71. (a) Adapting Eq. 43-20, we find

$$N_0 = \frac{(2.5 \times 10^{-3}\,\text{g})(6.02 \times 10^{23}/\text{mol})}{239\,\text{g/mol}} = 6.3 \times 10^{18} \ .$$

(b) From Eq. 43-14 and Eq. 43-17,

$$\begin{aligned} |\Delta N| &= N_0 \left[1 - e^{-t \ln 2/T_{1/2}}\right] \\ &= (6.3 \times 10^{18}) \left[1 - e^{-(12\,\text{h}) \ln 2/(24{,}100\,\text{y})(8760\,\text{h/y})}\right] \\ &= 2.5 \times 10^{11} \ . \end{aligned}$$

(c) The energy absorbed by the body is

$$(0.95)E_\alpha|\Delta N| = (0.95)\,(5.2\,\text{MeV})\,\left(2.5 \times 10^{11}\right)\,\left(1.6 \times 10^{-13}\,\text{J/MeV}\right) = 0.20 \text{ J} \ .$$

(d) On a per unit mass basis, the previous result becomes (according to Eq. 43-31)

$$\frac{0.20\,\text{mJ}}{85\,\text{kg}} = 2.3 \times 10^{-3}\,\text{J/kg} = 2.3 \text{ mGy} \ .$$

(e) Using Eq. 43-32, $(2.3\,\text{mGy})(13) = 30\,\text{mSv}$.