

Question Number	Answer	Mark
15(a)	<p>Use of conversion factor of $1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$ (1)</p> <p>Equate kinetic energy to electric potential energy at distance of closest approach</p> <p>Or equates potential at point of closest approach to E_k/Q (1)</p> <p>Use of $V = \frac{Q}{4\pi\epsilon_0 r}$ with $W = QV$ [must be correct values of Q] (1)</p> <p>$r = 4.1 \times 10^{-14} \text{ m}$ (1)</p> <p>1</p> <p><u>Example of calculation</u></p> <p>$E_k = 5.52 \times 10^6 \times 1.6 \times 10^{-19} \text{ J MeV}^{-1} = 8.83 \times 10^{-13} \text{ J}$</p> <p>$r = \frac{79 \times 1.6 \times 10^{-19} \text{ C} \times 2 \times 1.6 \times 10^{-19} \text{ C}}{4\pi \times 8.85 \times 10^{-12} \text{ F m}^{-1} \times 8.83 \times 10^{-13} \text{ J}} = 4.12 \times 10^{-14} \text{ m}$</p>	4
15(b)	<p>Use of $F = \frac{Q_1 Q_2}{4\pi\epsilon_0 r^2}$ or $F = \frac{kQ_1 Q_2}{r^2}$ (1)</p> <p>$F = 11 \text{ N}$ (1)</p> <p><u>Example of calculation</u></p> <p>$F = \frac{79 \times 1.6 \times 10^{-19} \text{ C} \times 2 \times 1.6 \times 10^{-19} \text{ C}}{4\pi \times 8.85 \times 10^{-12} \text{ F m}^{-1} \times (5.68 \times 10^{-14} \text{ m})^2} = 11.3 \text{ N}$</p>	2
Total for question 15		6