Checking Background in a Decay Simulation

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

A classroom simulation represents a detector counting emissions from a decaying sample. The detector also records background events. The background stays constant over the run. Every reading is taken over the same one-minute counting interval, and the counting intervals are short compared with the sample’s half-life.

Elapsed time (h)	**Counts in one minute**
0	100
4	60
8	40
12	30

A student says the half-life must be greater than four hours because the total count after four hours is still above half its original value. A separate run with no sample gives 20 counts in one minute.

1 Calculate the sample-only counts at zero hours and four hours. Use the no-sample reading. [1]

Answer and work

2 Which half-life best fits the corrected counts?

(1) 2 h

(2) 4 h

(3) 8 h

(4) 12 h

3 Explain why the total count does not halve after one half-life in this simulation. [1]

Answer and work

4 Predict the total count at 16 hours if the same model continues. Show how you included both sources of counts. [1]

Answer and work