Q1. (2018)

05.1	gamma		1	AO1 6.4.2.1	

Q2. (2018)

05.2	alpha		1	AO1 6.4.2.1	

Q3. (2018)

05.3	gamma		1	AO1 6.4.2.1	

Q4. (2019)

a)

04.2	points correctly plotted to within 1 mm a curved line of best fit passing within 1 mm of all 5 points	 ignore any line beyond 200 seconds	1 1	AO2.2 6.4.2.3 WS 3.2	E

b)

04.3	70 (s)	allow an answer between 65 and 75 (s) allow an answer consistent with their drawn line	1	AO2/2 6.4.2.3 WS 3.5	E

c)

04.4	70 (s)	allow an answer between 65 and 75 (s) allow their answer to question **04.3**	1	AO3/2b 6.4.2.3	E

d)

04.5	beta		1	AO1.1 6.4.2.1	A

Q5. (2020)

a)

06.1	A = 206		1	AO2 6.4.2.2	

b)

06.2	Z = 82		1	AO2 6.4.2.2	

Q6. (2020)

06.3	89 39	numbers must be in this order	1 1	AO2 6.4.2.2	

Q7. (2020)

06.4	electromagnetic waves		1	AO1 6.4.2.1

Q8. (2020)

06.5	**Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO1 6.4.1.2 6.4.2.1 6.4.2.2
	Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	
	No relevant content	0	
	Indicative content <u>alpha radiation</u> • an alpha particle is the same as a helium nucleus • alpha is the least penetrating • alpha is stopped by paper or skin • alpha has the shortest range in air • alpha will travel a few cm in air • because alpha is most ionising • because alpha has a charge of +2 <u>beta radiation</u> • a beta particle is an electron (emitted from the nucleus) • beta penetrates less than gamma and more than alpha • beta is stopped by a thin sheet of aluminium • beta has a shorter range than gamma • beta will travel up to 1m in air • because beta is more ionising that gamma and less ionising than alpha • because beta has a charge of -1 <u>gamma radiation</u> • gamma radiation is an electromagnetic wave • gamma is the most penetrating • gamma is reduced/stopped by several cm of lead or thick concrete • gamma has the largest range in air • gamma will travel very large distances in air • because gamma is least ionising • because is uncharged to access level 3 the answer should compare alpha, beta and gamma radiation and provide some explanation of their properties		

Q9. (2021)

06.2	the atom becomes a positive ion the atom loses an electron		1 1	AO1 6.4.1.2

Q10. (2022)

a)

03.1	$^{241}_{95}Am \longrightarrow {}^{237}_{93}Np + {}^{4}_{2}He$	first box ticked	1	AO2 6.4.2.2

b)

03.4	$^{0}_{-1}e$		1	AO1 6.4.2.2

Q11. (2023)

a)

01.1	alpha		1	AO1 6.4.2.2

b)

01.3	82		1	AO2 6.4.2.2

Q12. (2023)

01.8	electromagnetic waves		1	AO1 6.4.2.1

Q13. (2024)

07.1	2 protons and 2 neutrons	ignore helium nucleus	1	AO1 6.4.2.1