Exercise- p 626 Oxtoby

$N = \frac{A\, T_{1/2}}{\ln 2}$ = # nuclei present @ any moments

We have a mixture of Co-60 + Co-59, the number of atoms of Co-60 is:

$$N = \left(4.0\times10^{4}\ \frac{dis}{sec}\right)\left(5.27\ yr \times \frac{365\ day}{1\ yr} \times \frac{24\ hr}{1\ day} \times \frac{3600\ sec}{1\ hr}\right)\left(\frac{1}{0.693}\right)$$

$N = 9.59\times10^{19}$ atoms of Co-60 are present

We have 0.19 g of Co-59 and Co-60.

$$9.59\times10^{19}\ atoms\ Co\text{-}60 \times \frac{1\ mol\ Co\text{-}60}{6.02\times10^{23}\ atoms\ Co\text{-}60} \times \frac{60\ g\ Co\text{-}60}{1\ mol\ Co\text{-}60} = 9.56\times10^{-3}\ g$$

$$= 9.56\ mg\ Co\text{-}60$$

We have $\frac{9.56\ mg\ Co\text{-}60}{190\ mg\ total\ cobalt} = 5.03\%$

Exercise p 630

Liner contains 1 atom C-14 for every 8.25×10^{11} atoms C-14

Estimate Age of Cloth.

Alive: 1 C-14 in every 7.54×10^{11} atoms (p 629)

Now: 1 C-14 in every 6.25×10^{4} atoms (p 630 exercise)

$\ln\frac{N}{N_0} = -kt$, $t = \frac{T_{1/2}}{0.693}\ln\frac{N}{N_0} = \frac{5730}{0.693}\ln\frac{N}{N_0} = 8268.4\ln\frac{N}{N_0}$

$$t = 8268.4\left(\ln\frac{7.54\times10^{11}}{8.25\times10^{4}}\right) = 744\ yrs$$