

PHYSICS PRACTICALS

Aim

To study the dependence of potential difference (V) across a resistor on the current (I) passing through it and determine its resistance. Also, plot a graph between V and I.

Materials Required

Following is the list of materials required for this experiment:

1. A battery
2. An insulated copper wire
3. A key
4. An ammeter
5. A voltmeter
6. A rheostat
7. A resistor
8. A piece of sandpaper

Procedure

1. Arrange the devices as shown in the circuit diagram.
2. Connect the devices with the connecting wires keeping the key open.
3. The positive terminal of the battery should be connected to the positive terminal of the ammeter.
4. Before connecting the voltmeter in the circuit, check for +ve and -ve terminals.
5. Check for ammeter and voltmeter reading once the circuit is connected and also adjust the slider of rheostat after inserting the key.
6. For current I and voltmeter V, record three different readings using a slider.
7. Record the observations in the observation table.
8. Using the formula R=V/I, calculate the resistance.
9. To plot the graph between V and I, take V on the x-axis and I on the y-axis.
10. For pure metals, resistance increases with increase in temperature.

Observation Table

i) Least count of ammeter and voltmeter

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl.no** |  | **Ammeter (A)** | **Voltmeter (V)** |
| 1 | Range | 0-0.5 A | 0-0.1 V |
| 2 | Least count | 0.01 A | 0.01 V |
| 3 | Zero error (e) | 0 | 0 |
| 4 | Zero correction | 0 | 0 |

ii) For the reading of ammeter and voltmeter

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sl.no** | **Current in Ampere (I)**  **(ammeter reading)** | | **Potential difference in volts (V)**  **(voltmeter reading)** | | **Resistance in ohms**  **R = V/I (Ω)** |
| **Observed** | **Corrected** | **Observed** | **Corrected** |
| 1 | 0 | 0.02 | 0 | 0.04 | R1= 2Ω |
| 2 | 0 | 0.03 | 0 | 0.06 | R2= 2Ω |
| 3 | 0 | 0.04 | 0 | 0.08 | R3= 2Ω |

Graph

Conclusions

1. For all the three readings, the R value is the same and constant.
2. The ratio of potential difference V and current I is the resistance of a resistor.
3. With the help of the graph between V and I, Ohm’s law is verified as the plot is a straight line.

Aim

To determine the equivalent resistance of two resistors when connected in parallel.

Theory

If the resistors are connected in parallel along with a battery, then the total current I is calculated as a sum of the separate value of current through each branch. It is given as:

I = I1+I2+I3+….

Materials Required

1. A battery
2. A plug key
3. Connecting wires
4. An ammeter
5. A voltmeter
6. Rheostat
7. A piece of sandpaper
8. Two resistors of different values

Procedure

1. Make all the connections as shown in the experimental setup I by keeping the key off.
2. Insert the key when the circuit is connected appropriately.
3. For resistors R1 and R2, note three readings of ammeter and voltmeter.
4. Connect the circuit as shown in the experimental setup II.
5. Resistors and voltmeter both are connected in parallel.
6. Record three different readings of ammeter and voltmeter and also use a rheostat.
7. Remove the key.
8. With the help of observation table, do the calculations.

Observation Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Resistor used** | **No.of observations** | **Voltmeter reading in Volts (V)** | **Ammeter reading in Ampere (I)** | **R=V/I (in Ohm)** | **Mean value of resistance (Ohm)** |
| R1 (first resistor) | a | 0.01 | 0.01 | 1 | R1= 1 ohm |
| b | 0.02 | 0.02 | 1 |
| c | 0.04 | 0.04 | 1 |
| R2 (second resistor) | a | 0.02 | 0.01 | 2 | R2= 2 ohm |
| b | 0.06 | 0.03 | 2 |
| c | 0.08 | 0.04 | 2 |
| 1/Rp=(1/R1)+(1/R2)  Parallel combination | a | 0.026 | 0.04 | 0.67 | Rp=0.67 ohm  1/Rp=1.5 ohm |

Result

|  |  |
| --- | --- |
| The calculated value of 1Rp | 1Rp=(1R1)+(1R2)=1.5Ω |
| The experimental value of 1Rp | 1Rp=1.5Ω |
| The equivalent resistance Rpis less than the individual resistance. | |

Aim

To determine the equivalent resistance of two resistors when connected in series.

Theory

Depending on the combination and connections in a circuit, the resistance can be increased or decreased. The [difference between the series and parallel circuit](https://byjus.com/physics/difference-between-series-and-parallel-circuits/) is based on the arrangement of the resistors. Resistors are said to connected in series if their ends are joined. The potential difference across each resistor would be different but the current would be the same.

If two resistors are connected in series then;

Resistance, R = R1+R2

Current, I = constant

Potential difference, V = V1+V2

On applying [Ohm’s law](https://byjus.com/physics/ohms-law/), we get,

V1 = IR1

V2 +IR2

V = V1+V2

V = I(R1+R2)

∴ R = R1+R2

Materials Required

* Two resistors of different values
* A battery of 6 volt
* Ammeter
* Plug key
* Connecting wires
* A piece of sandpaper
* Voltmeter
* Rheostat

Circuit Diagram

Procedure

1. With the help of circuit diagram, make the connections.
2. Do not switch on the key.
3. The ammeter should be connected in series, voltmeter in parallel and the rheostat in series.
4. Make the connections as shown in the experimental setup and check of +ve and -ve terminals of the battery.
5. By inserting the key, record the ammeter and voltmeter readings.
6. Note three readings by adjusting the rheostat.
7. Note down the readings of a voltmeter by connecting it to each resistor.
8. Measure the potential difference, V1 across the first resistor by plugging in the key.
9. Measure the potential difference, V2 across the second resistor by plugging in the key.
10. Calculate the relationship between V, V1 and V2.

Observation Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Resistor used** | **No.of observations** | **Voltmeter reading in Volts (V)** | **Ammeter reading in Ampere (I)** | **R = V/I (in ohm)** | **Mean value of resistance (ohm)** |
| R1 (first resistor) | a | 0.01 | 0.01 | 1 | R1=1+1+13=33=1ohm |
| b | 0.02 | 0.02 | 1 |
| c | 0.04 | 0.04 | 1 |
| R2(second resistor) | a | 0.02 | 0.01 | 2 | R1=2+2+23=63=2ohm |
| b | 0.06 | 0.03 | 2 |
| c | 0.08 | 0.04 | 2 |
| Rs=R1+R2 (series combination) | a | 0.03 | 0.01 | 3 | R1=3+3+33=93=3ohm |
| b | 0.06 | 0.02 | 3 |
| c | 0.09 | 0.03 | 3 |

Result

|  |  |
| --- | --- |
| The calculated value of Rs | Rs=R1+R2=3Ω |
| The experimental value of Rs | 3Ω |

Hence, it is verified that Rs=R1+R2.

## Aim

To trace the path of the rays of light through a glass prism.

Materials Required

Following are the list of materials required for this experiment:

* A white sheet
* Soft board
* Thumb pins
* 4-6 all pins
* Prism
* Pencil
* Scale
* Protractor
* Drawing board

Experimental Setup

Procedure

1. Fix a white sheet on a drawing board using drawing pins.
2. Place the triangular prism resting on its triangular base. Using a pencil, draw the outline of the prism.
3. Draw NEN normal to the face of the prism AB. make an angle between 30**°** and 60**°**.
4. On the line PE, fix two pins at a distance of 5cm from each other and mark these as P and Q.
5. Look for the images of the pins at P and Q through the other face of the prism AC.
6. Fix two pins at R and S such that they appear as a straight line as that of the P and Q when it is viewed from AC face of the prism.
7. Remove the pins and the prism.
8. At point F, make the points R and S meet by extending them.
9. PQE is the incident ray which is extended till it meets face AC. SRF is the emergent ray which is extended backward to meet at point G.
10. Now mark the angle of incidence ∠i, angle of refraction ∠r and the angle of emergence ∠e and ∠D as shown in the experimental setup.
11. Repeat the experiment for more angles between 30**°** and 60**°.**

Observations

1. At surface AB, the light ray enters and bends towards the normal on refraction.
2. At surface AC, the light ray bends away from the normal as it travels from one medium (glass) to the other (air).
3. The angle of deviation is observed. Here, the emergent ray bends at an angle towards the direction of the incident ray.

Conclusion

1. The incident ray bends towards the normal when it enters the prism and while leaving the prism it bends away from the normal.
2. With the increase in the angle of incidence, the angle of deviation decreases. After attaining the minimum value  it increases with an increase in the angle of incidence