

An aircraft was found and tested for its carbon -14 content. If 80% of the original carbon -14 was still present, what is its probable age (to the nearest 100 years)? (Carbon 14 has a - life of 5,730 years.)

The number of radioactive atoms C can be written as a function of time:

$$N(t) = N_0 2^{-\frac{t}{T}}, \text{ where}$$

N_0 - an initial number of radioactive atoms C

$N(t)$ - the amount of radioactive carbon in the time t ($N(t)=80\%N_0=0.8N_0$)

$T=5,730$ - radiocarbon half-life

Hence

$$0.8N_0 = N_0 2^{-\frac{t}{5730}}$$

$$2^{-\frac{t}{5730}} = 0.8$$

Logarithm

$$\ln 2^{-\frac{t}{5730}} = \ln 0.8$$

$$\ln a^b = b \ln a, \text{ so}$$

$$-\frac{t}{5730} \ln 2 = \ln 0.8$$

$$t = -5,730 \frac{\ln 0.8}{\ln 2} = 1,844$$

Answer: The probable age of an aircraft is 1,800 years.