Question Number	Answer		Mark
16a	Most alpha particles were undeviated **Or** Most particles pass through with little or no deviation	(1)	**6**
	Most of the atom is empty space (MP2 with reference to lack of deviation)	(1)	
	Few alpha particles were scattered by small angles	(1)	
	There is a concentration of charge in the atom (MP4 with reference to scattering)	(1)	
	Very few alpha particles were deviated by more than 90°	(1)	
	Most of the mass is concentrated in a small region of the atom **Or** Most of the mass is concentrated in nucleus (Accept Mass of nucleus much greater than mass of alpha particle) (MP6 with reference to back scattering)	(1)	
16bi	Applies conversion factors for MeV to J	(1)	**4**
	Use of $V = \dfrac{Q}{4\pi\varepsilon_0 r}$	(1)	
	Use of $W=VQ$	(1)	
	$r = 4.8 \times 10^{-14}$ (m)	(1)	
	Example of calculation		
	$4.7\,\text{MeV} = 4.7 \times 10^6\,\text{eV} \times 1.6 \times 10^{-19}\,\text{J/eV} = 7.52 \times 10^{-13}\,\text{J}$		
	$7.52 \times 10^{-13}\,\text{J} = 8.99 \times 10^9\,\text{Nm}^2\text{C}^2 \times 2 \times 1.6 \times 10^{-19}\text{C} \times 79 \times 1.6 \times 10^{-19}\text{C}/r$		
	$r = 4.8 \times 10^{-14}\,\text{m}$		
16bii	Use of $E = \dfrac{Q}{4\pi\varepsilon_0 r^2}$	(1)	**3**
	With $Q = 79 \times 1.6 \times 10^{-19}$	(1)	
	$E = 4.9 \times 10^{19}\,\text{N C}^{-1}$	(1)	
	(use of show that value gives $E = 4.5 \times 10^{19}\,\text{N C}^{-1}$) allow ecf from (i)		
	Example of calculation		
	$E = 8.99 \times 10^9\,\text{Nm}^2\text{C}^2 \times 79 \times 1.6 \times 10^{-19}\,\text{C}/(4.8 \times 10^{-14})^2\,\text{m}^2$		
	$E = 4.9 \times 10^{19}\,\text{N C}^{-1}$		
	Total for question 16		**13**