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EXPERIMENT - 7

OBJECT: To verify Ohm's law and hence to determine the resistance of a given conductor wire.

APPARATUS: A conductor wire (manganin wire), an ammeter, a voltmeter, a rheostat, a key, a battery and connecting wires.

THEORY: According to Ohm's law, the current flowing through a conductor is directly proportional to the potential difference at the ends of the conductor provided the temperature of the conductor remains same.

If 'V' is the potential difference at the ends of the conductor provided the temperature of the wire and 'I' is the current flowing through it, then $V \propto I$ or $V = IR$.

METHOD:

1. The terminals of a battery B are connected

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through a key K, an ammeter A, the given conductor wire R, and a rheostat Rh, in series, by means of connection wires. See that the positive terminal of the battery is connected to the + marked terminal of ammeter A. The voltmeter V is connected in parallel across the conductor wire R, with +ve terminal of the battery on the side of voltmeter V marked + as shown in figure.

2. Note down the least count of ammeter A and voltmeter V. Also note the zero error of the meters (If any). If correct reading is obtained by subtracting the zero error with sign, from the observed reading.

3. Insert the plug into the key K and adjust the rheostat Rh, by sliding its variable terminal until the current I shown by the ammeter is 0.8A. Record V, the reading of the voltmeter. Take out the

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plug of the key K.

4. Repeat the experiment for I = 0.7A, 0.6A, 0.5 A, and 0.4 A and record the corresponding value of V in each case. Take care that the plug is inserted into the key K only while taking the observations otherwise due to flow of current through the wire R for a long time it will get heated up and temperature will no longer remain constant.

OBSERVATIONS:

Least count of the ammeter = 0.02 A
Zero error of the ammeter = 0 A
least count of the voltmeter = 0.05 A
Zero error of the voltmeter = 0 A

No of observations	Ammeter reading I (in A)	Voltmeter reading V (in V)	Resistance R = V/I (in Ohm)
1	0.8	1.6	2

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2	0.7	1.4	2
3	0.6	1.2	2
4	0.5	1.0	2
5	0.4	0.8	2

Plot the graph between V and I, taking V on Y axis I on X axis and origin at (0,0). From the graph and record V_1 the value of V when I = 0.45A and V_2 the value of V when I = 0.75A.

Calculate $R = \frac{V_2 - V_1}{0.3} = \frac{10(V_2 - V_1)}{3} =$ 2 ohm

The graph plotted between V and I is a straight line which proves that $V \propto I$. Moreover, the calculated values of V/I in each set comes out to be nearly constant.

Resistance of the wire R = 2 ohm

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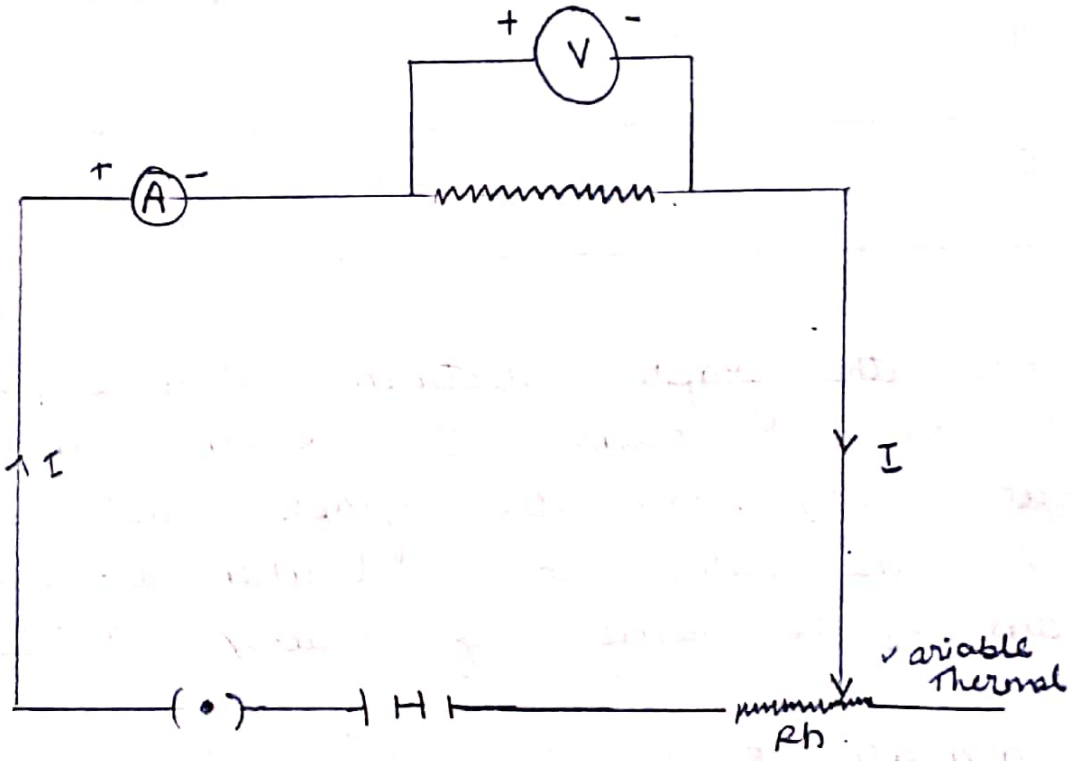

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1. Make all the connections properly 'See that positive terminal of battery is connected to the terminal marked + of ammeter and voltmeter. Do not leave any connection loose, this adds some indefinite resistance in the circuit. Check the circuit before passing the current in it.

2. Never allow current to flow for a longer time in the wire. This heats up the wire which changes the temperature of the wire and hence its resistance. For this, the key should remain inserted in the plug only as long as the observations are taken.

3. The range of the voltmeter used, must be more than the e.m.f. of the battery.

4. Take care that the battery is not short circuited.

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