

Question Number	Answer	Mark
18(a)	<ul style="list-style-type: none"> Ratio of stress to strain (for a material). Or stress per unit strain. Or σ / ϵ with symbols defined. Or $\frac{F x}{A \Delta x}$ with symbols defined. 	(1) (1)
18(b)(i)	<ul style="list-style-type: none"> Mean diameter = 0.234 mm (rounds to) Use of $A = \pi r^2$ $A = 4.3 \times 10^{-8} \text{ m}^2$ or 0.043 mm^2 <p><u>Example of calculation</u> Mean diameter = $\frac{1}{4} (0.230 + 0.235 + 0.230 + 0.240) = 0.234 \text{ mm}$ Area = $\pi \frac{(0.234 \times 10^{-3} \text{ m})^2}{4} = 4.30 \times 10^{-8} \text{ m}^2$</p>	(1) (1) (1) (3)
18(b)(ii)	<ul style="list-style-type: none"> Use of $W = m g$ Use of gradient = $m / \Delta x$ in Young Modulus formula i.e. $E = \text{gradient} \times g \times x / A$ $E = 1.6 \times 10^{11} \text{ Pa}$ e.c.f. from (b)(i) <p><u>Example of calculation</u> Young modulus = $195 \times 9.81 \text{ N kg}^{-1} \times \frac{3.50 \text{ m}}{4.30 \times 10^{-8} \text{ m}^2}$ $= 1.56 \times 10^{11} \text{ Pa}$</p>	(1) (1) (1) (3)
18(b)(iii)	<p>Shorter wire gives greater gradient.</p> <p>Young modulus the same.</p>	(1) (1) (2)
Total for question 18		9