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.

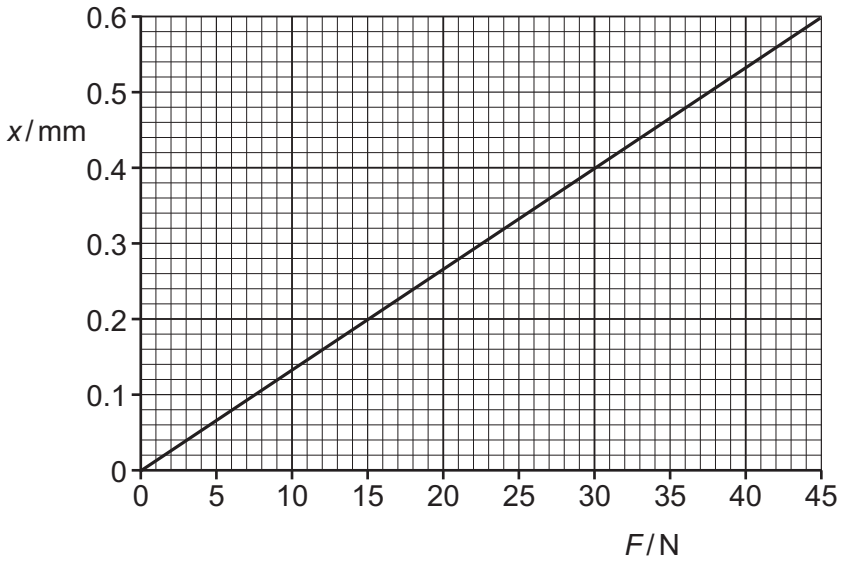

Fig. 5.1

The wire has a cross-sectional area of $4.1 \times 10^{-7}\,m^2$ and is made of metal of Young modulus $1.7 \times 10^{11}\,Pa$. 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 = ... 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.

.....

..... [1]

[Total: 9]