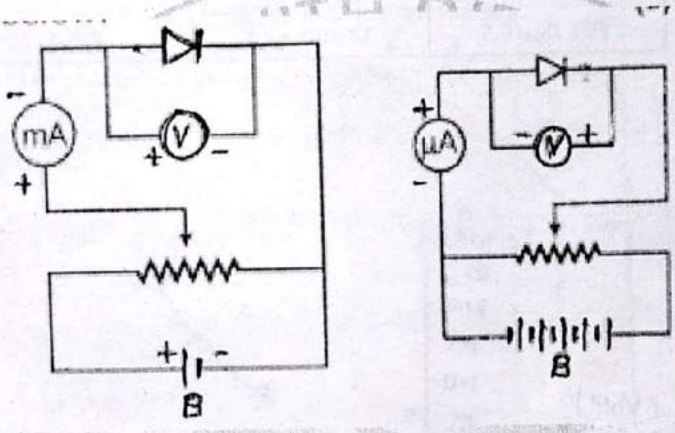
1. The microscope should be carefully focussed.
2. The rock and pinion arrangement should not be distrubed during the experiment.
3. The experiment must be performed in a well lit room.

EXPERIMENT - 10

Aim :
To draw the I-V characteristics curves of a p-n junction in forward bias and reverse bias.

Apparatus
p-n junction diode, battery, millaimmeter, micro ammeter, voltmeter, rheostate, switch and connecting wire.

Circuit Diagram :



Principle

Forward bias : When the positive terminal of battery connected to p-side and negative terminal is coneected to n-side of the p-n junction diode then this arrangement is called forward bias.

Reverse bias : When the positive terminal of battery is connected to the n-side and negative terminal is common to p-side of the p-n junction diode then this arrangement is called reverse bias.

Observation :

Forward bias

$$\text{Least count of voltmeter} = \frac{\text{Range}}{\text{No. of Div.}} = \frac{1}{50} = 0.02 \text{ volt}$$

$$\text{Least count of milliammeter} = \frac{\text{Range}}{\text{No. of Div.}} = \frac{10}{50} = 0.2 \text{ mA}$$

Reverse bias

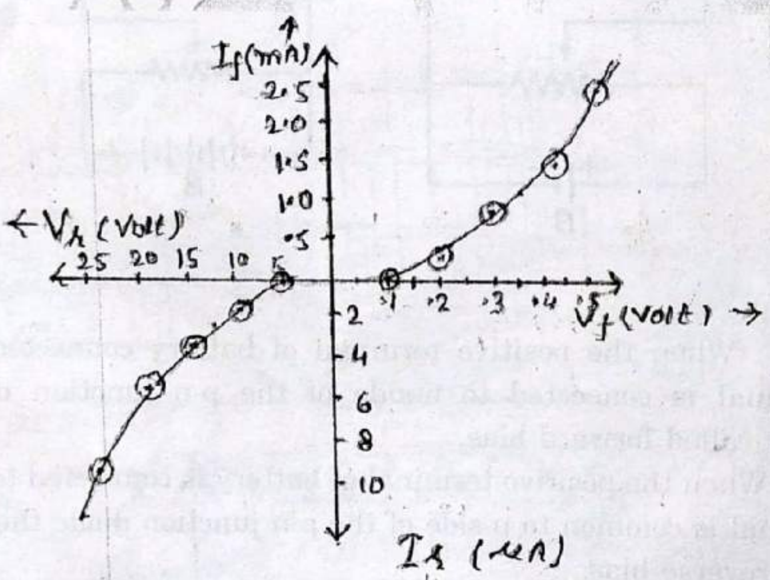
$$\text{Least count of voltmeter} = \frac{\text{Range}}{\text{No. of Div.}} = \frac{50}{50} = 1 \text{ volt}$$

$$\text{Least count of micro-ammeter} = \frac{\text{Range}}{\text{No. of Div.}} = \frac{100}{50} = 2\mu\text{A}$$

Observation Table :

S.No.	Forward Bias		Reverse Bias	
	Voltmeter Reading Vf (volt)	Milli-ammeter Reading If (mA)	Voltmeter Reading Vr (volt)	Micro-ammeter Reading Ir (uA)
1	5 x .02 = 0.1	0 x 0.2 = 0	5 x 1 = 5	0 x 2 = 0
2	10 x .02 = 0.2	1 x 0.2 = 0.2	10 x 1 = 10	1 x 2 = 2
3	15 x .02 = 0.3	4 x 0.2 = 0.8	15 x 1 = 15	2 x 2 = 4
4	20 x .02 = 0.4	7 x 0.2 = 1.4	20 x 1 = 20	3 x 2 = 6
5	25 x .02 = 0.5	12 x 0.2 = 2.4	25 x 1 =25	5 x 2 = 10

Graph :



Result : The I-V charactertistics curve of P-N Junction diode in forward and reverse bias are shown in figure graph.

Precautions :

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

(ii) Forward and reverse bias voltage beyond breakdown should not be applied.

(iii) The pointer of meters should be adjusted to read zero.

(ivi) When no curren tis passing through.