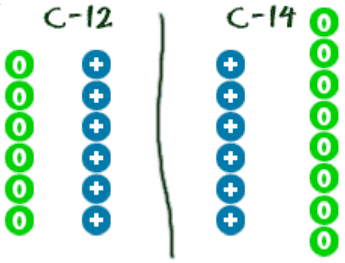
Chp12 Lect 4: The Atom

1 pt ec printing | Reviewing Isotopes & Atoms

Neutron Madness: Not all atoms are perfect. Let's say an atom is missing a neutron or has an extra neutron. That type of atom is called an _____. It's still the same atom, it's just a little different from every other atom of the same element.

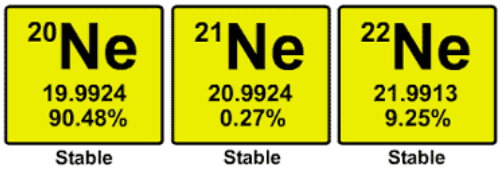
Isotope Example #1: Carbon

- There are a lot of carbon atoms in the universe.
- The normal ones are _____.
- Those atoms have 6 neutrons, 6 protons, & 6 electrons
- There are a few straggler atoms that don't have 6.
- Those odd ones may have 7 or even 8 neutrons.
- Carbon-14 actually has 8 neutrons (2 extra).



Isotope Example #2: Neon

- Neon usually has 10 neutrons.
- But, sometimes a neon atom has 11 or 12 neutrons.
- So we have 3 different versions of neon:
  - 10 protons, 10 neutrons
  - 10 protons, 11 neutrons (1 extra)
  - 10 protons, 12 neutrons (2 extra)
- All 3 can occur in nature, but Ne-20 is way more common than the other 2 versions.



Everything Else Stays the Same: In an isotope, the number of protons & electrons stays the same. Only the number of neutrons changes.

- What would happen if an atom lost or gained a proton? It would become_____

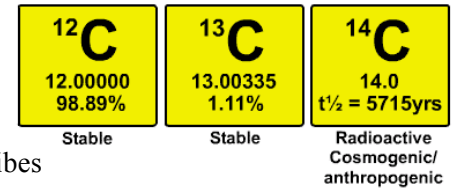
- What would happen if an atom lost or gained an electron? It would become _____

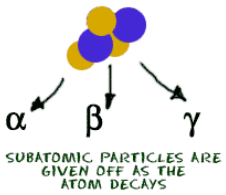
Learn about isotopes: What happens to the mass of an atom if it has an extra proton? It gets _____. Remember, protons each have a mass of 1 amu, so if you add an extra… it raises the atomic mass by 1.

Messing with Mass: If you've looked at another periodic table, you may have noticed that the atomic mass of an element is rarely an even number. That happens because of the isotopes. Atomic masses are calculated by figuring out how many atoms of each type are out there in the universe. For carbon, there are a lot of C-12, some C-13, and a few C-14 atoms. When you average out all of the masses, you get a number that is a little bit higher than 12 (the weight of a C-12 atom). The mass for element is actually 12.011. Since you never really know which C atom you are using in calculations, you should use the mass of an average C atom.

Mass Number vs. Atomic Mass: Atomic mass is actually a _____ of the the isotopes' mass (protons + neutrons). _____ is protons + neutrons. Read the fine print on our periodic table…

Returning to Normal: If we look at the C-14 atom one more time we can see that C-14 does not last forever. There is a point where it loses those extra neutrons and becomes C-12, which is _____. That loss of the neutrons is called _____ _____. That decay happens regularly *like* a clock. For carbon, the decay happens in a couple of thousand years. Some elements take longer and others have a decay that happens over a period of minutes. The term _____ describes the time it takes for the amount of radioactivity to go down by one half.





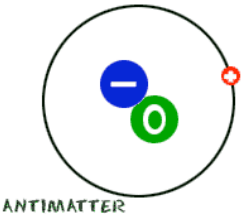
Dangerous Particles: Radioactivity occurs when an atomic nucleus breaks down into smaller particles. There are three types of particles: alpha, beta, and gamma. Alpha particles are positively charged, beta particles are negatively charged, and gamma particles have no charge. The particles also have increasing levels of energy, first Alpha, then Beta, and finally Gamma, which is the fastest and most energetic of all the emission particles.

Harness that Energy: Nuclear energy is the energy released when the nuclei of atoms split or are fused. _____ is when two nuclei come together. _____ is when one nucleus is split into two or more parts, causing a chain reaction. Huge amounts of energy are released when either of these reactions occurs. Fusion reactions create much of the energy given off by the Sun. Nuclear power involves uranium-235 and nuclear fission.

Why is radioactivity bad? Radiation is bad for humans because it can sometimes kill or damage cells in our bodies. Being exposed to most radioactive isotopes will make you very sick and probably kill you. UV waves are a type of radiation,

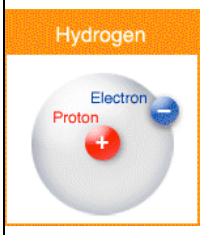
which is why it is bad for your skin to lay out in the sun without sunscreen. X-Rays and other instruments used my doctors may also damage parts of our body, but the benefits typically outweigh the risks. In some cases, radiation is good. Cancer patients use chemotherapy radiation treatments to target and kill the deadly cancer cells.

Really Complex Stuff: Protons & neutrons are made of smaller bits called _____. There are 6 quarks, but physicists usually talk about them in terms of three pairs. A quark has a fractional electric charge, unlike the proton and electron. Since we are talking a little about atomic and nuclear physics, we wanted to tell you about _____. Scientists have proved that it is real. While a regular atom has positive and neutral pieces (protons/neutrons) in the nucleus and negative pieces in orbiting clouds (electrons), antimatter is just the opposite. Antimatter has a nucleus with a negative charge and little positive pieces in the orbits. Those positively charged pieces are called _____. ***Want more info:*** *http://www.particleadventure.org*



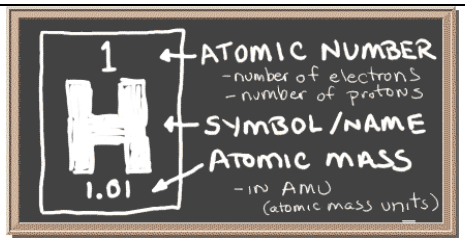
What makes 1 atom different from another?

Answer: the amount of protons, neutrons and electrons present in each atom. The amount of these particles present determines the type of _____. The number of protons in an atom is also the atomic number. Again, _____ = _____. Also, since there is almost always an equal number of electrons & protons in an atom: ***atomic # = # of electrons***.



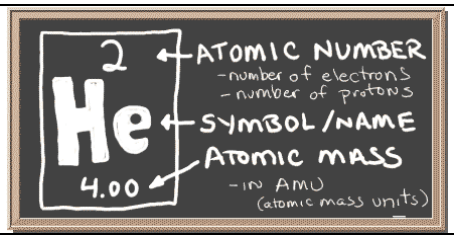
The #1 Element: Hydrogen

Look at hydrogen. Its atomic number is 1, which means it has _____ in the center of the atom. Because the atom should be neutral, we need to add _____ to the outside. The two opposite charges cancel and we're left with one happy, neutral atom.



Let's make a Helium!

Step 1: add 2 protons (since the atomic # is 2)
Step 2: add 2 neutrons (since the 2 protons repel one another, the nucleus is unhappy & needs some inner peace)
Step 3: add 2 electrons (-2) (since we want a happy atom & we need two negatives to balance the two positives)



Atomic Mass

Think of it this way… what are the only two parts of an atom that have any mass at all? Protons & Neutrons! Electrons are so teeny they don't weigh anything. So, to find the mass of the atom, add the two together. Atomic Mass is the number of _____.

Group Challenge: Atomic Math

Use the periodic table new information to be the first group to accurately complete the table below.

Element	Atomic #	Protons, Electrons	Atomic Mass	Neutrons
Lithium				
Boron				
	7			
		10		
			31	
				35