Following Mass Numbers Through a Decay Chain

Base your answers on the information provided and your knowledge of chemistry. Use the 2025 Chemistry Reference Tables as needed.

A class uses a nuclear simulation that follows one parent through two successive changes. P, I, and D label the parent, intermediate, and final daughter. The display records the mass number A and atomic number Z for each nucleus.

Nucleus	**A**	**Z**
P	226	88
I	222	86
D	218	84

1 Which emitted particle balances the change from P to I?

(1) A neutron

(2) An alpha particle

(3) A beta-minus particle

(4) A proton

2 Calculate the combined mass number and combined charge number of the particles emitted in the two steps. Use the parent and final daughter values. [1]

Answer and work

A second display shows the same parent and final daughter but gives the intermediate values as A = 222 and Z = 87. It claims each of the two steps emits one alpha particle.

3 Explain how the intermediate charge number reveals an error even though the parent-to-daughter total remains the same. Use either step. [1]

Answer and work

4 A corrected record gives 136 neutrons and a mass number of 222 for the intermediate. Calculate its atomic number and identify the element using the periodic table. [1]

Answer and work