

# **A Level Physics A**

**H556/02** Exploring physics

## **Question Set 25**

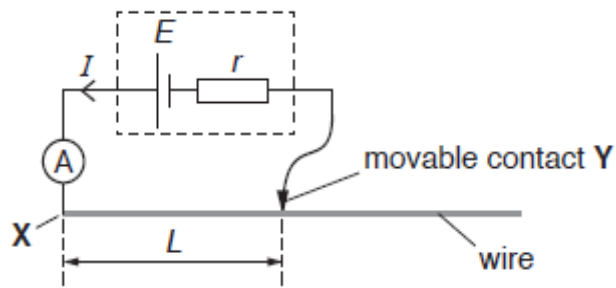
1 (a) State Kirchhoff's second law **and** the physical quantity that is conserved according to this law. [2]

(b) The S.I. base units for the ohm ( $\Omega$ ) are  $\text{kg m}^2 \text{s}^{-3} \text{A}^{-2}$ .

Use the equation  $R = \frac{\rho L}{A}$  to determine the S.I. base units for resistivity  $\rho$ .

base units for  $\rho$ ..... [2]

- (c) Fig. 18.1 shows a circuit used by a student to determine the resistivity of the material of a wire.

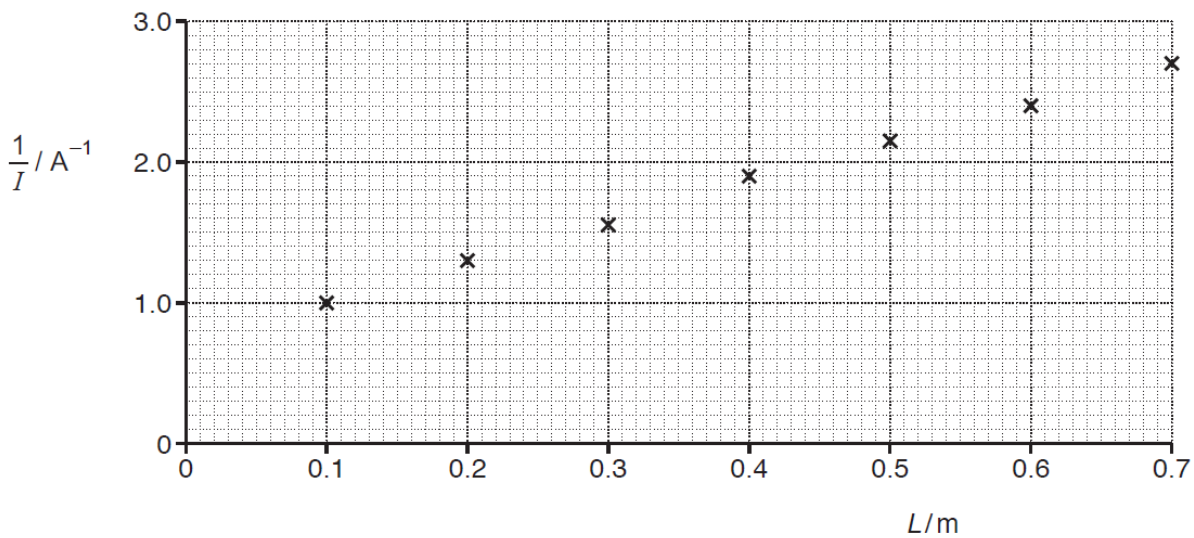


**Fig. 18.1**

The wire is uniform and has diameter 0.38 mm. The cell has electromotive force (e.m.f.)  $E$  and internal resistance  $r$ . The length of the wire between  $X$  and  $Y$  is  $L$ .

The student varies the length  $L$  and measures the current  $I$  in the circuit for each length.

Fig. 18.2 shows the data points plotted by the student.



**Fig. 18.2**

- (i) On Fig. 18.2 draw the straight line of best fit. Determine the gradient of this line.

gradient = .....  $A^{-1} m^{-1}$  [2]

- (ii) Show that the gradient of the line is  $\frac{\rho}{AE}$ , where  $\rho$  is the resistivity of the material of the wire,  $A$  is the area of cross-section of the wire and  $E$  is the e.m.f. of the cell.

[2]

- (iii) The e.m.f.  $E$  of the cell is 1.5V. The diameter of the wire is 0.38 mm.

Use your answer to (i) and the equation given in (ii) to determine  $\rho$ .

$$\rho = \dots\dots\dots\Omega\text{m} \quad [2]$$

- (iv) Fig. 18.3 illustrates how the student had incorrectly measured all the lengths  $L$  of the wire.

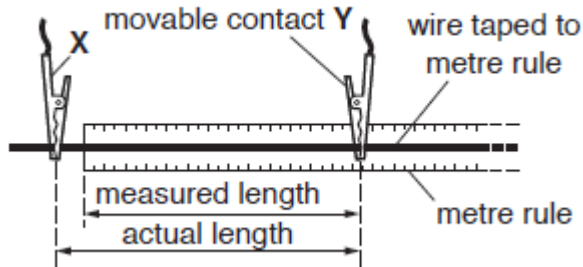


Fig. 18.3

According to the student, re-plotting the data points using the **actual** lengths of the wire will not affect the value of the resistivity obtained in (iii).

Explain why the student is correct.

[2]

**Total Marks for Question Set 25: 12**

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