Physics Practical For class XII (2018-2019)

Exp No : 1

Aim /Object : To determine the resistance per unit length of a given wire by plotting a graph between potential difference and electric current.

Appratus Required : Ammeter ,Voltmeter , Battery eliminator, Experimental Resistance Wire, Plug Key, Connection Wires And a meter Scale ,. Etc.

Theory /Formula Used: The ohm ,s Law state that the Potential difference applied across the resistance Of a wire is directly proportional to the electric current flowing through the wire .If V is the potential difference and I be electric current , Then

$$V = R I$$

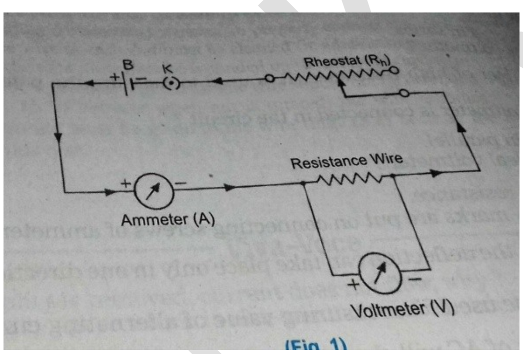
$$R = V / I$$

The constant R is called the resistance of the conductor. The value of the resistance of a conductor depends upon the length L , The cross section area A and the characteristics of the material of the wire. The graph between V and I is a straight line. The slop of the graph gives the resistance R of the wire. Resistance per unit length is given by:

$R / L =$ Ohm /cm

Circuit Diagram :

Graph : To be Pasted After plotting on Graph paper



Observations:

Least count of Volt meter : ---------------volt

Least count of Am meter: -------------- Ampere

Table for V and I :

SNO	Volt meter Reading		Am meter Reading		Resistance R = V/I(ohm)
	No of div	Value V (volt)	No of div	Current I (Amp)	
1.					
2.					
3.					
4.					
5.					
6.					

Calculations : 1. For every set of observations ,find the value of V/I

2. Plot the graph between V and I . This will be a straight line.

3. The resistance per unit length is R/L = -------------ohm/cm.

Result: 1. Calculated value of V/I for all the set of readings comes out to be the same. Also the graph between V and I is a straight line passing through the origin.

2. The resistance per unit length of the given wire is ------------------------ Ohm /cm.

Precautions:

1. While making connections, the plug of the key should be removed so that current may not flow unnecessarily.

2. Every time, the current should be passed for small interval of time and after every observation, the plug should be removed otherwise the wire may get heated.

3. The length of only that part which is between the end of the voltmeter should be measured.

Source of Errors : 1. Sometimes the pointer of ammeter or voltmeter lies between two divisions. This will cause error in the result.

2. Due to flow of current, the wire may be heated up. Due to this its resistance will increase slightly.

Exp No : 2

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

Appratus Required : Meter Bridger , Battery eliminator, Experimental Resistance Wire, Plug Key, resistance box, Galvanometer, Connection Wires , jockey And a meter Scale ,. Etc.

Theory /Formula Used: The working of meter bridge is based upon the principle of Wheatstone bridge.In the balanced condition of the bridge

$$P/Q = R/S$$

The resistances P and Q are in the of two parts of length l and (100- l)of the wire AC.(divided by the jockey in balanced condition)

$$P/Q = l/(100-l)$$

The value of R is known and thus S is to determined by

$$l/(100-l) = R/S$$

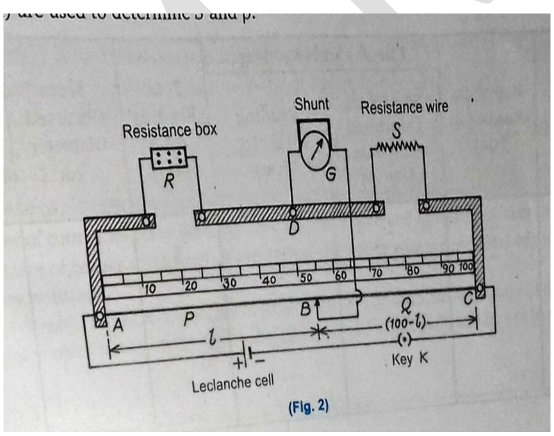
Or S = R¿)

If the length of the experiential wire is L and radius is r then $S = \rho L / \pi r2$

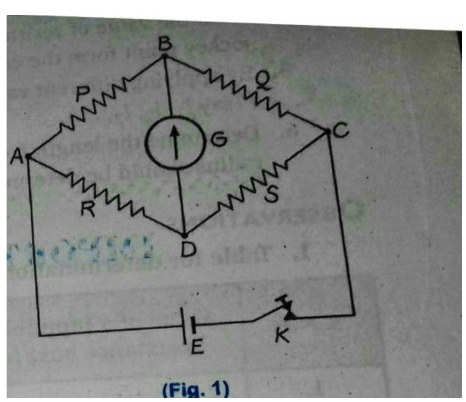
Where ρ is the specific resistance of the material of the wire .From these

$$P = S \pi r^2 / L$$

Cir cuit Diagram:



(Fig. 2)



(Fig. 1)

Observations:

1. **Table for determination of unknown resistance S :**

SNo.	Value of R (applied from resistance box) Ohm	Length l in Null posisition l (cm)	(100 – l) cm	S=R ¿)Ohm
1.				
2.				
3.				
4.				

2.Length of the experimental wire (L) =---------------- cm

3. **Table for radius of the experimental wire:**

SNo	Direction of measurement	MSR a (cm)	CSR b(cm)	Total Reading a+b (cm)	Mean observed diameter (cm)	Radius r = d /2
1.						
2.						
3.						

Calculations : To be Done For each set of observations

Result: 1. The resistance of the given wire is --------------- Ohm.

2. The specific resistance of the given wire is --------------------- Ohm –cm

Precuations: 1.Clean the connecting wires and the connecting points of meter bridge properly with Sand paper.

2. All connections should be neat and tight.

3. Balance point should be between 40cm to 60 cm.

Sources of Error: 1. The screws of the instrument may be loose.

2. The keys of the resistance box may not be clean and tight.

Exp No 3.

<u>Aim :</u> To verify the laws of series and parallel combinations of resistances using meter bridge.

Apparatus required : Meter bridge , Galvanometer, Resistance box, Battery eliminator, Plug key, Two resistance wire, connecting wires.

<u>Theory /Formula Used</u>: If two resistances R1 and R2 are connected in series, then their equivalent resistance is given by :

$$R = R1 + R2$$

And if the resistances are connected in parallel combination, then their equivalent resistance is given by:

$$1/R = 1/R1 + 1/R2$$

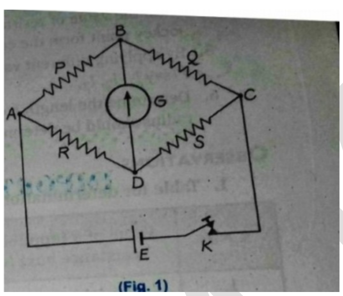
The values of resistances of the two wires are determined separately and also combining them in series or in parallel.

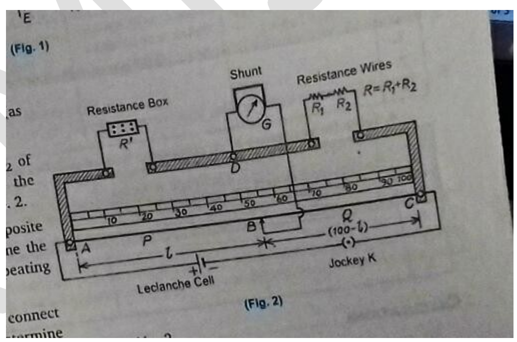
For calculation of resistance by meter bridge , the formula used is

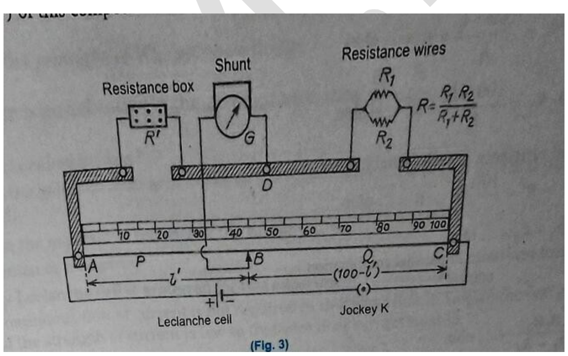
S = R ¿)

Where R is resistance applied from resistance box and l is length of meter bridge wire (from one end point) in the null position of galvanometer.

Circuit Diagram:







<u>Observations:</u>

1. Table for resistance R1:

SNo	Resistance R in left gap (ohm)	Length of wire for balance of bridge L1 (cm)	100- L1 (cm)	R1 = R¿) ohm	Mean value of R1 (ohm)
1.					
2.					
3.					

2. Table for resistance R2 :

SNo	Resistance R in left gap (ohm)	Length of wire for balance of bridge L2 (cm)	100- L2 (cm)	R2 = R¿) Ohm	Mean value of R2 (ohm)
1.					
2.					
3.					

3. Table for R' of series combination:

SNo	Resistance R in left gap (ohm)	Length of wire for balance of bridge L' (cm)	100- L' (cm)	R' = R¿)' Ohm	Mean value of R' (ohm)
1.					
2.					
3.					

4. Table for resistance R'' of parallel combination:

SNo	Resistance R in left gap (ohm)	Length of wire for balance of bridge L'' (cm)	100- L'' (cm)	R'' = R¿) Ohm	Mean value of R'' (ohm)
1.					
2.					
3.					

Calculation : To be done by the students for each set of observations separately:

Result :

Combination	Experiential value of combined resistance (ohm)	Calculated value of combined resistance (ohm)	Difference(ohm)
Series combination			
Parallel combination			

Within experimental limits ,the experimental and calculated values agree. Thus the law series and parallel Combination of resistances are verified.

Precuations: 1.Clean the connecting wires and the connecting points of meter bridge properly with sandpaper.

2. All connections should be neat and tight.

3. Balance point should be between 40cm to 60 cm.

Sources of Error: 1. The screws of the instrument may be loose.

2. The keys of the resistance box may not be clean and tight.

Exp No :4

Aim : To find the focal length of a convex lens by plotting the graphs between u and v

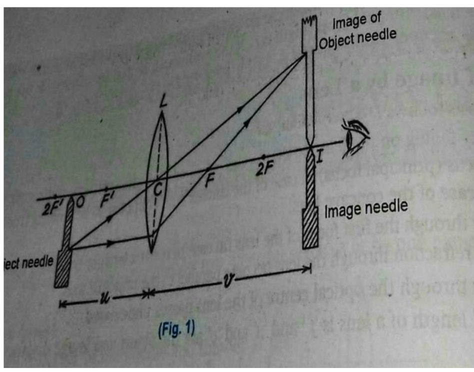
or (between 1/u and 1/v).

Appratus Required: Optical bench, three uprights, twi needles, given convex lens .

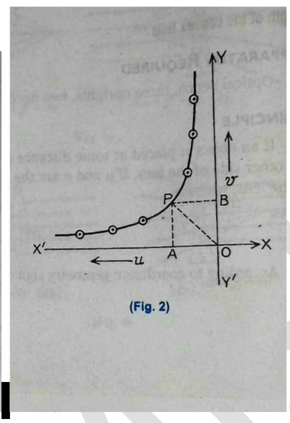
Theory /Formula Used: If an object is placed at some distance (greater than the focal length of the convex lens) , the real image is formed on the other side of the lens . If u and v are the object distance and image distance respectively, then for the focal length f of the lens , we have the formula :

$$1/f = 1/v - 1/u \quad \text{or} \quad f = \frac{uv}{u+v}$$

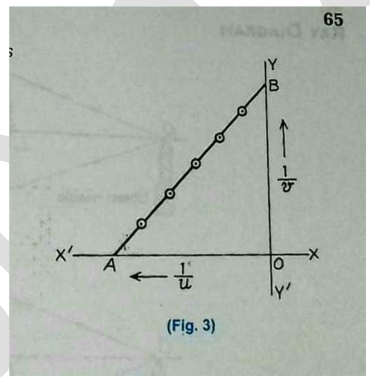
Ray Diagram :



(Fig. 1)



(Fig. 2)



(Fig. 3)

To Note : (Both the graphs to be pasted after plotting on the graph paper from the observations)☺

Observations :

Table for u and v:

SNO.	Position of object needle O a (cm)	Position of convex lens L b(cm	Position of image needle I c(cm)	u =(a –b) cm	V = (b –c) cm	1/u cm-1	1/v cm-1
1.							
2.							
3.							
4.							
5.							

Calculations : 1. By u-v graph : The origin is taken at (0,0) . The object distance u is taken on X axis and image distance v on Y axis . Taking equal suitable scale for u and v ,graph is drawn. the shape of the curve is rectangular hyperbola . A line is drawn through the origin O making an angle of 45^0 with X 'axis . The coordinates of point P at which this line meets the curve are equal PA = PB .

In the equation 1/v – 1/u = 1/f putting u= -v 2/v =1/f v = 2f

2. Using 1/u and 1/v graph: The graph is plotted with 1/u on X axis and 1/v on Y axis. The obtained graph is a straight line. Putting 1/u = -x and 1/v = y the x + y = 1/f

If x = 0 , y = 1/f and when y =0 x = 1/f Thus the reciprocal of intercept on either axis gives the value of focal length of the convex lens.

Result :

The focal length of given convex lens f = --------------- cm.

Precautions:

1. The tips of the needles should be sharp so that parallax is accurately removed.
2. While removing the parallax, the eye should be kept at sufficient distance from the needle.
3. During removing of parallax the tip of the image be in contact with the object needle.

Exp No 5.

Aim : To determine angle of minimum deviation for a given prism by plotting a graph between angle of incidence and angle of deviation and to find the refractive index of the prism.

Apparatus Required : Prism ,drawing board, white paper, needles ,protector, centimeter scale.

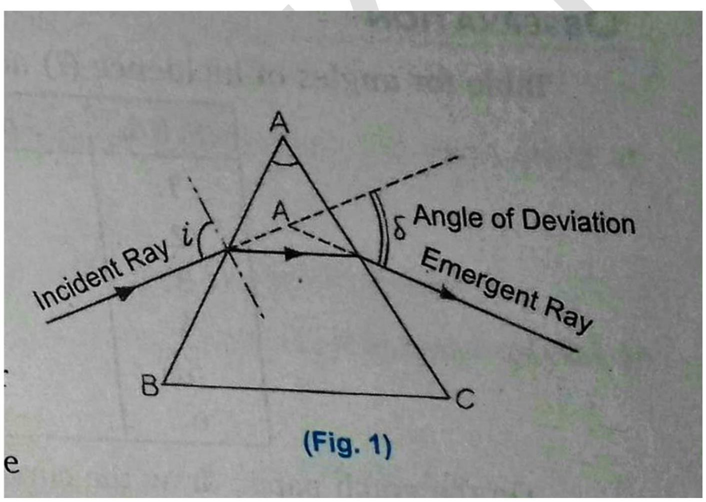
Theory /Formula Used: When a light ray falls on one face of a prism, after refractions on two faces, it emerges out of the prism.

The angle between the incident ray and the emergent ray is called the angle of deviation ( ). The angle of deviation due to a prism depends upon the angle of incidence. On increasing the angle of incidence ,the angle of deviation first decreases, becomes minimum for some value of angle of incidence and then begins to increase. The angle of minimum deviation (δ) id different for different prism materials .

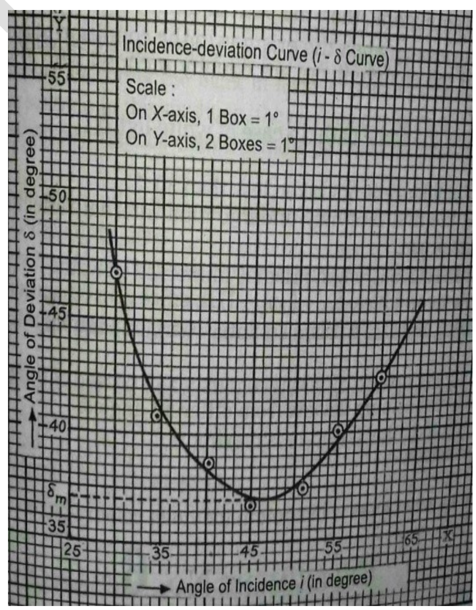
In terms of prism angle (A) and angle of minimum deviation (δm), the refractive index of the prism material is given by :

$$\text{Mu} = \frac{\sin(A+\delta m)/2}{\sin A/2}$$

Diagram to be drawn on the left page of the note book:



(Fig. 1)



Observations:

1. Angle of Prism (A) = 60^0

2. Table for angle incidence (i) and angle of deviation (δ) :

SNo.	Angle incidence (i)	Angle of deviation (δ)
1.		
2.		
3.		
4.		
5.		
6.		

Calculation :

On the graph paper, draw the curve between the values of angle of incidence and angle of deviation. The curve similar to the diagram shown is obtained. The minimum value of angle of deviation is read on the curve.

To find the refractive index of the prism, use the formula:

$$\text{Refractive index} = \frac{\sin(A+\delta m)/2}{\sin A/2} = \text{-------------}$$

Result : 1.From the graph , angle of minimum deviation is= --------------

2. The refractive index of the material of the prism is ----------------

Precuations: 1.The angle of incidence should not be less than 30^0 and more than 60^0 .

2. The pins fixed should be well apart (at least 3 cm away) and should be vertical.

3. The position of the prism should not be changed while performing the experiment.

Sources of error:

1 .Measurement of angles may be wrong.

2. The pins are fixed very closed to each other.

Exp No 06

Aim : To compare the EMF s of two given primary cells using a potentiometer.

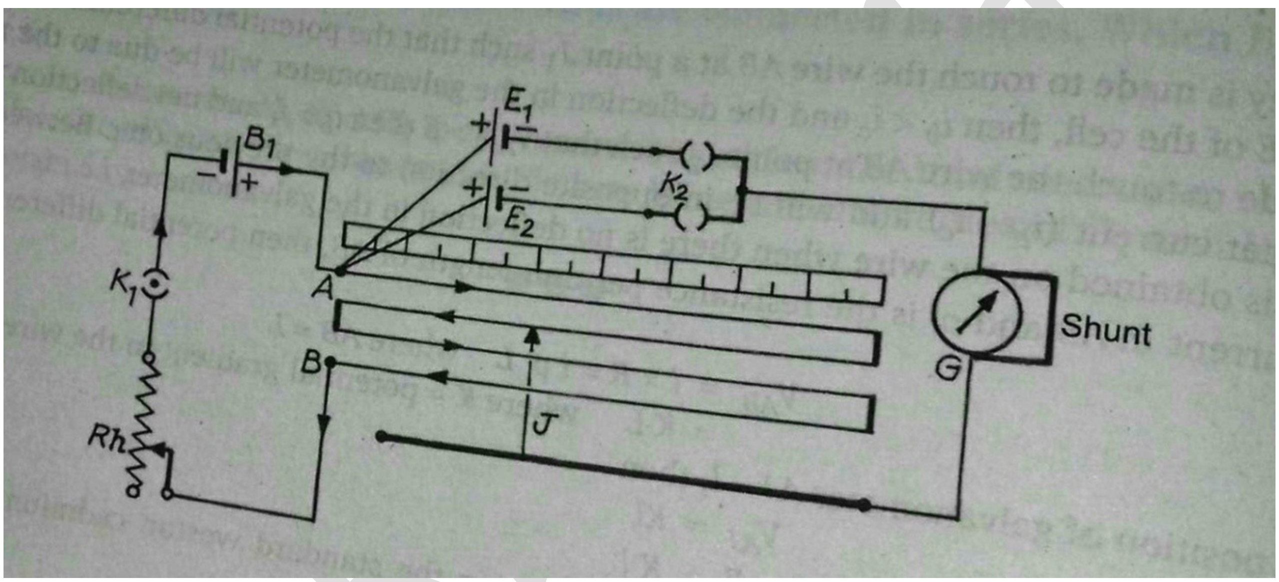
Apparatus Required : Potentiometer ,Battery eliminator, a plug key , a two way key, given primary cell (Leclanche and Daniel cell) Galvanometer, connection wires .

Theory /Formula Used: If the potential gradient in the potentiometer wire is K . The EMFs of experimental cells are E_1 and E_2 and the lengths of potentiometer wire for null points in the galvanometer with cell E_1 and E_2 are l_1 and l_2.

$E_1 = Kl_1$ and $E_2 = K l_2$

Or $E_1 / E_2 = l_1 / l_2$

Diagram to be drawn on the left page of the note book:



Observations : Table for E_1 and E_2 :

SNo	Position of null point with one cell (Leclanche cell)			Position of null point with second cell (Daniel cell)			$E_1 / E_2 = l_1 / l_2$
	Complete wires	Reading of jockey point (cm)	Total Length l_1 (cm)	Complete wires	Reading of jockey point (cm)	Total Length l_2 (cm)	
1.							
2.							
3.							

Calculations : In the formula $E_1 / E_2 = l_1 / l_2$

Do calculation for each set of readings and then find mean of E1 and E2.

Result : The ratio of the EMF of given Leclanche and Denial cell is =----------------.

Precautions :

1.The positive terminal of all the cells should be connected to the same end of the potentiometer wire.

2.The emf of storage cell B should be higher than the emf of cells E1 and E2. Otherwise null point will not be obtained.

3.After taking the observations with one cell, the other cell should be taken quickly in the circuit, The current in the wire should remain unchanged throughout.

4. The jockey should not be rubbed on the wire; otherwise the wire will not remain uniform in cross section throughout.

Sources of Errors :

1. The_ of the wire is not uniform throughout.
2. The galvanometer is not sensitive so that there is error in taken null position.

Exp No 07

Aim : To determine the internal resistance of a primary cell (Leclanche cell) using a potentiometer.

Apparatus Required : Potentiometer ,Battery eliminator, a plug key , a two way key, resistance box, Rheostat, given primary cell ((Leclanche cell), Galvanometer, connection wires .

Theory /Formula Used: Let the emf of a cell is E and internal resistance is r . When a resistance R is connected in the external circuit of the cell ,the current in the circuit is given by :

$$I = \frac{E}{R+r}$$

Or $$E = I\,(R+r)$$

The potential difference V between the ends of R ,then V = IR

Then $$E / V = (R+r) / R = (1 + r/R)$$

Or $$r = R\,(E/V - 1)$$

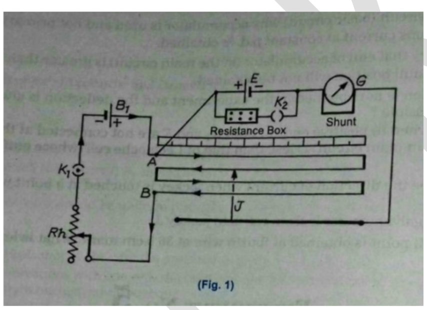
The value of E and V determined by potentiometer.

If the length of potentiometer wire is l_1 for Leclanche cell in open circuit and the length l_2 when cell is not in open circuit, then

$$E / V = l_1/l_2$$

And $$r = R\left(\frac{l1-l2}{l2}\right)$$

Circuit Diagram :



(Fig. 1)

Observation:

SNO	Position of null point when K1 is open circuit	Position of null point when k2 is closed	External resistance R (ohm)	Value of $r = R\left(\frac{l1-l2}{l2}\right)$ ohm

	No of complete wire	Reading of jockey point(cm)	Total length l_1(cm)	No of complete wire	Reading of jockey point(cm)	Total length l_2(cm)		
1								
2.								
3								

Calculations : Using formula r = R ($\frac{l1-l2}{l2}$) for each set of observation , Calculate internal resistance r .

Result : The internal resistance of the given cell is = ohm.

Precautions :

1.The positive terminal of all the cells should be connected to the same end of the potentiometer wire.

2.The emf of storage cell B should be higher than the emf of cells E1 . Otherwise null point will not be obtained.

3 The rheostat should be adjusted such that the null point is obtained at the last wire.

4. The jockey should not be rubbed on the wire; otherwise the wire will not remain uniform in cross section throughout.

Sources of errors:

1. Due to disturbance, the internal resistance may change.
2. The heating of the potentiometer wire may introduce some error.
3. The end resistances may be neglected.

Exp NO 8

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

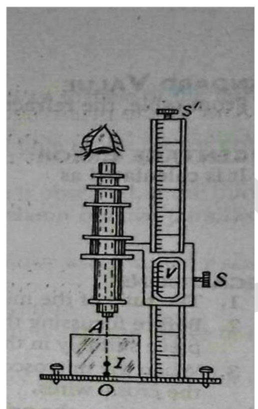
Apparatus Required : A glass slab, a travelling microscope ,Lycopodium powder and marker.

<u>Theory /Formula Used</u>: The ratio of real depth to the apparent depth of a refracting medium is equal to the the refractive index of the medium.

Then μ = Real depth /Apparent depth

$$\mu = \frac{R3 - R1}{R3 - R2}$$

Diagram:-



(Fig. 2)

Observation:

Step 1. To find the Vernier constant of travelling microscope:

50 VSD = 49 MSD

1 VSD = 49/50 MSD

Vernier constant = 1 MSD – 1 VSD

= 1 MSD – 49/50 MSD = 1/50 MSD

= 1/50 (1/2cm) = 1/100 mm = 0.001 cm

Step 2.

SNO	microscope reading					
	Cross mark R1 cm	Image I of cross mark R2 cm	Lycopodium powder R3 cm	Real Depth (R3-R1) cm	Apparent depth (R3- R2) cm	μ= Real depth /Apparent depth
1						
2.						
3						

Calculations : To be done by students using formula for each observations.

Result : The refractive index of glass slab is -----------.

Precautions : .1. The eye piece should be adjusted such that cross wires are clearly visible.

2. The thickness of the lycopodium powder sprinkled on the top surface of the glass slab should be very small.

3. The glass slab must be sufficiently thick and clear.

Exp NO 9

Aim : To determine the resistance of a galvanometer by half deflection method and to find its figures of merit.

Apparatus Required : A galvanometer , a battery eleminater, two resistance boxes, two one way keys , connecting wires, etc.

<u>Theory /Formula Used</u>: When a high resistance R is connected in series with galvanometer of resistance G , the current through the galvanometer is given by (When key K2 is kept open and K1 is closed)

$$I_g = \frac{E}{R+G} \qquad \text{------------------- (1)}$$

Where E = emf of the battery

R = resistance (high value) from resistance box

G = Resistance of galvanometer

If is the deflection in galvanometer , then $I_g = K\vartheta$ ---------(2)

Where K is figure of merit

Therefore E / R+G = Kϑ --------------------------------------(3)

After inserting K2 and adjusting the resistance of shunt S so that galvanometer shows half deflection, ,

Then current through galvanometer $I'_g = K\vartheta/2$ --(4)

Since G and S are parallel, the effective resistance R' is given by 1/R' = 1/ G + 1/ S

And

$$R' = \frac{GS}{G+S}$$

Total resistance of the circuit = R + $\frac{GS}{G+S}$

If current I is drawn from the battery , then $I = \frac{E}{R+\frac{GS}{G+S}}$

The current I'_g through the galvanometer is given by

$$I g = = \frac{E}{R+\frac{GS}{G+S}} \text{ X } \frac{S}{G+S} = \frac{K\vartheta}{2} \qquad \frac{ES}{R(G+S)+GS} = \frac{K\vartheta}{2}$$ -- (5)

Comparing equation (3) and (5)

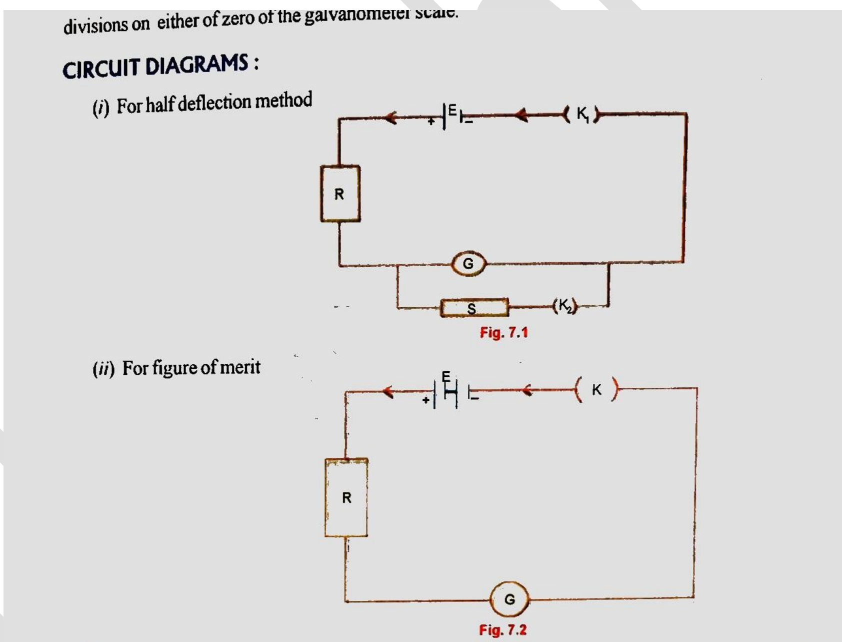
$$\frac{E}{R+G} = ¿ \frac{2\,ES}{R(G+S)+GS}$$

On solving $G = \frac{RS}{R-S}$

Figure of merit : It is defined as the current, Which produces a deflection of one scale division in the galvanometer,

$$K = \frac{I g}{\vartheta} = \left(\frac{E}{(R+G)\vartheta} \right.$$

Circuit Diagram :



Observations:

Table for resistance of galvanometer and figure of merit:

Sno	Resistance R (ohm)	Deflection in Galvanometer	Value of shunt S (ohm)	Half deflection	G= $\frac{RS}{R-S}$ ohm	K= $\frac{E}{(R+G)\vartheta}$
1.						
2.						
3.						

Calculation: Mean value of K = ------------ A /div

Result:1. The resistance of given galvanometer is to be found = ------------- ohm.

2. The figure of merit of the galvanometer is = ---------------- Amp / div.

Precuations:

1. All the connections should be neat ,clean and tight.
2. Ensure that the plugs of resistance box are tight.
3. Initially a high resistance from resistance box should be introduced

Sources of Error:

1. The screws of the instruments may be loose.
2. The plug of galvanometer may not be tight.
3. The galvanometer divisions may not be of same size.
4. The emf of the battery may not be constant.

Exp 10

Aim : To determine the focal length of convex mirror using a convex lens.

Apparatus Required : Optical bench , convex mirror, convex lens, two needles , four uprights on optical bench.

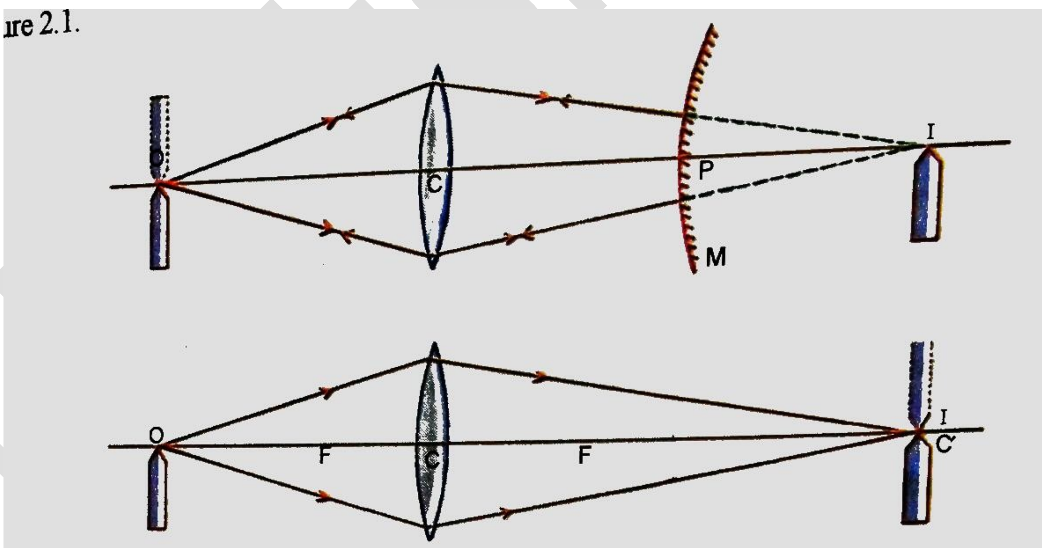
Theory /Formula Used: The rays starting from a point O, after reflecting from the convex lens L meet at C where real image I of O is formed. If a convex mirror is now introduced between the lens L and the point C in such a way that its reflecting surface is towards the lens L, Then by moving the mirror both sides on the optical , a position of the mirror can be obtained where the real image I of O is formed. This condition is possible only when the rays starting from O and refracted from the lens L fall perpendicular on the mirror. Obviously if mirror is removed, the rays will meet at C and this point C should be the center of curvature of the convex mirror. The distance of C from pole P of the mirror is the radius of curvature R of the mirror.

The distance PC is obtained on knowing LC and LP as

$$R = PC = LC - LP$$

$$\text{Or} \quad f = R/2$$

Diagram:-



Observations :

Table for radius of curvature of convex mirror :

SNO	Position of	Position	Position	Position	LC= a-b	LP = a-c	Radius of

	object Needle (cm)	of Lens a(cm)	of Image Needle O' b (cm)	of mirror C (cm)	Cm	cm	curvature R= LC-LP (cm)
1							
2.							
3.							

Calculations :

Using formula, Focal length f = R /2 **(DO calculation for each observation and find mean**)

Average focal length f = --------- cm.

Result :focal length of given convex mirror = --------- cm

Precuations:

1. The uprights should be vertical.
2. Do not place the object needle closer than the rough focal length of the3 lens. This will produce a virtual image.
3. Keep your eye At least 30 cm away from the image needle to view image clealy.
4. Parallex should be removed tip to tip.

Sources of Error:

1. The uprights may not be vertical.
2. The parallax removed may not be perfect.

Exp NO . 11

Aim : To find the refractive index of a liquid (water) using a concave mirror.

Apparatus Required : A concave mirror, A needle, a clamp, a clamp stand, a meter scale and liquid

(water)

<u>**Theory /Formula Used**</u>: When ray BA of light goes from water to air, it bends away from the normal and goes along A C'.

Using Snell's law $$\frac{1}{\mu} = \frac{\sin i}{\sin r}$$

$$\mu = \frac{\sin r}{\sin i} = \frac{AC}{AC'}$$

For normal incidence, A lies close to D. For thin layer of liquid. D lies close to P.

$$\mu = \frac{PC}{PC'}$$

Or Refractive index = $$\frac{\text{Radius of curvature of concave mirror}}{\text{Rad ius of curvature of concave mirror with water} \in \text{it}}$$

<u>Ray Diagram :</u>

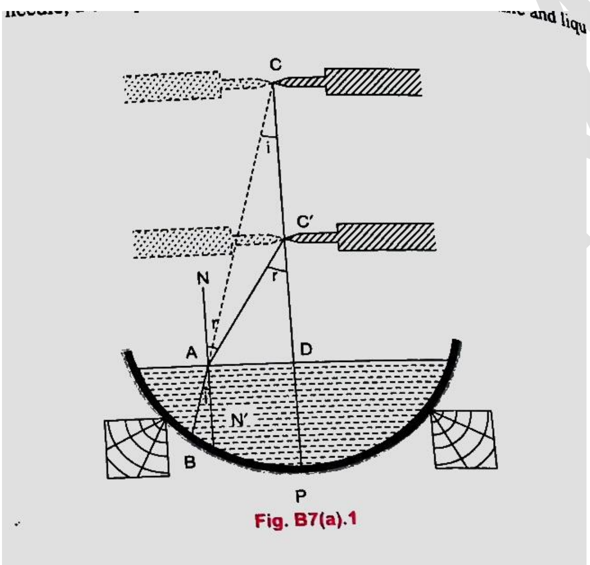


Fig. B7(a).1

<u>Ob servations:</u>

SNO	Distance PC (cm)	Distance PC' (cm)	

			μ = $\frac{PC}{PC'}$
1.			
2.			
3.			

The mean value of refractive index = --------------.

Result ; The refractive index of liquid (water) using a concave mirror is = ----------

Precautions:

1. The principal axis of the mirror should be kept vertical and needle horizontal.
2. The parallax should be removed tip to tip.
3. The eye should be kept at a distance of about 30 cm from the tip of the needle, while removing parallax.
4. The concave mirror should have large radius of curvature.

Exp NO . 12.

Aim : To find the refractive index of a liquid (water) using a Convex lens and a plane mirror.

Apparatus Required : A convex lens, a plane mirror, A needle, a clamp, a clamp stand, a meter scale and liquid (water),

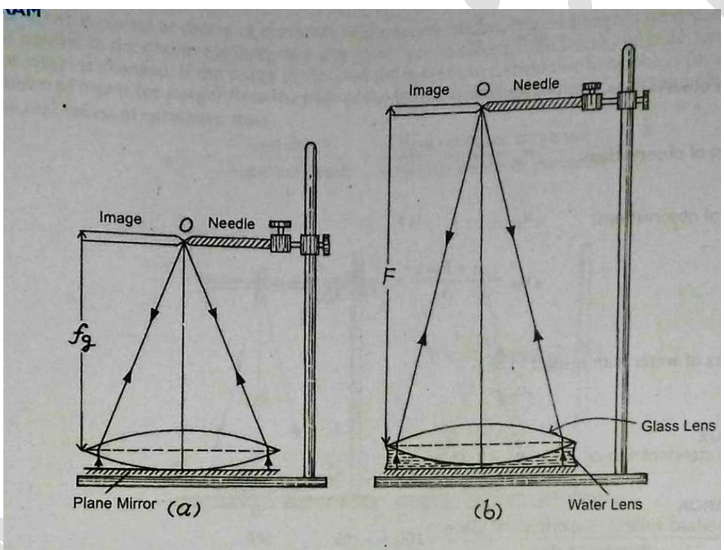
<u>Theory /Formula Used</u>:

When an object is placed at focus of a convex lens, its real image will be formed at infinity . if lens ;ie on a plane mirror, then the emergent parallel rays will fall perpendicular on the plane mirror and after reflection will retrace the path and form the image coinciding with the object. The distance of the image from the lens is equal to its focal length (fg).

If some liquid is poured between the convex lens and the plane mirror, then above the plane mirror ,a lens combination of glass convex lens and liquid water plano concave lens of combined focal length (F) is formed. If the image is now made to coincide with the object ,Then distance of the object from the lens system is equal to F . The refractive index of liquid in terms of fg and F is given by :

$${}_a n_w = 2 - f_g / F$$

Ray Diagram :



(Fig. 1)

Observation:

Table for focal length (fg) of convex lens and equivalent focal length (F).

SNo	Without water placed on plane mirror	With water placed on plane mirror

	Vertical distance of needle from upper surface of lens a (cm	Vertical distance of needle from plane mirror b (cm)	Focal length of convex lens fg= $\frac{a+b}{2}$	Vertical distance of needle from upper surface of lens c (cm	Vertical distance of needle from plane mirror d (cm	Equivalent focal length F = $\frac{c+d}{2}$
1.						
2.						
3						

Calculations:

Refractive index of water w.r.t air is $_a n_w$ = 2- f_g /F

Do calculation for each set of observation.

Average value of refractive index = -------------

Result :

The refractive index of water wrt air determined from the experiment =-----------.

Standard Value: From the table standard value of refractive index of water is equal to = 1.33

Percentage Error:

Percentage error = $\frac{Standard\ value - Experintal\ value}{Standard\ value}$ x 100 = ------------ %

Precuations :

1. Before starting the experiment, The plane mirror and the convex lens should be cleaned properly.
2. The Needle in the clamp should be attached in such a way that the tip of the needle falls on the principal axis of the lens.
3. While observing the image, the eye should be kept at least 25 cm above the needle.
4. Few drops of liquid (water) are sufficient.

Exp No 13.

Aim : To find the value of v for different values of u in case a concave mirror and plot the graph between 1/u and 1/v and also find the focal length of concave mirror.

Appratus Required : Optical bench, concave mirror, two needles, three

Uprights.

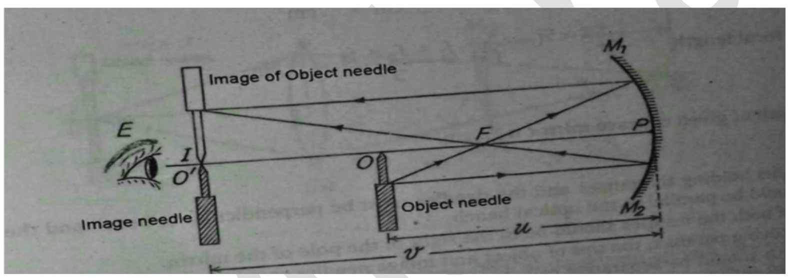
Theory/ formula used: If an object is placed at a distance u from a concave mirror of focal length f and its image is formed at a distance v from the concave mirror, then :

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v} \qquad \text{or } f = \frac{uv}{u+v}$$

According to sign convention, u and v are both negative. Thus

$$f = -\frac{uv}{u+v}$$

Ray Diagram :



Observations:

Table for values of u and v:

SNo	Position of concave	Position of object needle	Position of image needle	u= a-b cm	V= a-c Cm	1/u	1/v

	mirror a (cm)	b (cm)	c (cm)				
1.							
2.							
3.							
4							

Calculations :

1. For each set of u and v ,focal length is calculated by using formula $f = -\frac{uv}{u+v}$

2. Plot a graph between 1/u and 1/v ,

3. Find mean of focal length f = $\frac{f1+f2+f3}{3}$ = -------------cm

Result : The focal length of the given concave mirror = -------------cm

Precuations:

1. The up rights holding the mirror and needles must be perpendicular to bench and principal axis of the mirror should parallel to the optical bench.
2. The tips of both the needles should be in the sight of the pole of the mirror.
3. While removing parallax , The tips of object and image needles should be in contact.

Sources of Errors:

1. Bending of optical bench or uprights is the main source of error.
2. Parallax error.

Exp No 14.

Aim ; To draw I –V characteristic curves for P N junction Diode in forward and reverse biasing.

Apparatus Required : PN Junction Diode, milliammeter, microammmeter, voltmeter, rheostat, plug key, 6 volt battery.

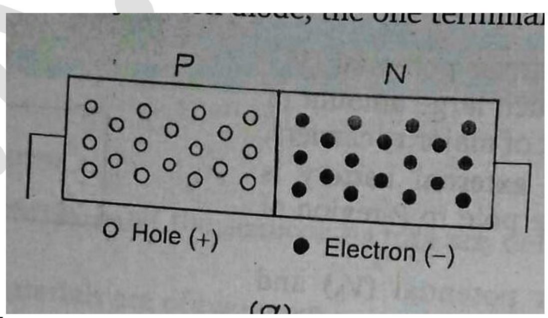
Theory :

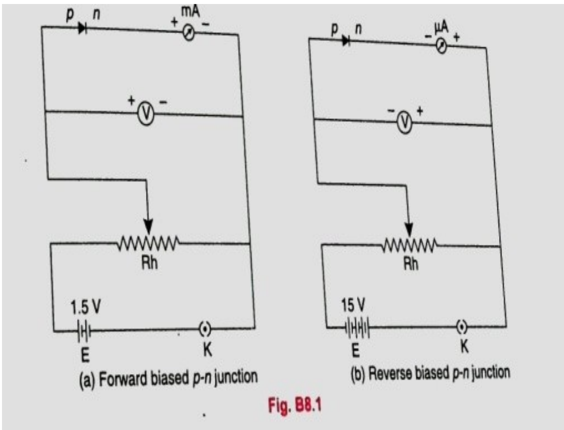
To form a PN junction, A P type crystal is jointed with N type crystal by a special method. In the N type crystal, the charge carriers are eledctrons while in P type crystal the charge carrior are the holes. The mobility of holes is small as compare to that of electrons. In the absence of battery, no current flows through the junction.

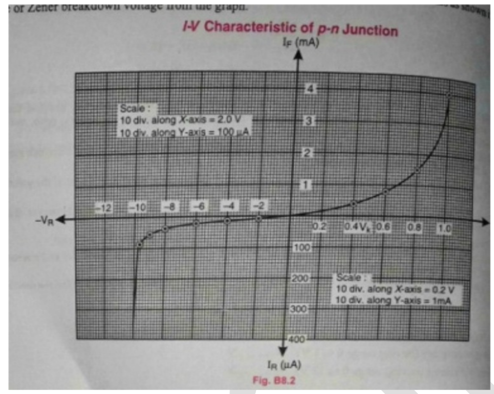
The pn junction diode can be connected across an external battery in two ways:

1. **Forward Biasing**: In forward biasing ,the P type crystal is connected to the +ive terminal of the battery and N type crystal is connected to the negative terminal of the battery. The current increases as Potential increases. The current increases slowly in the beginning and then sharply.
2. **Reverse Biasing**: A PN junction is said to be reverse biased if the P type crystal is connected to negative terminal and N type is connected to +ive terminal of the battery. Now a very small current (in micro amp) flows due to minirity carriers, Thiscurrent is called stturated current because it is found to be independent of the reverse bias. At a certain reverse voltage, the current suddenly increases due the breaking of covalent bonds. This is called reverse break down voltage.

Circuit Diagram: :







Observations:

SnO	Forward Biasing		Reverse Biasing	
	Applied Voltage V (volt)	Current I (in mA)	Applied Voltage V (volt)	Current I (in micro Amp)
1.				
2.				
3.				
4.				
5.				
6.				

Result: The V –I charateristic curves in both the biasis are shown in graph on graph paper.

Precuations:

1. In forward biasing, the voltage should be very much low so that the junction may not demage.
2. Current in diode should not be passed for long time, otherwise it will burn.

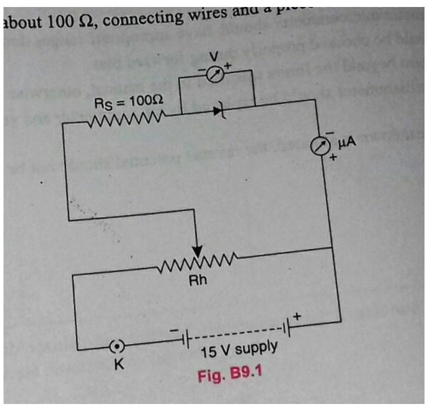
Exp No 15.

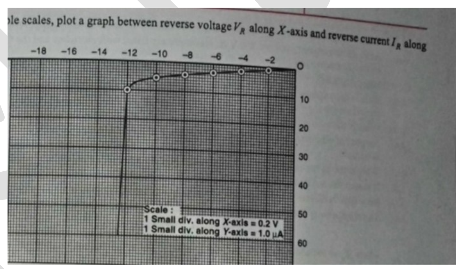
Aim ; To draw I –V characteristic curve for Zener Diode and to determine the break down voltage.

Apparatus Required : A complete apparatus of Zener diode, a c power supply

Theory: Zener diode is a heavily doped p-n junction diode operated in the reverse biased region. The voltage drop across the zener diode in the breakdown region is independent of current through it.

Circuit Diagram:





Observations :

Least count of voltmeter = volt

Least count of micro ammeter = Amp

Table V-I charateristic of zener diode:

SNo	Voltmeter reading (V) volt	Micro ammeter reading (I) Amp
1.		
2.		
3.		
4.		
5.		
6.		

Result :

1. The I- V characteristic s of zener diode are shown on the plotted graph on the graph paper.
2. The Zener breakdown voltage is = -------------- volt.

Precuations :

1. Voltmeter and microammeter of appropreiate range should be used.
2. The zener diode should be connected in reverse bias.
3. The reverse bias voltage should not be increased by more than 5 % of the zener breakdown voltage, otherwise zener diode will get damaged.