Question number	Answer		Mark
18(a)	• Use of $E_k = ½\ m\ v^2$ • Use of $V = Q / 4\pi\varepsilon_0 r$ and $W = QV$ • Use of $F = Q_1Q_2 / 4\pi\varepsilon_0 r^2$ • Use of $F = ma$ • $a = 4.2 \times 10^{27}$ m s^{-2} Example of calculation $E_k = ½ \times 6.64 \times 10^{-27}$ kg $\times (1.74 \times 10^7$ m s$^{-1})^2$ $= 1.01 \times 10^{-12}$ J $1.01 \times 10^{-12}\ \text{J} = \frac{2 \times 1.6 \times 10^{-19}\ \text{C} \times 79 \times 1.6 \times 10^{-19}\ \text{C}}{4 \times \pi \times 8.85 \times 10^{-12}\ \text{F m}^{-1} \times r}$ $r = 3.60 \times 10^{-14}$ m $F = \frac{2 \times 1.6 \times 10^{-19}\ \text{C} \times 79 \times 1.6 \times 10^{-19}\ \text{C}}{4 \times \pi \times 8.85 \times 10^{-12}\ \text{F m}^{-1} \times (3.60 \times 10^{-14}\ \text{m})^2}$ $= 28.1$ N $a = 28.1$ N $/ 6.64 \times 10^{-27}$ kg $a = 4.23 \times 10^{27}$ m s^{-2}	1 1 1 1 1	(5)
18(b)	• alpha particle does not ever have zero speed/ke • so not all of the energy has been transferred from the kinetic energy store to the electric potential energy store • it is not as close to the nucleus **Or** minimum r is greater • so (max) force is less, so (max) acceleration is less	1 1 1 1	(4)
	Total for Question 18		**9**