Counting What Remains After Two Decays

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

A classroom simulation contains two radioactive parents, P and Q. Each decay makes one nucleus of the same stable daughter type. There are no daughter nuclei initially. Over one model interval half the P parents decay, while one quarter of the Q parents decay.

Record after one interval	**Count**
P parents still present	20
Q parents still present	30
Stable daughters in all	30

1 Which number of P parents must have been present at the start?

(1) 20

(2) 30

(3) 40

(4) 50

2 Calculate the starting number of Q parents and the number of daughters made by Q. [1]

Answer and work

3 A student adds all 30 daughters to the 20 remaining P parents to infer the original P count. Evaluate the calculation using both parent records. [1]

Answer and work

A repeat display hides both parent counts and reports only the 30 pooled daughters. The starting amounts of the two parents are not given.

4 Give two possible pairs of P and Q decay counts consistent with the 30 pooled daughters. Explain why the reading cannot distinguish the pairs. [1]

Answer and work