EXPERIMENT NO: 5

Aim : To find resistance of a given wire using metre bridge and hence determine the specific resistance of its material.

Apparatus : A metre bridge, battery or a battery eliminator, galvanometer, low resistance box, high resistance box, jockey, key, resistance wire, screw gauge, meter scale and connecting wires

Theory : A meter bridge is a practical form of a Wheatstone bridge. For a balanced Wheatstone bridge, i.e. when the galvanometer shows null deflection,

$$\frac{P}{Q} = \frac{R}{S},$$

Using the same, for a meter bridge, we have,

$$\frac{R}{l} = \frac{X}{100-l} \text{ ------ (1)}$$

$$\therefore X = \frac{100-l}{l} R \text{ ------- (2); Where } X \text{ is the resistance of the resistance wire.}$$

The resistivity of the wire can be calculated using the equation,

$$\rho = \frac{X \pi r^2}{l} \text{ -------- (3);}$$ where 'r' is the radius of the wire and l the length of the given resistance wire.

Procedure :

1. Arrange the apparatus accordingly, with reference with the circuit diagram.
2. Connect the resistance wire whose resistance is to be found in the right gap of the meter bridge.
3. Connect the low resistance box in the left gap of the metre bridge.
4. Make all other connections as shown in the circuit diagram.
5. Take out a small resistance (say 5 Ω) from the low resistance box and a high resistance (say 2000 Ω) from the high resistance box.
6. Touch the jockey on both ends of the metre bridge wire(A and C). If thre galvanometer shows opposite deflections, the connections are correct.
7. Move the jockey along the metre bridge wire from the left to the right, till the galvanometer shows zero or null deflection. This point is called the null point.
8. Adjust the value from the low resistance box (R), such that the null point is between 40cm and 60 cm of the metre bridge wire. Measure the length AD=l.
9. Repeat the same for different values of R and take five sets of observation.

Result :

1. The resistance of the given wire is _____ Ω
2. The resistivity of the material of the wire is _____ Ωm

Precautions :

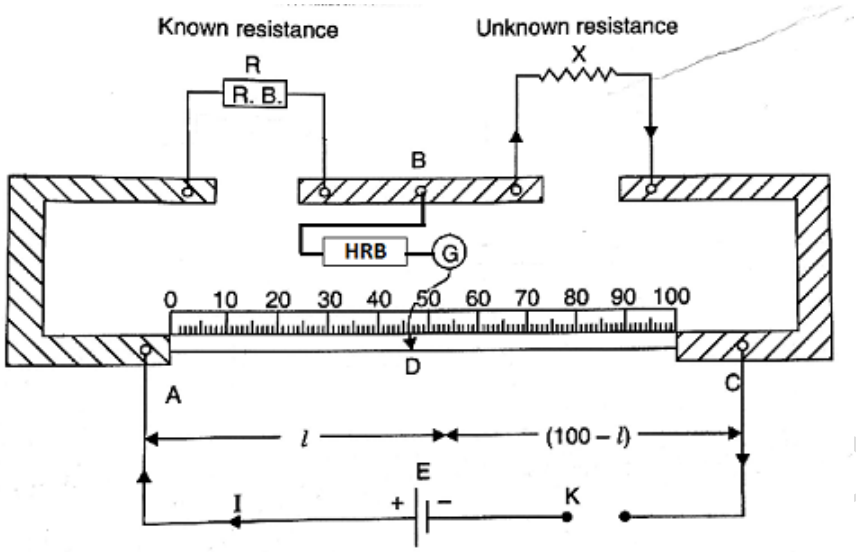
1. The connections should be clean and tight.
2. All the plugs in the resistance box should be tight.
3. The diameter should be measured in two mutually perpendicular directions.

Sources of error :

1. The instrument screws may be loose.
2. The wire may not have uniform thickness.
3. The resistance box plugs may not be clean.

Eby P Kurien
ebypkurien@gmail.com

Circuit Diagram :



Observation Table :

To find the resistance of the wire:

Sr. No.	Resistance (R) (Ω)	Length AD = l (cm)	Length DC = 100 – l (cm)	$X = \frac{100-l}{l} R$ (Ω)
1				
2				
3				
4				
5				

Mean X = _____ Ω

To find the diameter of the wire:

LC = _____ mm

Zero error = _____ Zero correction : _____

Sr. No.	P.S.R (mm)	Circular Scale Division(CSD)		CSR = CSD x LC (mm)	Diameter d = PSR + CSR (mm)
		Observed	Corrected		
1					
2					

Mean diameter = _____ mm

Mean radius (r) of the wire = _____ mm

Length(l) of the resistance wire : _____ cm

Calculation:

Resistivity of the wire , $\rho = \frac{X \pi r^2}{l}$

ρ = _____ Ω m

Eby P Kurien
ebypkurien@gmail.com