

Question			Expected response	Max mark	Additional guidance
7.	(a)		Protons are (positively) charged (1) Protons experience a <u>force</u> (in the electric field) (1)	2	Must state protons are charged otherwise, maximum (1) mark. Any mention of protons being negatively charged or uncharged - award (0) marks. Charged particles experience a <u>force</u> , on its own, award (1) mark.
	(b)	(i)	$E_k = \frac{1}{2}mv^2$ (1) $E_k = \frac{1}{2} \times 1.673 \times 10^{-27} \times (3.8 \times 10^5)^2$ (1) $E_k = 1.2 \times 10^{-16} \text{ J}$	2	SHOW question
		(ii)	$W = QV$ (1) $W = 1.60 \times 10^{-19} \times 2.8 \times 10^3$ (1) $W = 4.5 \times 10^{-16} \text{ J}$ (1)	3	Accept: 4, 4.48, 4.480
		(iii)	$E_k = 1.2 \times 10^{-16} + 4.5 \times 10^{-16}$ (1) ($E_k = 5.7 \times 10^{-16} \text{ J}$) $E_k = \frac{1}{2}mv^2$ (1) ($1.2 \times 10^{-16} + 4.5 \times 10^{-16}$) $= \frac{1}{2} \times 1.673 \times 10^{-27} \times v^2$ (1) $v = 8.3 \times 10^5 \text{ m s}^{-1}$ (1)	4	OR consistent with (b)(ii) Accept: 8, 8.25, 8.255 $E_k = \frac{1}{2}mv^2$ anywhere (1) Must attempt addition of kinetic energy and work done, otherwise maximum (1) mark. Demonstrated arithmetic mistake can be carried forward through the response. If using $4.48 \times 10^{-16} \text{ (J)}$, accept: 8, 8.2, 8.24, 8.240
	(c)		No effect (1) Work done is the same OR <u>gain in</u> kinetic energy is the same (1)	2	MUST JUSTIFY Look for this statement first - if incorrect or missing then (0) marks. charge and potential difference are unchanged, on its own, is insufficient for second mark. Any mention of magnetic field/force on its own is insufficient for second mark.