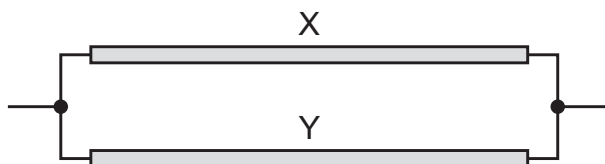


- 36** Two identical wires X and Y, each of length L and radius r , are connected in parallel as shown.



The total resistance of this combination is R_1 .

Wire X is replaced with a wire of the same material with length L and radius $2r$.

The total resistance of the new combination is R_2 .

What is the ratio $\frac{R_1}{R_2}$?

A $\frac{2}{5}$

B $\frac{2}{3}$

C $\frac{3}{2}$

D $\frac{5}{2}$

- 31** There is a potential difference V across a resistor of resistance R . The current in the resistor is I .

Which equation gives the power P dissipated by the resistor?

A $P = V^2 I$

B $P = \frac{V^2}{I}$

C $P = V^2 R$

D $P = \frac{V^2}{R}$

- 32** What is a possible charge on a particle?

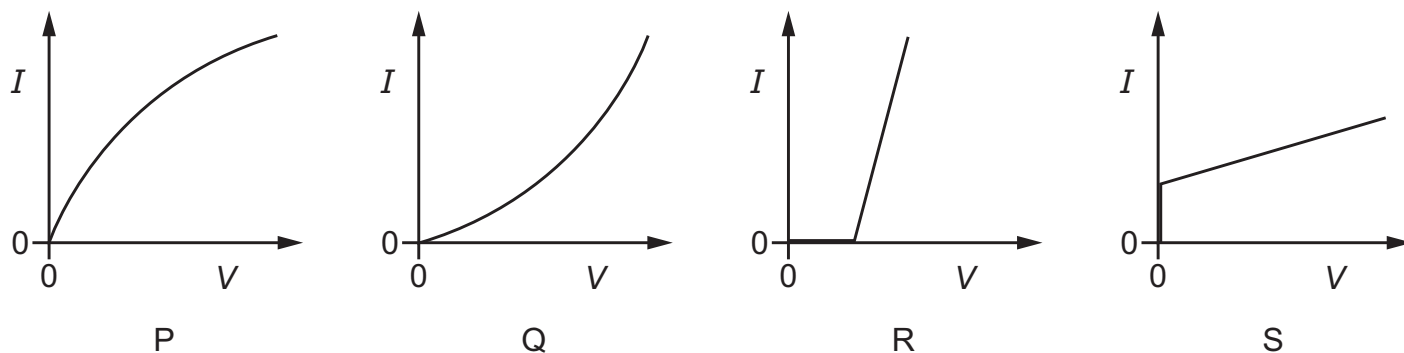
A $6.40 \times 10^{-20} \text{ C}$

B $4.00 \times 10^{-19} \text{ C}$

C $1.12 \times 10^{-18} \text{ C}$

D $9.11 \times 10^{-18} \text{ C}$

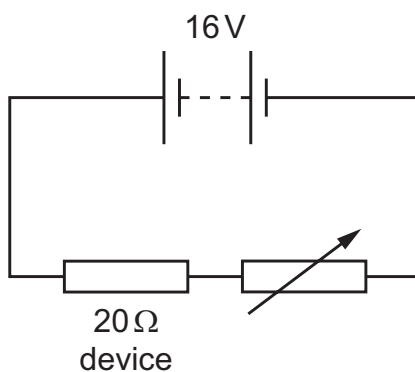
- 33** The graphs show possible current–voltage (I – V) characteristics for a filament lamp and for a semiconductor diode.



Which row identifies the I – V graphs for the lamp and for the diode?

	filament lamp	semiconductor diode
A	P	R
B	P	S
C	Q	R
D	Q	S

- 37** An electrical device of fixed resistance $20\ \Omega$ is connected in series with a variable resistor and a battery of e.m.f. $16\ \text{V}$ and negligible internal resistance.



The power dissipated in the electrical device is $4.0\ \text{W}$.

What is the resistance of the variable resistor?

- A** $16\ \Omega$ **B** $36\ \Omega$ **C** $44\ \Omega$ **D** $64\ \Omega$

- 6** A nichrome wire X of length 45 cm and cross-sectional area $4.7 \times 10^{-7} \text{ m}^2$ is connected into the circuit shown in Fig. 6.1.

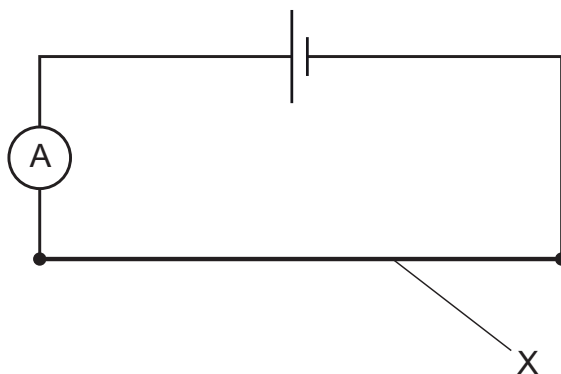


Fig. 6.1

The resistance of X is $1.1 \, \Omega$. The cell has electromotive force (e.m.f.) 1.3 V and negligible internal resistance.

- (a) (i)** Calculate the current in X.

current = A [1]

- (ii)** The number density of charge carriers (electrons) in nichrome is $8.5 \times 10^{28} \text{ m}^{-3}$.

Calculate the average drift speed of the charge carriers in X.

average drift speed = ms^{-1} [2]

- (iii)** Calculate the resistivity of the nichrome.

resistivity = $\Omega \text{ m}$ [3]

- (b) Wire Y is identical to wire X. Wire Y is added to the circuit in parallel with wire X, as shown in Fig. 6.2.

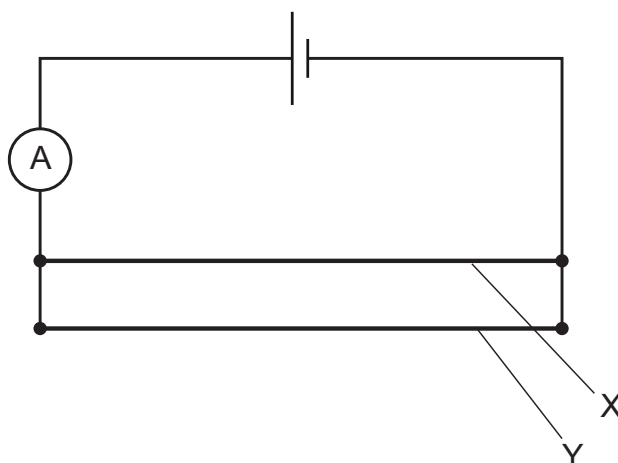


Fig. 6.2

State and explain the effect, if any, of this change on:

- (i) the reading on the ammeter

.....
.....
..... [2]

- (ii) the average drift speed of the charge carriers in X.

.....
..... [1]

[Total: 9]

1 In this experiment, you will investigate a light-dependent resistor (LDR).

- (a) • Connect the circuit shown in Fig. 1.1.

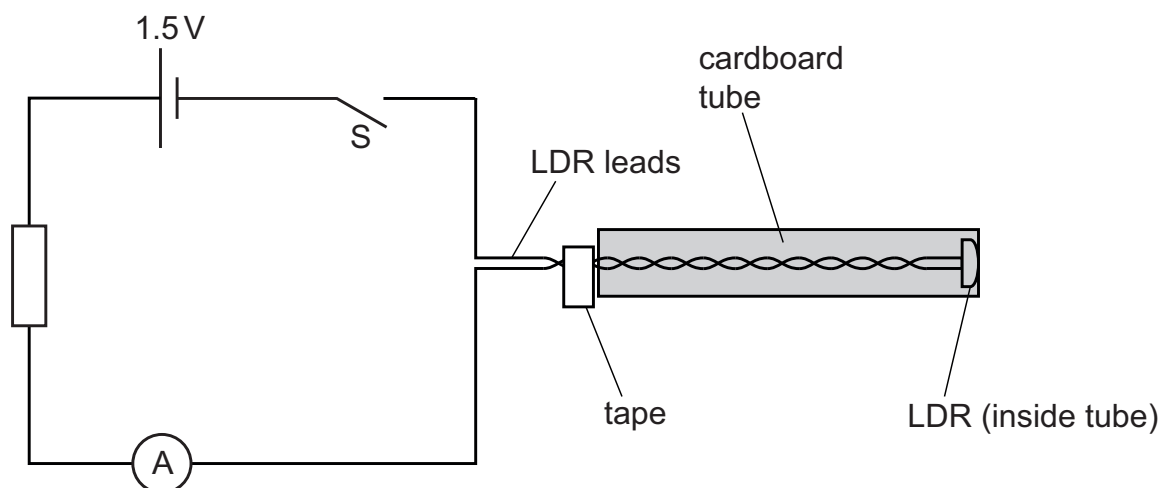


Fig. 1.1

- Ensure that the switch S is open.
- Slide the LDR leads into the tube until the front of the LDR is just level with the open end of the tube, as shown in Fig. 1.1.
- With the LDR in this position, attach a piece of adhesive tape to the leads as a marker at the other end of the tube, as shown in Fig. 1.1.
- Slide the tube until the LDR is approximately half-way along it, as shown in Fig. 1.2.

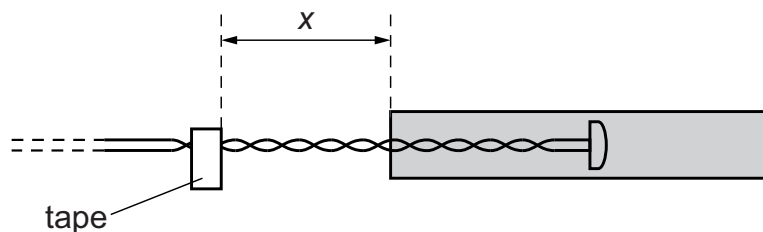


Fig. 1.2

- The distance between the tape and the tube is x .

Measure and record x .

$x =$

- Close S and record the ammeter reading I .

$I =$

- Open S.

[2]

(b) Change x by moving the LDR to a new position inside the tube, with x in the range 4 cm to 18 cm. Record x and I .

Repeat until you have six sets of values of x and I .

Record your results in a table. Include values of $\sqrt{I}$ in your table.

[10]

(c) (i) Plot a graph of $\sqrt{I}$ on the y -axis against x on the x -axis.

[3]

(ii) Draw the straight line of best fit.

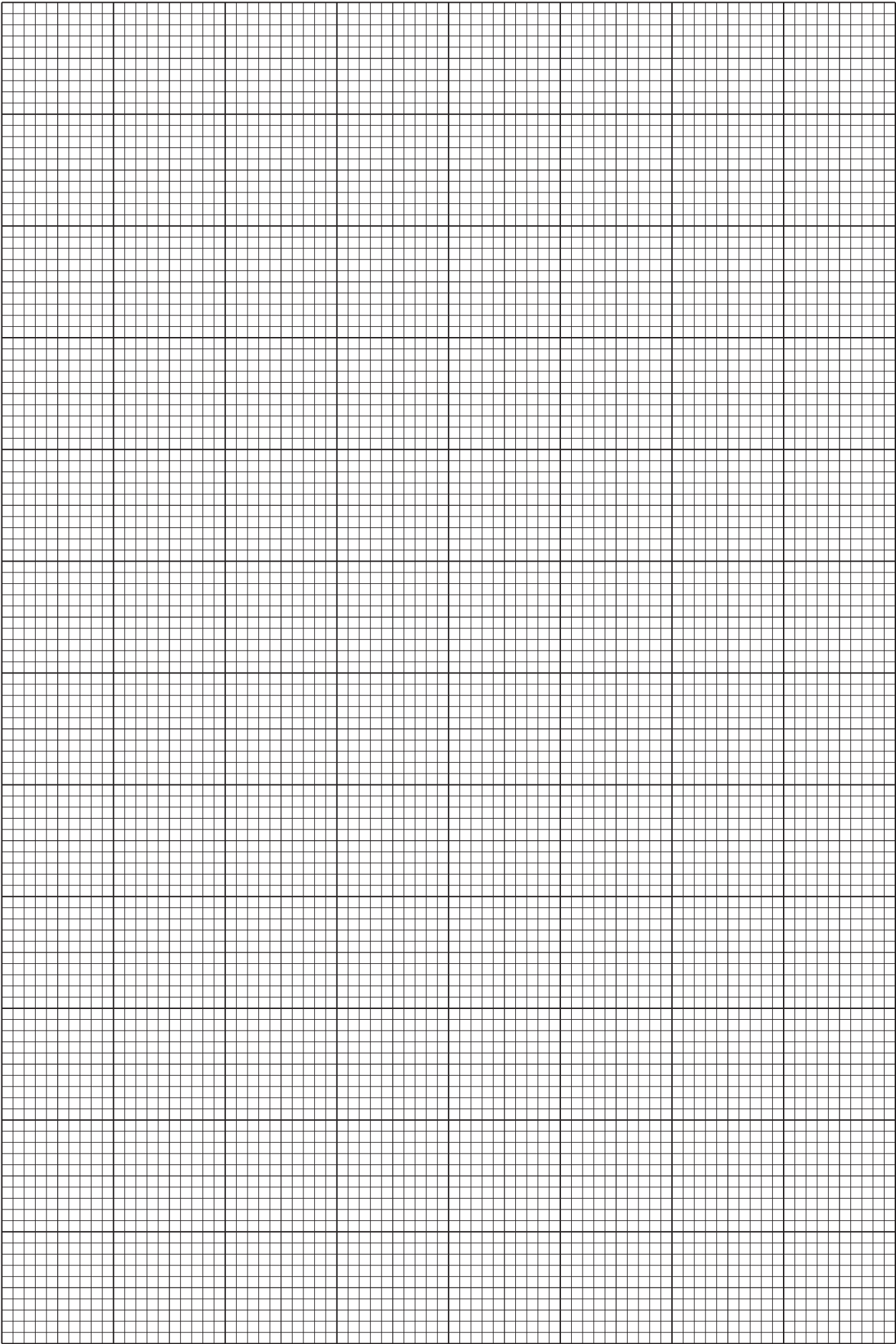
[1]

(iii) Determine the gradient and y -intercept of this line.

gradient =

y -intercept =

[2]



(d) It is suggested that the quantities I and x are related by the equation

$$\sqrt{I} = ax + b$$

where a and b are constants.

Using your answers in (c)(iii), determine the values of a and b .
Give appropriate units.

$a =$

$b =$

[2]

[Total: 20]

You may not need to use all of the materials provided.