5 **(a)** Define the *Young modulus*.

.....

.....[1]

(b) A load F is suspended from a fixed point by a steel wire. The variation with extension x of F for the wire is shown in Fig. 5.1.

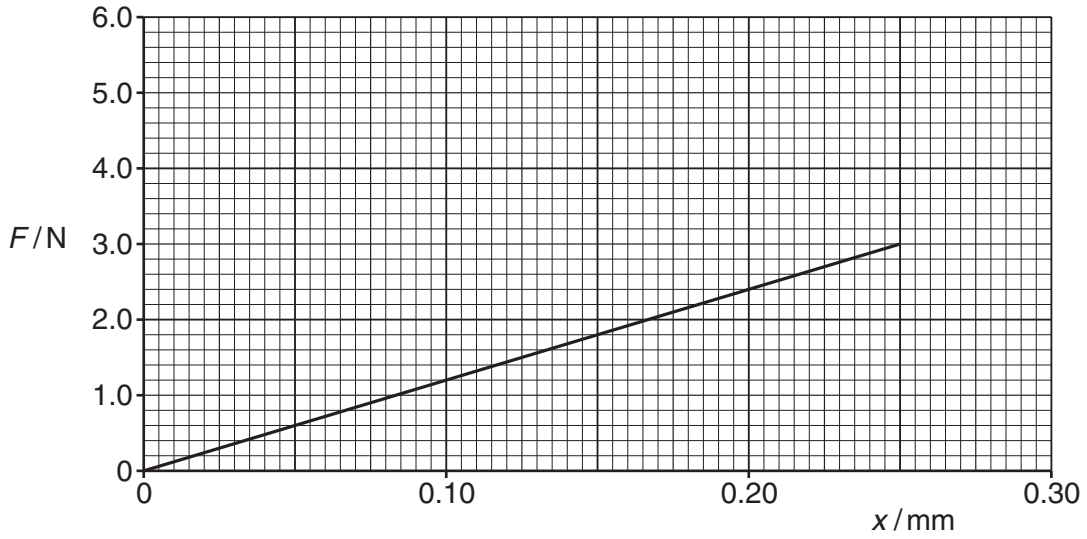

Fig. 5.1

(i) State two quantities, other than the gradient of the graph in Fig. 5.1, that are required in order to determine the Young modulus of steel.

1. .....

2. .....
[1]

(ii) Describe how the quantities you listed in **(i)** may be measured.

.....

.....

.....[2]

(iii) A load of 3.0 N is applied to the wire. Fig. 5.1 to calculate the energy stored in the wire.

energy = ... J [2]

(c) A copper wire has the same original dimensions as the steel wire. The Young modulus for steel is $2.2 \times 10^{11}\,\text{N m}^{-2}$ and for copper is $1.1 \times 10^{11}\,\text{N m}^{-2}$.

On Fig. 5.1, sketch the variation with x of F for the copper wire for extensions up to 0.25 mm. The copper wire is not extended beyond its limit of proportionality. [2]