Chapter 20 Nuclear Chemistry Math Summary

Particles Involved in Nuclear Reactions, either as Nucleons, Emitted particles or Particles that React with a Nucleus and Induce a Decay

(Memorize these for Test)

-the first three, alpha, beta, and positrons are the crucial ones for balancing radioactive nuclear decay reactions

$^{4}_{2}He$	α-particle (alpha)	$^{0}_{0}\gamma$	gamma
$^{0}_{-1}e$	ß-particle (beta), electron	$^{1}_{0}n$	neutron
$^{0}_{+1}e$	positron	$^{1}_{1}H$	proton

Radioactive Decay Math

$t = (t_{1/2}/0.693) \ln (A_o/A_t)$ When solving for time, given half life and quantities of material

$\ln (A_o/A_t) = 0.693 (t/t_{1/2})$ When solving for the amount of material left after a given time, given the half life

Handling "ln y = x" on calculator, when you know "x" but want to solve for "y": enter "x", then hit your "e^x" button.

Mass Defect/Binding Energy Math

Proton mass: 1.00783

Neutron mass: 1.00867

$E = \Delta mc^2$ Δm = (sum mass of protons plus neutrons) – actual mass

- The binding energy will depend on the Δm difference between the summed weight of the protons and neutrons minus the actual mass of the nucleus.
- Δm in terms of kilograms (you'll normally need to convert from grams to kg)
- The energy answer from the formula comes out in terms of Joules, not kJ; you'll routinely need to convert from J to kJ to fit the answers.