

Question number			Answer	Notes	Marks																									
3	a		<table><thead><tr><th>Type of radiation</th><th>Deflected upwards</th><th>Deflected downwards</th><th>Not deflected</th></tr></thead><tbody><tr><td>alpha</td><td>(✓)</td><td></td><td></td></tr><tr><td>beta</td><td></td><td>✓</td><td></td></tr><tr><td>gamma</td><td></td><td></td><td>✓</td></tr><tr><td>neutrons</td><td></td><td></td><td>✓</td></tr><tr><td>protons</td><td>✓</td><td></td><td></td></tr></tbody></table> each correct ; ; ; ;			Type of radiation	Deflected upwards	Deflected downwards	Not deflected	alpha	(✓)			beta		✓		gamma			✓	neutrons			✓	protons	✓			4
Type of radiation	Deflected upwards	Deflected downwards	Not deflected																											
alpha	(✓)																													
beta		✓																												
gamma			✓																											
neutrons			✓																											
protons	✓																													
	b	i	any sensible suggestion (however phrased); e.g. - alpha has a small range in air - alpha would not hit the gold leaf - alpha would be deflected - alpha would collide with the air {particles/molecules/RA} - alpha would ionise the {air/particles/molecules}	Allow RA condone phrases such as - air particles interact with alpha - air particles interfere with alpha ignore - react - diffracting - to create a vacuum	1																									

	ii	any TWO results from: MP1. most went (straight) through; MP2. (the paths of) a few were deflected at an acute/small angle; MP3. (the paths of) very few were {deflected through an obtuse angle / backscattered};	NB: no mark for structure of atom or deductions allow bent allow for obtuse • large • $>90^\circ$ for backscattered • bounced off the gold foil	2
	c	MP 2, 4 can be shown on a diagram any FOUR explanations or deductions from: MP1. Small nucleus; MP2. mostly empty space; MP3. because not many α deflected / because most α go straight through; MP4. Positive OR high mass nucleus; MP5. which causes deflection of positive (or low mass) α;	Ignore ALL comments about electrons NB to get MP 3, 5 a causal link is needed allow protons are in the centre repulsion, recoil idea that α same charge as nucleus	4
			total = 11 marks	

Question number	Answer	Notes	Marks
2 (a) i)	C - 14		1
(ii)	B - 8		1
(iii)	A - 6		1
(b)	A - An electron		1
(c)	A - 1.5 g		1
(d)	Atoms/nuclei with same number of protons / same atomic number / same element; Different numbers of neutrons / different mass number / different atomic mass;	ALLOW 'different mass' for second mark if it's clear they are comparing atoms within the same element rather than different elements IGNORE references to electrons if possible, but if candidates makes an incorrect reference to electrons then list principle applies for that mark (e.g 'same number of protons but different number of neutrons and electrons' = 1)	1 1
		Total	7

Question number	Answer	Notes	Marks
3 (a)	(nuclear) fission;	DO NOT ALLOW fusion	1
(b)	<u>Nucleus</u> splits; Releasing <u>neutrons</u> ; Which (hit / are absorbed by) different (uranium) <u>nuclei</u> ;	PENALISE ONCE if 'atom' used for 'nucleus'	3
(c)	Kinetic (energy of particles) Of (fission) products / (daughter) nuclei / neutrons	DO NOT ALLOW 'movement' for kinetic	1 1
(d) (i)	Slow down <u>neutrons</u> ;	DO NOT ALLOW 'movement' for kinetic	1
(ii)	Kinetic/heat/thermal; Kinetic; Kinetic/electrical; Electrical;	ALLOW 'electric' for 'electrical'	4
		Total	11