## Physics

## Standard level

## Paper 2

## Markscheme

Question	Answer	Note	Marks
1 (a)	Pa 🗸	Accept N m <sup>-2</sup>	1
1 (b)	Mass affects force applied onto wire 🖌 Force applied affects change in length [as per formula] 🖌		2
1 (c)	1/r² OR r⁻² ✔ mm⁻² ✔		2
1 (d)	$\Delta L = \frac{FL}{\pi r^2 E}$ $\Delta L = \frac{mgL}{\pi (\Delta a Lr^2)} \checkmark$ $E = \frac{(20)(9.81)(1.00)}{r^{3}} \checkmark$	Award ✔ for line of best fit, ✔ for triangle drawn Accept range of Δ <i>L</i> as 3.35-3.45	5

$E \approx 1.15 \times 10^{11} Pa \checkmark$	

Question	Answer	Note	Marks
2 (a)	Any of: Mass destroying the string and potentially damaging the floor Wire is sharp so could cause cuts Loose screws causing damage	Accept OWTTE	1
2 (b)	$kg^{-\frac{1}{2}}m^{-\frac{1}{2}}\checkmark$		1
2 (c)	46.4 ✔ s <sup>-1</sup> kg <sup>-1</sup> ✔	Accept reasonable range	2
2 (d)	Assumed mass of string was zero ✔ Therefore, there is still some tension in the string at m=0 that allows for vibration ✔	Accept OWTTE	2

2 (e)	Uncertainty in mass leads to uncertainty in the horizontal axis $(\sqrt{m})$ , affecting data point positions. $\checkmark$ Uncertainty in frequency leads to uncertainty in the vertical axis, increasing scatter and uncertainty in the calculated gradient. $\checkmark$	Accept OWTTE	2
2 (f)	Increasing tension increases the frequency, which increases the kinetic and potential energy of the string. Higher tension means greater restoring force and faster oscillation, increasing the total energy stored.	Accept OWTTE	2