**4** **(a)** A uniform wire has length $L$ and constant area of cross-section $A$.
The material of the wire has Young modulus $E$ and resistivity $\rho$.
A tension $F$ in the wire causes its length to increase by $\Delta L$.

this wire, state expressions, in terms of $L$, $A$, $F$, $\Delta L$ and $\rho$ for

**(i)** the stress $\sigma$,

..... [1]

**(ii)** the strain $\varepsilon$,

..... [1]

**(iii)** the Young modulus $E$,

..... [1]

**(iv)** the resistance $R$.

..... [1]

**(b)** One end of a metal wire of length 2.6 m and constant area of cross-section $3.8 \times 10^{-7}\,m^2$ is attached to a fixed point, as shown in Fig. 4.1.

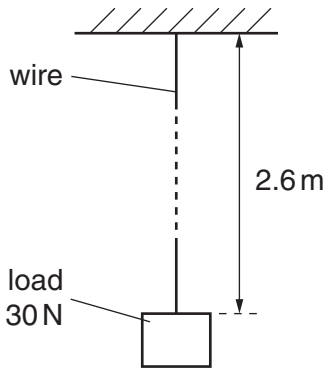


**Fig. 4.1**

The Young modulus of the material of the wire is $7.0 \times 10^{10}$ Pa and its resistivity is $2.6 \times 10^{-8}\,\Omega$ m.
A load of 30 N is attached to the lower end of the wire. Assume that the area of cross-section of the wire does not change.
this load of 30 N,

**(i)** show that the extension of the wire is 2.9 mm,

[1]

**(ii)** calculate the change in resistance of the wire.

change = ..... Ω [2]

**(c)** The resistance of the wire changes with the applied load.
Comment on the suggestion that this change of resistance could be used to measure the magnitude of the load on the wire.

.....

.....

..... [2]