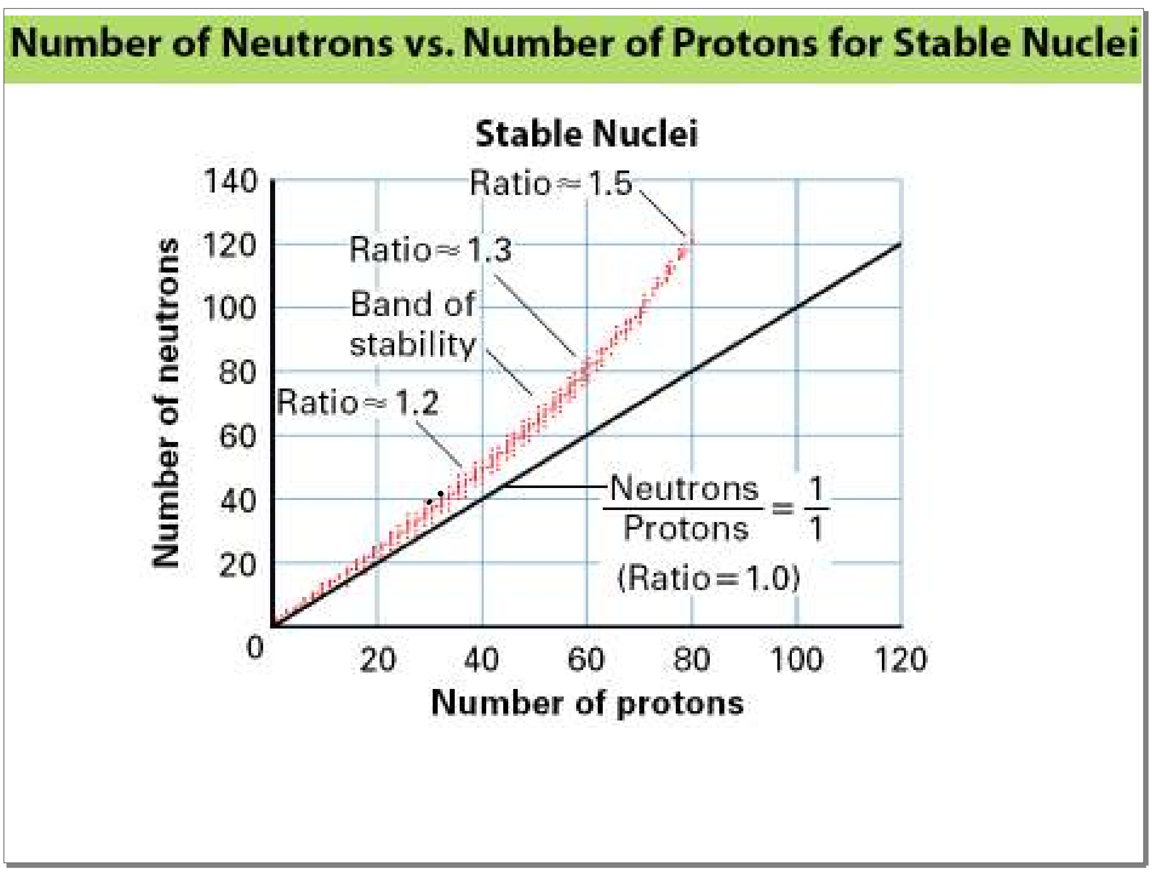
Ch 28
Sec 28.2

HW:Sec Rev 6,10,34-36,49,59

obj: Use half-life to calculate the amount of a radioisotope remaining after a period of time.

Nuclear Stability

- The stability of a nucleus depends on the proton-neutron ratio.
  * Ratio of 1 to 1 is stable for atomic numbers 20 or Less.
  * As the atomic number increases the proton-neutron ratio increases for stable nuclei.



Decay Processes		
Beta Emission		
$^{66}_{29}Cu$	$\longrightarrow$	$^{66}_{30}Zn + ^{0}_{-1}e$
$^{14}_{6}C$	$\longrightarrow$	$^{14}_{7}N + ^{0}_{-1}e$
Electron Capture		
$^{59}_{28}Ni + ^{0}_{-1}e$	$\longrightarrow$	$^{59}_{27}Co$
$^{37}_{18}Ar + ^{0}_{-1}e$	$\longrightarrow$	$^{37}_{17}Cl$
Positron Emission		
$^{8}_{5}B$	$\longrightarrow$	$^{8}_{4}Be + ^{0}_{+1}e$
$^{15}_{8}O$	$\longrightarrow$	$^{15}_{7}N + ^{0}_{+1}e$
Alpha Emission		
$^{226}_{88}Ra$	$\longrightarrow$	$^{222}_{86}Rn + ^{4}_{2}He$
$^{232}_{90}Th$	$\longrightarrow$	$^{228}_{88}Ra + ^{4}_{2}He$

Radiation

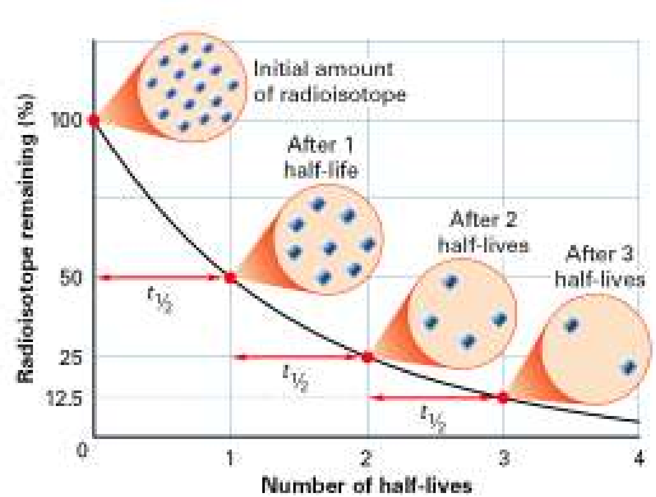
- Elements w/ atomic numbers below 83 will emitt Beta particles.
  - * Ratio of Protons to Neutrons is closer to 1-1.
- Positron - Radiation particle Identical to a Beta particle except for the charge.
  - * Changes a Proton into a neutron.

- Elements w/ atomic number 83 or greater will emitt alpha radiation.

Half-Life.

- The amount of time needed for ½ of the radioactivity isotopes to Decay.
  - * A physical property.

Decay Curve for a Radioactive Element



– Calculating Half-Lifes

1) The time elapsed for a # of half lifes.

* Half life times the # of half lifes

2) Amount of substance Left.

$A = m \times \frac{1}{2}$ ^ # half lifes

A radioisotope has a half-life of 12 minutes. How long does it take for the radioisotope to go through 3.8 half life's?

Given

½ Life = 12 min

½ Life's = 3.8

time = half life × # of ½ Life's

= 12 min × 3.8

=

Find the mass of a radioisotope that is left from a 100 g sample after 3 half-life's.

Given

m = 100 g

½ Life's = 3

Wanted

A = ?

$A = m \times \frac{1}{2}$ ^ # ½ lifes

$= 100g \times \frac{1}{2}$ ^ 3