

- 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.

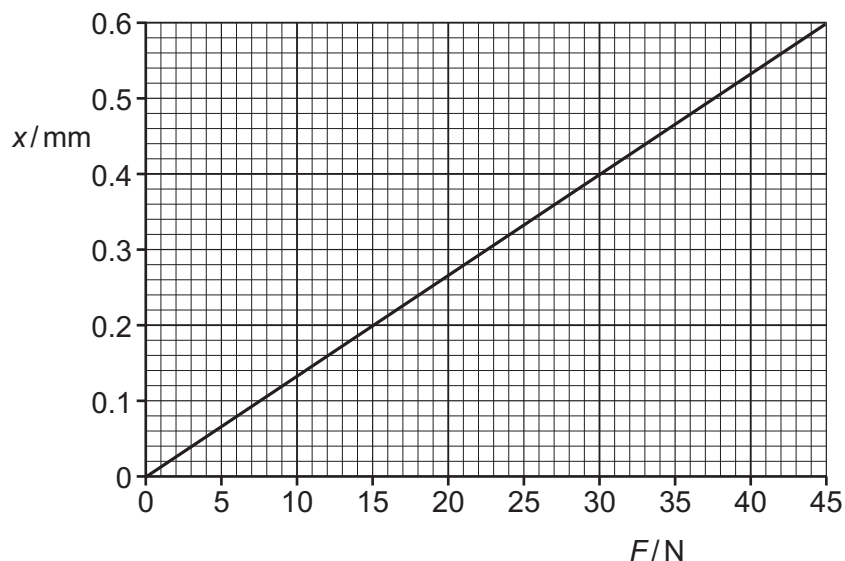


Fig. 5.1

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.

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- (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 = Ω [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]