Separating Model Radiation With Two Screens

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

A classroom simulation records alpha particles and gamma photons from a model source. The detector counts either type as one event. Screen P stops all alpha particles and passes all gamma photons in the model. Screen Q stops half of both types. The readings are expected counts for equally long recordings, with the background already removed.

Condition	**Expected count**
No screen	80
Screen P only	50
Screen Q only	40

1 Which reading directly measures the gamma contribution in this model?

(1) 80 with no screen

(2) 50 with screen P

(3) 40 with screen Q

(4) The sum of the two screen readings

2 Calculate the alpha contribution to the no-screen reading. Show how the gamma reading is used. [1]

Answer and work

3 Explain why the Q-only result would fit a different alpha–gamma mixture as long as the no-screen total stayed at 80. [1]

Answer and work

The class combines P and Q in the same line. In the simulation each screen still passes the same fraction of what reaches it.

4 Predict the expected count with both screens and explain what reaches the detector. [1]

Answer and work

In a later test, the records include the same unknown background count. With no screen the total is 90, with P only it is 60, and with P and Q it is 35. The screens affect only the source contributions. The background enters after the screens.

5 Calculate the common background count from the two readings involving screen P. Show how the model for Q enters the calculation. [1]

Answer and work