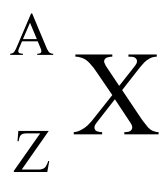
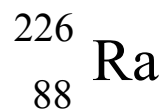
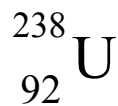



Radioactivity...the spontaneous disintegration of atomic nuclei



- A - Atomic mass number
- number of nucleons (protons + neutrons)
- Z - Atomic Number
- number of protons (or electrons)



 <http://holbert.faculty.asu.edu/eee460/decay.html>

Nuclear Stability...

The strong nuclear force is an attractive force between nucleons (p&n) and acts only over very short distances.

It is stronger than the force of repulsion between protons.

So...the number of neutrons determines the stability since they can provide the strong nuclear force to hold the nucleus together without increasing the repulsive electric force.

As the number of protons increases, the repulsive force increases and the nucleus becomes less stable.

When the repulsive force > strong nuclear force the atom is unstable and will radioactively decay.

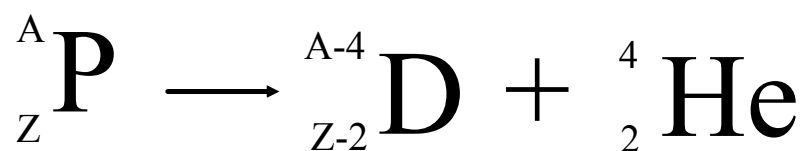
$^{209}_{83}\text{Bi}$ is the last stable element. Elements with more than 83 protons are unstable and can spontaneously break apart. This is *radioactivity*.

"An enterprising firm ...was marketing it (thorium) to the German public in toothpaste as a way to make your teeth glow white."

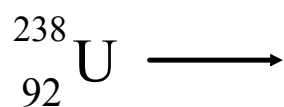
When a nucleus decays it releases a particle or radiation and becomes more stable.

There are several types of radioactive decay.

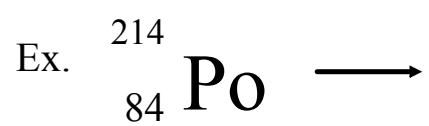
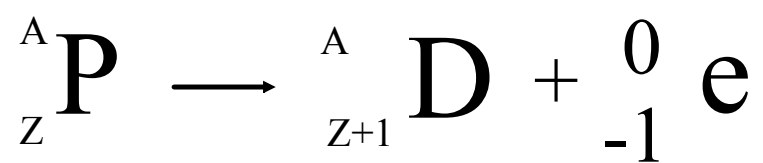
(1) Alpha Decay



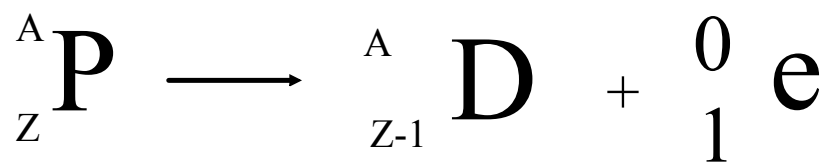
Ex.



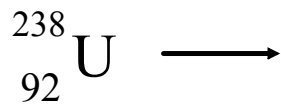
(2) Electron Emission (beta minus decay β^-)



(3) Positron Emission (β^+)

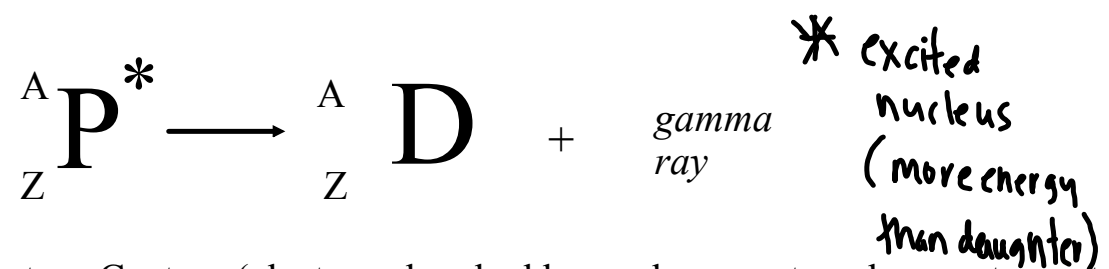


Ex.

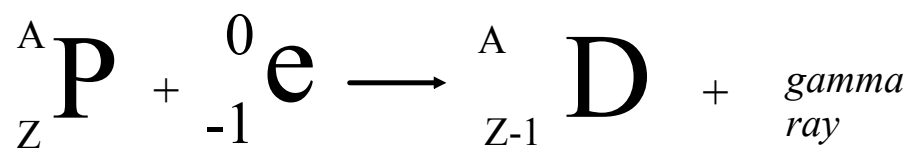


(4) Gamma Decay

- nucleus loses energy, giving it off as a photon of light



(5) Electron Capture (electron absorbed by nucleus, proton changes to neutron)



Notes on emission...

Alpha particle - Helium nucleus

- most massive
- (+2) charge
- low penetrating power
- highest ionizing ability

Beta particle - electron

- low mass
- (-1) charge
- medium penetrating power
- medium ionizing ability

Gamma rays - negligible mass

- zero charge
- strong penetrating power
- low ionizing ability

*Practice page 751 #2,3,4
page 773 # 42-45*

transmutation - the changing of one element into another