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

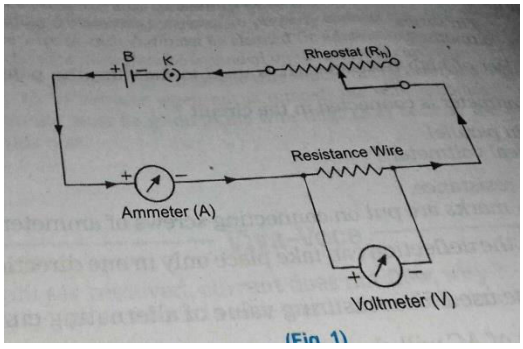
$$V = R\ I$$

$$R = V / I$$

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:

$$R / L = \quad \text{Ohm /cm}$$

Circuit Diagram : **Graph : To be Pasted After plotting onGraph 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

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

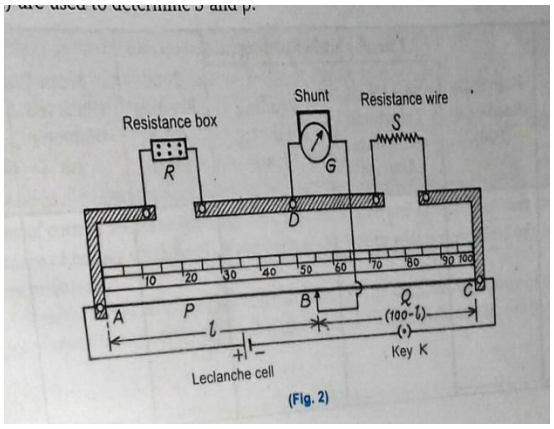
Or $$S = R(100-l/l)$$

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

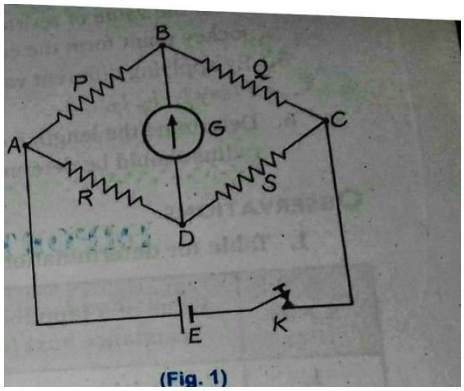
Where ρ is the specific resistance of the material of the wire .From these

$P = S \pi r2 /L$

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

Precautions: 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 3.

Aim : 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.

Theory /Formula Used: 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:

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

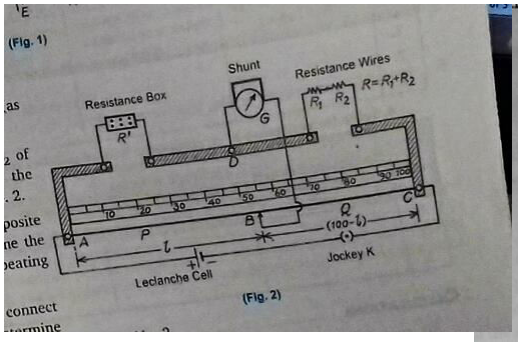
The values of resistances of the two wires are determined separately and also combining them in series or in parallel.

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

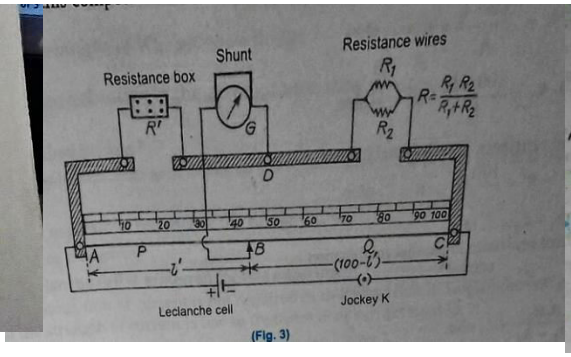
$$S = R (100-l/l)$$

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.

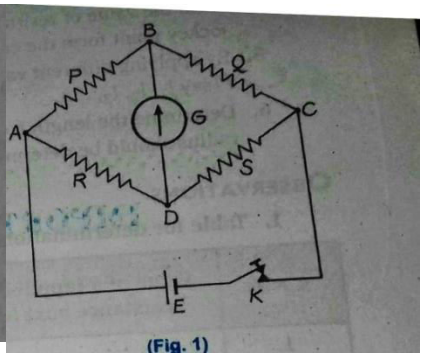
Circuit Diagram:



(Fig. 2)



(Fig. 3)



(Fig. 1)

Observations:

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(100-L1) /L1 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(100-L2) /L2 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(100-L') /L' 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(100-L'') /L'' 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.

Precautions: 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

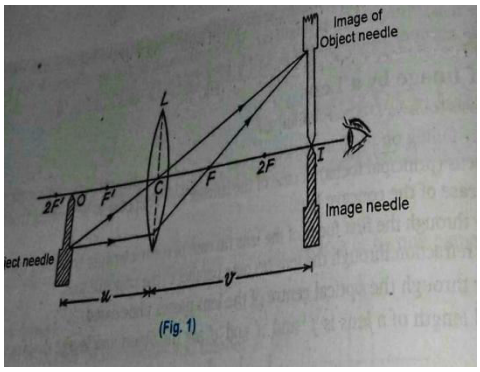
or (between 1/u and 1/v).

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

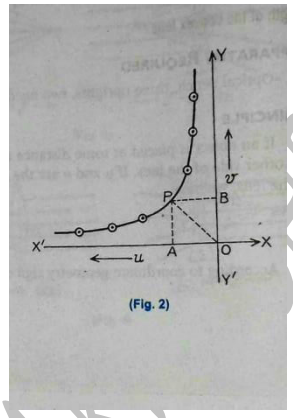
Theory /Formula Used: If an object is placed at some distance (greater than the focal length of the convex lens) , the real image is formed on the other side of the lens . If u and v are the object distance and image distance respectively, then for the focal length f of the lens , we have the formula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

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

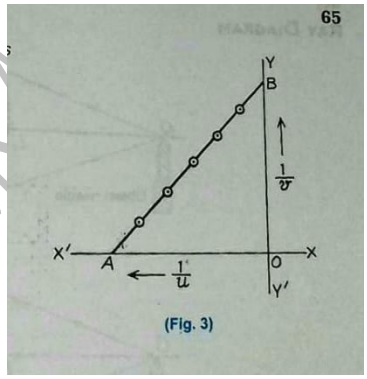
Ray Diagram :



(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.

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

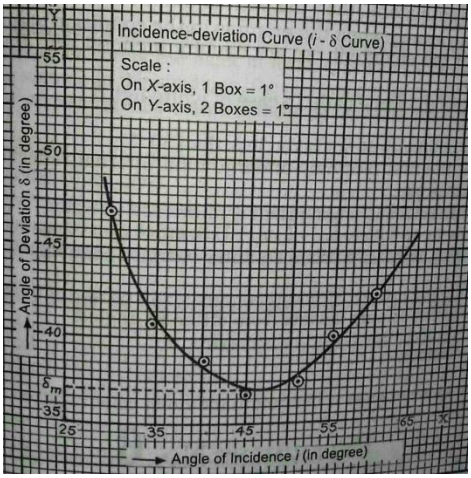
Theory /Formula Used: When a light ray falls on one face of a prism, After refractions on two faces, it emerges out of the prism.

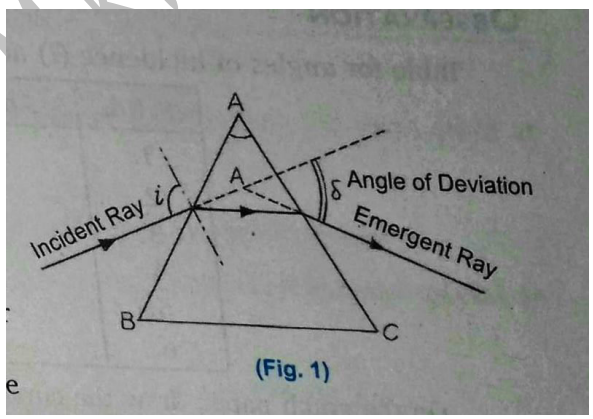
The angle between the incident ray and the emergent ray is called the angle of deviation ( ). The angle of deviation due to a prism depends upon the angle of incidence. On increasing the angle of incidence ,the angle of deviation first decreases, becomes minimum for some value of angle of incidence and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

$$\mu = \sin (A+ \delta m)/2 \ / \sin A/2$$

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





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 prislm use the formule:

Refractive index = Sin (A+ δm) /2 / Sin A/2

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

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

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.