P_u^{238} $\lambda = 87.7$

$$A(t) = A_0\left(\frac{1}{2}\right)^{t/87.7}$$

Population of amoeba doubles every 3 years.

$$A(t) = A_0(2)^{t/3}$$

$\boxed{38}$

$$91 = 46(1.1)^x$$

$$\frac{91}{46} = 1.1^x$$

$$\log\left(\frac{91}{46}\right) = \log(1.1)^x$$

$$\log(91/46) = x\log(1.1)$$

$$\frac{\log(91/46)}{\log(1.1)} = x$$

41

$$0.4\left(\frac{1}{3}\right)^{3x} = 7(2)^{-x}$$

$$\left(\frac{1}{3}\right)^{3x} = \frac{35}{2}(2)^{-x}$$

$$\log\left(\frac{1}{3}\right)^{3x} = \log\left(\frac{35}{2}\right) + \log(2)^{-x}$$

$$3x\log\left(\frac{1}{3}\right) = \log\left(\frac{35}{2}\right) - x\log(2)$$

$$3x\log\left(\frac{1}{3}\right) + x\log(2) = \log\left(\frac{35}{2}\right)$$

$$x\left(3\log\left(\frac{1}{3}\right) + \log 2\right) = \log\left(\frac{35}{2}\right)$$

$$x = \frac{\log(35/2)}{3\log\left(\frac{1}{3}\right) + \log 2}$$

P_u^{238}

$\lambda = 87.7$

$$A(t) = A_0 \left(\frac{1}{2}\right)^{t/87.7}$$

rewrite:

$$A(t) = A_0 e^{kt}$$

$$e^{k} = \left(\frac{1}{2}\right)^{\frac{1}{87.7}}$$

$$k = \ln\left(\frac{1}{2}\right)^{\frac{1}{87.7}}$$

$$k = \frac{\ln\left(\frac{1}{2}\right)}{87.7} = \frac{\ln(2^{-1})}{87.7}$$

$$= -\frac{\ln 2}{87.7}$$

$$\boxed{A(t) = A_0 e^{\frac{-\ln 2}{87.7} t}}$$

$$A(t) = (10\text{kg}) e^{-\frac{\ln 2}{87.7} t}$$

when will only have 2kg. left

$$2 = 10 e^{-\frac{\ln 2}{87.7} t}$$

$$\frac{1}{5} = e^{-\ln 2/87.7 \, t}$$

$$\ln(0.2) = -\frac{\ln 2}{87.7} t$$

$$203 \approx \frac{-87.7}{\ln 2}(\ln(0.2)) = t$$

Radio Carbon Dating.

C^{14} $\lambda = 5730$ years.

35% C^{14} is left in a sample of cloth.

$$A(t) = 1\, e^{-\frac{\ln 2}{5730} t}$$

$$0.35 = e^{-\ln 2/5730\, t}$$

$$\ln(0.35) = \frac{-\ln 2}{5730} t$$

$$8678 = \frac{5730}{-\ln 2} \ln(0.35) = t$$

years