Alpha Decay

New Regents original practice • Name: _____ Date: _____
Show your work for written answers.

An alpha particle is a helium nucleus with mass number 4 and atomic number 2. Use A for mass number and Z for atomic number.

1 What change occurs to the parent nucleus when it emits one alpha particle?

(1) A decreases by 2 and Z decreases by 4.

(2) A decreases by 4 and Z decreases by 2.

(3) A stays the same and Z decreases by 1.

(4) A decreases by 4 and Z stays the same.

2 An alpha-emitting parent has 138 neutrons. How many neutrons are in its daughter after one alpha emission? Show the reasoning. [1]

Answer and work

_____

_____

3 Which observation distinguishes alpha emission from emission of a neutron alone?

(1) The nucleus loses mass number 1.

(2) The nucleus retains the same atomic number.

(3) The emitted particle contains two protons.

(4) The emitted particle has zero charge.

4 Explain why an alpha-emitting parent and its daughter are atoms of different elements. [1]

Answer and work

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Decoding a Model Decay Record

Use the information below to answer the questions.

An archive shows one alpha decay for each record. Each row gives the parent and daughter mass and atomic numbers. Use the periodic table to identify elements as needed.

Record	Parent (A, Z)	Daughter (A, Z)
P	(210, 84)	(206, 82)
Q	(222, 86)	(218, 84)
R	(232, 90)	(228, 88)

5 Which element is the daughter in record P?

(1) Lead

(2) Polonium

(3) Radon

(4) Thorium

6 Use record Q to show separate mass-number and atomic-number balances that include the emitted alpha particle. [1]

Answer and work

7 Which record starts with a thorium nucleus?

(1) P

(2) Q

(3) R

(4) All three

8 A student replaces the daughter in record R with (228, 90). Explain which balance fails and give the corrected daughter pair. [1]

Answer and work