Aim: What is the nature of radioactivity?

1) **Radiation**- the "stuff" emitted by radioactive elements.

BAD

cancer

death

birth defects

2) **All** isotopes having an **atomic number > 83** are naturally radioactive.

Refer to Periodic Table:

Some vs. ALL

$_{83}Bi$ $_{84}Po$

I call this the "radioactivity border" b/c beyond this point, all the isotopes are radioactive.

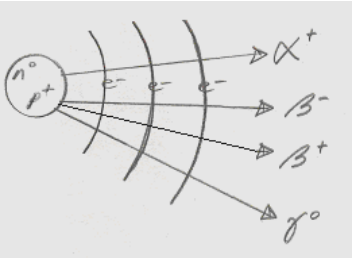
example: $_{92}U^{238}$, $_{92}U^{233}$, $_{92}U^{235}$ are all radioactive

Some isotopes with an **atomic number < 83** are also radioactive, but there's no way of knowing other than referring to a **Table N**.

examples: $_{79}$Au-198, $_{6}$C-14

$^{198}_{79}Au$ vs. $^{197}_{79}Au$	$^{14}_{6}C$ vs. $^{12}_{6}C$
radioactive / not radioactive	radioactive / not radioactive

3) Radiation **comes from the nuclei** of radioactive atoms.



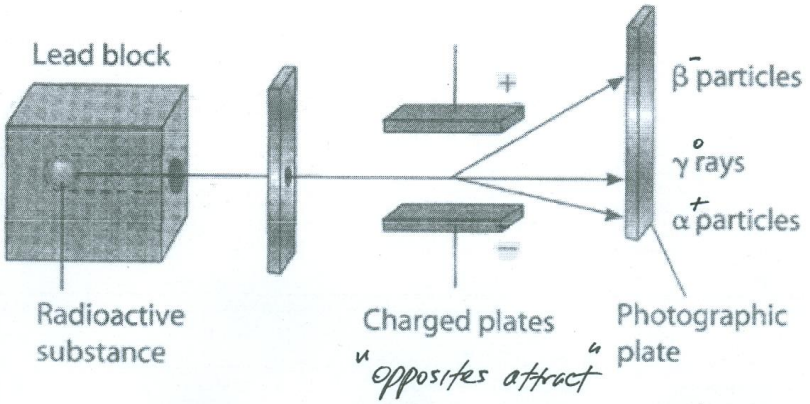
Why? These nuclei naturally disintegrate (decay, break down) because they have an **unstable neutron to proton ratio (n:p).**

4) **Types of radiation**: alpha particle (α^{+}), beta particles (β^{-}), positrons (β^{+}) and gamma rays (γ^{0})

Some Common Forms of Radiation

PARTICLE	COMPOSITION	MASS (amu)	CHARGE	NOTATION (TABLE O)	SYMBOL	PENETRATING POWER	Stopped by
Alpha	p+ p+ n° n°	4	+2	$^{4}_{2}He$ or $^{4}_{2}\alpha$	α	LOW	paper
Beta	e^{-}	$\frac{1}{1836}$	-1	$^{0}_{-1}e$ or $^{0}_{-1}\beta$	β^{-}	MODERATE	aluminum
Positron	e^{+}	$\frac{1}{1836}$	+1	$^{0}_{+1}e$ or $^{0}_{+1}\beta$	β^{+}	" "	"
Gamma Rays (Not particles)	HIGH Energy X-rays	0	0	$^{0}_{0}\gamma$	γ	HIGH	Lead

SEPARATING RADIATION



NOTE: 1) an alpha particle is also referred to as a helium nucleus;
2) a beta particle is formed when a neutron converts into a proton and an electron; the proton remains in the nucleus while the electron is emitted.