Smoke detectors use $^{241}_{95}Am_{146}$ to provide ionization radiation. Let's investigate some properties of smoke detectors. Note that some data for this comes from
http://www.nndc.bnl.gov/chart/reCenter.jsp?z=95&n=146
which you may use for this problem.

(a) it is found that $^{241}_{95}Am_{146}$ is unstable against α decay (this is essentially the only decay mode it experiences). Write a balanced equation showing this decay. Note that this reaction is accompanied by γ emission which you should also show.

$$^{241}_{95}Am_{146} \rightarrow {}^{237}_{93}Np_{144} + {}^{4}_{2}He_{2} + \gamma$$

(b) Show, using the binding energy calculation, that this decay is unstable against α decay. Express your results in MeV.
If you refer to the site:
http://www.nndc.bnl.gov/masses/mass.mas03
You can find the atomic masses for the various parts of the reaction. (They are in mux10$^{-6}$ (which I use mu as amu) For example, you'll find for $^{241}_{95}Am_{146}$ the following:
51 146 95 241 Am 52936.008 1.829 7543.272 0.008 B- -767.417 1.172 241 056829.144 1.963

Looking across you will see the mass as 241 056829.144 μmu which is 241.056829144 mu.
Use the conversion 1 mu=931.494 MeV.
0 2 2 4 He 2424.91565 0.00006 7073.915 0.000 B- -22898.270 212.132 4 002603.25415 0.00006
51 144 93 237 Np 44873.275 1.833 7574.982 0.008 B- -220.032 1.298 237 048173.444 1.967

$$B = (4.00260325415 + 237.04813744 - 241.056829144) = -0.00608844585u$$
$$\Rightarrow B = -5.67135\,MeV$$

(c) Go to the site:
http://www.nndc.bnl.gov/nudat2/indx_sigma.jsp
Enter your nucleus as 241Am and choose the mode of decay to be alpha. From this, obtain the half life of 432.6 yr (indicate that you have done this step by saying so). Calculate the decay constant (in yr$^{-1}$) for $^{241}_{95}Am_{146}$ .

$$\tau_{1/2} = \frac{\ln(2)}{\lambda} \Rightarrow \lambda = \ln\frac{(2)}{\tau_{1/2}} = \frac{0.0016/yr}{3.18} x\,10^{-11}/sec$$

Suppose you have initially 0.29x10$^{-6}$ g of Americium dioxide (the form in smoke detectors). We want to calculate its activity in Bq. In order to do this, it is necessary to calculate the atomic weight of $AmO_2$ which is 273.05569 g/mole or mu. Since the atomic weight of Am is 241.056829144, the percentage of Am which is active is about 88.3%. Show then that the initial amount of Am in a typical smoke detector is about 0.256μg. You need this to answer the following question.

After a period of 5 years, how much $^{241}_{95}Am_{146}$ remains (in μg)?

$$N = N_0 e^{-\lambda t} = (0.256\mu g) e^{-50.0016} = 0.254\mu g$$

Calculate the initial activity ($R_0$) of the radiation in the smoke detector in Bq. In order to do this, you need to calculate the number of atoms present.
Do this in the following way:
(a) show that about 0.001062 μmoles of $^{241}_{95}Am_{146}$ are present.

$$n = 0.256\,\mu g\,x \left( \frac{1\,mole}{241.0568\,g} \right) = 0.001064\,\mu m$$

(b) show that the number of nuclei present is about $6.393x10^{14}$.
This is given by:

$$n = N_A \left( \frac{Number}{mole} \right) x\, m_A \left( \frac{\mu g}{mole} \right) = 6.3932\,x\,10^{14}$$

(c) now calculate the activity in Bq. You may use the approximation that the number of seconds in a year is about $\pi x10^7$ s.

$$R_0 = \lambda N_0 \Rightarrow R_0 = \frac{0.0016}{\pi\,x\,10^7} = 6.393x10^{14} = 32559\,Bq$$

(d) What is the activity after 5 years in Bq?

How many 5 year old smoke detectors would be required to obtain an activity of 1 Ci?
32559 x n=$3.7x10^{10}$ so n=$1.11x10^6$