

EXPERIMENT 6

Determining resistance of a galvanometer by half deflection method and to find its figure of merit:

Aim: To determine resistance of a galvanometer by half deflection method and to find its figure of merit.

Apparatus : A Weston type of galvanometer , a voltmeter , a battery /battery eliminator , two 10,000 ohm and 200 ohm) resistance boxes , two one way key , a rheostat , a screw gauge , a meter scale , an ammeter of given range , connecting wires and a piece of sand paper .

Theory:

The resistance of the given galvanometer as found by half deflection method.

$$G = (R \times S) / (R - S) \quad (1)$$

Where R is the resistance connected in series with the galvanometer and S is the shunt resistance.

$$\text{The figure of merit, } K = E / [(R + G)Q] \quad (2)$$

Where E is the end of the cell and Q is the deflection produced with resistance R.

The maximum current that can pass through the galvanometer, $I_g = nk$

Where n is the total number of dimension on the galvanometer scale on either side of zero.

Procedure:

1. Resistance of galvanometer by half deflection method

- Make the connections accordingly as shown in circuit diagram.
- See that all plugs of the resistance boxes are tight

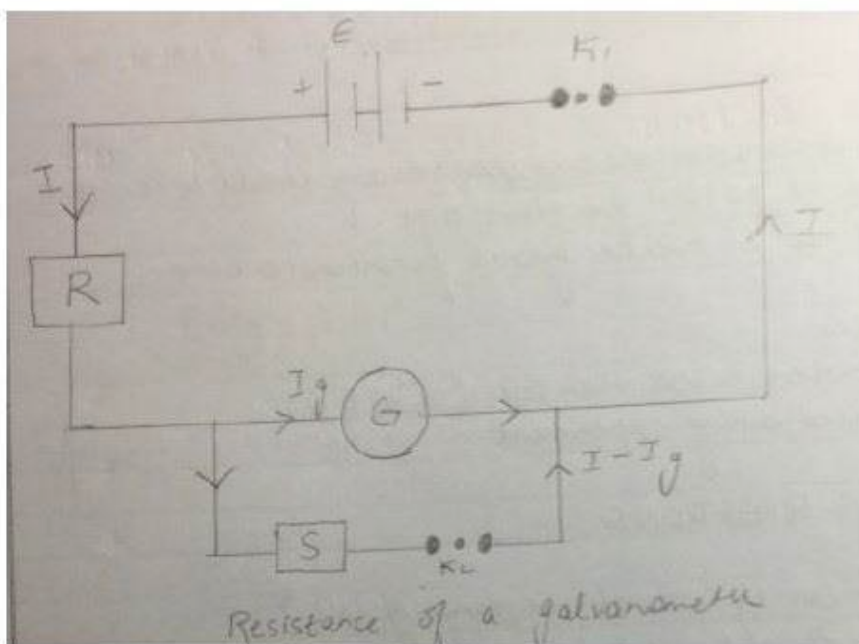
- Take out the high resistance (200 Ohm) from the resistance box R and insert key K1 only.
- Adjust the value of R1 so that deflection is maximum, even in number and within the scale.
- Note the deflection. Let it be Q.
- Insert the key k2 also and without changing the value of R2, adjust the value of S, such that deflection in the galvanometer reduces to exactly half the value of resistance S.
- Note the value of resistance S.
- Repeat step 4 & 7 three times taking different R and adjusting.

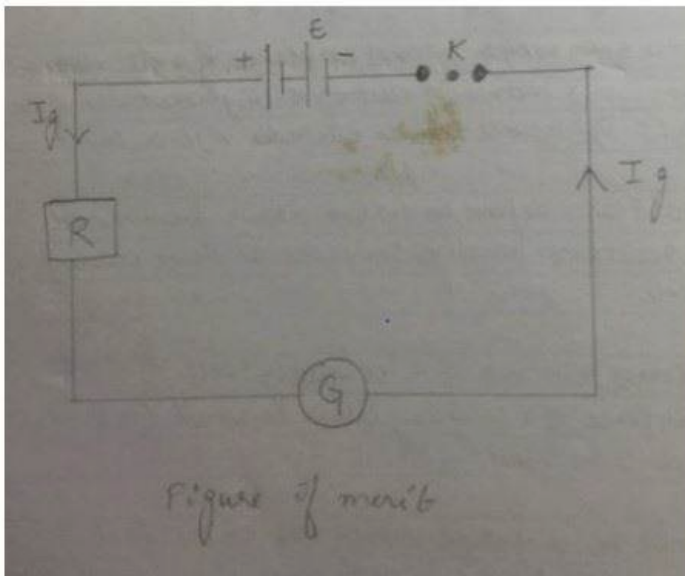
2. Figure of merit

- Take one cell of the battery and find its emf by a voltmeter by connecting +ve of the voltmeter with +ve of cell and – ve of the voltmeter with -ve of cell. Let it be E.
- Take connection as in circuit diagram.
- Adjust the value of R to obtain a certain deflection Q when circuit is closed.
- Note the value of resistance R and deflection Q.
- Now change the value of R and note the galvanometer deflection again.
- Repeat the step with both cells of the battery with different voltages like 2, 4, 6, 8 volts from battery eliminator.
- Find the figure of merit K using the formula.

Diagram:

Resistance of Galvanometer:





Observation table :

Resistance (R)	Deflection (Q)	Shunt (S)	$G = \frac{R \times S}{R - S}$
5000	10	5	5.005
10000	6	3	3
2000	20	10	10.05
1500	26	3	13.11
Average			$G = 7.79 \text{ ohms}$

Resistance (R)	Deflection (Q)	K
5000	9	0.556
10000	5	0.60
2000	20	0.502
1500	25	0.524
Average		$K = 0.5455 \text{ A/dn}$

Calculations:

1. $G = (5.005 + 3 + 10.05 + 13.11) / 4$ [$E = 1.45V$]
2. Figure of Merit : Current in the galvanometer per unit time
3. $K = IQ = [(E)/(R+G)] \times [1/Q]$ – SI unit = AD division = 10^{-5} A/div

Result:

Resistance of given galvanometer is 7.79 ohm.

Figure of merit of given galvanometer is 0.545 A/dn.

Precautions:

All connections should be neat and tight.

The emf of cell / battery should be constant.