Question Number	Answer	Mark
14(a)	Maximum value of weight/force for which weight/force is proportional to extension **Or** Point beyond which Hooke's Law no longer applies **Or** Point beyond which graph line ceases to be straight **Or** Point beyond which weight/force is no longer proportional to extension **(1)**	**1**
14(b)(i)	Use of large triangle to determine gradient **(1)** Gradient = 18 500 (N m^{-1}) (sf range 18 - 19, no ue) **(1)** <u>Example of calculation</u> gradient = 37 N ÷ (2 × 10^{-3} m) = 18 500 (N m^{-1})	**2**
14(b)(ii)	Rearranges *E* = stress / strain to get $E = \text{gradient} \times \frac{x}{A}$ **Or** Rearranges *E* = stress / strain to get $\text{gradient} = \frac{A}{x}E$ **(1)** Use of $A = \pi r^2$ **(1)** Young modulus = 2 × 10^{11} Pa **(1)** (allow ecf from (b)(i)) <u>Example of calculation</u> $A = \pi \times (2.8\times 10^{-4})^2 = 2.46 \times 10^{-7}$ m^2 $E = 1.85 \times 10^4$ N m^{-1} × 2.6 m ÷ 2.46×10^{-7} m^2 = 1.95×10^{11} Pa	**3**
14(c)	Use of $\sigma = \frac{F}{A}$ **(1)** Determines maximum safe load **Or** Determines maximum stress **Or** Determines minimum cross section **(1)** Valid conclusion by comparison with student's calculation **(1)** <u>Example of calculation</u> $\sigma_{max} = \frac{W^{max}}{A}$ 4.80×10^8 Pa = $\frac{W_{max}}{2.46 \times 10^{-7}\text{m}^2}$ W_{max} = 480 × 10^6 Pa × 2.46×10^{-7} m^2 = 118 N > 100 N so yes	**3**
	Total for question 14	**9**