2(a)	(electric) force is (directly) proportional to product of charges
	force (between point charges) is inversely proportional to the square of their separation
2(b)(i)	charge = (+)2*e*
2(b)(ii)	$F = 2 \times (1.60 \times 10^{-19})^2 / [4\pi \times 8.85 \times 10^{-12} \times (170 \times 10^{-12})^2] = 1.6 \times 10^{-8}$ N
2(c)(i)	$F = mv^2 / r$
	$v = [\,(1.6 \times 10^{-8} \times 170 \times 10^{-12}) / (9.11 \times 10^{-31})\,]^{½}$ $= 1.7 \times 10^{6}$ m s^{-1}
2(c)(ii)	$F = mr\omega^2$ **and** $\omega = 2\pi / T$ $F = 4\pi^2 mr / T^2$
	$T = [\,(4\pi^2 \times 9.11 \times 10^{-31} \times 170 \times 10^{-12}) / (1.6 \times 10^{-8})\,]^{½}$ $= 6.2 \times 10^{-16}$ s
	or
	$v = 2\pi r / T$
	$T = (2\pi \times 170 \times 10^{-12}) / (1.73 \times 10^{6})$ $= 6.2 \times 10^{-16}$ s
2(d)(i)	$E \propto Q / r^2$
	ratio = $[1.60 \times 10^{-19} \times (170 \times 10^{-12})^2] / [3.2 \times 10^{-19} \times (340 \times 10^{-12})^2]$ = 0.13
2(d)(ii)	resistant force slightly less (than 1.6×10^{-8} N) so speed lower **or** resistant force slightly less (than 1.6×10^{-8} N) so period greater

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2(d)(ii)	resistant force slightly less (than 1.6×10^{-8} N) so speed lower **or** resistant force slightly less (than 1.6×10^{-8} N) so period greater

4(a)	(electric) force is (directly) proportional to product of charges
	force (between point charges) is inversely proportional to the square of their separation
4(b)(i)	arrows showing tension upwards in direction of string, electric force horizontally to the right and weight vertically downwards and all three labelled
4(b)(ii)	$F_E = \frac{96\times10^{-9}\times64\times10^{-9}}{4\times\pi\times8.85\times10^{-12}\times0.080^2}$ $(= 8.63\times10^{-3}\,\text{N})$
	either angle to vertical $= \sin^{-1} 0.080 / 1.2$ $(= 3.82°)$
	weight $= F_E / \tan 3.82 = 8.63\times10^{-3} / \tan 3.82$ $(= 0.129\,\text{N})$
	mass $= 0.129 / 9.81$ $= 0.013\,\text{kg}$
	or $T \sin\theta = mg$ **and** $T\cos\theta = F_E$ **or** $\tan\theta = mg / F_E$
	$\tan\theta = 1.2 / 0.080$
	$m = (1.2\times8.63\times10^{-3}) / (0.080\times9.81)$ $= 0.013\,\text{kg}$
4(b)(iii)	$E_p = \frac{Q_1Q_2}{4\pi\varepsilon_o r} = \frac{96\times10^{-9}\times64\times10^{-9}}{4\times\pi\times8.85\times10^{-12}\times0.080}$ $= 6.9\times10^{-4}\,\text{J}$
4(c)(i)	towards the top of the page / towards plate P
4(c)(ii)	$F = QE$ **and** $E = V / d$
	$F = 1.6\times10^{-19}\times250 / 0.018$ $= 2.2\times10^{-15}\,\text{N}$
4(c)(iii)	**either** the force is not (always) perpendicular to the velocity **or** the force is always in the same direction