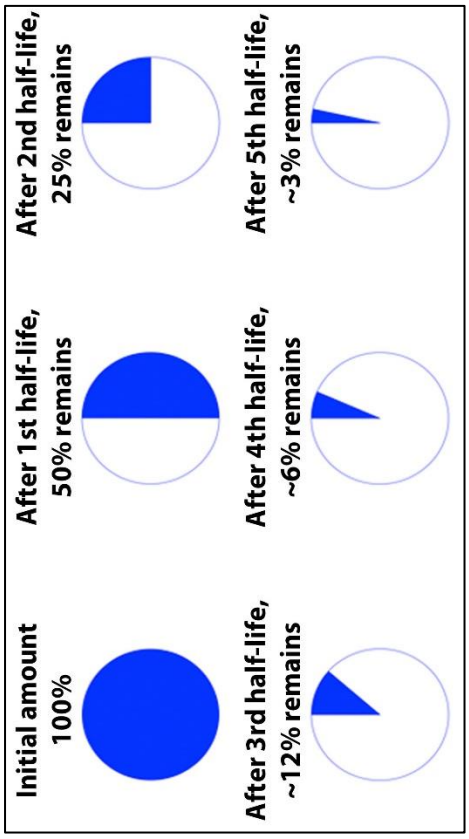
Reference Sheets for
Unit #2 – Nuclear Chemistry

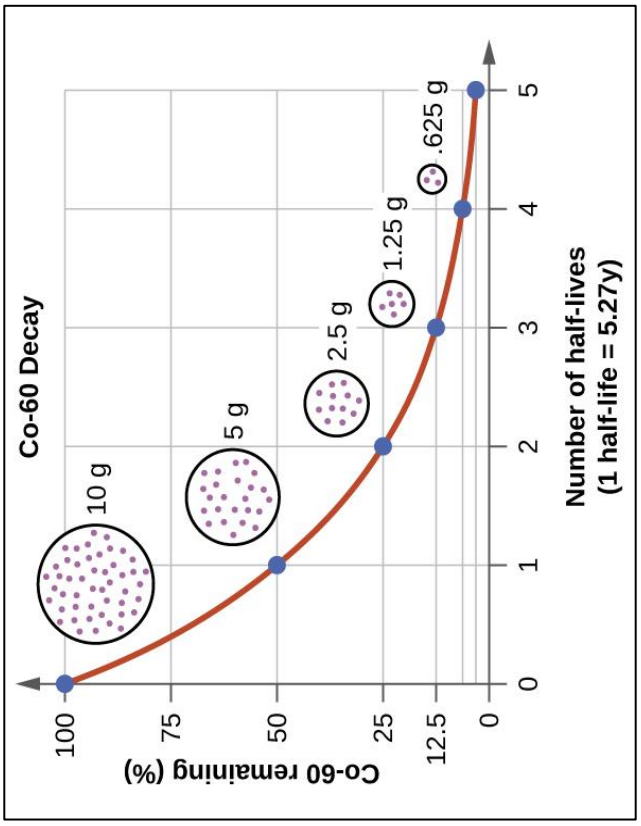
Nuclear Decay Organizer

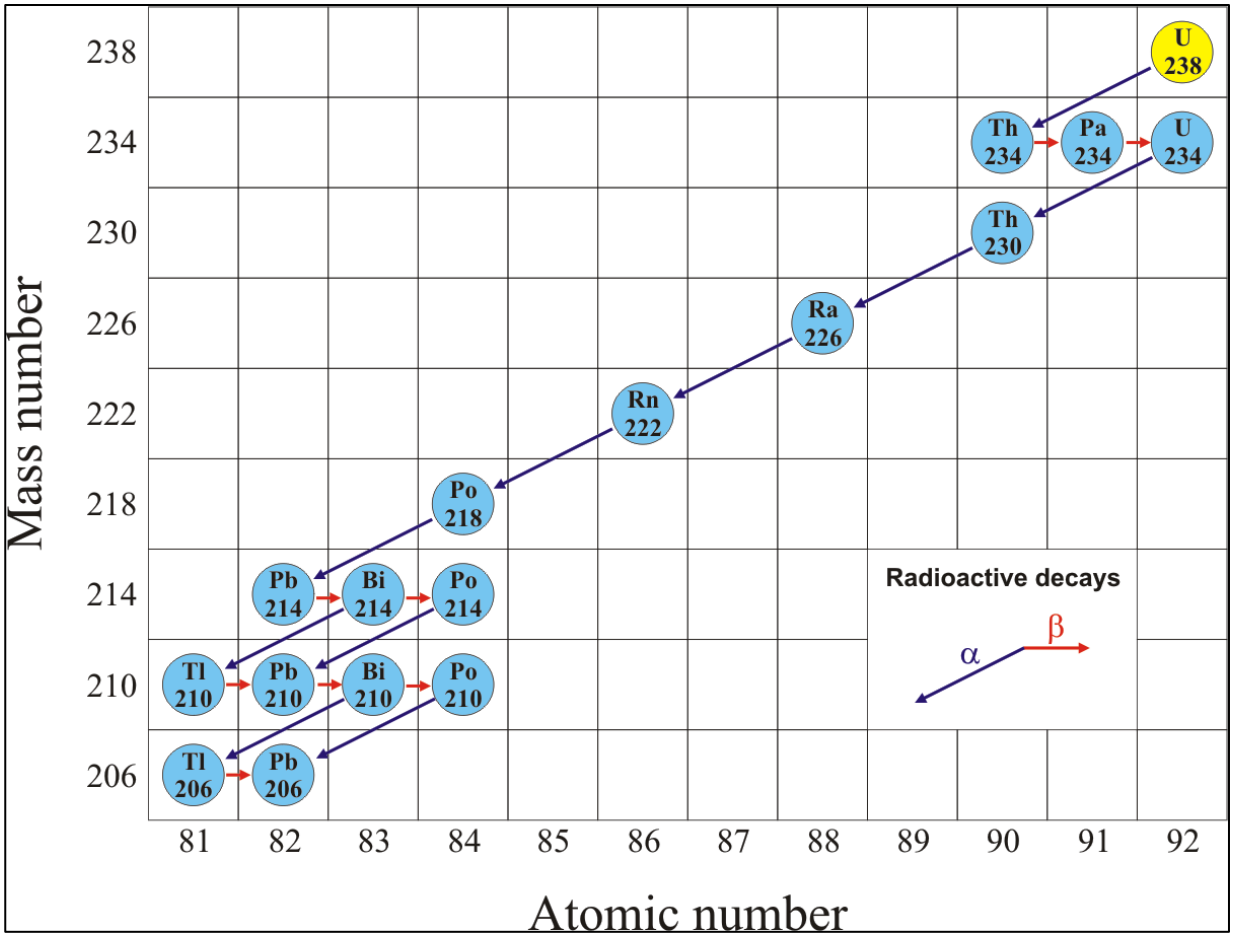
Students know the three most common forms of radioactive decay (alpha, beta, and gamma) and know how the nucleus changes in each type of decay.
Students know alpha, beta, and gamma radiation produce different amounts and kinds of damage in matter and have different penetrations.
Students know some naturally occurring isotopes of elements are radioactive, as are isotopes formed in nuclear reactions.

	Alpha Particle Emission	**Beta Particle Emission**	**Gamma Ray Emission**
Symbol	${}_{2}^{4}He^{2+}$ or ${}_{2}^{4}\alpha^{2+}$	${}_{-1}^{0}e$ or ${}_{-1}^{0}\beta$	${}_{0}^{0}\gamma$
Mass	Heavy	Light	No Mass
How it changes the nucleus	• Decreases the mass number by 4 • Decreases the atomic number by 2	• Converts a neutron into a proton • Increases atomic number by 1	No change to the nucleus
Penetration	Low	Medium	High
Protection provided by…	Skin	Paper, clothing	Lead
Danger	Low	Medium	High

Nuclear Info Sheet







Nuclear Info Sheet

Half Life Equation

$$A_E = A_s \times 0.5^n$$

A_E = amount ending
A_S = amount starting
n = number of half lives

of Half Lives

$$n = \frac{t}{h}$$

n = number of half-lives
t = time that has passed
h = length of a half life

% still radioactive or % decayed

$$\%_{still\ r.a.} = \frac{A_E}{A_S} \times 100$$

A_E = amount ending
A_S = amount starting
n = number of half lives

$$\%_{still\ r.a.} = 0.5^n \times 100$$

$$\%_{decayed} = 100 - \%_{still\ r.a.}$$

Solving for t, or h

Same as this version:

$$\log\left(\frac{A_E}{A_S}\right) = n \times log(0.5)$$

$$\log\left(\frac{A_E}{A_S}\right) = \frac{t}{h} \times log(0.5)$$

Simply isolate the variable you are trying to solve for

$$t = \frac{h \times \log\left(\frac{A_E}{A_S}\right)}{log(0.5)}$$

$$h = \frac{t \times \log(0.5)}{log\left(\frac{A_E}{A_S}\right)}$$