EXPERIMENT – 5

METRE BRIDGE

AIM

To find resistance of a given wire / standard resistor using metre bridge.

APPARATUS

Metre bridge, Galvanometer, Resistance box, one way key , a cell ,unknown resistance, screw gauge , connecting wires and jockey

FORMULA

Metre bridge is a form of Wheatstone bridge, under balanced conditions.

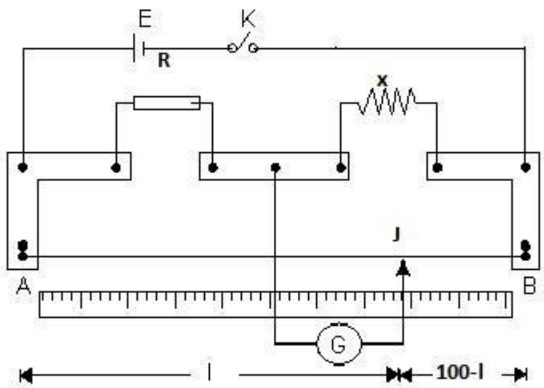
$$P/Q = R/X$$

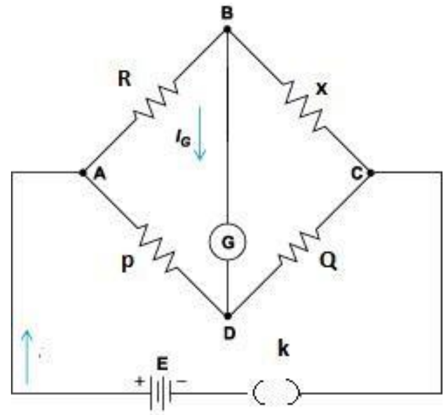
For a metre bridge, the expression becomes $X = R(\frac{100-l}{l})$

Where, X is unknown resistance

R is known resistance

l is the balancing length





PROCEDURE

1. Arrange the apparatus and assemble it as shown in the figure
2. Close the key and test the connection. Take out 1 or 2 ohms resistance from the resistance box and touch the jockey at two ends of the wire. If the deflection in the galvanometer is in opposite direction, the connections are correct.
3. Move the jockey over the wire and find the position for which the galvanometer shows the zero deflection. Note the value of R.
4. Repeat the experiment for getting more values

SOURCES OF ERROR

1. The meter bridge wire may not be of uniform area of cross section through out its length.
2. The thick copper strips at the two ends of the wire offer some resistance.
3. As current passes through the wire, it gets heated and its resistance can change.
4. Plugs in the resistance box may need to be tight.
5. The screw gauge may have errors

PRECAUTIONS

1. The balance point must be confined to the middle region of the wire (40-60 cm)
2. Plugs should be tight.
3. The jockey should not touch the wire, when it is moved to and fro.
4. Keep the key of the battery closed only when the reading is being taken and open it immediately after that.
5. Avoid backlash error by rotating the circular scale in many directions.

OBSERVATIONS

Least count of Metre Bridge =-----------------------cm

To determine the unknown resistance X

S NO	R [ohms}	Balancing length l [cm]	($100-l$) [cm]	$X = R \frac{[100-l]}{l}$ (ohms)
1				
2				
3				
4				
5				

Mean value of resistance X =---------------------- ohms

CALCULATIONS

Length of the wire L= -----------cm

Resistance of the wire =

RESULT

Resistance of the wire = ---------------------Ω

ORAL QUESTIONS WITH ANSWERS

1 Why is it called metre bridge?

Ans. Since the bridge uses one metre long wire, it is called a metrebridge.

2 Why a metre bridge is also called a slide wire bridge?

Ans. Since a jockey is slided over the wire (during the experiment) it is also called a slide wire bridge.

3 What is null point?

Ans. It is a point on the wire keeping jockey at which the galvanometer gives no direction.

4 Why is it advised to keep null point between 40 cm and 60 cm?

Ans. It is done to minimize the effect of neglecting of end resistances in calculation.

5 What are end resistances?

Ans. The resistances of thick copper strips which keep the two ends of the wire pressed are called end resistances.

6 What is an ideal value of null point and why?

Ans. Null point at 50 cm is an ideal null point. It make P /Q = 1.This ratio is not effected by neglecting end resistance of equal values at the two ends.

7 How can a null point be obtained near 50 cm?

Ans. It can be done by keeping value of R very near the value of X.

8 Why the bridge method for resistance measurement is better than Ohm's Law?

Ans. It is so because the bridge method is a null method and more sensitive.

9 Why should current be passed for a short time?

Ans. Continuous current will cause unnecessary heating effecting values of resistances used.

10 Why the metre bridge is suitable for measuring moderate resistances?

Ans. The bridge is more sensitive for moderate values.

EXPERIMENT-6

METRE BRIDGE –(2)

AIM

To verify the laws of combination of resistances (in series) using Metre bridge

APPARATUS

Metre Bridge, Galvanometer, Resistance box, one-way key, a cell, two unknown resistance wires, connecting wires and jockey

FORMULA

For a metre bridge, the resistance can be determined by the formula

$X = R(\frac{100-l}{l})$

Where

X is unknown resistance

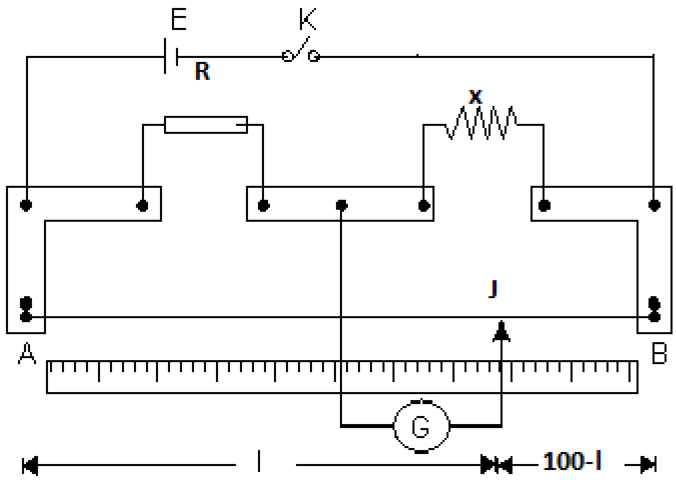
R is known resistance

l is the balancing length

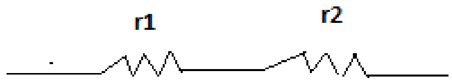
1. When two resistances R1&R2 are connected in series, then the total resistance R_s will be

$\mathbf{R_s = R_1+R_2}$

CIRCUIT DIAGRAM



(a) Series combination



PROCEDURE

1. Mark the two given resistance coil as R1 and R2.
2. Connect R1 in the right gap of metre bridge and determine its resistance as explained in metre bridge1
3. Repeat the similar observation for resistance coil R2 and determine its value.
4. Connect R1 and R2 in series in the right gap of the Meter bridge as shown in the figure and find the resistance of combination.
5. Connect the two coils R1 and R2 in parallel in the right gap of the Meter bridge as shown in the figure and find the resistance of combination.
6. Record the observations in the observation table..

SOURCES OF ERROR

1. The metre bridge wire may not be of uniform area of cross section through out its length.
2. The thick copper strips at the two ends of the wire offer some resistance.
3. As current passes through the wire, it gets heated and its resistance can change.
4. Plugs in the resistance box may nit be tight

PRECAUTIONS

1. The balance point must be confined to the middle region of the wire (40-60 cm)
2. Plugs should be tight.
3. The jockey should not touch the wire, when it is moved to and fro.
4. Keep the key of the battery closed only when the reading is being taken and open it immediately after that.

OBSERVATIONS

Least count of Metre Bridge = -------------------- cm
Given R_1 = --------------------Ω
R_2 = --------------------Ω

To determine the resistance

Unknown resistors	S no	R [ohms]	Balancing length l [cm]	100-l [cm]	$R_1 = R\frac{[100-l]}{l}$ (Ω)	Mean resistance [Ohms]
R1 & R2 in Series	1 2 3 4					

R_1 = -------------

R_2 = --------------

CALCULATIONS

1.In series

Experimental value, Rs = ----- -------------- ohm

Theoretical value, $Rs = R_1+R_2$ = ----- -------------- ohm

RESULT

1. Value of resistance in **series R_s** = --------------------- **Ω**
2. Within limits of experimental error, experimental and theoretical values of Rs are same. Hence, law of resistances in series is verified.

ORAL QUESTIONS WITH ANSWERS

1 Why is it called metre bridge?

Ans. Since the bridge uses one metre long wire, it is called a metrebridge.

2 Why a metre bridge is also called a slide wire bridge?

Ans. Since a jockey is slided over the wire (during the experiment) it is also called a slide wire bridge.

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Ans. It can be done by keeping value of R very near the value of X.

8 Why the bridge method for resistance measurement is better than Ohm's Law?

Ans. It is so because the bridge method is a null method and more sensitive.

9 Why should current be passed for a short time?

Ans. Continuous current will cause unnecessary heating effecting values of resistances used.

10 Why the metre bridge is suitable for measuring moderate resistances?

Ans. The bridge is more sensitive for moderate values.

EXPERIMENT – 7

REFRACTIVE INDEX OF A LIQUID

AIM
To find the refractive index of a liquid (water) by using convex lens and plane mirror.

APPARATUS
A convex lens, A plane mirror, A clamp stand, A spherometer, An optical needle, A plumb line, A meter scale, Water

THEORY
(a) If a convex lens of focal lengthf$_1$ is placed over a few drops of water ,then focal length of the Plano-concave formed of water is given by

$$\frac{1}{f} = \frac{1}{F} - \frac{1}{f1}$$

Where F is the focal length of the combination of two lenses, i.e, convex lens and plano-concave lens form water.

(b) The refractive index of water can be give us

$$\mu = 1+ \frac{R}{f}$$

Where R is the radius of curvature of concave surface of the plano-concave lens formed of water, i.e.it I radius of curvature of convex surface of convex lens.

(c) The radius of curvature R of the convex surface of the lens is given by

$$R = \frac{l2}{6h} + \frac{h}{2}$$

Where l is the mean distance between the two legs of the spherometer and h is the height of the central above the plane of outer legs.

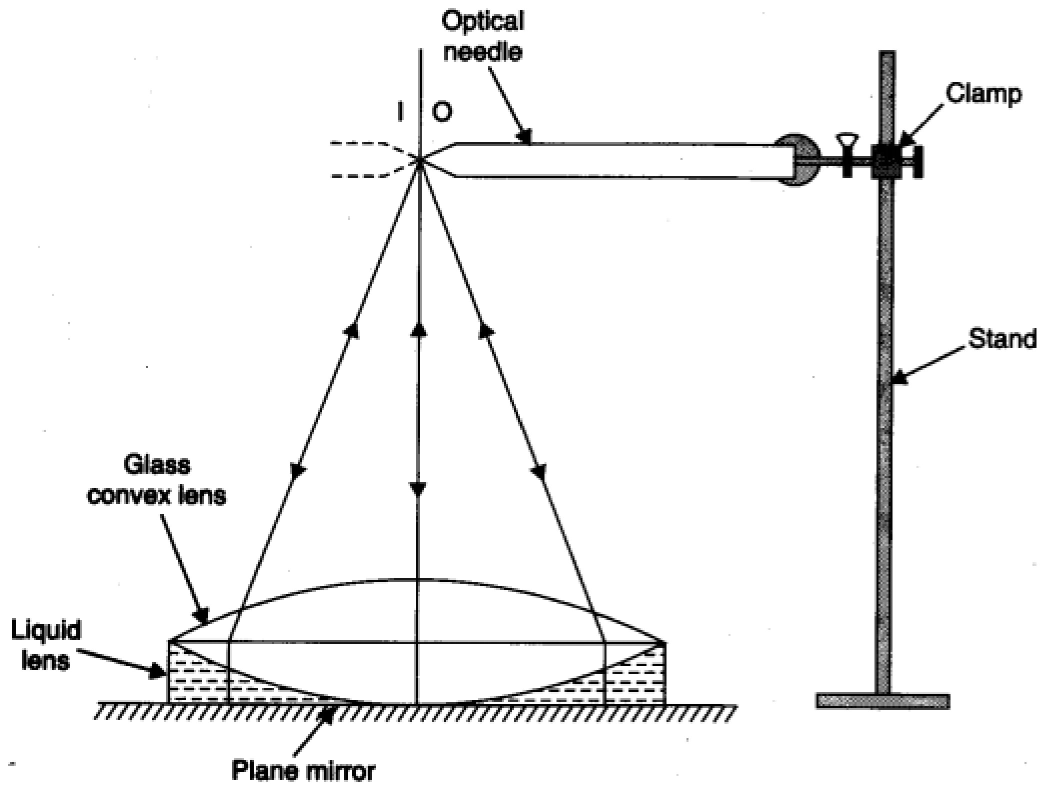


Fig. Focal length of glass convex lens and liquid lens combination.

SOURCE OF ERROR

1. The distance measured with the help of plump line may not have been measured correctly.
2. The parallel may not have been removed tip to tip.
3. The backlash error may not have been avoided.

PRECAUTIONS

1. The parallel should be removed tip to tip.
2. The convex lens of a large focal length should be used.
3. The lens and plane mirror should be cleaned before used.
4. The screw of the spherometer should be moved in one direction to avoid backlash error.

PROCEDURE

(A) **Determination of the focal length of the convex lens (f_1)**

1. Find the rough focal length of the convex lens.
2. Take a plane mirror and clean it.Place it on the horizontal base of an iron stand fitted with a clamping arrangement.

3. Place the convex lens on the plane mirror, so that principle axis of the convex lens is along vertical.
4. Now fix the optical needle in the clamp stand and hold it horizontally above the convex lens, so that tits tip vertically above the optical center of the lens as shown in Fig.2.6 (a) Adjust the height of the needle equal rough focal length of the convex lens. By keeping the eye at a distance of about 30 cm from the needle look for image of the needle formed by convex lens and plane mirror.
5. Adjust the position of the needle 0 so that there is no parallex between the tip of the needle 0 and its image l shown in Fig.2.6(a).
6. Using a plumb line and meter scale, measure the distance of the tip of the needle from the center of the up surface of the convex lens. Let it be a ‘a’. Now remove the convex lens and measure the distance of tip of the needle from the plane mirror. Let it ‘b’. Then focal lens of the convex lens $f_1 = \frac{a+b}{2}$
7. Repeat the step 1 to 6 at least two times more and take the two more observations.
8. Record all the observation s in the table.

(B) <u>Determination of focal length of the plano-concave lens formed by water</u>

9. Pour some water whose refractive index u is to be determined over the plane mirror. Now place the convex lens over the water. Let f is the focal length of the plano-concave lens of water formed between the convex lens and the plane mirror.
10. Now proceed in steps 4 to 6 to find the focal length of the combination of concave lens (f) and convex lens (f_1) {Fig.2.6(b)} Let ‘a’ and ‘b’are the distance of the upper surface of the convex lens and the plane mirror from the tip of needle {Fig 2.6 (b)} then the focal length of the combination of convex lens and plano-concave lens formed of water is given by

$$F= \frac{a'+b\prime}{2}$$

11. Repeat the steps 9 and 10 at least two times more and take two more observations.
12. Record all the observations in table.
13. After determination of focal length of convex lens f_1 and focal length of combination of convex lens and plano concave lens formed by water F. The focal length of plano-concave lens f can be calculated as

$$\frac{1}{f} = \frac{1}{F} - \frac{1}{f1}$$

<u>OBSERVATION</u>

1. Table for focal length of the convex lens (f_1)

S.no	Distance of tip of the needle from		Focal Length of convex lens $f1 = \frac{a+b}{2}$ (cm)
	Upper surface of the convex lens *a*(cm)	Upper surface of the plane mirror *b* (cm)	
1			
2			
3			

Mean Focal length $f1 = \ldots cm$

2. Table for focal length of combination of convex lens and plano- concave lens formed by water (F)

S.no	Distance of tip of the needle from		Focal Length of combination $F = \frac{a\prime+b\prime}{2}$ (cm)
	Upper surface of the convex lens *a'*(cm)	Upper surface of the plane mirror *b'* (cm)	
1			
2			
3			

Mean Focal length $F = \ldots cm$

Radius of curvature of surface of the convex lens

Mean value of $f1$ =….cm

Mean value of F =….cm

Calculate 'f' from $\frac{1}{f} = \frac{1}{F} - \frac{1}{f1}$

f =….cm

Refractive index of water by using the formula μ = $1+\frac{R}{f}$.

On putting the value of R and f, μ…………..calculated

RESULT

The refractive index of water by using convex lens and plane mirror is..

VIVA VOCE QUESTIONS

1. Define a prism.

   Ans: A prism is a portion of transparent medium bounded by three plane surfaces inclined to each other at a certain angle.
2. Define refracting edge.

   Ans: The edge at which two refracting surfaces of a prism meet, is called the refracting edge of the prism.
3. Define the angle of prism

   Ans: The angle between the two faces of a prism called the angle of prism
4. Define the base of prism.

   Ans: The triangular face containing the refracting edges of the prism , is called the base of prism.
5. Define the angle of deviation.

   Ans: The angle between the incident ray and emergent ray is called angle of deviation.
6. What is the angle of minimum deviation?

   Ans: The angle of deviation changes with angle of incidence. At a particular value of angle of incidence, it is minimum. This angle of deviation is called angle of minimum deviation.
7. Does angle of minimum deviation depend upon the angle of prism?

   Ans: Yes. As angle of prism A decrease angle of minimum deviation D_m increases and vice-versa. From the relation .

   μ= $\frac{sin\frac{(A+Dm)}{2}}{\sin A/2}$ as u is constant, if A decrease D_m increases and vice-versa.
8. Give the relation between angle of incidence i angle of emergence e, angle of deviation D and the angle of prism A

   Ans: A+D = i+ e
9. Does angle of minimum deviation depend upon the colour of the light (wavelength of the light)?

   Ans: Yes. Since the deviation for different colours are different so the value of D_m are also different for different colours.
10. Define the refraction of light ?

    Ans: The phenomenon of bending of ray of light from its straight line path when it passes from one medium to another is called refraction of light.
11. State the laws of refraction.

Ans: First law: The incident ray the refracted ray and the normal ray at the point of incidence, all lie in the same plane.

Second law: The ratio of the line of the angle of incidence to the line of angle of refraction is constant for a given pair of media.

$\frac{\sin i}{\sin r} =$ a constant $= \mu$ (refractive index)

This law is known as Snell's law.

12. Define refractive index of a medium.

Ans: It is the ratio of line of angle of incidence 'i' to the line of angle refraction 'r' i,e.

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

13. Can refractive index be defined in terms of velocity of light?

Ans: Yes. Refractive index of a medium is defined as the ratio of velocity of light in vacuum to the velocity of light in that medium.

14. What are the units of refractive index?

Ans:It is the ratio between two similar quantities and hence have no unit.

15. On what factors does the refractive index of a medium depend?

Ans:It depends upon (i) wavelength of light, (ii) surrounding medium, (iii) temperature

EXPERIMENT 8

I-V CHARACTERISTIC OF A P-N JUNCTION DIODE

AIM

To draw the *I-V* characteristic of a p-n Junction diode in forward bias

APPARATUS:

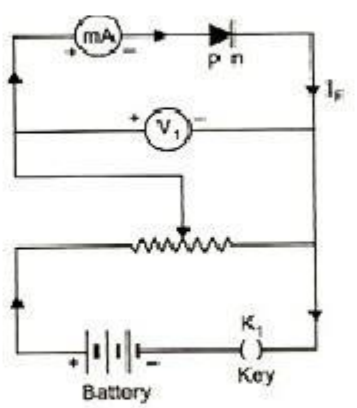
A semiconductor diode, a millimeter of range 0-50 mA, one variable power supplies (0-3 V), two voltmeters of ranges 0-3 V and 0-15 V, connecting wires.

THEORY:

A p-n junction is said to be forward biased when p-region is connected to the +ve terminal of the source of emf (battery or cell and n-region is connected to –ve terminal as shown in figure. The forward bias characteristics of p-n junctions diode shows that forward current increase s with increase in forward bias voltage. But this increase is not proportional.

DIAGRAM

Forward bias circuit of p-n junction diode



PROCEDURE:

For forward bias characteristics:-

Make a neat labeled circuit diagram as shown in fig. Make all connections neat, clean and tight according to the circuit diagram. Record the least count and zero if any mille ammeter and voltmeter V_1 of range 0-3 V.Adjust the initial position of voltmeter V_1 at zero and then increase the forward bias voltage V_F in step of 0.1V. Note the values of forward bias voltage V_F and corresponding forward current I_F. It should be noted the mille ammeter reading will start increasing from zero value when V_F crosses the limit of potential barrier. Now plot a graph between V_F along X-axis and I_F along the Y-axis.

PRECAUTIONS:-

1. All connections should be neat, clean and tight.
2. Voltmeter and ammeters of appropriate least count and range should be selected.
3. The voltage applied should not be exceeding the maximum allowed limit of the given diode.
4. Terminals of voltmeters and ammeter should be connected to the battery in the right manner.

SOURCE OF ERROR

1. The junction diode supply may be faulty.

2. Any one of the connection may be loose or connected wrongly.

OBSERVATIONS

Least count of the voltmeter V_1 (0-3V) = ...V

Least count of the milli ammeter (0-10mA) = ……mA

Zero error of the voltmeter V_1 = ...V

Zero error of milli ammeter = ...mA

Table forward bias characteristics:-

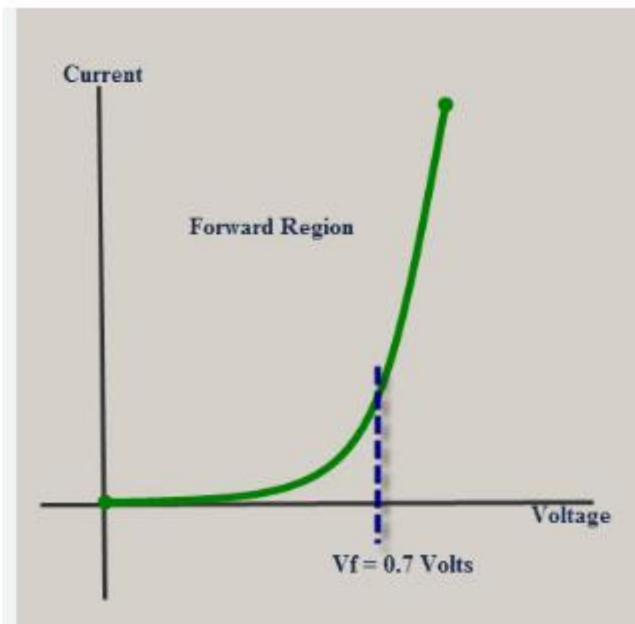
Sl. No:	For forward biasing	
	Forward bias Voltage V_F (V)	Forward current I_F (mA)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		

12		
13		
14		
15		

CALCULATIONS

1. Plot a graph between V_F and I_F taking V_F along X axis and I_F along Y axisfor theforward biase characteristics of p-n junction diode, as shown in fig.
2. Plot the graph between V_R and I_R taking V_R along X axis and I_R along Y axis on the same graph paper on which forward characteristic was plotted. This graph will give the reverse bias characteristic of given p-n junction diode as shown in fig.

Forward bias characteristic



Result :- The forward bias characteristics of the given p-n junction diode are shown on the graph paper.

VIVA VOCE

1 Define energy level in an atom.
Definite energy value of an electron in the subshell of the atom is called energy level of the atom.

2 What is SI unit of conductance?
S.I. unit of conductance is siemen(s)

3 Define a hole

A place vacated by an electron, is called a hole. It is associated with a positive charge.

3 Define an intrinsic semiconductor.
A pure semiconductor material is called an intrinsic semiconductor.

4 Which materials are commonly used as semiconductor?
Silicon and germanium are commonly used as semiconductors.

5 Define an extrinsic semiconductor.
A semiconductor material made deliberately impure is called an extrinsic semiconductor.

6 Define characteristic of a junction diode.
Graph drawn between bias voltage and circuit current of a junction diode, is called characteristic of the diode. It reveals the character of the junction diode.

7 What is biasing of a junction?
Applying an external potential difference on the faces of the junction is called biasing of the junction.

8 Why is reverse bias so called?
Because it makes free charge carries to move reverse away from junction.

9 What is junction potential barrier?
The potential difference between junction ends of the two types of semiconductors is called junction potential barrier.

10 Why is n-type semiconductor so called?
Because it contains free electrons with negative charge, as charge carries.

11 Why is p-type semiconductor so called?
Because it contains holes with positive charge, as charge carries.

12 How does the bias affect the junction resistance?
The forward bias makes junction resistance less, only 10 ohms.
The reverse bias makes resistance more, it becomes 10,000ohm.

SECTION A

ACTIVITY 1

AIM

To study the variation in potential drop with length of a wire for steady current .

APPARATUS

Potentiometer, voltmeter, battery , rheostat, one-way key and jockey.

THEORY

When a study current is flowing through the potentiometer wire of uniform cross-section area, the fall of potential V along a potentiometer wire is directly proportional to the wire L, ie, $V \alpha L$.

According to principle of potentiometer, the potential gradient $k = V/L$

SOURCES OF ERROR

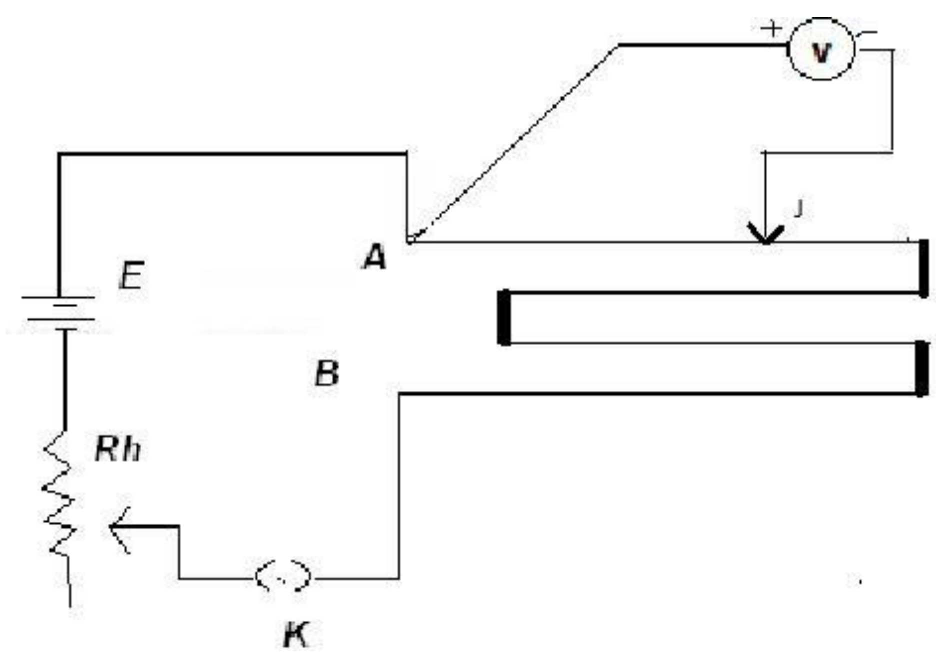
1. The potentiometer wire may not be uniform
2. The resistance of wire may change due to change in temperature

PRECAUTIONS

1.Do not drag the jockey on the wires. Press the jockey gently.

2.The current should remain fixed each sets of observations.

CIRCUIT DIAGRAM



PROCEDURE

1. Arrange the apparatus in the same manner as given in the circuit diagram.
2. Now move the jockey over the wire and observe the potential difference (V) corresponding to length (L).

OBSERVATIONS AND CALCULATIONS.

S.No	Voltmeter reading(V)	Balancing length (L) Cm	V /L(v/cm)

RESULT

The ratio V /L is constant. This quantity is called potential gradient of the wire.

ACTIVITY-2

AIM

Assemble the given electrical components

a. To find the unknown resistance using meter bridge.

b. To compare e.m.f. of two cells using potentiometer.

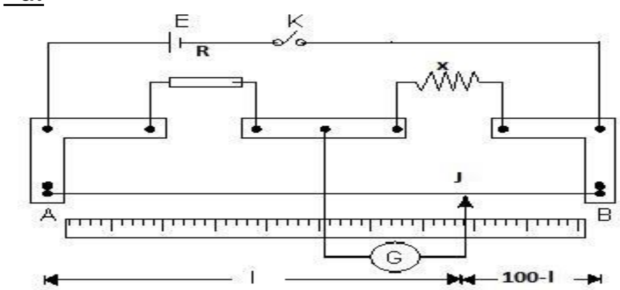
APPARATUS

a. Meter-bridge, Galvanometer, Resistance box, one way key, unknown resistance, screw gauge, jockey, connecting wires and sand paper.

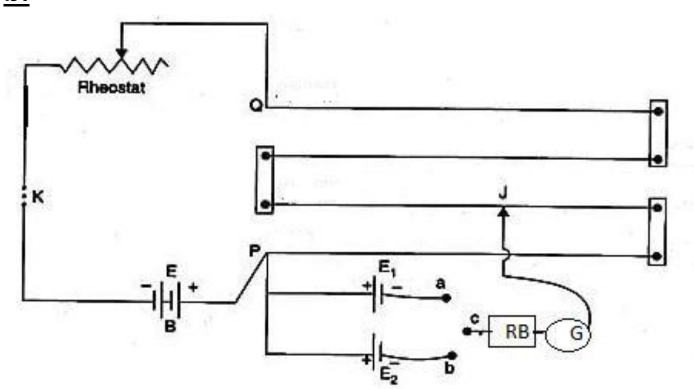
b. A potentiometer, Lechlanche cell, Daniel cell, resistance box, rheostat, galvanometer, one-way key, two way key, jockey, connecting wires and sand paper.

DIAGRAM

a.



b.



PROCEDURE

Connect the items as shown in the diagram.

INFERENCE

1. It is used for measuring an unknown resistance using meter bridge.
2. It is used for comparing e.m.f. using potentiometer

ACTIVITY-3

AIM

To measure resistance ,voltage (a.c /d.c),current(a.c) and check continuity of a given circuit using multimeter.

APPARATUS

A Multimeter, unknown resistance, carbon resistor and a battery.

THEORY

Multimeter: It is a single measuring device acting as an ammeter, a voltmeter and ohmmeter. For this reason is called AVO meter.

It can measure alternating as well as direct current and alternating as well as direct voltage in addition to resistance. For this purpose its panel is divided in to five different sections. There are many ranges in each sections so that it can measure from micro(10^{-6}) to mega(10^6) units. Rotation of a knob changes the section and the range in one section.

Rotation of knob for change in ammeter range brings shunt resistance of different values in circuit in parallel with the coil.

Rotation of knob for change in voltmeter range brings series resistance of different values in circuit in series with the coil.

Rotation of knob for change in ohmmeter range brings different resistance of different values in circuit in series with the multimeter cell.

PROCEDURE

1 For continuity test(Full scale deflection shows the continuity of the given circuit and other wise discontinuity)

(i) For continuity test

Turn the multimeter knob to ohmmeter range of least value. Touch the two lead points with each other and adjust the pointer to zero reading on resistance scale (maximum deflection).This zero lies on the extreme right of the multimeter scale. Now touch the two leads with the two points, one with each point ,between which continuity is to be tested. If the multimeter pointer gives zero value of the resistance ,the two points under test have continuity. In case of a loose contact the pointer will not come to zero and read some resistance value. If there is some break (discontinuity) in-between he points, the pointer will not move at all. It will stay at extreme left of the multimeter scale which corresponds to infinite resistance (no current from the multimeter cell).

(ii) Measurement of D.C voltages

Turn the multimeter knob to D.C voltage range of 15 V (maximum voltage on battery eliminator is 12V).Connect the black wire lead(connected to negative of multimeter) to the negative output terminal of the battery eliminator. Connect the red wire lead (connected to positive of multimeter) to the positive out put terminal of the battery eliminator.

The battery eliminator has different tapping connected to out put terminal with eliminator panel knob. These tapping have out put as 1.5V ,3.0 V,..... ,9V,10V and 12V.

Keeping eliminator panel knob at zero switches on the eliminator. The multimeter will give zero reading.

Rotate the panel knob to different tapping one by one. Note the corresponding multimeter reading. The reading may not be the same as marked on tapping. It is for this reason that a voltmeter is always used for noting the eliminator output while using it in some experiment.

Diagram

Symbols

OBSERVATIONS:

S.No	Components used	Reading in multimeter
1	Resistor	
2	Resistance wire	
3	Cell(dc)	
4	AC voltage	
5	AC current	

CONCLUSION: Resistance , voltage(ac/dc) and ac current was measured .

ACTIVITY 4

Aim

To identify a diode, a transistor, an IC, a resistor and a capacitor from a mixed collection of such items.

APPARATUS

Diode, a transistor, an IC, a resistor and a capacitor.

THEORY

Diode, resistor and capacitor are two terminal devices. A transistor has three terminals and an IC has minimum of eight legs.

The two terminal devices are identified by their characteristics.

Resistor

When connected to any d.c circuit, it shows a constant flow of current.

Capacitor

A capacitor when connected in any d.c circuit, a multimeter set at R shows initially a full scale deflection which decays to zero very quickly.

A diode conducts only when forward biased and does not conduct when reverse biased

PROCEDURE

1. **To identify an IC-** From the collection of the given items, pick the one having more than three legs (or pins). It is an IC.
2. **To identify a transistor-** After having identified the IC, now pick the item having three legs. It is a transistor. A transistor is a component which has three legs. It will be either a component having cylindrical shape with metal casing or a component black in colour.
3. **To identify the resistor, capacitor, juncton and diode and LED:-**Now all the remaining items will be two terminal devices and any one of them may be a resistor, capacitor, a junction diode or an LED. These item can be distinguished from each other by using a multimeter as an ohmmeter.
4. Set the multimeter as an ohmmeter. Touch the probes to the two ends of each items and observe the deflection on the resistance scale. After this, inter change the two probes and again observe the deflection.

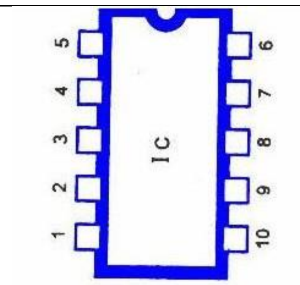
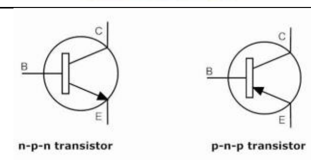
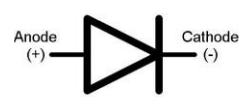
   a. If the same constant deflection is observe in the two cases(before and after interchanging the probes) the item under observation is a **resistor.**

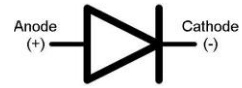
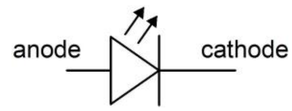
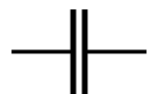
b. On touching the probes, if a large deflection is observed, which then gradually decrease to zero the item under observation is a capacitor. It may be pointed out the capaCitor will show the above type of behaviour only if its value is of the order of a hundreds of microfarad. In case the capacitor has a value of a few pF, no such behaviour will be observed. In case of such a capacitor, the deflection will become zero within no time.

c. If unequal deflection are observed in two cases (before and after reversing the probes), the item under observation is a **junction diode**.

d. If unequal deflections are observed in two cases along with emission of light in case when deflection is large, the item under observation is **an LED.**

<u>Observation:-</u>

S No	Number of legs	Device identified	Diagram
1	More than three legs	IC	
2	Three	Transistor	
3	Two	Capacitor, diode, or resistor.	  
S.no	Possible current flow	Device	Diagram

1	a.Unidirectional emits no light b.Unidirectional emits light	Diode LED	 
2	Both directions	Resistor	
3	Initially high but decays to zero	Capacitor	

RESULT

A diode, transistor, IC, resistor and capacitor have been identified.

ACTIVITY -5

Aim :To see the unidirectional flow of current in case of a diode and LED
Apparatus : A multimeter, Junction diode and LED
Theory: LED and Diode both conduct only when they are connected in forward biased state. There will be no flow of electric current if they are connected in reverse biased mode

Working order of a given component

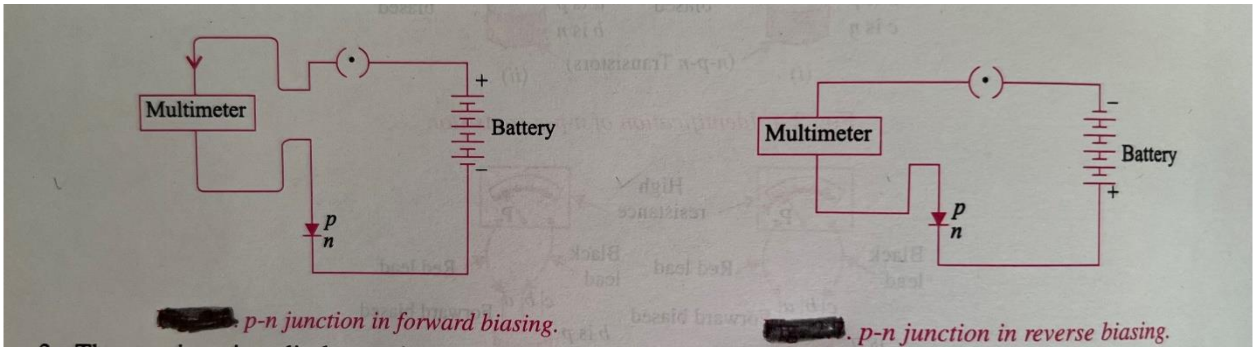
In case of diode and LED they will allow current to pass through them in forward biased only.

Procedure

For unidirectional flow of current

a) In case of the junction diode

1) Turn the selector switch and set the multimeter to measure the dc current of 10mA.
2) Make electrical connections as given in circuit diagram given below.



[redacted] p-n junction in forward biasing. [redacted]. p-n junction in reverse biasing.

3) Th p-n junction diode conducts due to forward biasing.The forward current is indicated by the deflection in multimeter
4) Now reverse the terminals of the battery or battery eliminator and record the value of current in the multimeter .No electric current is observed in the multimeter which proves that the junction diode conducts in one direction only.i.e. the flow of electric current in junction diode in unidirectional.

b) In case of LED

Replace the p-n junction diode with LED and repeat the steps 2 to 4 .It will be noted that the flow of current is also unidirectional in the LED and emits the light in the forward biased state .

When the connection of LED is reversed then multimeter shows no deflection and no light is emitted from LED. It means LED does not conduct when reverse biased.

Checking a diode

1.The p-n junction diode allows the flow of current in forward biased but does not allow the flow of current in the reverse biased. If it allows the flow of current in both biasing or doe not allow the flow of current in both biasing then junction diode is damaged.

Precautions

1.The multimeter should be set for appropriate range.
2.First check the base of the transistor

ACTIVITY 6

Aim :To study the effect of intensity of light (by varying distance of the source) on an LDR.

Apparatus : Light source, light dependent resistors (L.D.R.s) of different variety, a Multimeter (or meter bridge), a source of intense light (a lamp bulb with battery eliminator) and a convex lens.

Light Dependent Resistor

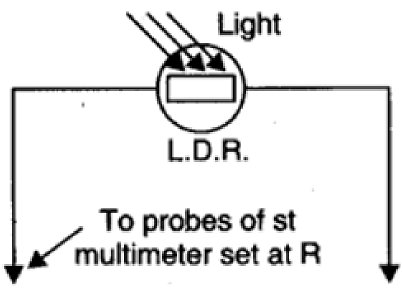
The light dependent resistance are the devices for detecting and measuring electromagnetic waves (light etc.). Its working is based upon the principle of variation of the photoconductivity when radiation is incident upon it and absorbed by it. A light dependent resistor is prepared from cadmium sulphide. Its resistance depends upon the intensity and duration of light incident on it. A good quality LDR shows a resistance variation from 1 MΩ in complete darkness to about 10 Ω in full day light. The intensity of light decreases inversely with increase the square of distance

PROCEDURE

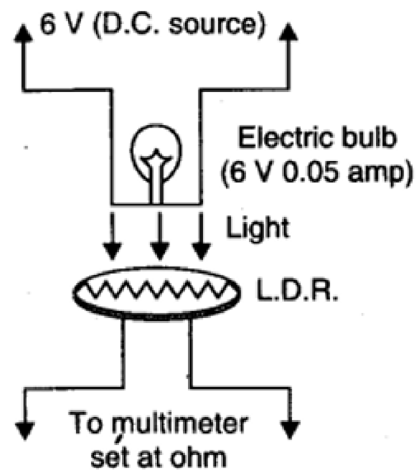
1.Plug the metallic ends of black probe in terminal marked common in Multimeter and that of red in terminal marked as P (or +). Short the other metallic ends and adjust the ‘R adjusting’ to get full scale deflection reading at zero ohm in the meter.

2. Touch the metallic probes to the two metal ends of the L.D.R. [Fig. (a)] and read the value of resistance when (a) the source is kept at a distance of 2 cm, fixing the source of light in a stand and keeping the L.D.R. vertically below it. (i) Moving the source to 4 cm distance from the L.D.R. and (ii) Moving the source to 6,8 and 10 cm from L.D.R. and repeating observation three more times.

Observation



(a) Symbol of L.D.R.



(b) L.D.R. in series with a 6 V battery and exposed to light from bulb incident normally

Table for Light Exposure Time and Resistance

Serial No. of Obs. (1)	*Distance of source from L.D.R. (cm)* (2)	*Resistance of L.D.R. R (ohm)* (3)
1	2	......
2	4	......
3	6	......
4	8	......
5	10	......

Conclusion

When the distance between light source and L.D.R. increases the resistance of L.D.R. increases.

Note: Same activity can be done by varying the exposure time in steps for same source of light, same LDR and for same distance. Precautions 1. 2. No stray light should fall on the L.D.R. It is better to work in a dark room. Connect L.D.R. carefully to the voltage source.

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