Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Mark Schemes

Q1.

Question Number	Answer		Mark
(a)	To prevent interaction/deflection/collision of the alpha particle with the air. [do not accept: 'don't get in the way' , 'cause ionisation', 'interfere with'. Looking for a definite interaction between the alpha and the air molecules. Accept air particles]	**(1)**	**1**
(b)	**MAX TWO** Nucleus (very) much smaller than separation of nuclei **Or** nucleus (very) much smaller than the atom Nucleus is charged (don't penalise if candidate says positively charged) Nucleus is (very) dense **Or** nucleus is massive **Or** nucleus contains most of the mass (no credit for candidates referring to the atoms and not the nucleus.)	**(1)** **(1)** **(1)**	**2**

(c)	**Top Particle** Path curves up with less deflection than for particle shown and must cross the printed line. **Or** a straight path. **Bottom Particle** Path curves up with more deflection than for particle shown Greatest curvature before greatest curvature of particle shown. (dependent mark) Example 	(1) (1) (1)	3

Q2.

Question Number	Acceptable answers	Additional guidance	Mark
	Before scattering experiment: • atom containing equally distributed mass/charge (1) After experiment: • very small nucleus containing (almost all) the mass of the atom (1) • atom mainly empty space (1) • nucleus is charged (1)	alt: reference to 'plum pudding model'	4

Q3.

Question Number	Acceptable Answer	Additional Guidance	Mark
	• Use of $W = QV$ (1) • Use of $KE = \frac{1}{2}mv^2$ (1) • Use of $1u = 1.66 \times 10^{-27}$ kg (1) • $v = 2.16 \times 10^5$ (m s^{-1}) (1)	Example of calculation: $\frac{1}{2}mv^2 = eV$ $\therefore v = \sqrt{\frac{2 \times 1.6 \times 10^{-19}\text{C} \times 8.5 \times 10^3\text{V}}{(34.97 \times 1.66 \times 10^{-27})\text{kg}}} = 2.16 \times 10^5 \text{ms}^{-1}$	4

Q4.

Question Number	Acceptable answers	Additional guidance	Mark
	• Use of $V = Q/4\pi\varepsilon_0 r$ **(1)** • Conversion MeV to J **(1)** • Use of $V = W/Q$ **(1)** • $r = 3.0 \times 10^{-14}$ m **(1)**	allow for $Q = 2$ or 79, accept $V = kQ/r$ Must use $e = 1.6 \times 10^{-19}$ C to convert atomic number to C Example of calculation: 7.7×10^{6}eV $\times$ 1.6×10^{-19}J eV^{-1} $= 8.99 \times 10^{9}$N m^{2}C^{-2} $\times$ 2 $\times$ 79 $\times$ $(1.6 \times 10^{-19}\ \text{C})^2 \div r$ $r = 2.27 \times 10^{-7} \div 7.7 \times 10^{6}$ $r = 2.95 \times 10^{-14}$ m	**4**