ACTIVITY

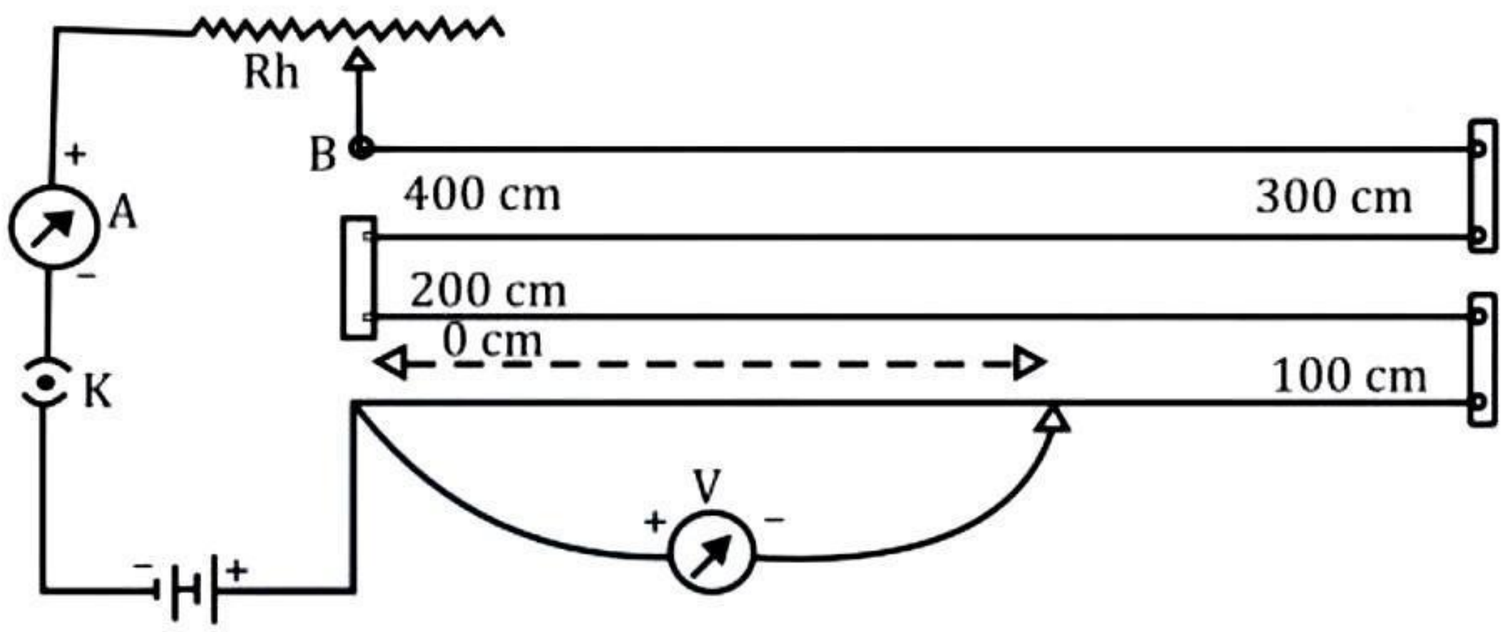
AIM

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

MATERIAL REQUIRED

A four-wire potentiometer battery (4.5 V), rheostat, key, voltmeter, connecting wires, sliding jockey, etc.

DIAGRAM



THEORY

For a resistance wire of length l having uniform composition and area of cross-section and the steady current flowing through it, the potential drop ' V ' along the wire is directly proportional to its length.

$$V \propto l$$

$$\boxed{\frac{v}{l} = k}$$

Where, k is a constant called potential gradient and is equal to potential drop per unit length of wire.

PROCEDURE

1. Find the range, least count, and zero error (if any) in the voltmeter and ammeter.
2. Connect the circuit components including the battery, rheostat, plug key, ammeter, and voltmeter with a potentiometer as shown in the circuit diagram.
3. Plugin the key. Touch the jockey at the end B of the potentiometer wire and adjust the sliding terminal of the rheostat so that the pointer of the voltmeter reads the maximum value.
4. Press the jockey gently at the 25 cm mark on the wire from point A and record the voltmeter reading.
5. Repeat step 4 several times, each time pressing the jockey 25 cm ahead of the previous time, up to the 400 cm mark on the potentiometer.

OBSERVATION

Steady Current Read by Ammeter = _____A.

Variation of the potential drop, V, for steady current I with the length of the potentiometer wire.

No. of Obser-vations	Steady current, I (A)	Length of the wire, l(cm)	Potential drop across the wire, V (volt)	Potential gradient, $\frac{V}{l}$ (volt cm^{-1})
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

GRAPH

Plot the graph with ' V ' at y-axis and ' l at x-axis.

Scale: X-axis: 10 small division =100cm
Y-axis: 10 small division =0.5v

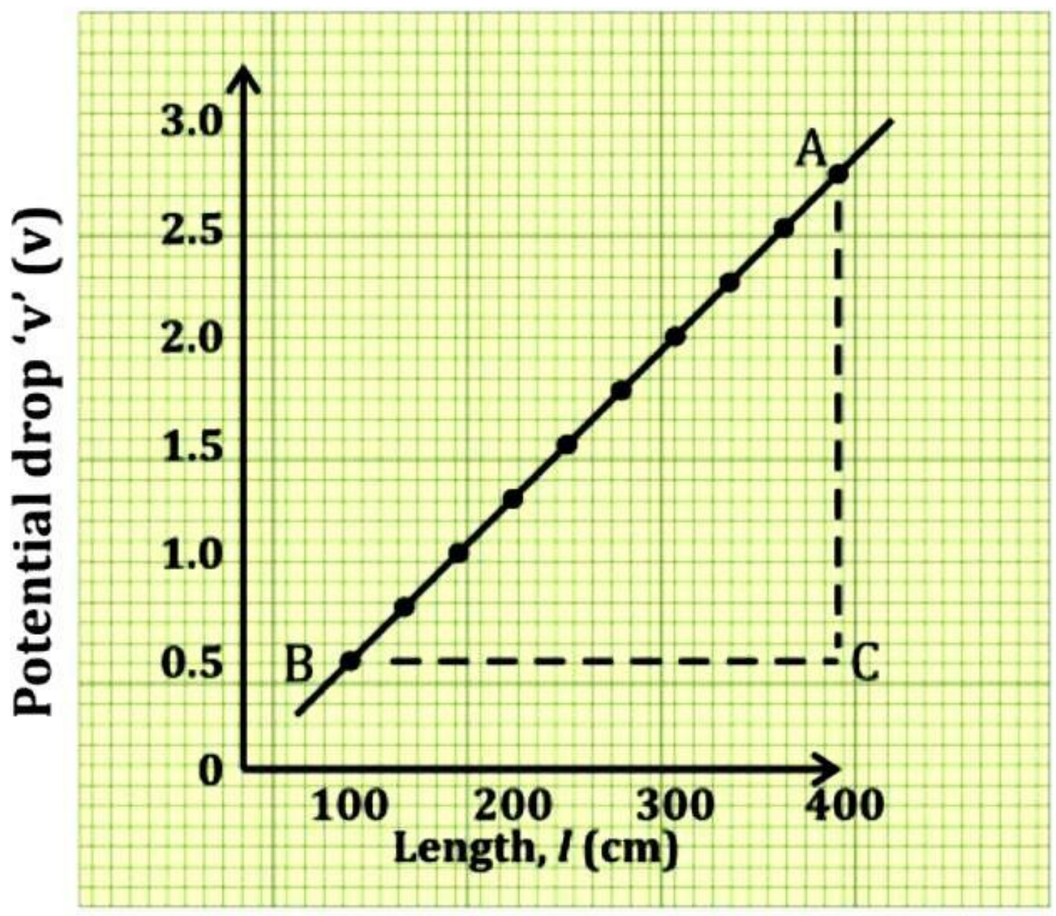


Fig. Nature of variation of V with L of a potentiometer wire

CALCULATION

Slope of graph = Potential drop per m = _____ V/cm.

The graph of V vs l is a straight line which indicates that the potential drop is directly proportional to the length of the wire.

Potential drop per unit length is calculated as_____ V/cm.

RESULT

1. The slope of the graph indicates that the potential drop per centimeter of the potentiometer wire is ... volts per centimeter.

2. Observing the nature of the variation as per the figure, it is evident that the relationship between V and l is a straight line. This signifies that the potential drop is directly proportional to the length for a constant current flow.

PRECAUTIONS

1. A steady current should flow through the circuit during the experiment.
2. Connections should be tight.
3. The circuit should not remain closed if readings are not being taken.
4. Zero correction must be carefully done in observations.

SOURCE OF ERROR

1. The wire should possess a consistent cross-sectional area throughout its entire length. Verify this by measuring its diameter at different points prior to commencing the experiment.
2. It's possible that the voltmeter may provide inaccurate readings.

VIVA- VOCE

Q 1. What is the slope of V – I graph equal to?

Ans. Potential gradient.

Q 2. Why should not jockey be pressed hard on the wire?

Ans. The wire may flatten on pressing and its cross-sectional area may change.

Q 3. State the factors upon which potential drop along a wire depends.

Ans. It is directly proportional to the current flowing through the wire, the length of the wire, and resistance per unit length of the wire