kinetics of radioactive decay

A = kN	N = number of nuclides *remaining* at time t N_0 = original number of nuclides (at time 0) $\frac{N}{N_0}$ = percentage of nuclides *remaining* at time t (in decimal form) A = "activity" at time t = rate of decay at time t A_0 = original activity (at time 0) Standard units for rate of decay are: $Bq = \frac{1}{s} = \frac{\text{decays}}{\text{second}}$ m = total mass of nuclides remaining at time t m_0 = original total mass of nuclides (at time 0) k = decay constant. Standard units for k = 1/s k represents the percentage decay per second (in decimal form) $t_{1/2}$ = half-life
$\ln\left(\frac{N}{N_0}\right) = -kt$ $\frac{N}{N_0} = e^{-kt}$ $\frac{N}{N_0} = \frac{A}{A_0} = \frac{m}{m_0}$	
$k \cdot t_{1/2} = \ln(2)$	

Be careful to note whether the problem is focusing on the number of nuclides *remaining* or the number that have been *lost*.

mass defect and binding energy

Δm = (total mass of all the reactants) – (total mass of all the products)	In calculating Δm, use all nuclear masses, or use all atomic masses. Express Δm as: $\frac{\Delta m}{\text{number of reactant or product particles}}$ When considering the formation of a nucleus out of separate protons and neutrons, Δm is referred to as the "mass defect" of the nucleus.
$\Delta E = \Delta mc^2$	Δm should be in SI units for ΔE to be in SI units c = speed of light Express ΔE as: $\frac{\Delta E}{\text{number of reactant or product particles}}$ When considering the formation of a nucleus out of separate protons and neutrons, ΔE is referred to as the "binding energy" of the nucleus.
$E_{\text{photon}} = hf$ $c = f\lambda$	h is Plank's constant c = speed of light f = frequency, λ = wavelength