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|---|---|
| 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) | $F = mv^2 / r$ |
| | $v = [\ (1.6 \times 10^{-8} \times 170 \times 10^{-12}) / (9.11 \times 10^{-31})\ ]^{½}$<br>$= 1.7 \times 10^6$ m s$^{-1}$ |
| 2(c)(ii) | $F = mr\omega^2$ **and** $\omega = 2\pi / T$<br>$F = 4\pi^2 mr / T^2$ |
| | $T = [\ (4\pi^2 \times 9.11 \times 10^{-31} \times 170 \times 10^{-12}) / (1.6 \times 10^{-8})\ ]^{½}$<br>$= 6.2 \times 10^{-16}$ s |
| | **or** |
| | $v = 2\pi r / T$ |
| | $T = (2\pi \times 170 \times 10^{-12}) / (1.73 \times 10^6)$<br>$= 6.2 \times 10^{-16}$ s |
| 2(d)(i) | $E \propto Q / r^2$ |
| | ratio = $[1.60 \times 10^{-19} \times (170 \times 10^{-12})^2] / [3.2 \times 10^{-19} \times (340 \times 10^{-12})^2]$<br>$= 0.13$ |
| 2(d)(ii) | resultant force slightly less (than $1.6 \times 10^{-8}$ N) so speed lower<br>**or**<br>resultant force slightly less (than $1.6 \times 10^{-8}$ N) so period greater |