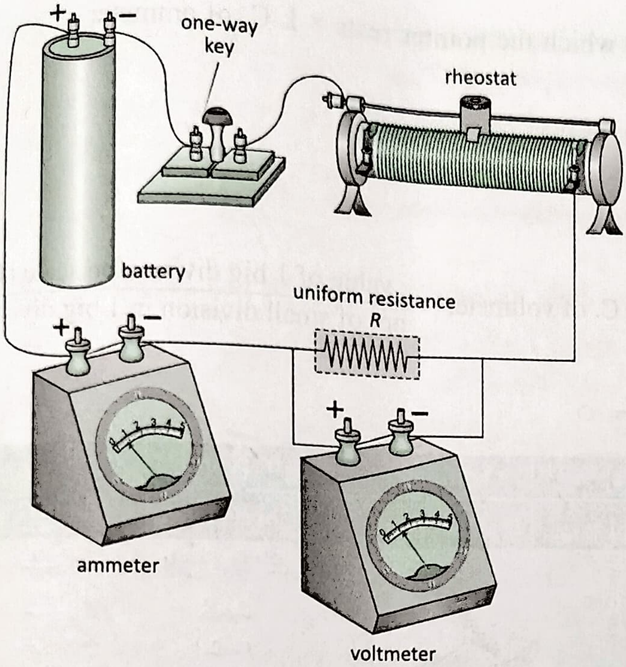


Fig. 5.2 Arrangement diagram

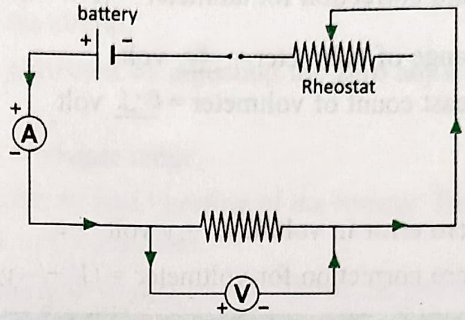


Fig. 5.3 Circuit diagram

positive (+) terminal of the cell, and negative (–) terminal of the ammeter is joined to the negative (–) terminal of the cell. Make neat and tight connections.

4. Connect the voltmeter in parallel to the resistor, as shown in circuit diagram. Ensure that the positive (+) terminal of the voltmeter is joined to the positive (+) terminal of the cell, and the negative (–) terminal of the voltmeter is joined to the negative (–) terminal of cell.
5. Determine the least count of the ammeter and voltmeter, and check if any zero error exists.
6. Insert the plug in the key. Check if the ammeter and voltmeter show deflection. There should be deflection in both. In case there is no deflection, check/tighten the connections in the circuit.
7. Now adjust the slider of the rheostat, so that a small current passes through the resistor. Say, the ammeter shows a current of 0.10 A.
8. Read the corresponding value of potential difference from the voltmeter.
9. Take out the plug from the key. Record the values of current and potential difference in the table drawn.
10. Replace the plug in the key. Adjust the slider of the rheostat, such that the ammeter shows a current of 0.20 A. Read the corresponding value of potential difference from the voltmeter. Record the readings of I and V in the table.
11. Repeat the experiment, by adjusting the slider, for the values of current 0.3 A, 0.4 A, 0.5 A and 0.6 A. Read and record the corresponding potential difference in the table.

OBSERVATIONS:

1. Range of ammeter = ___ ampere 500mA

   Least count of ammeter = ___ ampere 10mA

   $$\left[\text{L.C. of ammeter} = \frac{\text{value of 1 big division on scale (A)}}{\text{no. of small division in 1 big division}}\right]$$

Zero error in ammeter = number of division at which the pointer rests × L.C. of ammeter

= x ampere = 0

Zero correction for ammeter = $(I +/- x)$ ampere = 0

2. Range of voltmeter = 5 volt

Least count of voltmeter = 0.1 volt

$$\left[\text{L.C. of voltmeter} = \frac{\text{value of 1 big division on scale } (V)}{\text{no. of small division in 1 big division}}\right]$$

Zero error in voltmeter = y volt = 0

Zero correction for voltmeter = $(V +/- y)$ volt = 0

Battery V = 8V

S. No.	Ammeter reading I (ampere) mA		Voltmeter reading V (volt)		$V/I = R$ (ohm)
	Observed	Corrected	Observed	Corrected	
1.	40	40	0.4	0.4	10Ω
2.	80	80	0.8	0.8	10Ω
3.	120	120	1.2	1.2	10Ω
4.	160	160	1.6	1.6	10Ω
5.	200	200	2	2	10Ω
6.	240	240	2.4	2.4	10Ω

CALCULATIONS:

1. Mean resistance of the resistor = $\frac{10+10+10+10+10+10}{6}$ = 10 ohms
2. Plot a graph between V and I. Take potential difference (V) on y-axis and current (I) on x-axis. Join all points by a 'best fit' line so that most of the points lie on it. The slope of the line is the resistance of the resistor used in the circuit:

$$\text{Slope} = \frac{QM}{MP} = \frac{V_2 - V_1}{I_2 - I_1}$$

3. Extend the line backward and observe if it passes through the origin.

Slope = $\frac{V_2 - V_1}{I_2 - I_1}$

CONCLUSIONS:

1. As seen from the above table, the ratio of V/I is constant. Therefore, it is verified that potential difference is directly proportional to current (I) flowing in the circuit.

   This verifies Ohm's law.
2. As the graph is a straight line, it proves that V is directly proportional to I. This again verifies Ohm's law.
3. The resistance R of a conductor is equal to the ratio of potential difference V to current I.
4. The slope of the graph $\Delta V/\Delta I$ gives us the magnitude of resistance, i.e. $R = \Delta V/\Delta I$.

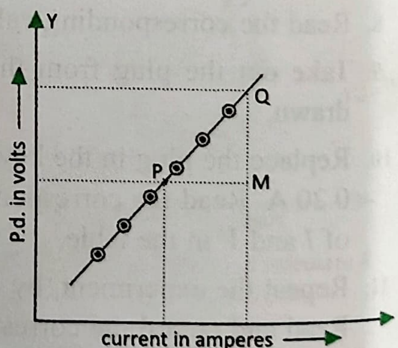
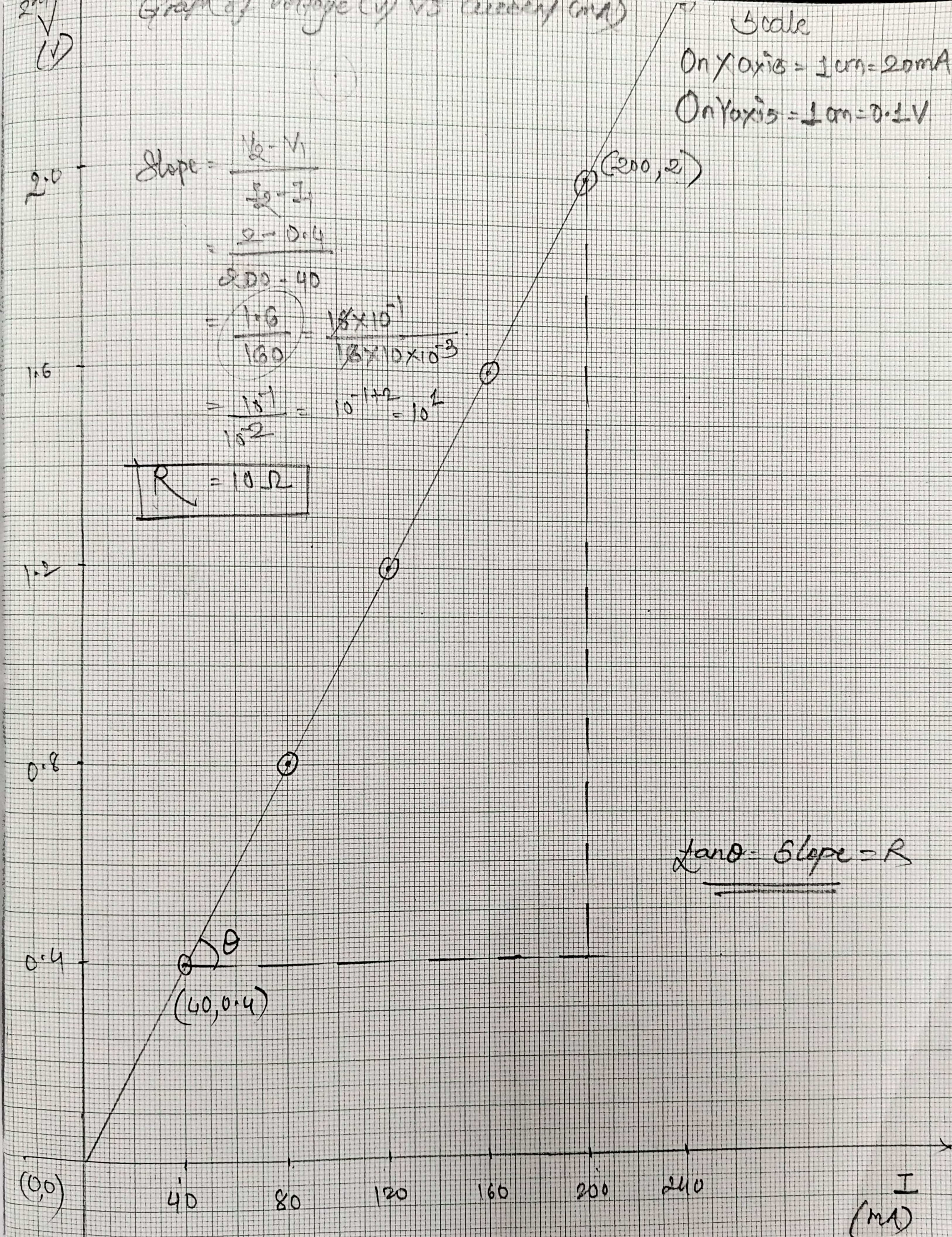


Fig. 5.4 Graph between potential difference and current

PRECAUTIONS:

1. Thick copper wires should be used as connecting wires.
2. All connections should be neat and tight.



V (V)
Scale
On X axis = 1 cm = 20 mA
On Y axis = 1 cm = 0.1 V
Slope = (V2 − V1) / (I2 − I1)
= (2 − 0.4) / (200 − 40)
= 1.6 / 160 = 16×10^-1 / 16×10×10^-3
= 10^-1 / 10^-2 = 10^(-1+2) = 10^1
R = 10 Ω
(200, 2)
(40, 0.4)
θ
tanθ = Slope = R
2.0
1.6
1.2
0.8
0.4
(0,0)
40
80
120
160
200
240
I (mA)