

- 5 One end of a wire is attached to a fixed point. A force  $F$  is applied to the wire to cause extension  $x$ . The variation with  $F$  of  $x$  is shown in Fig. 5.1.

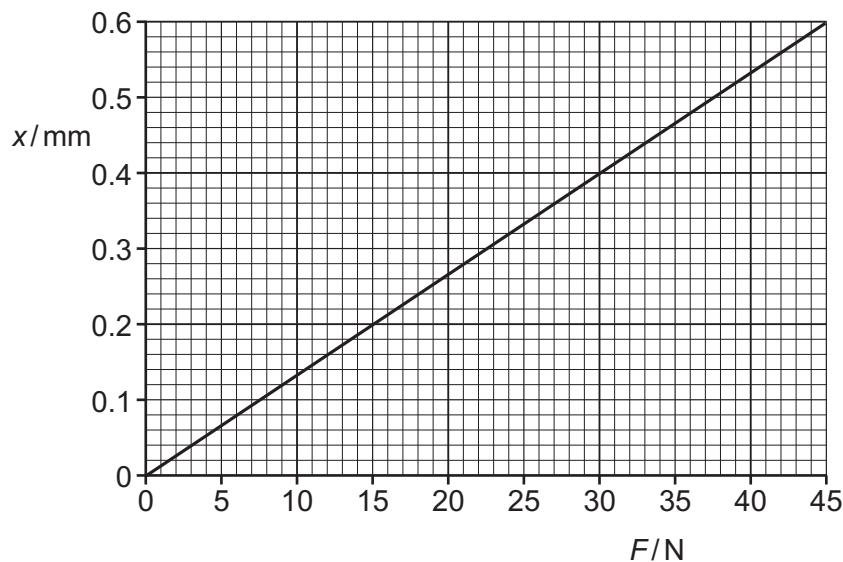


Fig. 5.1

The wire has a cross-sectional area of  $4.1 \times 10^{-7} \text{ m}^2$  and is made of metal of Young modulus  $1.7 \times 10^{11} \text{ Pa}$ . Assume that the cross-sectional area of the wire remains constant as the wire extends.

- (a) State the name of the law that describes the relationship between  $F$  and  $x$  shown in Fig. 5.1.

..... [1]

- (b) The wire has an extension of 0.48 mm.

Determine:

- (i) the stress

stress = ..... Pa [2]

- (ii) the strain.

strain = ..... [2]

- (c) The resistivity of the metal of the wire is  $3.7 \times 10^{-7} \Omega \text{ m}$ .

Determine the change in resistance of the wire when the extension  $x$  of the wire changes from  $x = 0.48 \text{ mm}$  to  $x = 0.60 \text{ mm}$ .

change in resistance = .....  $\Omega$  [3]

- (d) A force of greater than 45 N is now applied to the wire.

Describe how it may be checked that the elastic limit of the wire has not been exceeded.

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..... [1]