3 **(a)** the deformation of a wire under tension, define

(i) *stress*,

.....

.....[1]

(ii) *strain*.

.....

.....[1]

(b) A wire is fixed at one end so that it hangs vertically. The wire is given an extension x by suspending a load F from its free end. The variation of F with x is shown in Fig. 3.1.

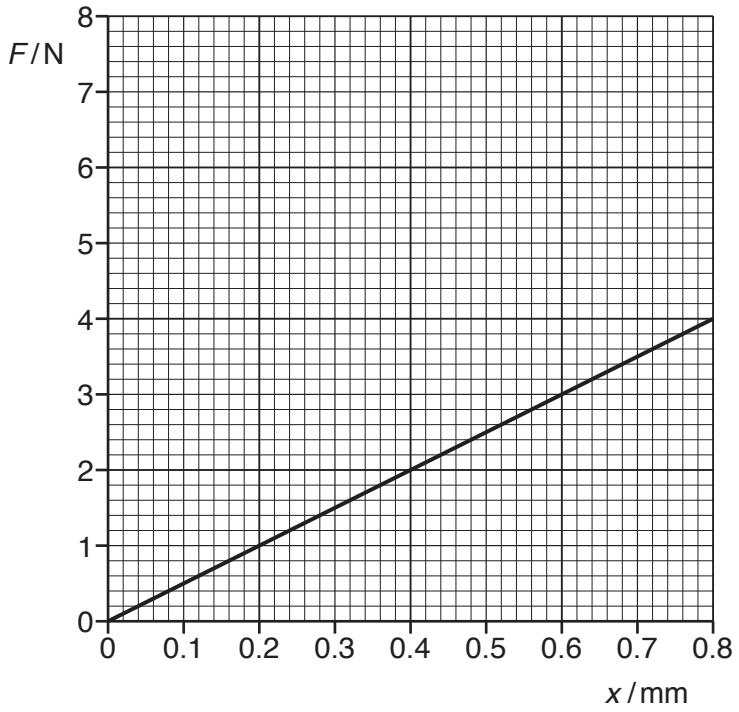

Fig. 3.1

The wire has cross-sectional area $9.4 \times 10^{-8}\,m^2$ and original length 2.5 m.

(i) Describe how measurements can be taken to determine accurately the cross-sectional area of the wire.

.....

.....

.....

.....

.....[3]

(ii) Determine the Young modulus E of the material of the wire.

E = ... Pa [2]

(iii) **Fig. 3.1** to calculate the increase in the energy stored in the wire when the load is increased from 2.0 N to 4.0 N.

increase in energy = ... J [2]

(c) The wire in **(b)** is replaced by a new wire of the same material. The new wire has twice the length and twice the diameter of the old wire. The new wire also obeys Hooke's law.

On Fig. 3.1, sketch the variation with extension x of the load F for the new wire from $x = 0$ to $x = 0.80$ mm. [2]

[Total: 11]