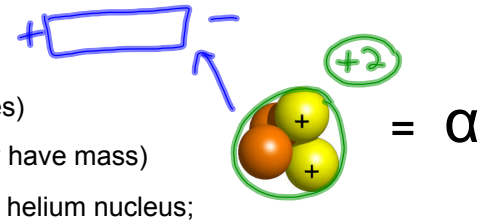
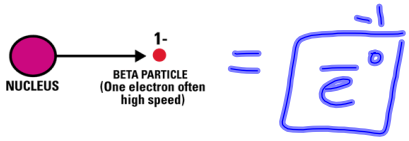
Types of Radioactive Emissions (Particles and Rays)



1. Alpha Particles (α -particles)

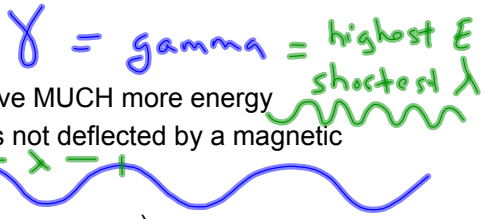
- consist of particles (i.e. they have mass)
- an alpha particle is simply a helium nucleus; it consists of 2 protons and two neutrons
- an alpha particle has a +2 charge (due to the two protons)
- is attracted to the negative pole of a magnetic/electric field (opposite charges attract)
- an alpha particle has the least penetrating power of all the radiation types; it can't pass through a sheet of paper

2. Beta Particles (β-particles)



- consist of particles (have mass)
- a beta particle is simply an electron
- a beta particle has a negative charge (since it's an electron)
- it is attracted to the positive pole of a magnetic/electric field
- it has more penetrating power than α-particles
- it can pass through a sheet of paper but can't pass through 2.5cm thickness of wood

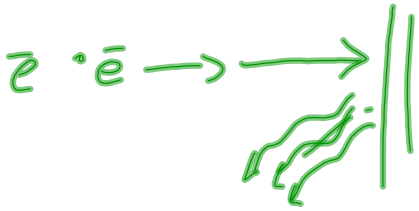
3. Gamma Rays (ɣ-rays)



- these resemble x-rays, but they have MUCH more energy
- a gamma ray has no charge, so it's not deflected by a magnetic or electric field.
- gamma rays consist of waves (they are energy) they are not particles; they have no mass
- they travel at the speed of light (300 000 km/s), like all waves in the electromagnetic spectrum See last page of this handout for the electromagnetic spectrum.
- gamma rays are the most penetrating type of radiation; 1 metre thickness of concrete or lead is needed to stop them

4. X-rays

- these are waves; energy; have no mass
- they travel at the speed of light
- they have no charge, and are less penetrating than gamma rays
- x-rays are not produced by radioactive elements (they are produced when high speed electrons are made to strike a metal target)



"Nuclear radiation": includes alpha and beta particles, and gamma rays (because they are all produced by radioactive elements.

"Ionizing radiation": gamma rays, x-rays, alpha, and beta particles are all forms of "ionizing radiation" because they all have enough energy to remove electrons from atoms and thus "ionize" them (make them charged).

Na metal

Na^+ Na^+ ions

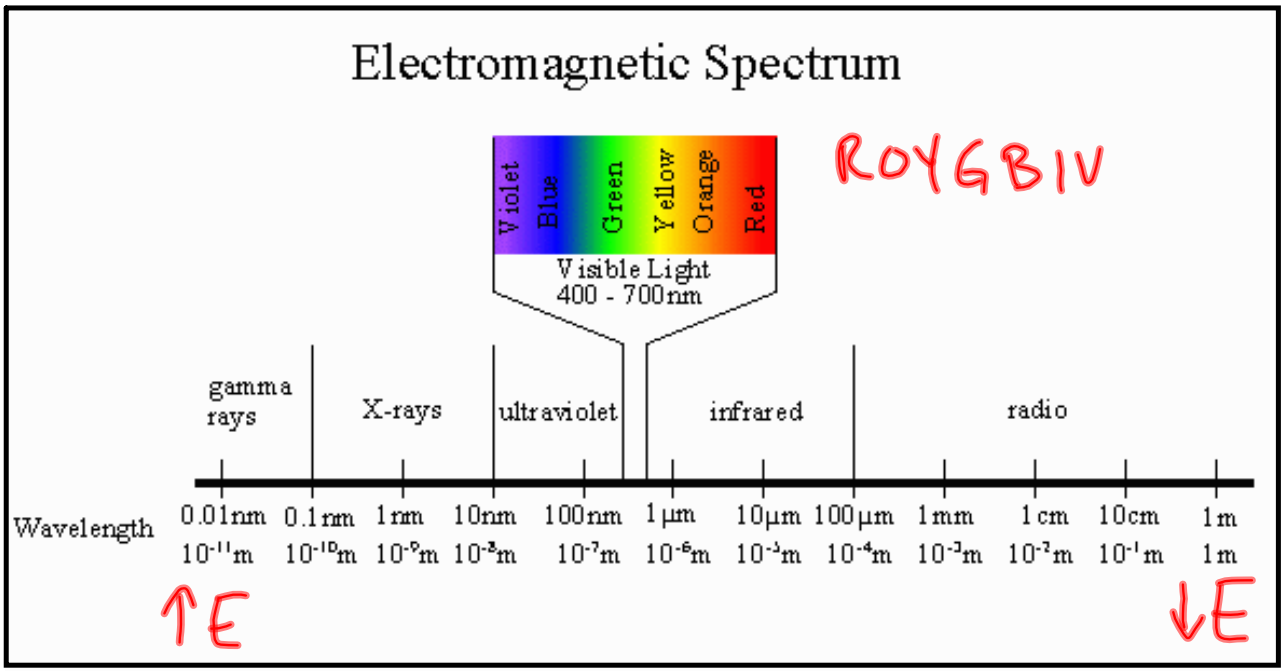
Check off the appropriate boxes:

	Type of Radiation			
Statement	α	β	γ	x
It is the most penetrating type of radiation.			✓	
It travels at the speed of light.			✓	✓
It is not produced by radioactive elements.				✓
It consists of particles.	✓	✓		
It is not deflected by a magnetic field.			✓ both have no charge	✓
It consists of electrons.		✓		
It consists of helium nuclei.	✓			
It can be stopped by a piece of wood.	✓	✓		

Natural radioactivity: found in nature; occurs spontaneously
e.g.s Uranium series, Actinium series, Thorium series

Artificial radioactivity: not found in nature; does not occur spontaneously; occurs when nuclei are bombarded (by scientists) with high-speed neutrons or other particles (like alpha particles).
e.g. all atoms heavier than Uranium are produced artificially ... Uranium is the heaviest naturally-occuring element.

This is given for you to see, since it's referenced on the first page of this handout:



Electromagnetic Spectrum song.....

http://www.youtube.com/watch?v=bjOGNVH3D4Y