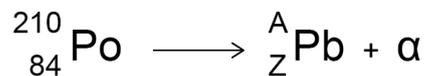


**0 6**

Different radioactive isotopes emit different types of nuclear radiation.

A polonium-210 (Po) nucleus emits an alpha particle ( $\alpha$ ) and turns into a lead (Pb) nucleus.

This can be represented by the equation:

**0 6 . 1**

What is the value of A in the equation?

**[1 mark]**Tick (✓) **one** box.A = 206 A = 208 A = 210 A = 211 **0 6 . 2**

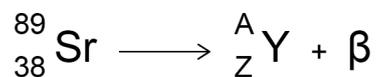
What is the value of Z in the equation?

**[1 mark]**Tick (✓) **one** box.Z = 80 Z = 82 Z = 85 Z = 86 **Question 6 continues on the next page****Turn over ►**

0 6 . 3

A strontium-89 nucleus (Sr) emits a beta particle ( $\beta$ ) and turns into an yttrium nucleus (Y).

This can be represented by the equation:



What are the values of A and Z in the equation?

[2 marks]

A = \_\_\_\_\_

Z = \_\_\_\_\_

0 6 . 4

Gamma radiation is another type of nuclear radiation.

What does gamma radiation consist of?

[1 mark]

Tick ( $\checkmark$ ) **one** box.

High energy neutrons

Electromagnetic waves

Particles with no charge

Positively charged ions





Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	A = 206		1	AO2 6.4.2.2
06.2	Z = 82		1	AO2 6.4.2.2
06.3	89 39	numbers must be in this order	1 1	AO2 6.4.2.2
06.4	electromagnetic waves		1	AO1 6.4.2.1

Question	Answers	Mark	AO / Spec. Ref.
06.5	<b>Level 3:</b> 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
	<b>Level 2:</b> Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	
	<b>Level 1:</b> Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	
	<b>No relevant content</b>	0	
	<b>Indicative content</b> <u>alpha radiation</u> <ul style="list-style-type: none"> <li>• an alpha particle is the same as a helium nucleus</li> <li>• alpha is the least penetrating</li> <li>• alpha is stopped by paper or skin</li> <li>• alpha has the shortest range in air</li> <li>• alpha will travel a few cm in air</li> <li>• because alpha is most ionising</li> <li>• because alpha has a charge of +2</li> </ul> <u>beta radiation</u> <ul style="list-style-type: none"> <li>• a beta particle is an electron (emitted from the nucleus)</li> <li>• beta penetrates less than gamma and more than alpha</li> <li>• beta is stopped by a thin sheet of aluminium</li> <li>• beta has a shorter range than gamma</li> <li>• beta will travel up to 1m in air</li> <li>• because beta is more ionising than gamma and less ionising than alpha</li> <li>• because beta has a charge of -1</li> </ul> <u>gamma radiation</u> <ul style="list-style-type: none"> <li>• gamma radiation is an electromagnetic wave</li> <li>• gamma is the most penetrating</li> <li>• gamma is reduced/stopped by several cm of lead or thick concrete</li> <li>• gamma has the largest range in air</li> <li>• gamma will travel very large distances in air</li> <li>• because gamma is least ionising</li> <li>• because is uncharged</li> </ul> <p>to access level 3 the answer should compare alpha, beta and gamma radiation and provide some explanation of their properties</p>		
<b>Total</b>		<b>11</b>	