Checking Decay With a Stable Tracer

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

A mineral exhibit simulates a sample containing radioactive parent nuclei and a stable isotope of the same element. The stable isotope does not decay during the test, and none of the stable nuclei enter or leave the sample. If the detector samples only part of the material, it counts the same fraction of each isotope present at that time. The only process that changes the number of radioactive parents in the whole sample is their decay.

Record	**Radioactive parents counted**	**Stable isotope nuclei counted**
Beginning, whole sample	80	80
End, sampled portion	20	40

1 What fraction of the material at the end was counted by the detector?

(1) One quarter

(2) One half

(3) Three quarters

(4) All of it

2 Calculate the number of radioactive parents remaining in the whole sample at the end. [1]

Answer and work

3 A student compares the raw parent counts of 80 and 20 and concludes that two half-lives passed. Evaluate the claim using the stable record. [1]

Answer and work

A repeat detector counts just one quarter of both isotope populations at the same final time.

4 Predict both reported counts and explain whether their ratio changes from the first final measurement. [1]

Answer and work