Ohm's Law I

AIM: To verify the relation between the voltage and current for a given resistance and hence to find the Resistance and Conductance of the wire, resistivity and conductivity of the material of the wire.

APPARATUS: Cells, Ammeter, Voltmeter, Rheostat, Key, Screw Gauge, Meter Scale, Bread Board, Connecting wires etc

THEORY: At constant temperature, the current passing through the conductor is directly proportional to the potential difference across the conductor.

That is **V α I** or $\frac{V}{I}=R$ the resistance of the conductor.

The Conductance G = $\frac{1}{R}$

The resistivity of the material of the conductor $\rho=\frac{\pi r^2 R}{L}$ where **r** is the radius and **L** is the length of the conductor.

The conductivity of the material of the wire $\sigma=\frac{1}{\rho}$
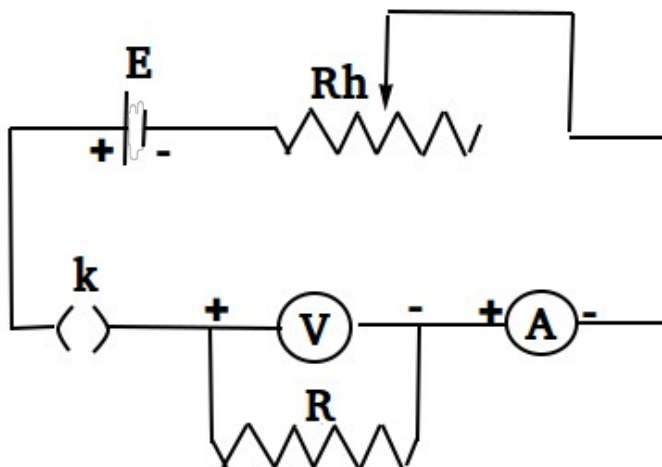

From graph R = $\frac{AB}{BC}$
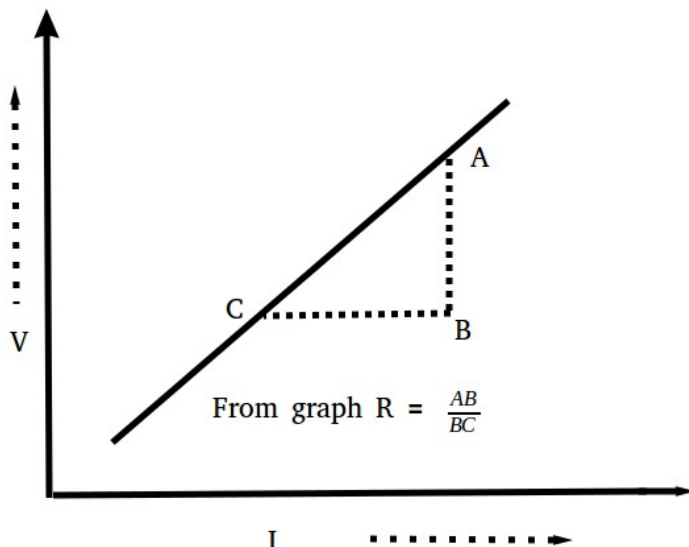
OBSERVATIONS:

1. **To find the resistance of the wire (R)**

Least Count of the ammeter =   A

Least Count of the voltmeter =   V

Length of the resistance wire L=   cm

         =   m

Trial No	Ammeter Reading (I) Ampere	Voltmeter Reading (V) Volts	$R=\frac{V}{I}$ Ω	Mean R Ω
1				
2				
3				
4				
5				
6				
7				

2. **To find the radius of the wire (r)**

Value of One Pitch Scale Division = mm

Pitch of the screw $P = \dfrac{Distance\ Moved}{Number\ of\ Rotations}$ = mm

Number of Divisions on the head scale N =

Least Count LC $= \dfrac{Pitch}{N}$ = mm

Zero Coincidence = Divisions Zero Correction = Divisions

Sl No	Pitch Scale Reading (**PSR**) mm	Observed Head Scale Reading (**HSR**)	Corrected Head Scale Reading (**Corr. HSR**)	Total Reading PSR + (Corr. HSR x LC)	Mean (d) mm
1					
2					
3					
4					
5					
6					

Radius of the wire $r = \dfrac{d}{2}$ = cm = m

<u>CALCULATIONS</u>:

Resistance of the wire from the graph $= \dfrac{AB}{BC}$ = = Ω

Mean Resistance R = = Ω

The Conductance of the wire $G = \dfrac{1}{R}$ = = mho

The resistivity of the material of the conductor $\rho = \dfrac{\pi r^2 R}{L}$ =

= Ω m

The conductivity of the material of the wire $\sigma = \dfrac{1}{\rho}$ =

= $\Omega^{-1} m^{-1}$

<u>RESULT</u>:

1. Voltage is found proportional to the current. Hence Ohm's Law is verified

2. Resistance of the given wire = Ω

3. Conductance of the given wire = Ω^{-1}

4. Resistivity of the material of the wire = Ω m

5. Conductivity of the material of the wire = $\Omega^{-1} m^{-1}$