

33. The rate of decay is given by $R = \lambda N$, where λ is the disintegration constant and N is the number of undecayed nuclei. In terms of the half-life $T_{1/2}$, the disintegration constant is $\lambda = (\ln 2)/T_{1/2}$, so

$$\begin{aligned} N &= \frac{R}{\lambda} = \frac{RT_{1/2}}{\ln 2} = \frac{(6000 \text{ Ci})(3.7 \times 10^{10} \text{ s}^{-1}/\text{Ci})(5.27 \text{ y})(3.16 \times 10^7 \text{ s/y})}{\ln 2} \\ &= 5.33 \times 10^{22} \text{ nuclei} . \end{aligned}$$