Experiment – 1

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

Apparatus :- A resistance wire of a battery or eliminator, voltmeter, ammeter, a rheostat, one plug key, connecting wires etc.

Theory :- According to ohm's law Let's 'I' be the current flowing through a conductor and 'v' be the potential drop across its ends.

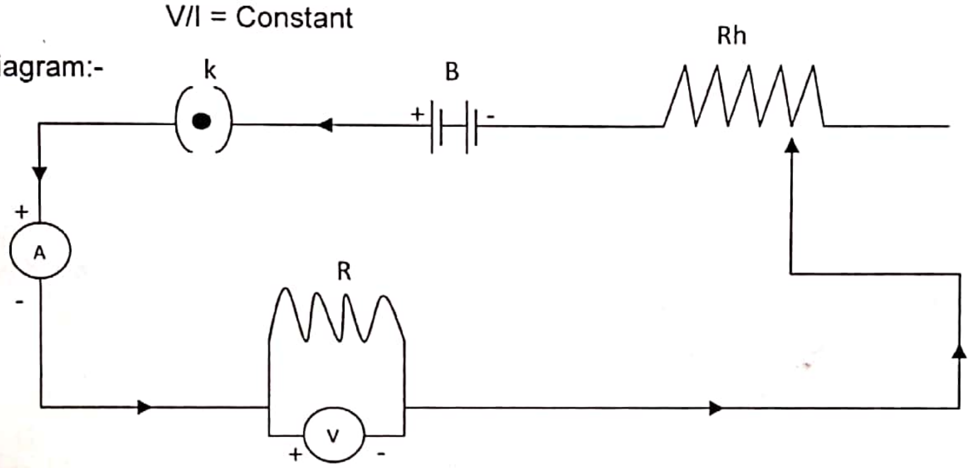
Then $V \alpha I$

$V = I R$

or $R = V/I$

V/I = Constant

Diagram:-



Observations:-

(1) Least Counts of Voltmeter = $\frac{Range}{Number\ of\ Division}$ = ... V

(2) Least Counts of ammeter = $\frac{Range}{Number\ of\ Division}$ = ... A

(3) Length of wire = ... cm

Observations table :-

S. N.	Voltmeter reading V (Volt)		Ammeter reading I (Amp)		$R=\frac{V}{I}$ (ohm)
	No. of Div.	Divi. XLC.	No. of Div.	Divi. XLC.	
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

Calculation :- (i) $R_1 = \frac{V}{I} =$ .... ohm

(ii) $R_2 = \frac{V}{I} =$ .... ohm

(iii) $R_3 = \frac{V}{I} =$ .... ohm

(iv) $R_4 = \frac{V}{I} =$ .... ohm

(i) $R_5 = \frac{V}{I} =$ .... ohm

Mean value of resistance

$$R = \frac{R1 + R2 + R3 + R4 + R5}{5} = \text{.......... ohm}$$

Result :-

1. The resistance of the given wire is R = ... ohm
2. Graph between Potential drop V and the current through the conductor I is straight line.
3. R/L = ... Ω/cm

Precautious :-

1. First of all, Circuit should be drawn and got checked.
2. The connecting wires used should be thick copper wires and the insulation of their ends should be removed by rubbing them with sand paper.
3. Connections should be tight.
4. Before plugging in key, ensure that circuit and connections are right.
5. The plug should be inserted only while taking observations, otherwise current would cause unnecessary heating in this circuit.

(Write any two)

Experiment – 2

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

Apparatus :- A meter bridge, a unknown resistance wire, a resistance box, a jockey, one wey key, a galvanometer, a Leclanche cell, thick connecting wire, screw gauge etc.

Theory :- It is simple apparatus based on the principle of Wheat Stone's bridge, when the bridge balanced

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

If three resistance P.Q and R are known the value of the fourth resistance S can be calculated.

Where-

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

The value of specific resistance $p = \frac{S\pi r^2}{L}$

where

P= l (Resistance of length A to B) cm

Q= 100 - l (Resistance of length B to c) cm

R = R (Resistance in R.B.)

S = S (Resistance of unknown resistance wire)

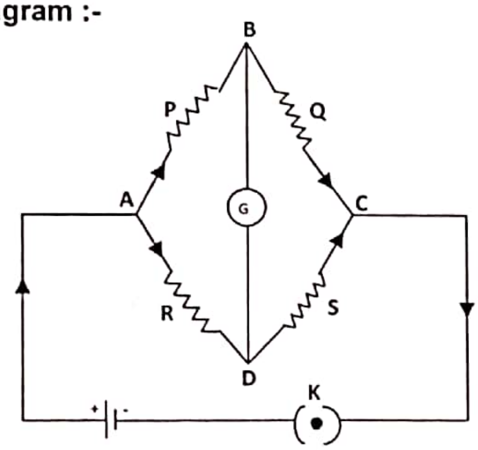
p = Specific of Resistance

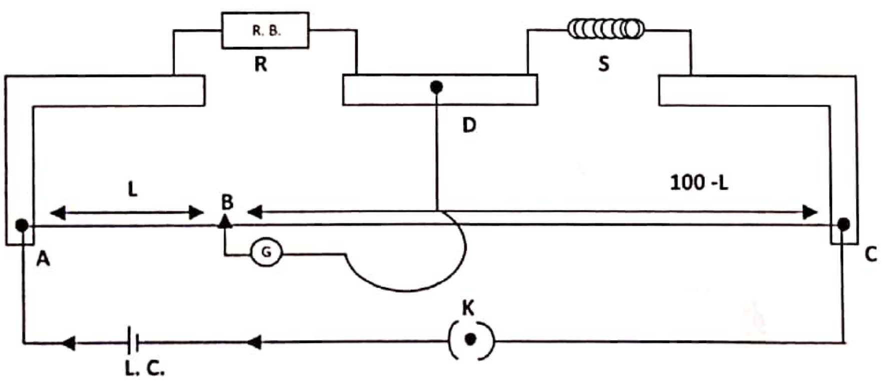
r = Radius of unknown resistance

s = Resistance of unknown resistance

l = Length of unknown resistance

Circuit diagram :-





Observation :-

S.	Resistance in Resistance Box R (ohm)	Balancing length AB= l (cm)	Length BC =100- l (cm)	Unknown Resistance $S=\frac{100-l}{l} xR(ohm)$
1				
2				
3				
4				
5				

Calculation :- (i) $S_1=\frac{100-l}{l}$ x R = ... ohm

(ii) $S_2=\frac{100-l}{l}$ x R = ... ohm

(iii) $S_3=\frac{100-l}{l}$ x R = ... ohm

(iv) $S_4=\frac{100-l}{l}$ x R = ... ohm

(v) $S_5=\frac{100-l}{l}$ x R = ... ohm

Mean value of resistance

$$S=\frac{S_1+S_2+S_3+S_4+S_5}{5} = \text{.......................} \text{ ohm}$$

Observations for specific Resistance :-

(i) Length of wire (L) .... cm.

(ii) Pitch of the screw gauge (P) = ... cm.

(iii) No. of divisions on the circular scale = 100

(iv) Least count of screw gauge (a) = P/100... cm.

Observations table for diameter of wire :-

S. N.	Main scale reading S (cm)	C.S.R n	Diameter d_1= S+nxa	Mean diameter d= $(d_1+d_2)/2$ cm
1.				
2.				
3.				

Mean radius (r) = d/2 = ... cm.

Calculation :-

L = ... cm, r = ... cm, S = ... ohm,

$$p= S\frac{\pi r^2}{L} = \text{................}\ \text{ohm-m}$$

Results :-

(i) Resistance of unknown resistance wire as determined by using a meter bridge is found to be S = ... ohm.

(ii) The value of specific resistance of the material of the wire is *p*= .... ohm-m

Precautions :-

(i) Plugs in the resistance box should be pressed and made tight by screwing them a little in the clockwise direction.

(ii) While moving the jockey to and fro to locate the balance point, the jockey should be lifted again and again should not be pressed and slided to touch the wire throughout.

(iii) As and when a sensitive galvanometer is used for detection of balance point it may get damaged due to sudden high current in the circuit.

(iv) To avoid any error due to non- uniformity of bridge wire, the balance point should always be obtained near the mid-point of the wire.

Experiment - 3

Aim :- To verify the law of combination of resistances in series and parallel using meter bridge

Apparatus :- A meter bridge, unknown resistance wires, a resistance box, a jockey, one way key, a galvanometer, a Leclanche cell, thick connecting wires, screw gauge etc.

Theory:- It is a simple apparatus based on the principle of Wheatstone's bridge, when the bridge is balanced

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

If three resistances P.Q and R are known the value of the fourth resistance S can be calculated.

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

Where

P = l (Resistance of length A to B) cm.

Q = 100- l (Resistance of length B to C) cm.

R = (Resistance in resistance box)

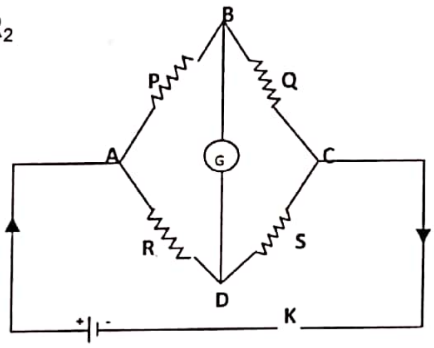
S = S (Resistance of unknown resistance wire)

(i) series Combination of resistance :-

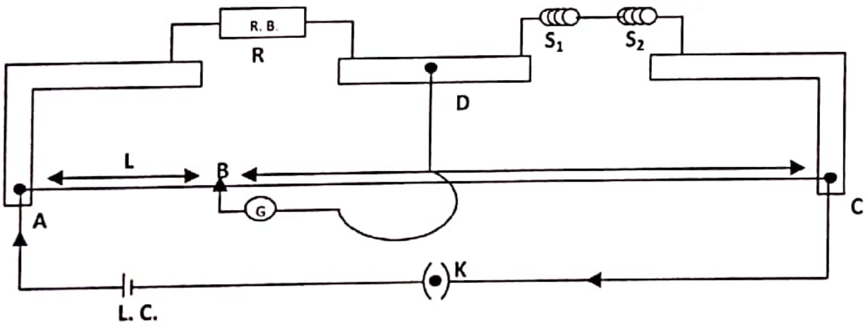
$$R_s = R_1 + R_2$$

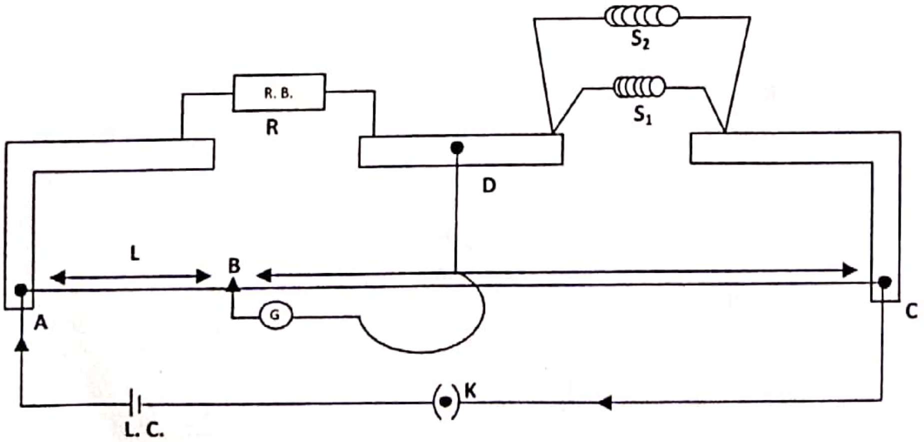
(ii) Parallel combination of resistance :-

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$$



Circuit Diagram :-





Observation table:-

Use of Unknown Resistance	S.N.	Resistance in Resistance box R (ohm)	Balancing length AB= l (cm)	Length BC=100- l (cm)	Unknown Resistnce $S=\frac{100-l}{l}xR$ (ohm)	Mean value
S_1						Mean S_1 = (ohm)
S_2						Mean S_2 = (ohm)
R_1 and R_2 in series						Mean Rs = (ohm)
R_1 and R_2 in parallel						Mean Rp = (ohm)

Calculation:-

Mean S_1 =

Mean S_2 =

Mean Rs =

Mean Rp =

Results:-

(i) The value of the individual resistance by meter bridge re :-

S_1 = ... ohm and S_2 = ... ohm

(ii) The equivalent resistance of series combination of S_1 and S_2 is R_s = ... ohm

(iii) The equivalent resistance of parallel combination of S_1 and S_2 is R_p = ... ohm

(iv) The value of series combination of S_1 and S_2, $S_1 + S_2$ = ... ohm where as R_s = ... ohm. Since R_s is nearly equal $S_1 + S_2$ the law of series combination of resistance stands verified.

(v) The sum of reciprocals of S_1 and S_2,

$\frac{1}{S_1} + \frac{1}{S_2}$ = ... $(ohm)^{-1}$ whereas $\frac{1}{R_p}$ = ... $(ohm)^{-1}$ R_p = ... ohm

Since the value of reciprocal of $(\frac{1}{S_1} + \frac{1}{S_2})$, R'_p is nearly equal to R_p. Their difference $R'_p - R_p$ = ... (ohm) being negligibly small. The law of combination of resistances in parallel stands verified.

Precautions:-

(i) Plugs in the resistance box should be pressed and made tight by screwing them a little in the clockwise direction.

(ii) While moving the jockey to and fro to locate the balance point, the jockey should be lifted again and again and should not be pressed and slided to touch the wire throughout.

(iii) As and when a sensitive galvanometer is used for direction of balance point it may get damaged due to sudden high current in the circuit.

(iv) To avoid any error due to non- uniformity of bridge wire, the balance point should always be obtained near the mid-point of the wire.

Experiment – 4

Aim – To compare the e.m.f. of two primary cell (Lechlanche and Daniell cell) using a potentiometer

Apparatus :- A potentiometer, a jockey, two primary cell (lechlanche and Daniell cells). two way key. one way key, a galvanometer, a battery eliminator, a rheostat, connecting wire and sand paper.

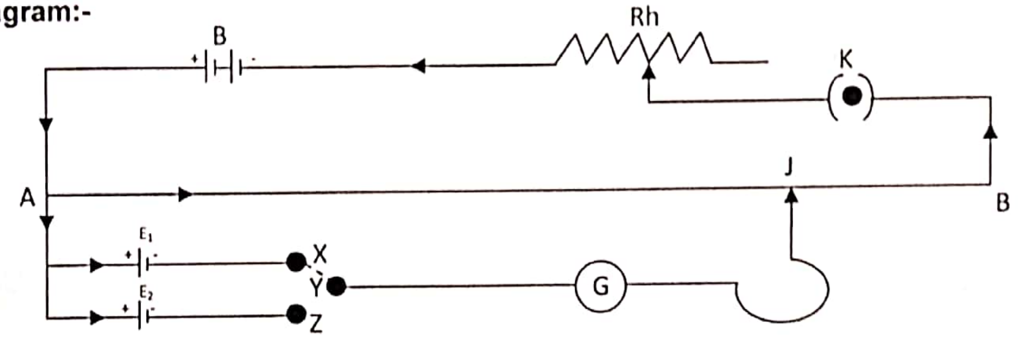
Theory :- Let the two primary cells whose e.m.f. are to e compared using the potentiometer.

$$\frac{E_1}{E_2} = \frac{l_1}{E_2}$$

E_1 = E.m.f. of Lechlanche cell l_1 = Balancing lengths for E_1

E_2 = E.m.f. of daniell cell l_2 = Balancing lengths for E_2

Diagram:-



Observation table- E_1 = ... Volt, E_2 = ... Volt

S.N.	Balance length for lechlanche cell when E_1 in the circuit l_1 (cm.)	Balance length for Daniel cell when E_2 in the circuit l_2 (cm.)	Ratio $\frac{l_1}{l_2}$
1			
2			
3			
4			
5			

Calcultion :-

(i) $\frac{l_1}{l_2}$ = ... (ii) $\frac{l_1}{l_2}$ = ...

(i) $\frac{l_1}{l_2}$ = ... (iv) $\frac{l_1}{l_2}$ =...............

(v) $\frac{l_1}{l_2}$ = ...

Mean value of $\frac{l_1}{l_2}$ = ...

Result :- The ratio of E.m.f. of $\frac{E_1}{E_2}$ for Lechlanche cell to daniell cell = ... and mean $\frac{l_1}{l_2}$ = ... both ratios are equal.

Precaution :-

(i) Ensure that e.m.f. of battery should be higher than E_1 and E_2 of the cells.

(ii) All the positive terminals should be connected t one point.

(iii) Jockey should not be pressed too hard on the wire.

(iv) The wire of the potentiometer should be thoroughly cleaned.

AIM :

Experiment – 5

Aim :- To determine the internal resistance o a given primary cell by using a potentiometer.

Apparatus :- A potentiometer, a jockey, a Lechlanche cell, two one way keys, a resistance box, galvanometer, a battery eliminator, a rheostat, connecting wire and sand paper.

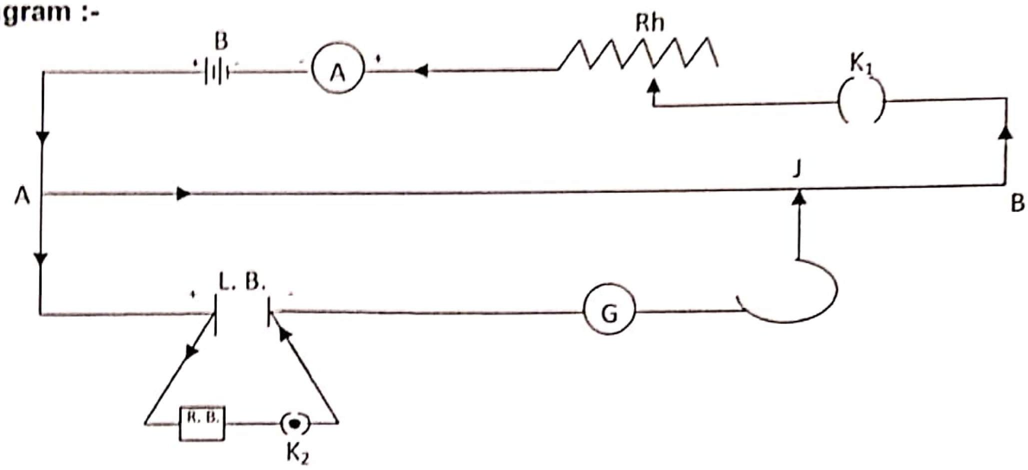
Theory :- Resistance offered by electrolyte of a cell to the flow of ions inside the electric cell is its internal resistance.

$$r = \frac{l_1 - l_2}{l_2} \times R$$

l_1 = Balancing length in open circuit l_2 = Balancing length in closed circuit

R = Resistance in resistance box r = Internal resistance of cell

Circuit diagram :-



Observation:-

S.N.	Resistance in Resistance Box R Ohm.	Balancing length for Lechlanche cell		Internal resistance $r = \frac{l_1 - l_2}{l_2} \times R$
		Balance Length in open circuit l_1 (cm.)	Balance Length in closed circuit l_2 (cm.)	
1				
2				
3				
4				
5				

Calculation :-

(i) $r = \frac{l_1 - l_2}{l_2} \times R$ .... ohm (ii) $r = \frac{l_1 - l_2}{l_2} \times R$ .... ohm

(ii) $r = \frac{l_1 - l_2}{l_2} \times R$ .... ohm (iv) $r = \frac{l_1 - l_2}{l_2} \times R$ .... ohm

(v) $r = \frac{l_1 - l_2}{l_2} \times R$ .... ohm

Result :- The internal resistance of the given Lechlanche cell lies between .... and .... Ω.

Precautions :-

(i) Potentiometer wire and resistance are not take into account.
(ii) All the positive terminals should be connected at one point.
(iii) Jockey should not be pressed too hard on the wire.
(iv) The wire of the potentiometer should be thoroughly cleaned.

Experiment – 6

AIM :- To determine the resistance of a galvanometer by half-deflection method and to find its figure of merit.

Apparatus :- A galvanometer, a voltmeter, a battery, two resistance boxes, (5000Ω & 500 Ω) two one way keys and connecting wires.

Theory :- (i) Resistance of galvanometer by half deflaction method :-

$$G = \frac{R.S}{R-S} = \text{....................} \quad (i)$$

When R>> S then R-S~ R and from equation (i) we get

$$G=S$$

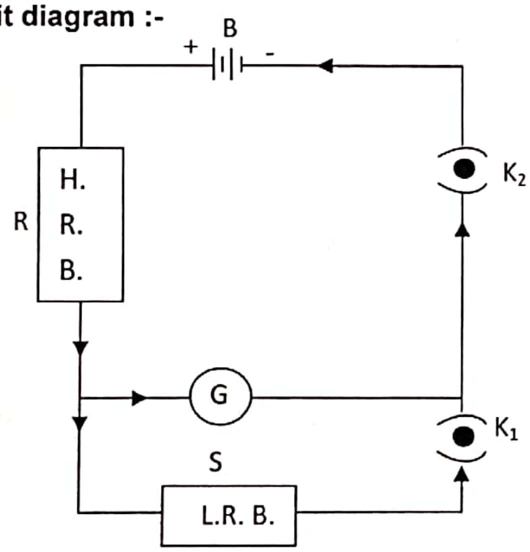
(ii) The figure of merit K is Define as the current required to produced one division in the galvanometer :-

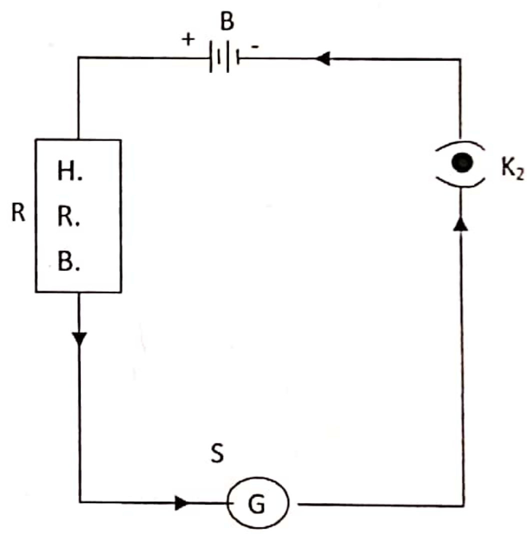
$$K = \frac{E}{(R+G)\theta'} = \text{.........................} \quad (ii)$$

Where R = Resistance of H.R.B. S= Resistance of L.R.B E = E.m.f. of battery

θ = Galvanometer Deflection K = Figure of merit

Circuit diagram :-





Observation Table :- **E = ... Volt**

S.N.	Resistance in H.R.B. (R) (ohm)	Deflection in galvanometer (θ)	Half deflection in galvanometer ($\theta/2$)	Resistance in L.R.B. (S) ohm	Galvanometer resistance $G=\frac{RS}{R-S}$ (ohm)	Figure in merit $K=\frac{E}{(R+G)^{\circ}}$ Amp./Divi.
1						
2						
3						

Result :-

(i) Resistance of galvanometer by half deflection method, G = ... ohm.

(ii) Figure of merit, K = ... Amp./Divi.

PRECAUTIONS :-

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

(ii) Ensure that the plugs of resistance box are tight.

(iii) Initially a high resistance from the resistance box should be introduced or else a small resistance can damage the galvanometer.

POSSIBLE SOURCES OF ERRORS :-

(i) The screw of the instruments may be loose.

(ii) The plugs of galvanometer may not be tight.

(iii) The galvanometer divisions may not be of same size.

Experiment – 7

Aim :- To find the focal length of a concave mirror by u-v method.

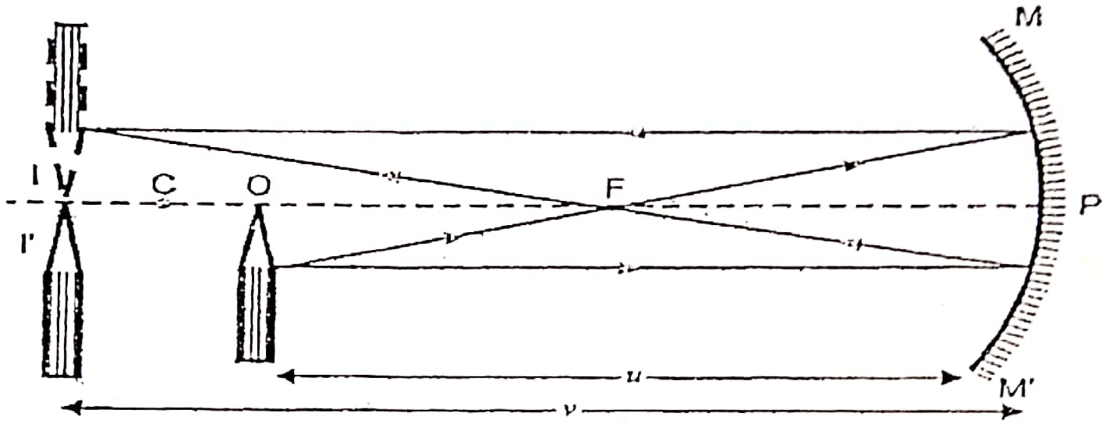
Apparatus :- An optical bench, one mirror holder, two needles, concave mirror, etc.

Theory :- The relation between the object distance u, the image distance v and the focal length f of a concave mirror is given as –

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

f = focal length u = Object Distance v- Image distance

Ray Diagram :-



Observation table :-

S.N.	Position of the			Object Distance (u) (cm.)	Image Distance (v) (cm.)	$\frac{1}{u}$ (cm.)$^{-1}$	$\frac{1}{v}$ (cm.)$^{-1}$	f = $\frac{uv}{u+v}$ (cm.)	Mean Fochal length f (cm.)
	Miror (M) (c.m.)	Object (O) (cm.)	Image (I) (cm.)						
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

Mean value of focal length (f) = ... c.m.

Calculation :- (i) $f_1 = \frac{u.v}{u+v}$ = ... cm (ii) $f_2 = \frac{u.v}{u+v}$ = ... cm

(iii) $f_3 = \frac{u.v}{u+v}$ = ... cm (iv) $f_4 = \frac{u.v}{u+v}$ = ... cm

(v) $f_5 = \frac{u.v}{u+v}$ = ... cm (vi) $f_6 = \frac{u.v}{u+v}$ = ... cm

(vii) $f_7 = \frac{u.v}{u+v}$ = ... cm (viii) $f_8 = \frac{u.v}{u+v}$ = ... cm

(ix) $f_9 = \frac{u.v}{u+v}$ = ... cm (x) $f_{10} = \frac{u.v}{u+v}$ = ...

cm

Mean focal length f = $\frac{f_1+f_2+f_3+f_4+f_5+f_6+f_7+f_8+f_9+f_{10}}{10}$ = ... cm

Result :- (1) Mean value of focal length by calculation = ... cm.

(2) Focal length of the given concave mirror as determined from the graph-

(i) (u-v) Hyperbola, (f) = ...cm.

(ii) (u-v) Intercepts on axes, (f) = ... cm.

(iii) $\frac{1}{u}$ v / s $\frac{1}{v}$ (straight line), (f) = ... cm.

Precaution :-

(i) The upright supporting the needles and the mirror should be rigid.

(ii) The tips of needles and the pole of the mirror should be at the same horizontal level.

(iii) Parallax of the image and object neediest should be removed tip to tip.

(iv) The principal axis of the mirror should be horizontal and parallel to the length of the scalw.

Experiment – 8

Aim :- To find the focal length of a convex lens by plotting of graphs between u and v and between 1/u and 1/v.

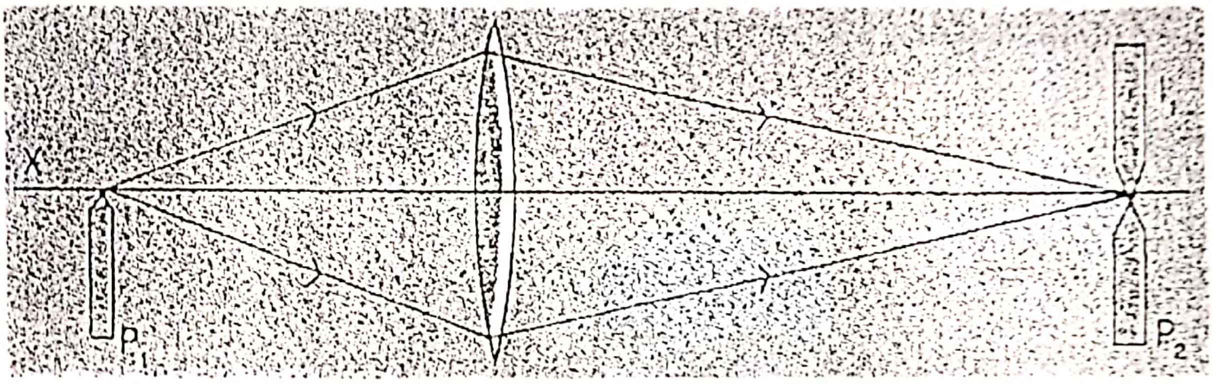
Apparatus :- An optical bench, one lens holder, two needles, convex lens, etc.

Theory :- The relation between the object distance u, the image distance v and the focal length f of a convex lens is given as-

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

f = focal length u = Object Distance v- Image distance

Ray diagram :-



Observation table :-

S.N.	Position of the			Object Distance (u) (cm.) LO	Image Distance (v) (cm.) LI	$\frac{1}{u}$ (cm.)$^{-1}$	$\frac{1}{v}$ (cm.)$^{-1}$	$f = \frac{uv}{u+v}$ (cm.)
	Lens (L) (c.m.)	Object (O) (cm.)	Image (I) (cm.)					
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Calculation :-(i) $f_1 = \frac{uv}{u-v} =$ .... cm (ii) $f_2 = \frac{uv}{u-v} =$ .... cm

(iii) $f_3 = \frac{uv}{u-v} =$ .... cm (iv) $f_4 = \frac{uv}{u-v} =$ .... cm

(v) $f_5 = \frac{uv}{u-v} =$ .... cm (vi) $f_6 = \frac{uv}{u-v} =$ .... cm

(vii) $f_7 = \frac{uv}{u-v} =$ .... cm (viii) $f_8 = \frac{uv}{u-v} =$ .... cm

(ix) $f_9 = \frac{uv}{u-v} =$ .... cm (x) $f_{10} = \frac{uv}{u-v} =$ ....

cm

Mean focal length $f = \frac{f_1+f_2+f_3+f_4+f_5+f_6+f_7+f_8+f_9+f_{10}}{10} =$ .... cm

Result :- (1) Mean value of focal length by calculation = ... cm.

(2) The focal length of the given convex lens as determined from the graph-

(i) (u-v) Hyperbola, (f) = ...cm.

(ii) $\left(\frac{1}{u} \text{ v / s } \frac{1}{v}\right)$ (straight line), (f) = ... cm.

Precaution :-

(i) The uprights carrying the lens and the needles should be straight.

(ii) The tips of needles should be as high as the optical centre of the lens .

(iii) Parallax should be removed tip to tip.

(iv) The image and object needless should not be interchanged for different sets of observation.

Experiment – 9

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

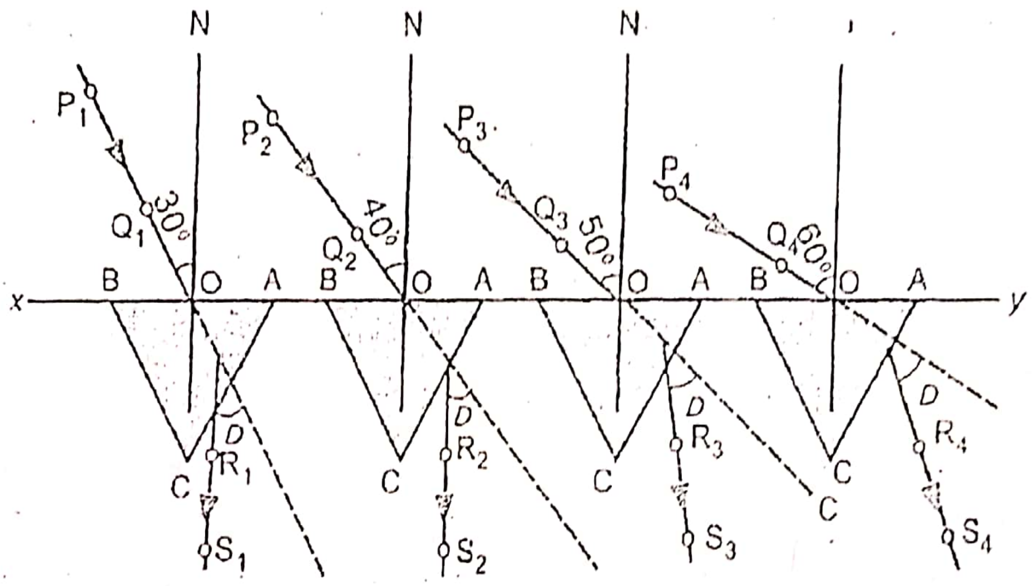
Apparatus :- A drawing board, a sheet of paper, glass triangular prism, pins, a half meter scale, a graph paper, a protector etc.

Theory :- The refractive index μ of the material of the prism is given by the relation :-

$$\mu = \frac{\text{Sin}\,\frac{A+D_m}{2}}{\text{Sin}\,\frac{A}{2}}$$

D_m = minimum deviation angle A = Prism angle

Diagram :-



Observation :-

S.N	Angle of incidence (i)	Angle of deviation (D)
1	30°	
2	35°	
3	40°	
4	45°	
5	50°	
6	55°	
7	60°	

Calculation :-

$$\mu = \frac{\text{Sin}\,\frac{A+D_m}{2}}{\text{Sin}\,\frac{A}{2}} = \text{.......................}$$

Result :-

(i) The angle of deviation D first decreases with the increase in the angle of incidence, attains a minimum value and then increases with further increase in the angle of incidence as indicated in the (D-i) graph.

(ii) The refractive index of the prism material (glass) = ...

Precaution:-

(i) The separation between the pins should not be less than 8 cm.

(ii) The angle of incidence should lie between 30^0 to 60^0.

Experiment – 10

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

Apparatus :- A marker, glass slab, travelling microscope.

Theory :- Refractive index $\mu = \frac{Real\ Deapth}{Apperent\ Deapth}$

If reading of real depth at the bottom of the slab is r_1 and reading at cross due to reflection is r_2 and at the top of slab reading is r_3.

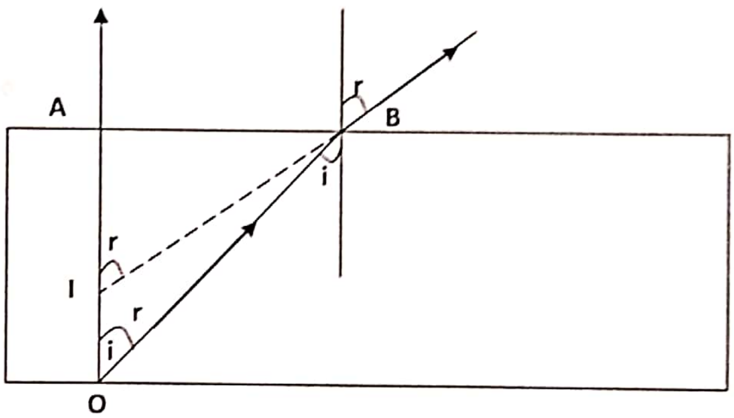
Then

real depth = $r_3 - r_1$ Apparent depth = $r_2 - r_1$

There for, refractive index of glass-

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

Diagram :-



Observation :-

Least count of travelling microscope = $\frac{\text{value of one main scale division}}{\text{Total vernier scale division}}$ = ... cm

Obsevation table :-

S.N	Reading without glass slab			Reading with glass slab			Reading with glass slab and Powder		
	M.S.R. S cm.	V.S.R. n	reading r_1 = S+nxa cm	M.R.S. S cm.	V.S.R. n	reading r_2 = S+nxa cm	M.R.S. S cm.	V.S.R. n	reading r_3 = S+nxa cm
1									
2									
3									

Mean value r_1 = ... cm r_2 = ... cm r_3 = ... cm

Calculation :-

$$\mu = \frac{Real\ Depth}{Apperent\ Depth}$$

Real depth $d_r = r_3 - r_1$ = ... cm   Apparent depth $d_r = r_3 - r_1$ = ... cm

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

Result - The refractive index of the glass slab using travelling microscope is determined as ....

Precaution :-

(i) Least count of the travelling microscope should be carefully calculated.

(ii) Eye piece should be adjusted such that cross wires are distinctly seen.

(iii) Only a thin layer of powder should be spread on the top of slab.

(iv) Cross wire, cross should be set on the ink cross mark on the paper.

Experiment -11

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

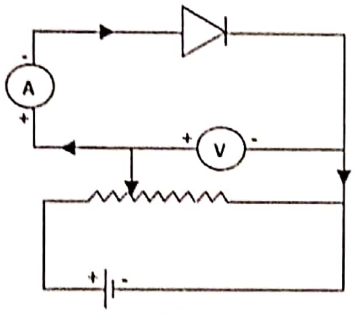
Requirement :- One p-n junction diode, a battery, a rheostat, a resistance, a milli ammeter, a micro ammeter, two voltmeter, connecting wires etc.

Theory :-

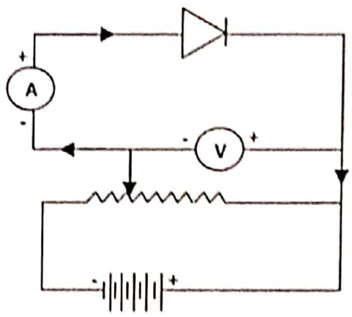
Forward biasing - In forward biasing p- type of crystal in connected to the +ve of battery and n-type is connected to the -ve of battery.

Reverse biasing - In reverse biasing p-type of crystal is connected to - ve of battery and n-type is connected to +ve of battery.

Circuit diagram :-



Forward Bias



Reverse Bias

Observation :-

Forward bias :-

Least count of Voltmeter = $\frac{\text{Range}}{\text{No of division}}$ = ... (volt.)

Least count of ammeter = $\frac{\text{Range}}{\text{No of division}}$ = ... (amp.)

Reverse bias :-

Least count of Voltmeter = $\frac{\text{Range}}{\text{No of division}}$ = ... (volt.)

Least count of Ammeter = $\frac{\text{Range}}{\text{No of division}}$ = ... (amp.)

Observation :-

S.N.	For Forward Bias				For Reverse Bias			
	Voltmeter Reading V_f (Volt)		Ammeter Reading I_f (ma)		Voltmeter Reading Vr (Volt)		Ammeter Reading I_r (μa)	
	Division	Divi. x L.C.	Division	Divi. x L.C.	Division	Divi. x L.C.	Division	Divi. x L.C.
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Precaution :-

(i) Never cross the limits specified by the manufacturer or the diode will get damaged.

(ii) Voltmeter and ammeter of appropriate least count and ranges should be selected.

(iii) The battery connection of p-n junction diode should be right.

(iv) The variation in V should be done should be right.

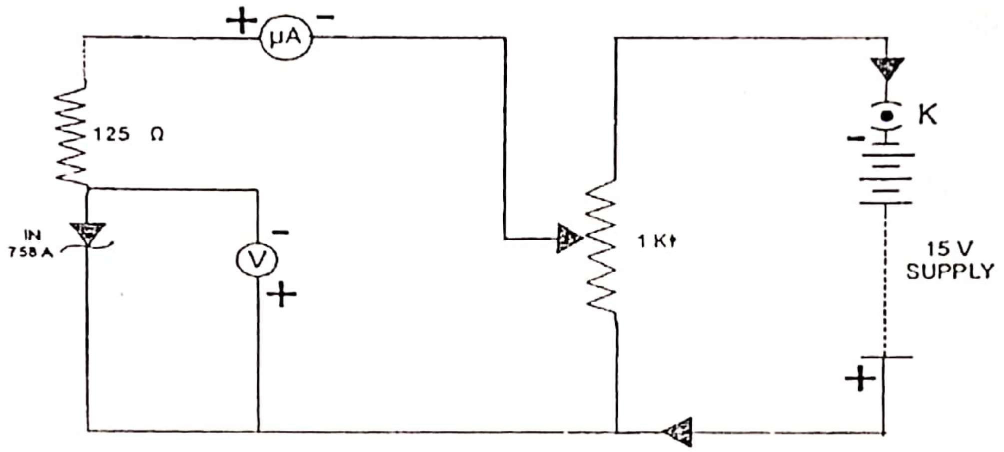
Experiment – 12

AIM :- To draw the determine of a Zener diode and to determine it break down voltage.

Apparatus :- One p-n junction Zener diode, a power supply with potential divided 0-15 v, a resistance of 125Ω, ammeter of range 0-15 mA, a voltmeter 0-15 with least count of 0-1v preferably a digit multimeter, connecting wires.

Theory :- Zener diode is a semiconductor diode in which the n-type and p-type sections are heavily doped. This heavy doping results in a low value of reverse breakdown voltage. Zener diode is always operated in the reverse bias. In the forward bias, it works as normal diode.

Circuit diagram :-



Observation :-

Least count of Voltmeter = $\frac{\text{Range}}{\text{No of division}}$ = ... (volt.)

Least count of ammeter = $\frac{\text{Range}}{\text{No of division}}$ = ... (amp.)

Observation table :-

S.N	Voltmeter reading V (Volt)		Ammeter I (ma)	
	Division	Division X L.C.	Division	Division X L.C.
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Calculation :-

From graph

the breakdown voltage is Z_{ev} = ... volt.

Result :- The reverse breakdown voltage = ... volt

Precautions :-

(i) Voltmeter and multi ammeter of appropriate least count and range should be selected for use

(ii) The zero error if any in the instruments should either be made nill by adjusting the pointer by a screw driver or connection should be applied.

Experiment No. 14

AIM: To convert a given galvanometer (of known resistance and figure of merit) into a voltmeter of (0 - 3 V range and to verify the same.

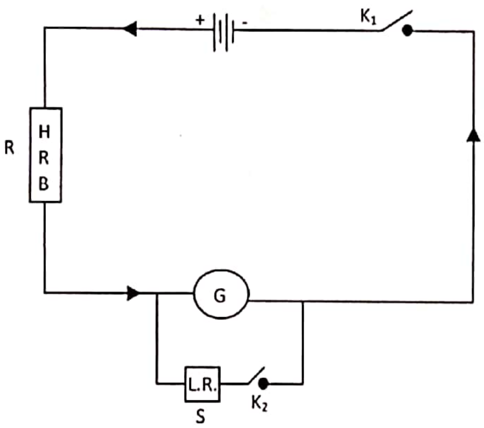
Requirements:

A galvanometer, a voltmeter of given range, battery of two cells. Two resistance boxes (5000 Ω and 500Ω), two one way keys, a rheostat, connecting wire.

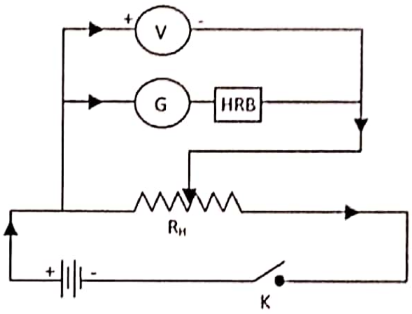
Theory: (i) The resistance of galvanometer $G = \frac{RS}{R-S}$

(ii) Figure of merit $k = \frac{E}{(R+G)\theta}$ amp/division

(iii) Full deflection current in galvanometer $I_g = nK$



Circuit for G & K



Circuit for conversion

Observation table for G & K

S.N	Resistance in H.R.B. (R) (ohm)	Deflection in galvanometer (θ)	Half deflection in galvanometer ($\theta/2$)	Resistance in L.R.B. (S) ohm	Galvanometer resistance $G=\frac{RS}{R-S}$ (ohm)	Figure in merit $K=\frac{E}{(R+G)^{\circ}}$ Amp./Divi.
1						
2						
3						

Calculations:

Resistance of galvanometer = (G) .... ohm

Figure of merit (k) = ... A/division

No. of divisions of galvanometer = (n) = ...

$I_g = nk$ = ...A

Range (V) = ... 3V

$R = \frac{V}{I_g} - G$ = ... Ω

Observation table of conversion 1 division of galvanometer = 0.1 V

S. No.	Voltmeter reading V	Galvanometer reading		Difference (V-V')
		in Div	V'	
1				
2				
3				
4				

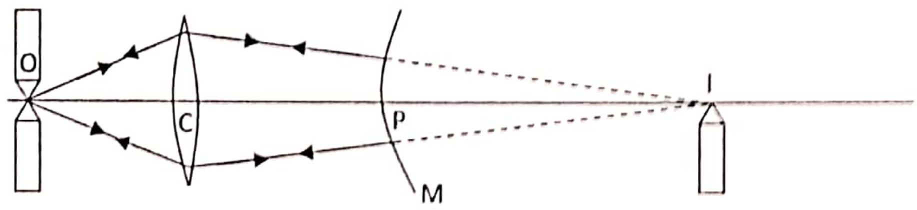
Experiment No. 15

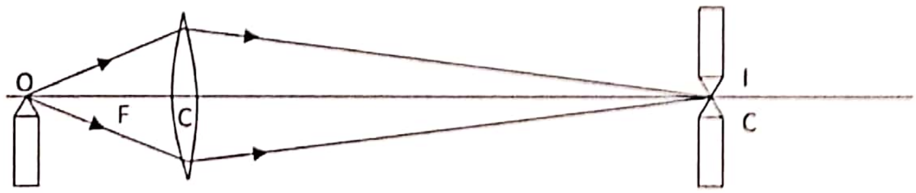
AIM : To find the focal length of a convex mirror, using a convex lens.

Requirements: Optical bench with two pins, a convex lens, convex mirror, lens holder, mirror holder and four uprights.

Theory: A convex mirror always form a virtual image and therefore its focal length cannot be found directly. To find the focal length, indirect method is used.

The focal length of a convex mirror $f = \frac{R}{2}$, where R is the radius of curvature and is equal to PI.





Record readings:

Rough focal length of the convex lens = ... cm

S. No.	Position of Convex mirror P (cm)	Position of Image needle I (cm)	Radius of curvature (R)	Focal length f= R/2 (cm)
1				
2				
3				
4				

Result : The focal length of the given convex mirror is .... cm

Precautions:

(i) The uprights should be vertical (use spirit level to make the optical bench horizontal)

(ii) Parallax should be removed tip to tip.

(iii) Index correction should be applied to R the radius of curvature of the mirror.

Sources of Error:

(i) The upright may not be vertical.
(ii) The parallax removed may not be perfect