

Marks
2

- A watch contains a radioactive substance with a decay constant of $1.40 \times 10^{-2} \text{ year}^{-1}$. After 50 years 25 mg of the radioactive material remains. Calculate the amount originally present.

The number of radioactive nuclei present reduces with time according to:

$$\ln\left(\frac{N_0}{N_t}\right) = \lambda t$$

With a decay constant, $\lambda = 1.4 \times 10^{-2} \text{ year}^{-1}$, and $N_t = 25 \text{ mg}$ for $t = 50 \text{ years}$, the amount originally present is given by:

$$\ln\left(\frac{N_0}{(25 \times 10^{-3})}\right) = (1.4 \times 10^{-2}) \times 50$$

$$N_0 = 0.050 \text{ g} = 50 \text{ mg}$$

Answer: **50 mg**