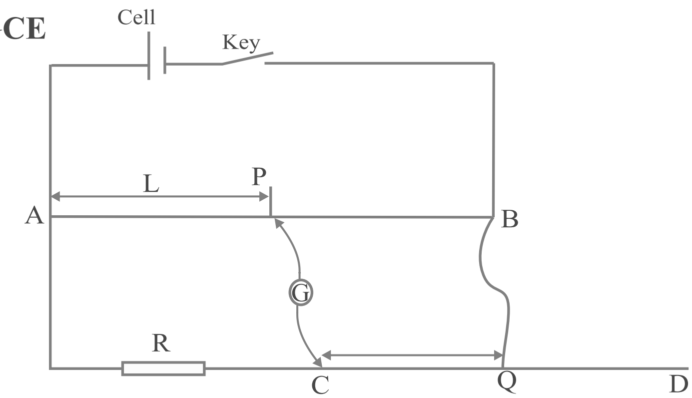
ELECTRICITY

Question 3 2008 NOV/DEC GCE



A circuit is connected as shown in the diagram above. **AB** is a uniform potentiometer wire, **CD** a uniform resistance wire and **R** is a standard resistor.

Jockeys are used to make contacts at **P** on the potentiometer wire and **Q** on the resistance wire. For a length x = **CQ** on the resistance wire, the length l = **AP** on the potentiometer wire is adjusted, while the key is closed, until the galvanometer shows no deflection.

The lengths x = **CQ** and l = **AP** are measured and recorded.

The procedure is repeated for five other values of x.

Fig 3(a) shows the various values of x_i while fig 3(b) shows the corresponding values of l_i where i = 1, 2, 3, 4, 5, and 6.

(i) Measure and record the real values of x_i.

(ii) Also measure and record the corresponding real values of l_i.

(iii) Evaluate $d = \frac{100}{l}$ in each case.

(iv) Tabulate your readings.

(v) Plot a graph of x on the vertical axis against d on the horizontal axis.

(vi) Determine the slope, s, of the graph.

(vii) Determine the value of d for which $x = 0$

(viii) State two precautions that are necessary when performing this experiment in the laboratory.

(b) (i) A wire of length 50cm has a cross sectional area of $1.0 \times 10^{-4} m^2$.

If the resistivity of the wire is $1.1 \times 10^{-6}\ \Omega m$, calculate its resistance.

(ii) A battery of *e.m.f.* $4V$ supplies a current of $1.2\ A$ to a 3Ω resistor.

Calculate the internal resistance of the battery.

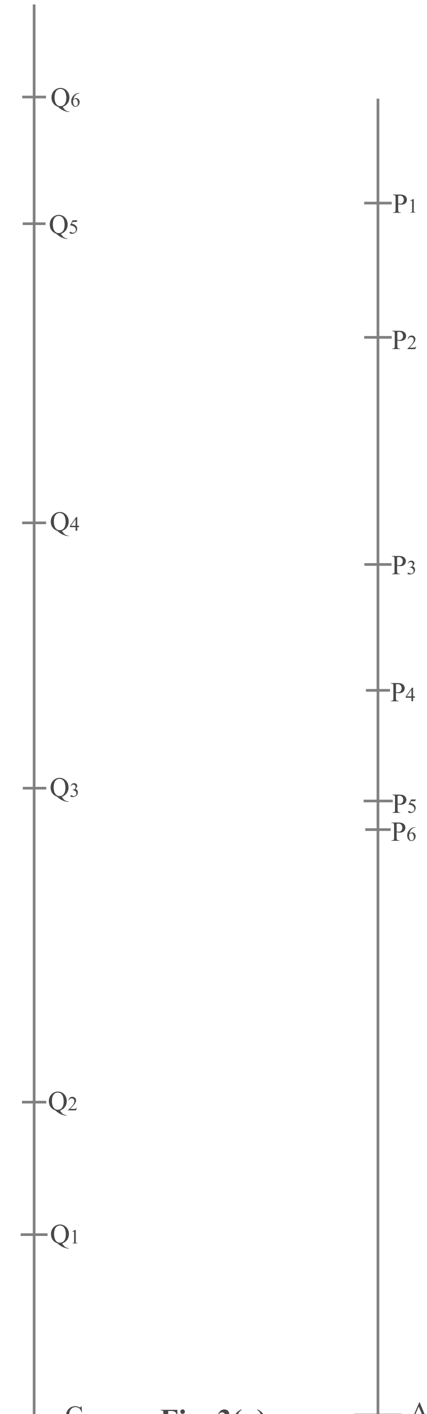


Fig. 3(a)

Solution

	1	2	3	4	5
i	*x(cm)*	*xconv(cm)*	*L(cm)*	*Lconv (cm)*	*d = 100/l (cm)$^{-1}$*
1	*2.5*	*13.0*	*17.1*	*85.5*	*1.17*
2	*4.4*	*22.0*	*15.2*	*76.0*	*1.32*
3	*8.9*	*44.5*	*12.0*	*60.0*	*1.67*
4	*12.6*	*63.0*	*10.2*	*51.0*	*1.96*
5	*16.8*	*84.0*	*8.7*	*43.5*	*2.30*
6	*18.6*	*93.3*	*8.2*	*41.0*	*2.41*

Explanation of table

Column 1 is obtained by measuring CQi directly from Fig.3(a) using a ruler and recording to 1 decimal place.

Column 2 is obtained by multiplying column 1 by the scale factor in 3a

Column 3 is obtained by measuring with a ruler from Fig 3(b) to 1 decimal place

$$\text{Slope (S)} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{82 - 22}{2.30 - 1.30} = \frac{60}{1.00} = 60.0 \text{ cm}^2$$

The value of d for which x = 0 , d = 0.95cm^{-1}(d on graph)

Precautions

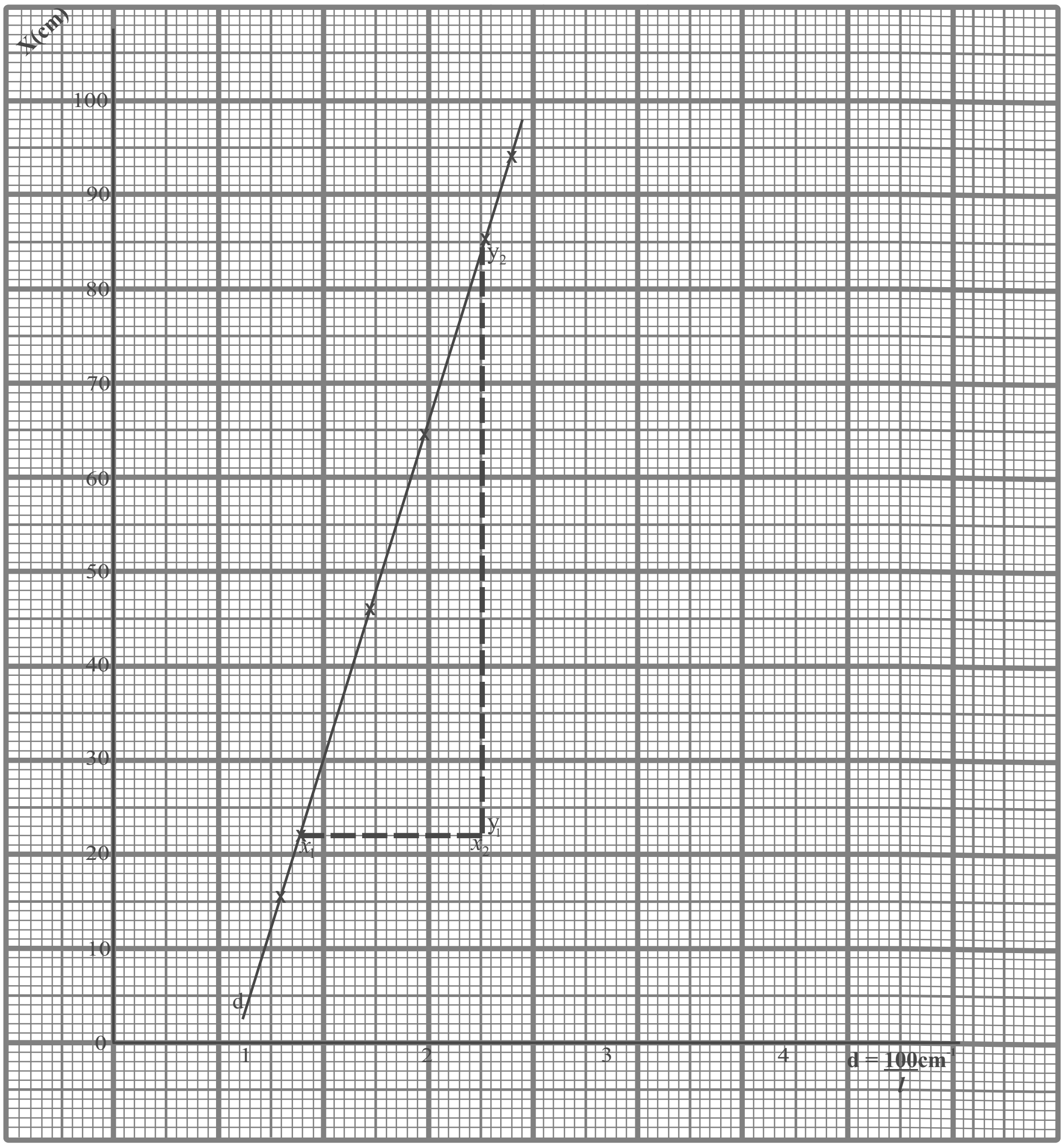
1. Ensure tight connections and clean terminals
2. Ensure key is removed when readings are not being taking
3. Avoid parallax error when reading the metre rule
4. Ensure jockey is not dragged on wire

b(i) $R = \frac{\rho L}{A} = \frac{1.1 \times 10^{-6} \times 0.50}{1.0 \times 10^{-4}} = 5.5 \times 10^{-3}$ SΩ

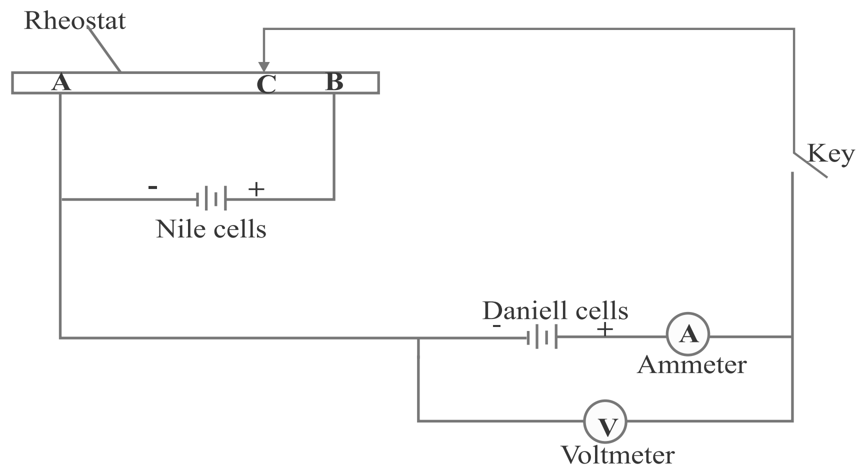
(ii) $I = \frac{E}{R+r}$ or $r = \frac{E}{I} - R = \frac{4}{1.2} - 3.0 = 3.33 - 33.00 = 0.3352\,\Omega$

TITLE: Graph of x(cm) against d= $\frac{100}{l}$cm^{-1}

Scale: 2cm represents 10 cm on x axis
4cm represents 1 cm on y-axis



Question 3 2001 NOV/DEC GCE



An electrical circuit is set up as shown in the diagram above.

The position of the sliding contact **C**, is adjusted on the rheostat, **AB**, such that the ammeter reading $\mathbf{I}_o$ is zero. The corresponding voltmeter reading $\mathbf{V}_o$ is read and recorded.
The procedure is repeated for six other values of ammeter reading, I. In each case the corresponding value of the voltmeter reading, **V**, is read and recorded.

Fig 3(a) and Fig 3(b) represent the ammeter and voltmeter readings respectively.

(I) Read and record I_i, where i = 1, 2, 3, 4, 5 and 6 and the corresponding voltmeter reading V_i, where i = 1, 2, 3, 4, 5 and 6 respectively.

(ii) Tabulate your readings.

(iii) Plot a graph of **V** on the vertical axis against **I** on the horizontal axis.

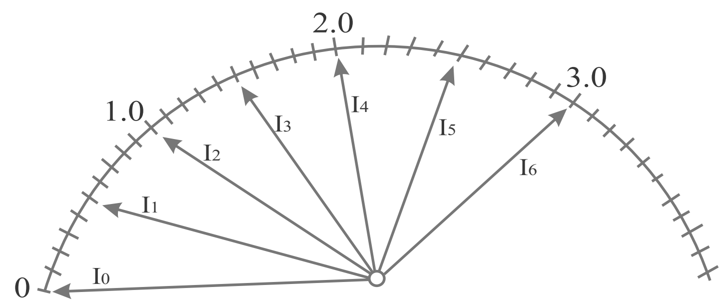
(iv) Determine the slope s, of the graph and the intercept c, on the vertical axis.

(v) Evaluate $k = \frac{c}{V}$

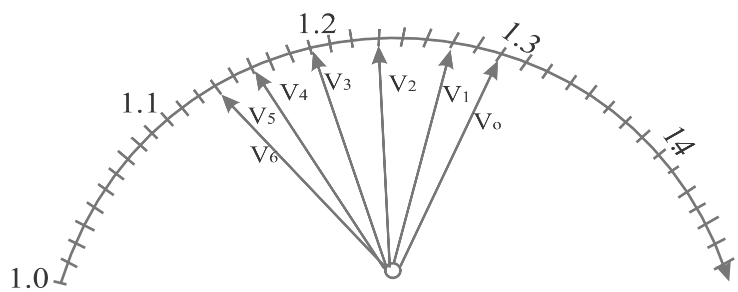
(vi) State two precautions you would take if you were performing this experiment in the laboratory.

b(i) State four factors upon which the resistance of a metallic conductor depends.

(ii) Explain the specific resistance of a wire.



(a)



(b)

Fig. 3

Solution

1 V (Volts)	2 I (Amp)
1.28	*0.5*
1.25	*1.0*
1.23	*1.5*
1.20	*2.0*
1.17	*2.5*
1.15	*3.0*

Explanation of table

Columns 1 and 2 are obtained by reading and recording the voltmeter and current readings from figs 3a and 3b respectively.

$$\text{Slope (S)} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1.32 - 1.10}{0 - 3.8} = \frac{0.22}{-3.8} = -0.05852\Omega$$

(iv) Intercept C on vertical axis = 1.32 volts.

(v) $k = \frac{c}{Vo} = \frac{1.32}{1.30} = 1.015$

Precautions

(i) Ensure the key is removed when readings are not being taken.

(ii) Ensure tight connections and clean terminals

(iii) Avoid error due to parallax when reading the voltmeter and ammeter.

(iv) Note and correct the zero error in voltmeter/Ammeter

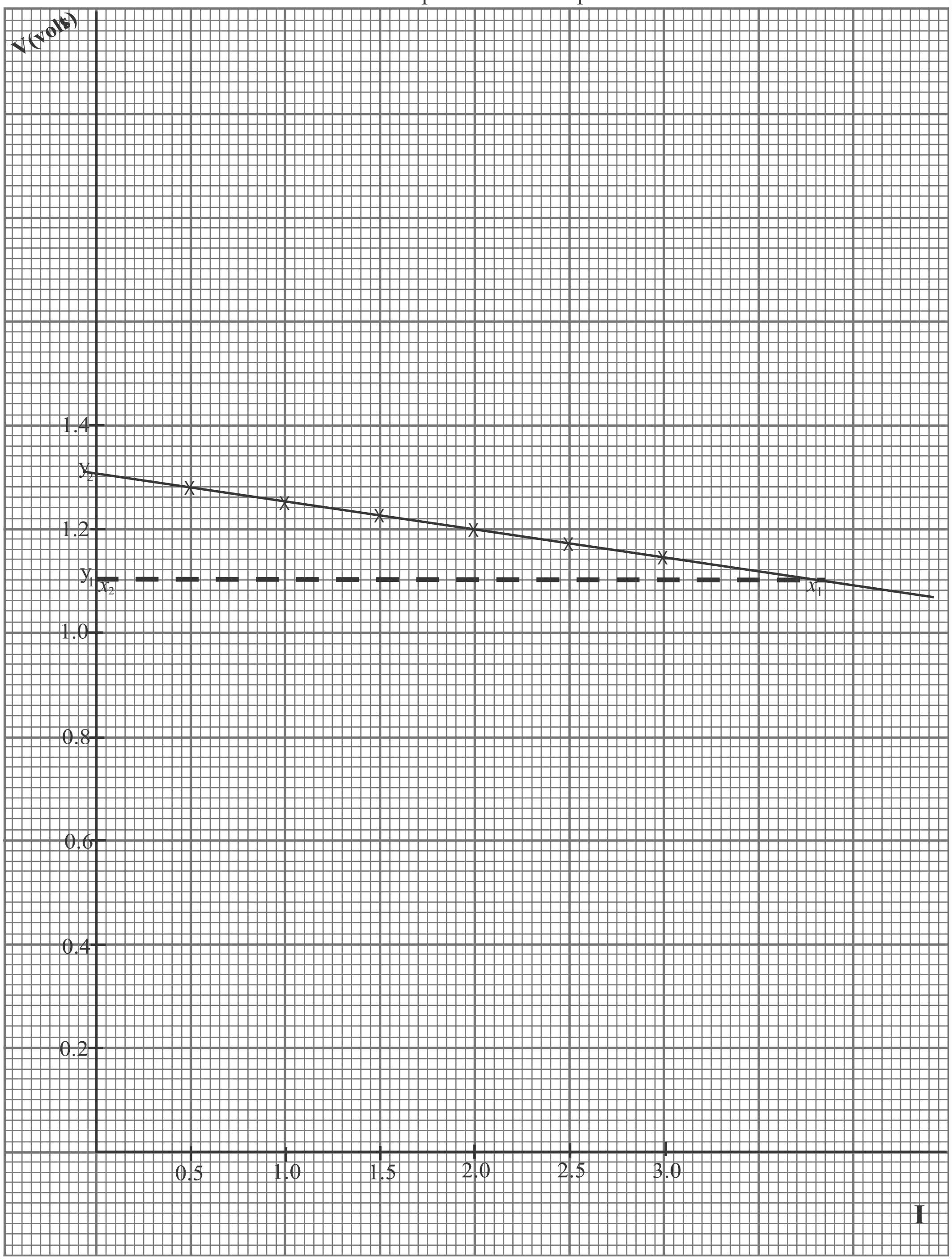
b (i) Four factors affecting resistance of a wire are

(i) Lengths (ii) Cross sectional area (iii) nature of material
(iv) surrounding temperature

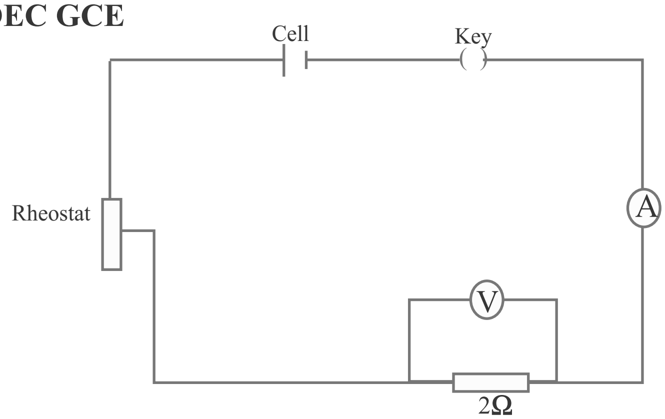
(ii) The specific resistance of material is the resistance of a unit length for a unit cross sectional area.

TITLE: Graph of V against I

Scale: 2cm represents 0.2 volt on y-axis
2cm represents 0.5 Amp on x-axis



Question 3 2006 NOV/DEC GCE



A circuit is connected as shown in the diagram above. With the key closed, the rheostat is adjusted such that a small current passes in the circuit.
The current, I, in the circuit is measured and recorded. Also the potential difference, *V*, across the 2Ω resistor is measured and recorded.
The procedure is repeated four more times by adjusting the rheostat each time to obtain higher values of the current and the potential difference.
Fig. 3(a) shows the values of the current I_1, while fig. 3(b) shows the corresponding values of the potential difference Vi where $i = 1, 2, 3, 4$ and 5 respectively.

(I) Read and record the values of current I.
(ii) Evaluate I^{-1} in each case.
(iii) Also read and record the corresponding values of the potential difference V.
(iv) Evaluate V^{-1} in each case.
(v) Tabulate your readings.
(vi) Plot a graph of V^{-1} on the vertical axis against I^{-1} on the horizontal axis, starting both axes from the origin (0,0).
(vii) Determine the slope, s, of the graph.
(viii) Evaluate $k = s^{-1}$
(x) State two precautions you would take to ensure accurate results if you were performing this experiment in the laboratory.

b(I) A constant wire has a cross sectional area of $4 \times 10^{-8}\ m^2$ and resistivity 1.1 × 10-6Ω*m*. If a resistor 11Ω is to be made from this wire, calculate the length of the wire required.
(ii) A cell supplies currents of 0.6 *A* and 0.2 *A* through 1.0Ω and 4.0Ω resistors respectively. Calculate the internal resistance of the cell.

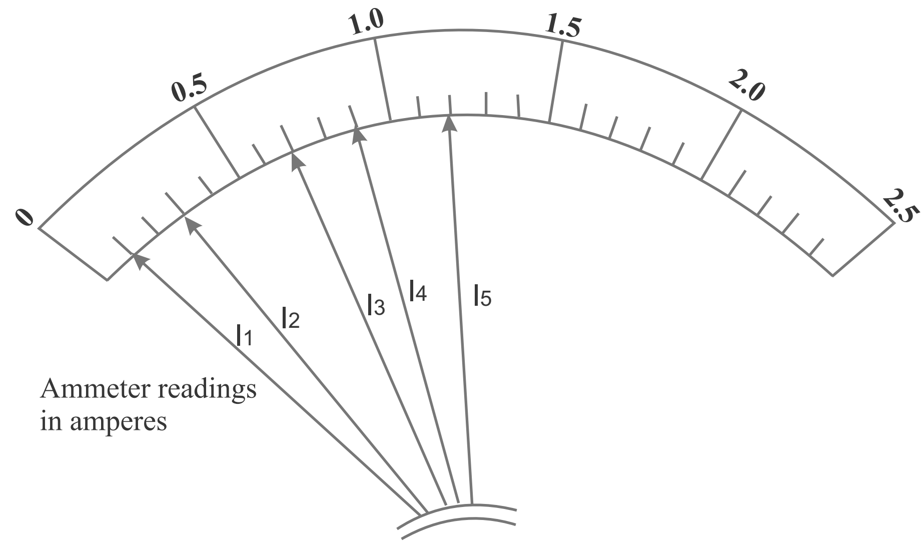

0
0.5
1.0
1.5
2.0
2.5
I1
I2
I3
I4
I5
Ammeter readings
in amperes

Fig. 3(a)

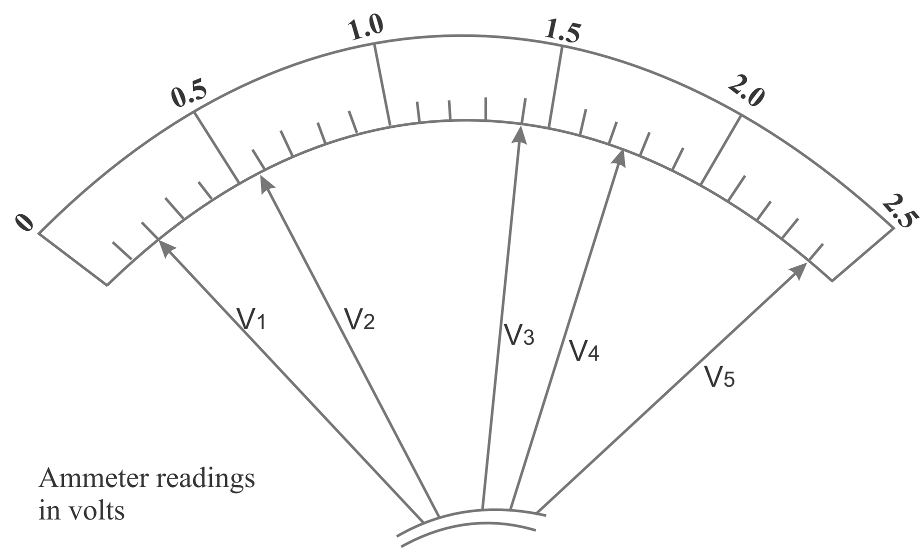

0
0.5
1.0
1.5
2.0
2.5
V1
V2
V3
V4
V5
Ammeter readings
in volts

Fig. 3(b)

Solution

	1	2	3	4
i	*I(Amp)*	*V(Volts)*	$I^{1}(Amp^{-1})$	$V^{1}(volts^{-1})$
1	*0.10*	*0.30*	*10.000*	*3.333*
2	*0.20*	*0.60*	*5.000*	*1.666*
3	*0.60*	*1.40*	*1.670*	*0.600*
4	*0.90*	*1.75*	*1.111*	*0.900*
5	*1.20*	*2.40*	*0.833*	*1.200*

Explanation of table

columns 1 and 2 are obtained by reading the values of current and potential difference in fig 3(a) and 3(b) respectively.
Columns 3 and 4 are obtained by calculating the reciprocal values of columns 1 and 2 respectively using a calculator.

$$\text{Slope (S)} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4.95 - 0.5}{10.0 - 1.0} = \frac{4.45}{9.0} = 0.494\Omega^{-1}$$

$$K = \text{slope}^{-1} = \frac{1}{0.494} \qquad K = 2.02W$$

Precautions

(I) Ensure key is removed when readings re not being taken to avoid running down battery.
(ii) Ensure clean terminals and tight connections
(iii) Correct the zero error in Ammeter and voltmeter.

b(i) $R = SL/A$

$L = RA/S$

$$= \frac{11 \times 4 \times 10^{-8}}{1.1 \times 10^{-6}}$$

$$= 40 \times 10^{-8+6} \quad = 40 \times 10^{-2} \quad = 0.4\text{m}$$

(Ii) $E = I(R + r)$

$0.6 (1 + r) = 0.2 (4 + r)$

$0.6 + 0.6r = 0.8 + 0.2r$

$0.6r - 0.2r = 0.8 - 0.6$

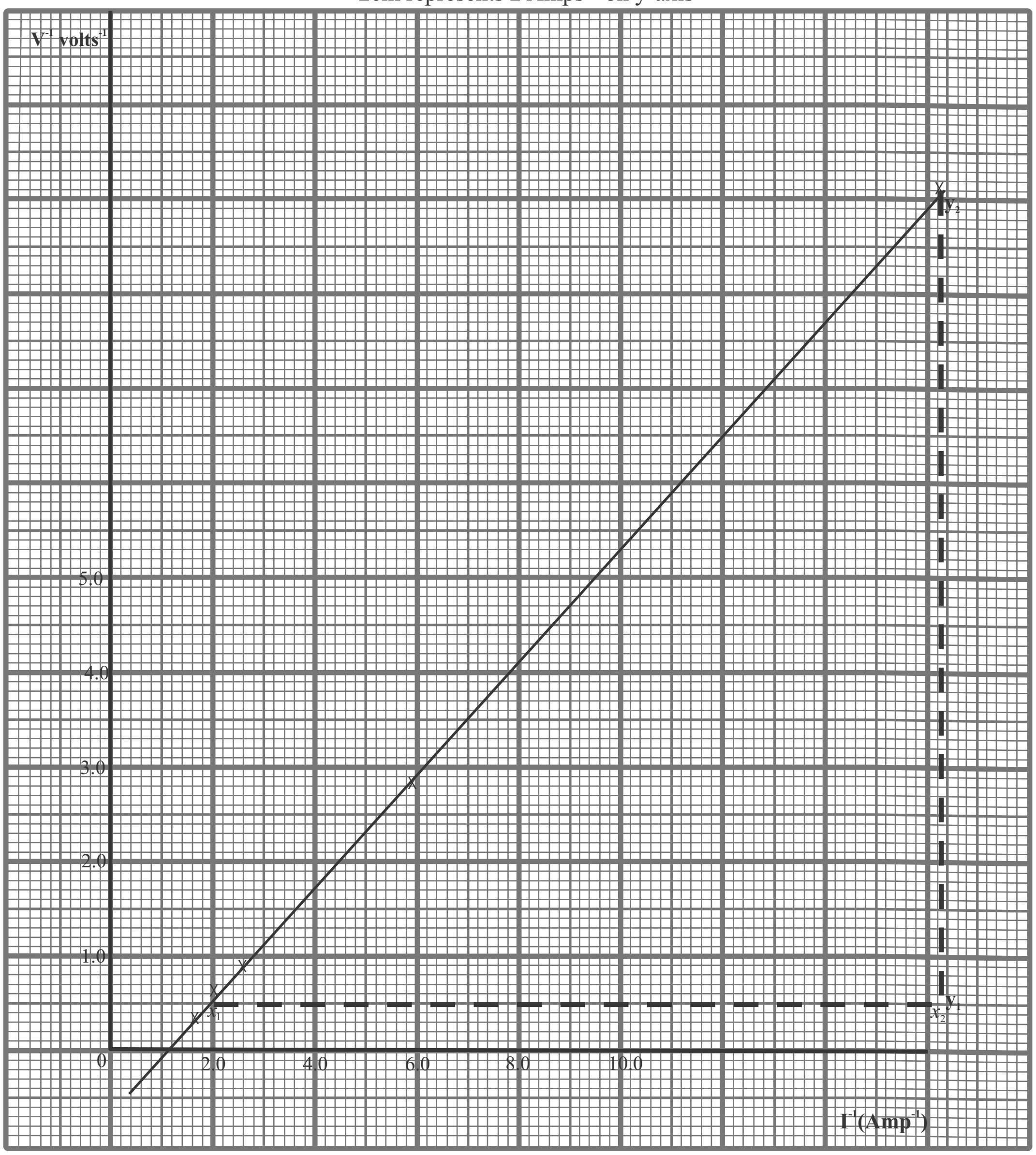
$0.4r = 0.2$

$$r = \frac{0.2}{0.4} = 0.5\Omega$$

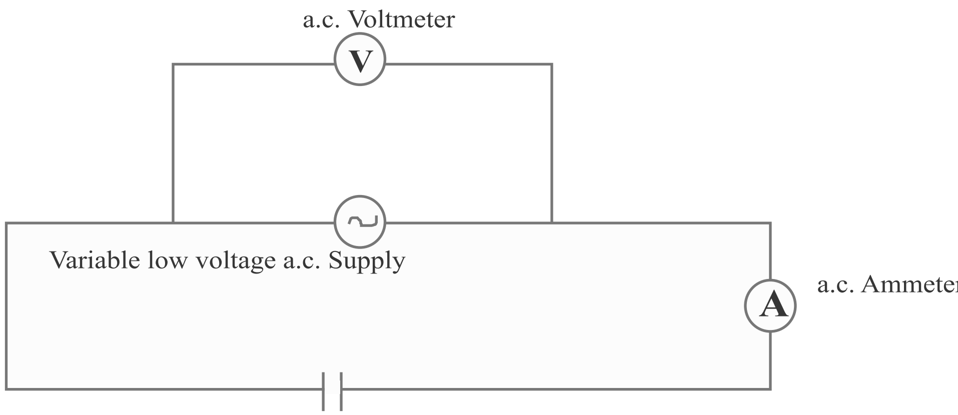
Title: The Graph of V^{-1} against I^{-1}

Scale: 2cm represents 1 $volt^{-1}$ on x-axis

2cm represents 2 $Amps^{-1}$ on y-axis



Question 3 2002 NOV/DEC GCE



The circuit diagram above shows a capacitor and an ammeter connected in series with an a.c. Source of variable voltage. A voltmeter is connected across the a.c. source. For five different low voltages from the a.c. Source, the current *I* and the corresponding potential difference *V* are read and recorded.

Fig. 3(a) and Fig. 3(b) show the ammeter readings *li* and the corresponding voltmeter readings *Vi* respectively, where *i* = 1, 2, 3, 4, 5 and 6 respectively.

(I) Read and record the values, I, of the current and the corresponding values, V of the voltage.

(ii) In each case, evaluate I^{-1} and V^{-1}

(iii) Tabulate your readings.

(iv) Plot a graph of V^{-1} on the vertical axis and I–1 on the horizontal axis.

(v) Determine the slope, s, of the graph

(vi) Determine the value of I when V is: (I) 8 *V*; (II) 16*V*

(vii) Determine the frequency, f, of the a.c. source from the formula: $f = \frac{s}{2\pi C}$
Take π = 22/7 and C = 1.59*uF*

(viii) State two precautions you would take to obtain accurate results if you were performing this experiment in the laboratory.

b(I) Give a reason why a moving-coil ammeter may not be suitable for measuring currents in this experiment. Mention one type of ammeter that could be used.

(ii) Define capacitive reactance and write down an expression for the reactance of the circuit used for the experiment above.

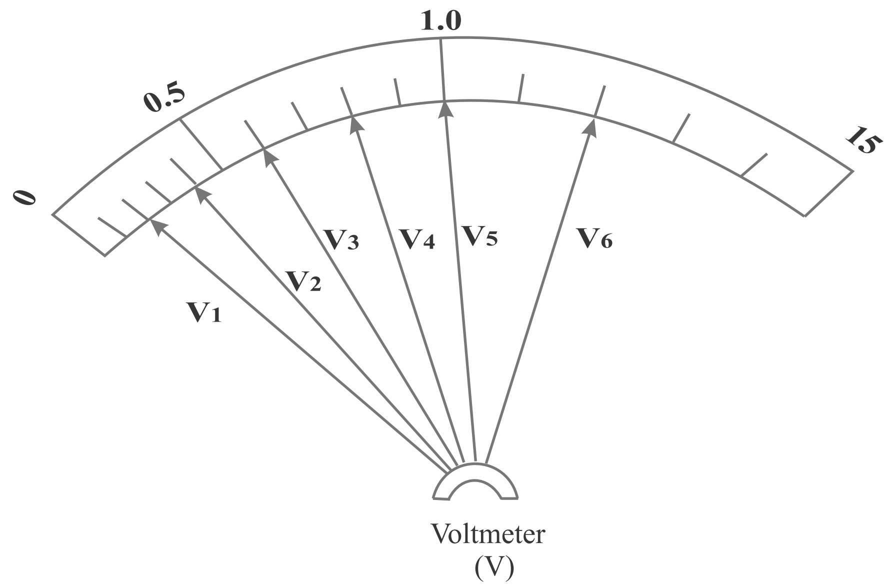

1.0
0.5
0
15
V1
V2
V3
V4
V5
V6
Voltmeter
(V)

Fig. 3(a)

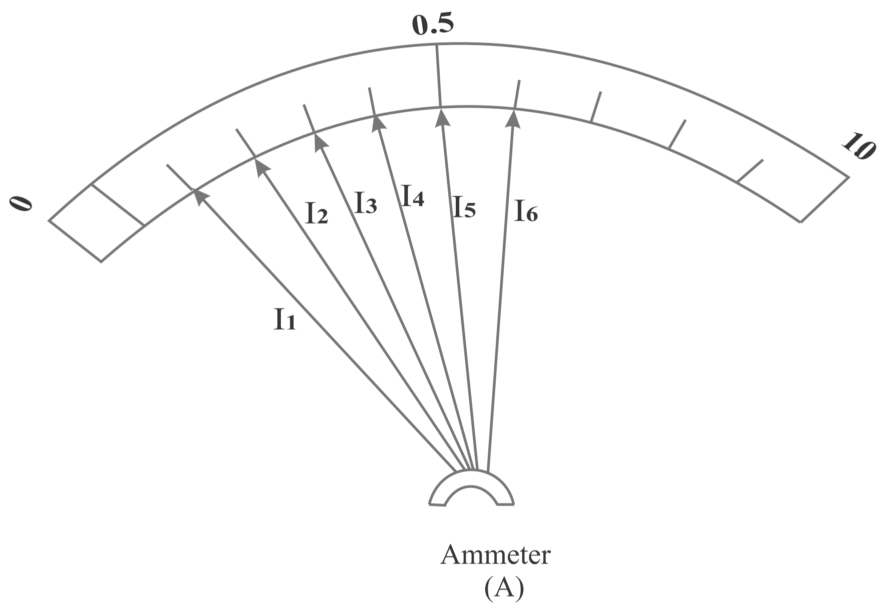

0.5
0
10
I1
I2
I3
I4
I5
I6
Ammeter
(A)

Fig. 3(b)

Solution

1	2	3	4	5
I	*Vi(Volts)*	*Ii(Amps)*	*V^{-1} Volts^{-1}*	*I^{-1}(Amp)$^{-1}$*
1	*0.20*	*0.10*	*5.000*	*10.000*
2	*0.40*	*0.20*	*2.500*	*5.000*
3	*0.60*	*0.30*	*1.667*	*3.333*
4	*0.80*	*0.40*	*1.250*	*2.500*
5	*1.00*	*0.50*	*1.000*	*2.000*
6	*1.20*	*0.60*	*0.833*	*1.667*

Explanation of table

Columns 1 and 2 are obtained by reading Voltmeter and Ammeter readings in figure 3a and 3b respectively and recording to 2 decimal places.
Columns 3 and 4 are obtained by calculating the reciprocal values in (i) and (ii) respectively.

(v) Slope (S) = $\frac{y_2 - y_1}{x_2 - x_1} = \frac{4.5 - 1.0}{9.0 - 2.0} = \frac{3.5}{7.0} = 0.5\Omega^{-1}$

(vi) I when V = 8V, V^{-1} (P) = 0.125 on graph I^{-1} (Q) = 0.25 so I = 4Amp
I when V = 16V, V^{-1} (K) = 0.0625 on graph I^{-1} (M) = 0.125 so I = 8 Amp

(Vii) $F = \frac{s}{2\pi C} = \frac{0.5}{2 \times \frac{22}{7} \times 1.59 \times 10^{-6}} = \frac{0.5 \times 10^{6} \times 7}{2 \times 22 \times 1.59}$ 4

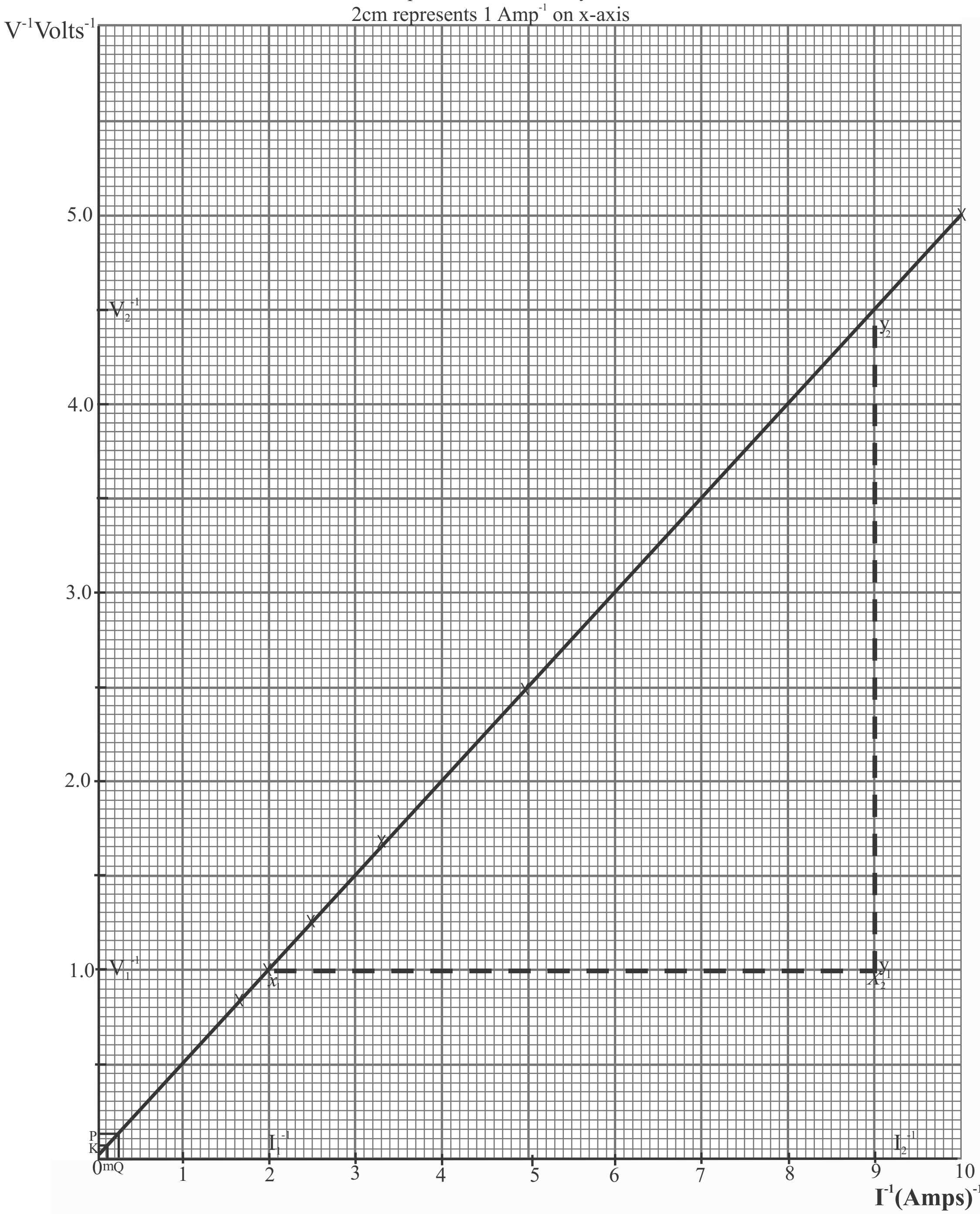
$= 0.50 \times 10 \times 0.1 \sim 5 \times 10^{6}$ Hz

Precautions

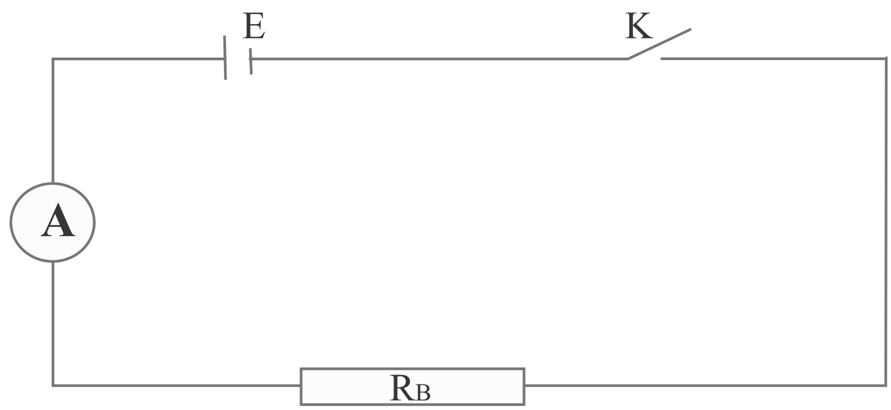
(i) Ensure tight connections and clean terminals
(ii) Avoid parallax error when reading the Ammeter and voltmeter
b(i) The circuit is an a.c. (Alternating current) circuit but a moving oil meter measures d.c. (Direct Current). A moving Iron instrument can be used.
(Ii) Capacitive reactance is the opposition offered to the flow of alternating current by the capacitor. In this circuit the capacitive reactance is $\frac{1}{s} = \frac{1}{2\pi fC}$

Title: Graph of V^{-1} against I^{-1}

Scale: 4cm represents 1 $Volts^{-1}$ on y-axis
2cm represents 1 Amp^{-1} on x-axis



Question 3 2007 NOV/DEC GCE



A circuit is connected as shown in the diagram above.
The *e.m.f. E* of the battery is 1.5 *V*.
With the resistance in the resistance box R_B, set at R_1 and the key K_1 closed, the current I in the circuit is read at the Ammeter A.
The procedure is repeated for five other values o f R.
Fig. 3(a) represents the values of R_i while fig. 3(b) shows the corresponding values of I_i where i = 1, 2, 3, 4, 5 and 6.

(i) Read and record the values of R (take the unshaded circles as active).
(ii) Read and record the corresponding values of I.
(iii) Evaluate $P = \frac{E}{I}$ in each case.
(iv) Plot a graph of P on the vertical axis against R on the horizontal axis, starting both axes from the origin (0,0).
(v) Determine the slope, s, of the graph and the intercept c on the vertical axis.
(vi) State the physical quantity represented by the intercept.
(vii) State two precautions you would have taken to ensure accurate results if you were performing this experiment in the laboratory.

b(i) Define the *internal resistance of a cell.*
(ii) A cell of *e.m.f.* 4.5 *V* is connected across a resistor of resistance 4 W. If a current of 0.9 *A* passes through the circuit, calculate the internal resistance of the cell.

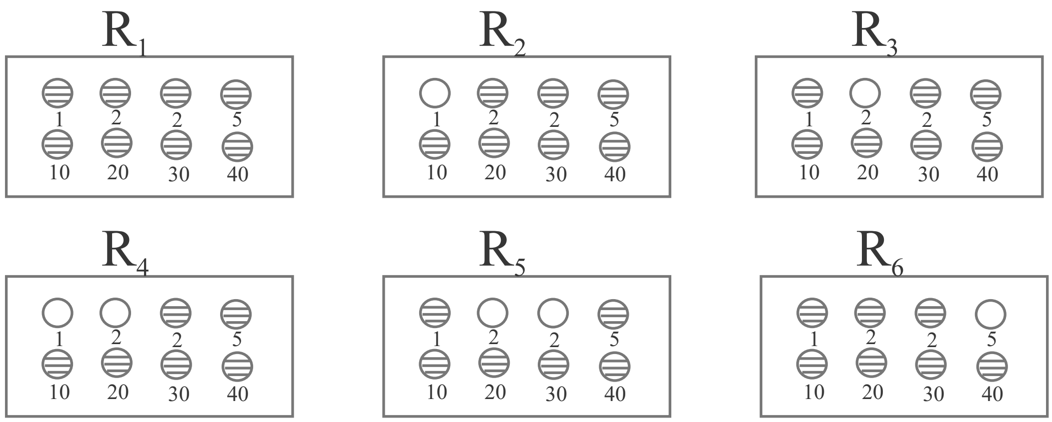

R1
1 2 2 5
10 20 30 40
R2
1 2 2 5
10 20 30 40
R3
1 2 2 5
10 20 30 40
R4
1 2 2 5
10 20 30 40
R5
1 2 2 5
10 20 30 40
R6
1 2 2 5
10 20 30 40

Fig.3 (a)

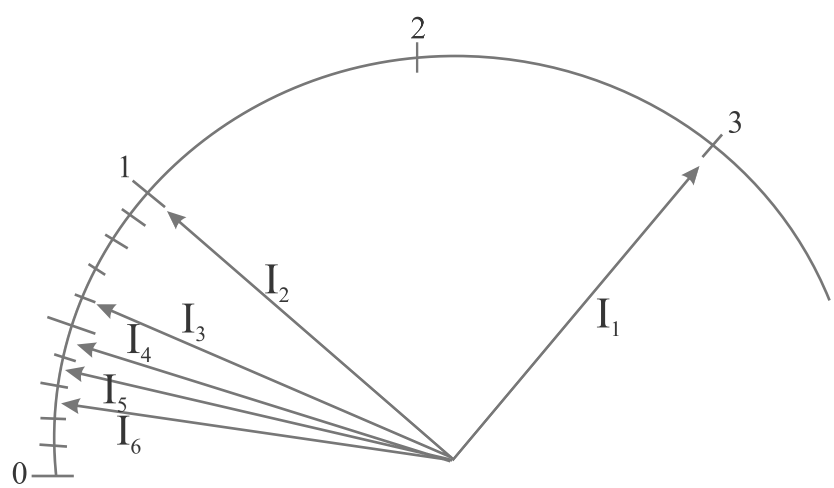

0
1
2
3
I1
I2
I3
I4
I5
I6

Fig.3 (b)

E = 1.5V

Solution

i	*Ri(W)*	*I(A)*	*P = E/I(W)*
1	*0*	*3.00*	*0.50*
2	*1*	*1.00*	*1.50*
3	*2*	*0.60*	*2.50*
4	*3*	*0.43*	*3.49*
5	*4*	*0.33*	*4.5*
6	*5*	*0.27*	*6.00*

$$\text{Slope (S)} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5.5 - 1}{5 - 0.5} = \frac{4.5}{4.5} = 1.0$$

Intercept C on y -axis = 0.5W

(vi) Intercept on Y-axis. From the equation for the current in a cell $I = \frac{E}{R + r}$

$\frac{E}{I} = R + r$ compared with $y = mx + c$ which is the equation of a straight line

C = Intercept on y-axis = r

r = Internal resistance of the cell.

Precautions

(i) Ensure key is removed when readings are not been taken

(ii) Ensure tight connections / ensure clean terminals

(iii) Avoid the zero error of ammeter

b(i) Internal resistance is the opposition offered to the flow of current by the cell itself.

(ii) $I = \frac{E}{R + r}$ = current in a cell

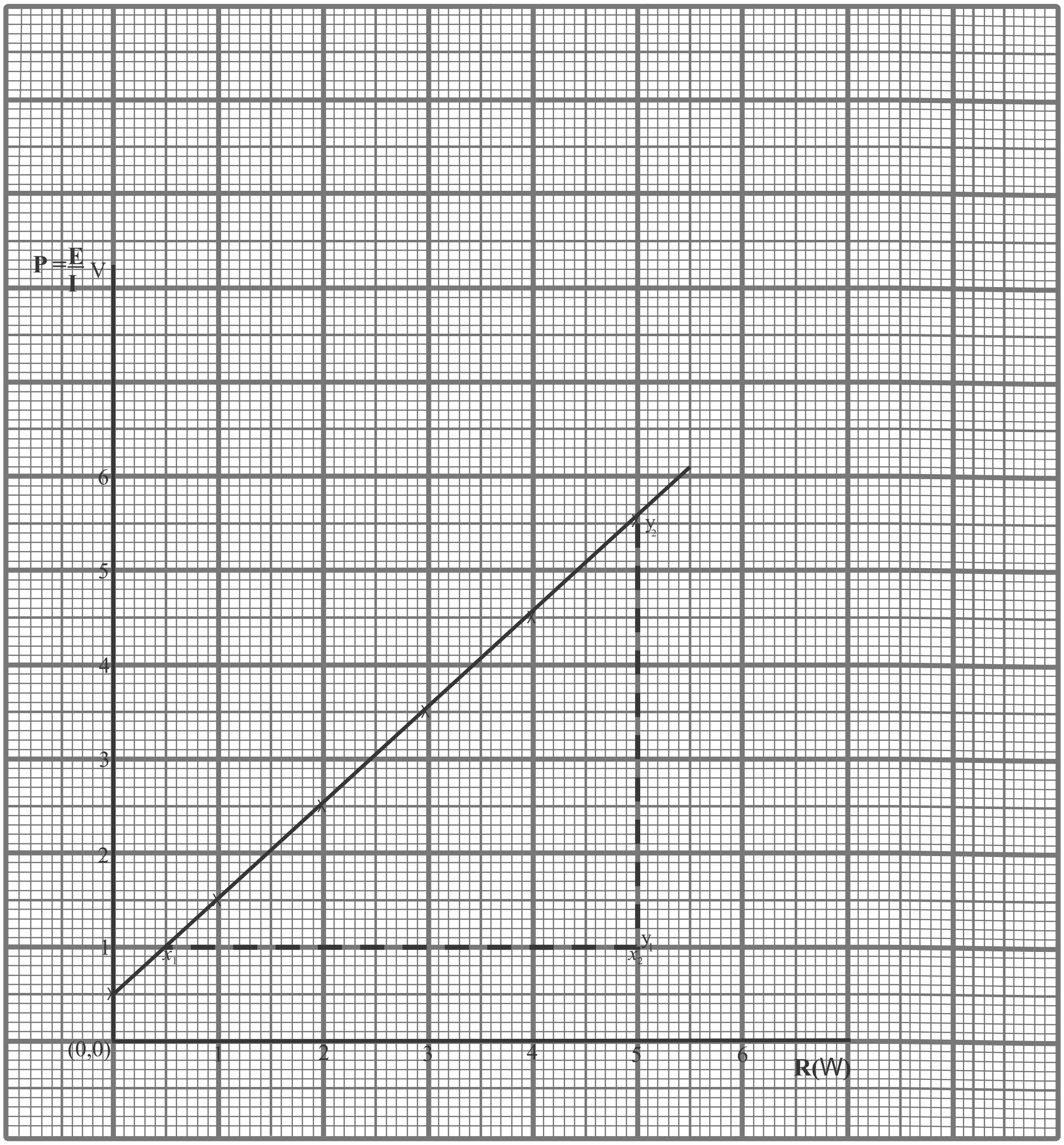
$$R + r = \frac{E}{I}$$

$$r = \frac{E}{I} - R$$

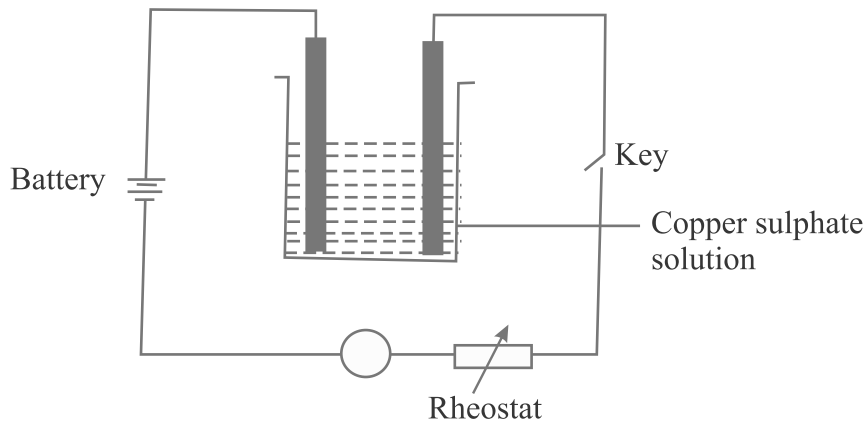
$$r = \frac{4.5}{0.9} - 4 = 5 - 4 = 1\Omega.$$

Title: Graph ofE/I against R

Scale: 2cm represents 1W on y-axis
2cm represents 1W on x-axis



Question 3 2005 NOV/DEC GCE



Two copper plates, P and Q, are thoroughly cleaned and dried. P is weighed and its mass, m, is recorded. P and Q are then placed in a jar containing a solution of copper sulphate so that they serve as cathode and anode respectively in an electric circuit as shown in the diagram above.

The circuit is closed and current, I, is allowed to flow in the circuit for *t* minutes. P is then removed, gently rinsed, dried and weighed again. The new mass *M* of P is recorded. The experiment is repeated for four other copper plates, P, of different masses. Each time *m, M, t* and I are measured and recorded.

Fig.3(a) shows the values of the masses m_i and M_i of P, fig. 3(b) shows the corresponding times ti during which current is passed while fig. 3(c) shows the corresponding current, I, flowing in the circuit, where *i* = 1, 2, 3, 4 and 5 respectively.

(i) Read and record the values of *m* and the corresponding values of *M*.
(ii) Read and record the corresponding time *t* of the flow of current.
(iii) Also read and record the corresponding values of the current I.
(iv) Evaluate d = *M*-*m* and z = I*t* in each case.
(v) Tabulate your readings.
(vi) Plot a graph of d on the vertical axis against z on the horizontal axis.
(Vii) Determine the slope, s, of the graph.
(Viii) Evaluate $r = \frac{s}{60}$
(ix) State the quantity represented by r.
(x) State two precautions you would take to ensure accurate results if you were performing this experiment in the laboratory.

b(i) Explain electromotive force.
(ii) List two sources of electromotive force other than a chemical cell.

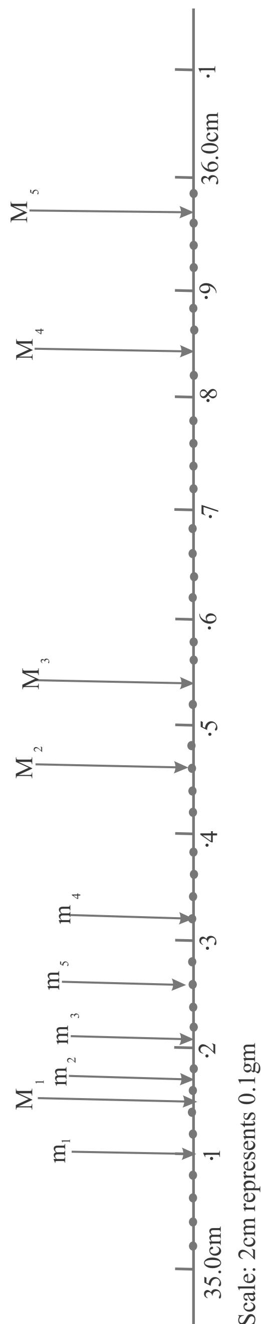


Fig.3(a)

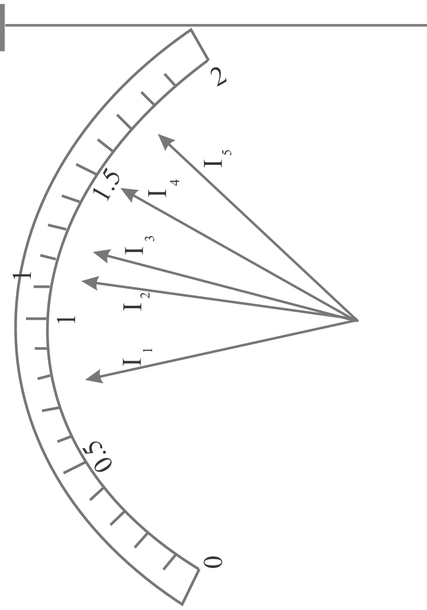


Fig.3(c)

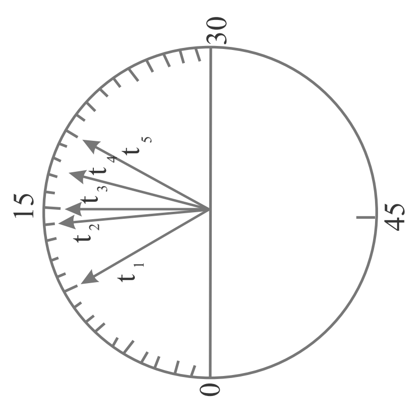


Fig.3(b)

Solution

m(g)	Micm	t(s)	Ii	mconv(g)	Mi(g)	d(g)	Z = It(A) mm
35.10	35.15	10.0	0.75	1.755	1.758	0.003	7.50
35.17	35.46	14.5	1.20	1.785	1.773	0.015	17.4
35.21	35.54	15.0	1.25	1.761	1.777	0.016	18.75
35.32	35.84	17.5	1.50	1.766	1.792	0.026	26.25
35.24	35.98	20.0	1.75	1.762	1.799	0.037	35.00

$$\text{Slope(S)} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0.037 - 0.005}{35 - 10} = \frac{0.032}{25} = 0.00128\text{g(AMIn)}^{-1}$$

$$r = \frac{s}{60} = \frac{0.00128}{60} = 000002133 = 2.133 \times 10^{-5}\text{gc}^{-1}$$

r represents the electrochemical equivalent.

Precautions

(i) I will ensure key is unplugged when readings are not being taken so that the battery does not run down

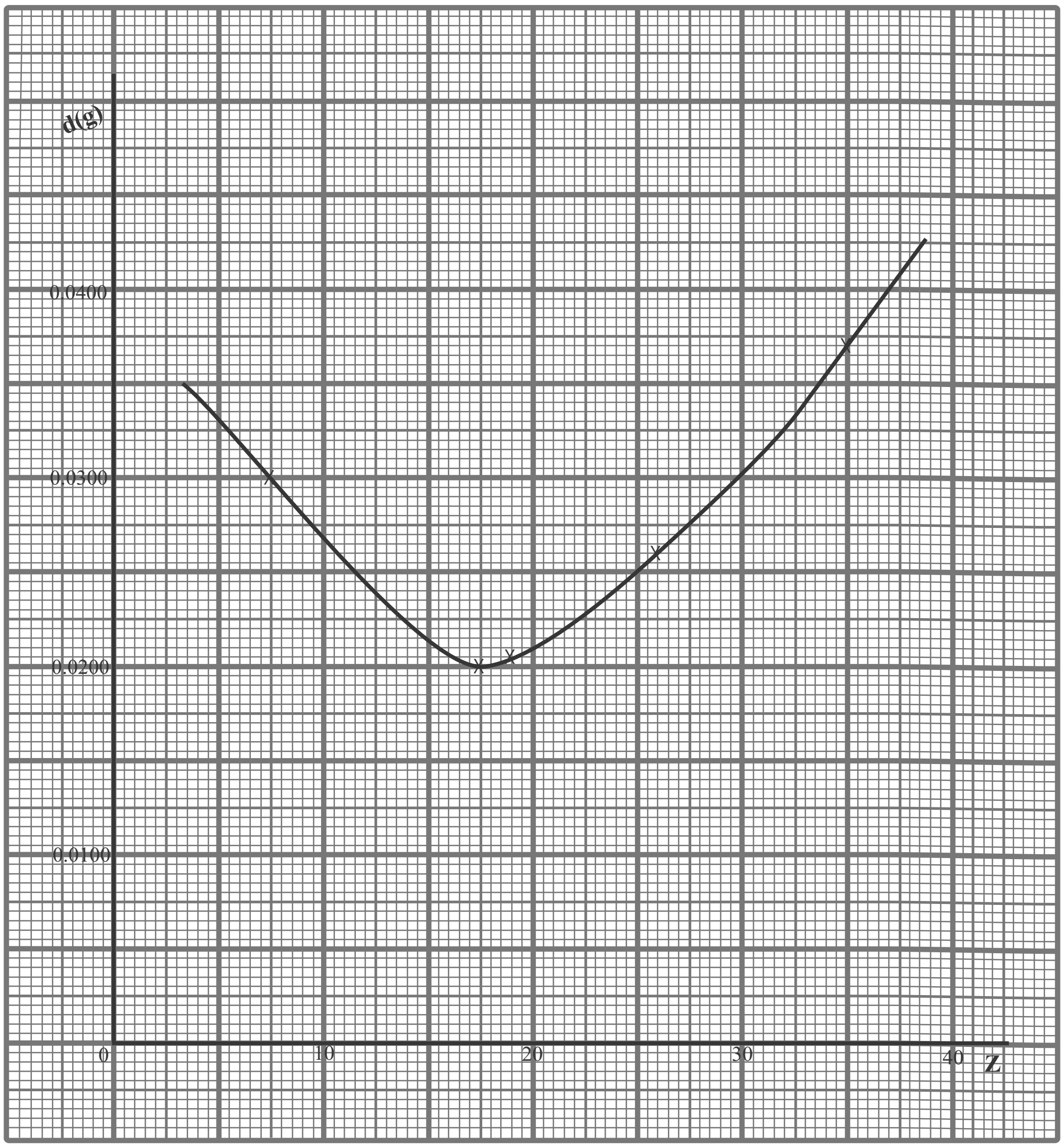
(ii) I will note and correct the zero error in Ammeter

(iii) I will avoid parallax error when reading the ammeter.

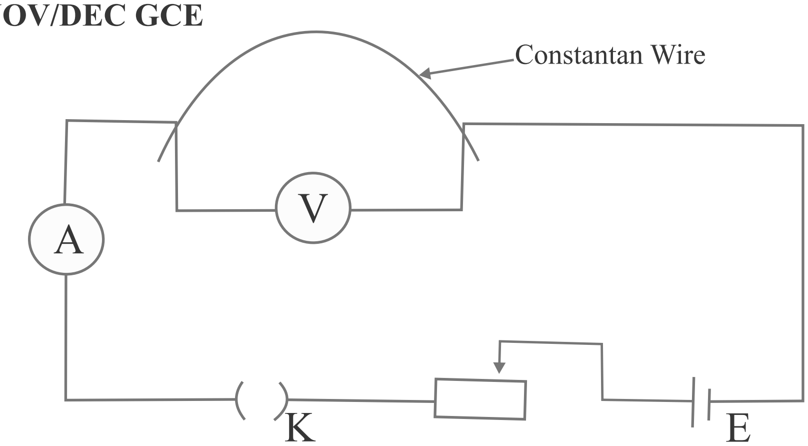
Title: Graph of d against Z

Scale:4cm represents 0.010g on y-axis

4cm represents 10 units on x-axis



Question 3 2009 NOV/DEC GCE



Five constantan wires fo different diameters marked **J, K, L, M** and **N**, each of the length 1.0m are connected in turns in a circuit as illustrated in the diagram above.
For each trial the rheostat is adjusted such that the same current flows through the wires. The corresponding voltmeter readings are noted and recorded.
Fig. 3(a) represents the voltmeter readings V_t
Fig. 3(b) represents the ammeter reading ***I.***
Fig. 3(c) represents the diameters of d_i of the wires **J, K, L, M** and **N** respectively
Where i = 1, 2, 3, 4 and 5.

(i) Read and record the value of I
(ii) Read and record the values of V_i
(iii) Record the corresponding values of d_i measured horizontally.
(iv) Evaluate R = V/I in **each** case
(v) Evaluate the cross-sectional area, A, of each constantan wire using its corresponding diameter *d*. Express your answers in standard form

$$[A = \frac{\pi d^2}{4}]$$

(vi) Evaluate A^{-1}
(vii) Tabulate your readings
(viii) Plot a graph of **R** on the vertical axis against $\mathbf{A^{-1}}$ on the horizontal axis
(ix) State two precautions necessary to ensure accurate results when performing this experiment

b(I) A bulb is rated 12 *V*, 6*W*. Calculate the time for which it can operate continuously for a 30 *Ah* 12 *V* battery
(ii) Explain why the *e.m.f.* of a cell is greater than the terminal *p.d.* when the cell is used to supply current to an external resistor.

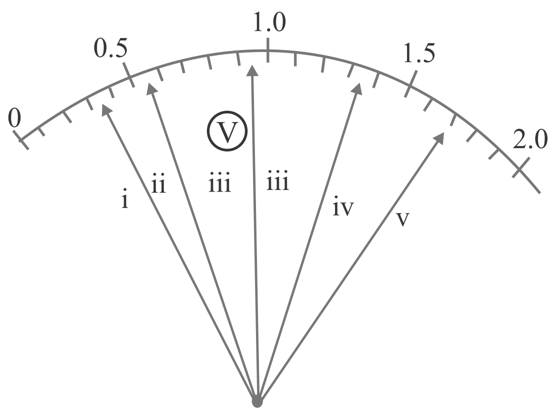


Fig. 3(a)

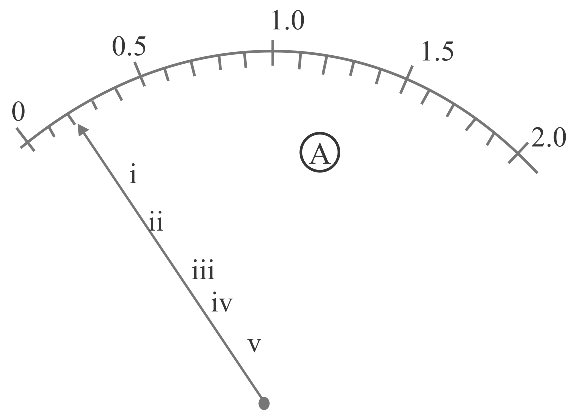


Fig. 3(b)

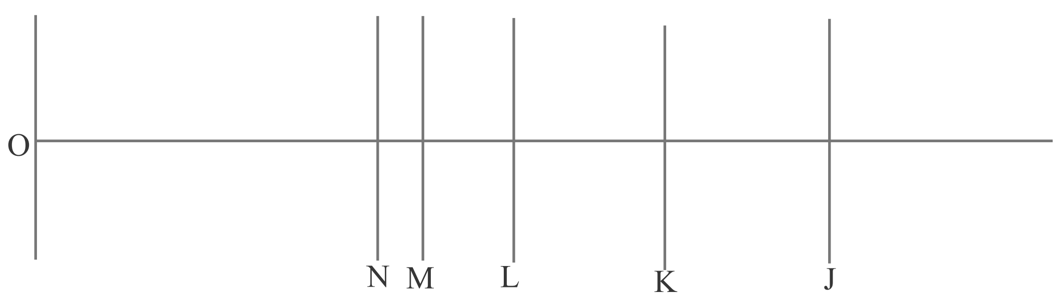


Fig. 3(c)

Scale: 1cm represents 0.00005m

Solution

I = 0.2A

i	*V/Volts*	d_i	d_i *real x* 10^4 *m*	*R=V/I*Ω	*A=* $\pi d^2/4$	$A^{-1} m^2$
1	*0.35*	*10.5*	*5.25*	*1.25*	2.165×10^{-7}	0.40×10^7
2	*0.55*	*8.3*	*4.15*	*2.75*	1.353×10^{-7}	0.74×10^7
3	*0.95*	*6.3*	*3.15*	*4.75*	7.794×10^{-8}	1.28×10^7
4	*1.35*	*5.1*	*2.55*	*6.75*	5.108×10^{-8}	1.96×10^7
5	*1.70*	*4.5*	*2.25*	*8.5*	3.9×10^{-8}	2.56×10^7

Precautions

1. I will ensure that key is removed when readings are not being taken so that the battery does not run down.
2. I will ensure clean terminals/tight connection to prevent insulation.
3. I will note and correct the zero error of voltmeter and Ammeter.
4. I will avoid parallax error when reading the voltmeter, ammeter or micrometer screw gauge.

b(i) Pt = QV

$t = \frac{QV}{P} = \frac{30 \times 12}{6}$

t = 60 hrs

= 60 x 60 x 60

= 2.16×10^5 seconds

b(ii) Electromotive force of a cell is not always the same as its terminals potential difference because some energy will be used to circulate electric charge through the cell itself in addition to that required in the external circuit.

OR mathematically

E = IR + Ir

E = V + Ir

E is found to be greater than V by Ir.

Where E = Electromotive force

IR = terminal potential difference

Ir = Lost volts

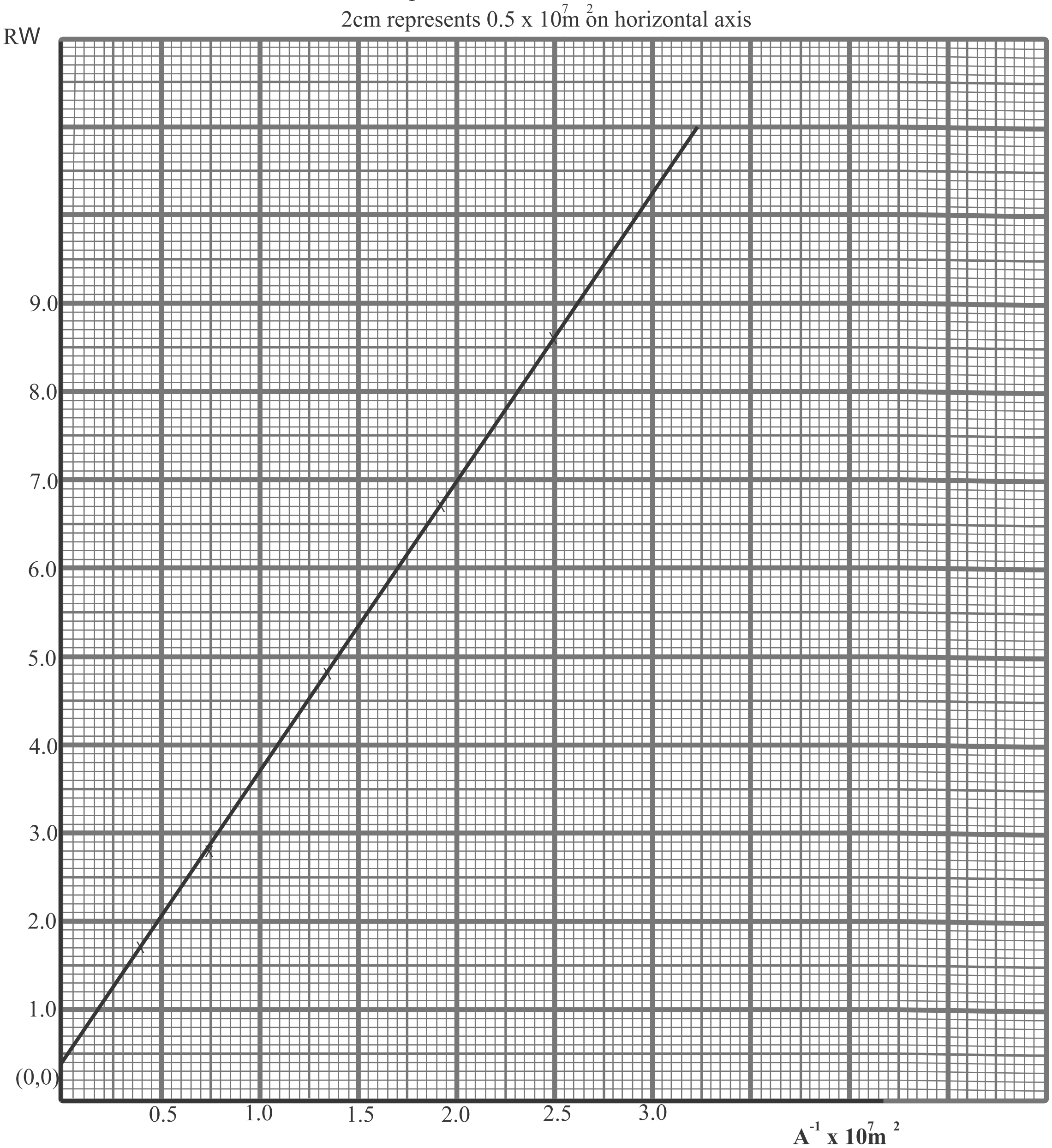
R = External resistance

R = Internal resistance

Title: Graph of R against A^{-1}

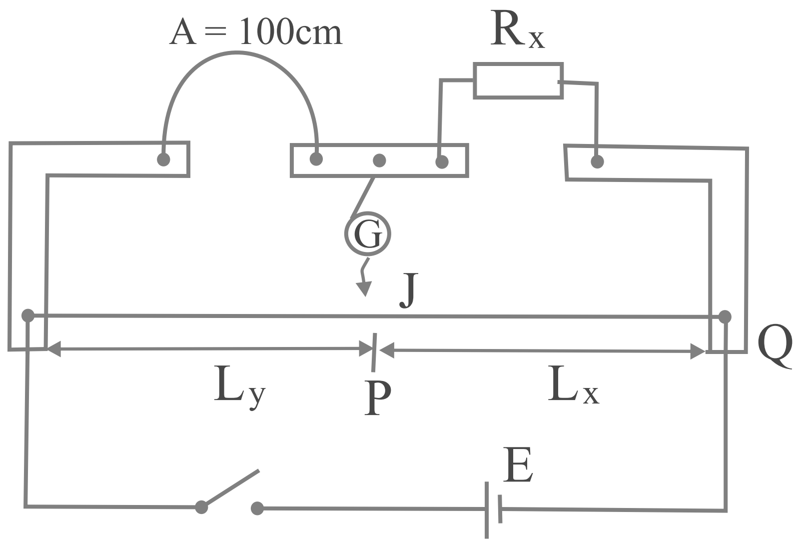
Scale: 2cm represents 1.0 W on vertical axis

2cm represents $0.5 \times 10^{7} m^{2}$ on horizontal axis



MAY/JUNE 2008

(Class Activities 1)



(a)You are provided with two resistance wires A and B, a 1Ω standard resistor Rx and other necessary apparatus.

(i) Connect Rx in the left hand gap of the metre bridge, a length L = 100cm of wire A in theright hand gap and the other apparatus as shown in the diagram above.

(ii)Determine and record the balance point P on the bridge wire NQ.

(iii)Measure and record lx = NP and lx = PQ.

(iv)Evaluate $R1 = \frac{l_Y}{l_x} R_x$

(v)Repeat the experiment for four values of L = 95, 85, 75 and 65cm. In each case, determine and record the balance point P and the lengths l_x and l_y Also evaluate R_1

(vi)Repeat the experiment with the second wire B. Obtain the balance points and the values of lx and ly.

(vii) Evaluate $R1 = \frac{l_y}{l_x} R_x$ in each case. Tabulate your readings.

(viii) Plot a graph of R_2 on the vertical axis against R_1 on the horizontal axis.

(ix)Determine the slope, s, of the graph

(x) Evaluate $k = \sqrt{s}$

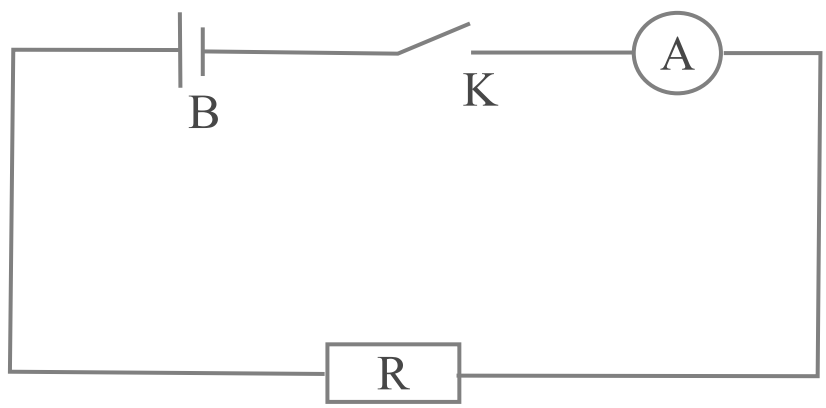
(xi)State two precautions taken to obtain accurate results.

(b)(i) State two advantages of using potentiometer over a voltmeter for measuring potential difference.

(ii)Define internal resistance of a cell.

GRAPH SHEET

MAY/JUNE 2008 *(Class Activities 2)*



A = Ammeter
R = Resistance box
K = Key
B = Battery

(a)You are provided with a battery, a resistance box and other necessary apparatus.

(i) Connect a circuit as shown above.

(ii)Set the resistance in the resistance box at R_o = 0,0. Read and record the ammeter readings I_o.

(iii) Evaluate Io^1.

(iv)Repeat the procedure for five other values of R = 2, 3, 4, 5 and 6Ω. In each case, read and record the ammeter reading I. Also evaluate I^1 .

(v)Plot a graph of I on the vertical axis against R on the horizontal axis.

(vi)Determine the slope, s, of the graph. Also determine the intercept, c, on the vertical axis.

(vii) Evaluate $k = \frac{c}{s}$

(viii) State two precautions taken to obtain accurate results.

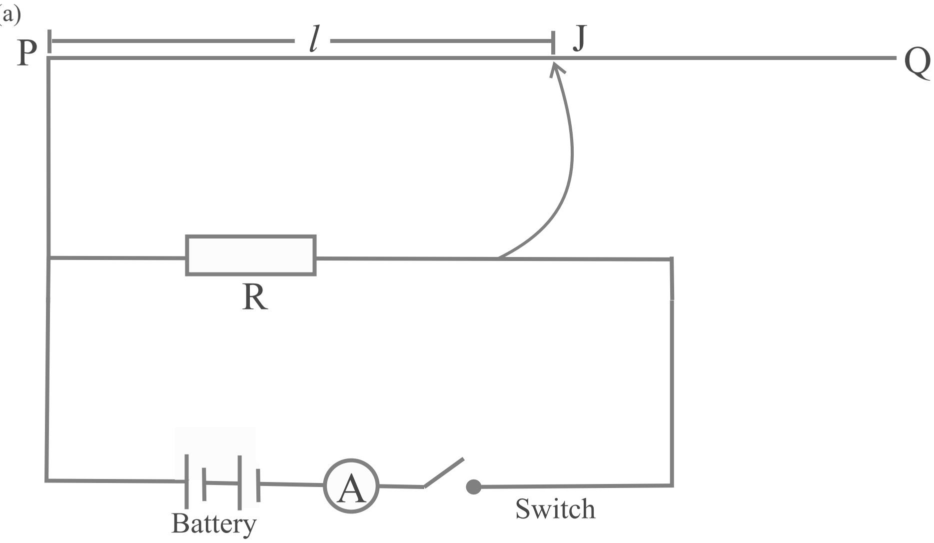
(b)(i) Explain *electromotive force of a cell.*

(ii)Explain, with the aid of a labelled diagram, how a galvanometer may be adapted to read as an ammeter.

GRAPH SHEET

MAY/JUNE 2009 *(Class Activities 3)*

(a)



(I) Connect the circuit as shown in the diagram above. PQ is a potentiometer wire 100cm long and R is a standard resistor of 5Ω.

(ii) With the jockey J not making contact with PQ, close the switch. Read and record the ammeter reading I. Open the switch.

(iii) Use the jockey to make contact with PQ at the 20cm mark such that PJ = l = 20cm. Close the switch, read and record the value, l_I of the ammeter. Evaluate l^{-1}.

(iv) Repeat the procedure for other values of l = 35, 50, 65 and 80cm. In each case determine the corresponding values of l_I and l^{-1}. Tabulate your readings.

(v) Plot a graph of l^{-1} on the vertical axis and l_i on the horizontal axis starting both axes from the origin (0,0).

(vi) From your graph deduce the value l_o of l_i when $l^{-1} = 0$.

(vii) Evaluate $\frac{l_o}{l}$

(viii) State two precautions taken to ensure accurate results.

b(I) Define the e.m.f. of a battery.

(ii) A cell X of e.m.f. 1.00 is balanced by a length of 40.0 cm on a potentiometer wire. Another cell Y is balanced by a length of 60.0cm on the same wire. Calculate the e.m.f. of Y.