

ATOMS!!!!!!!!!!

- What is the structure of the atom?
- How are elements described in terms of their atoms?
- Why do we use models to understand atoms?

I. Atoms are the tiny units that determine the property of all materials. They are the building blocks of molecules. Atoms are the smallest part of an element that still has the element's properties. An atom of gold is different from an atom of oxygen.

What is an atom?

A. Two parts of the atom: nucleus & electron cloud

1. Nucleus – small, **dense** center of the atom

Positive charge (+)

Contains protons & neutrons

Both have almost the same size

Protons have a (+) charge

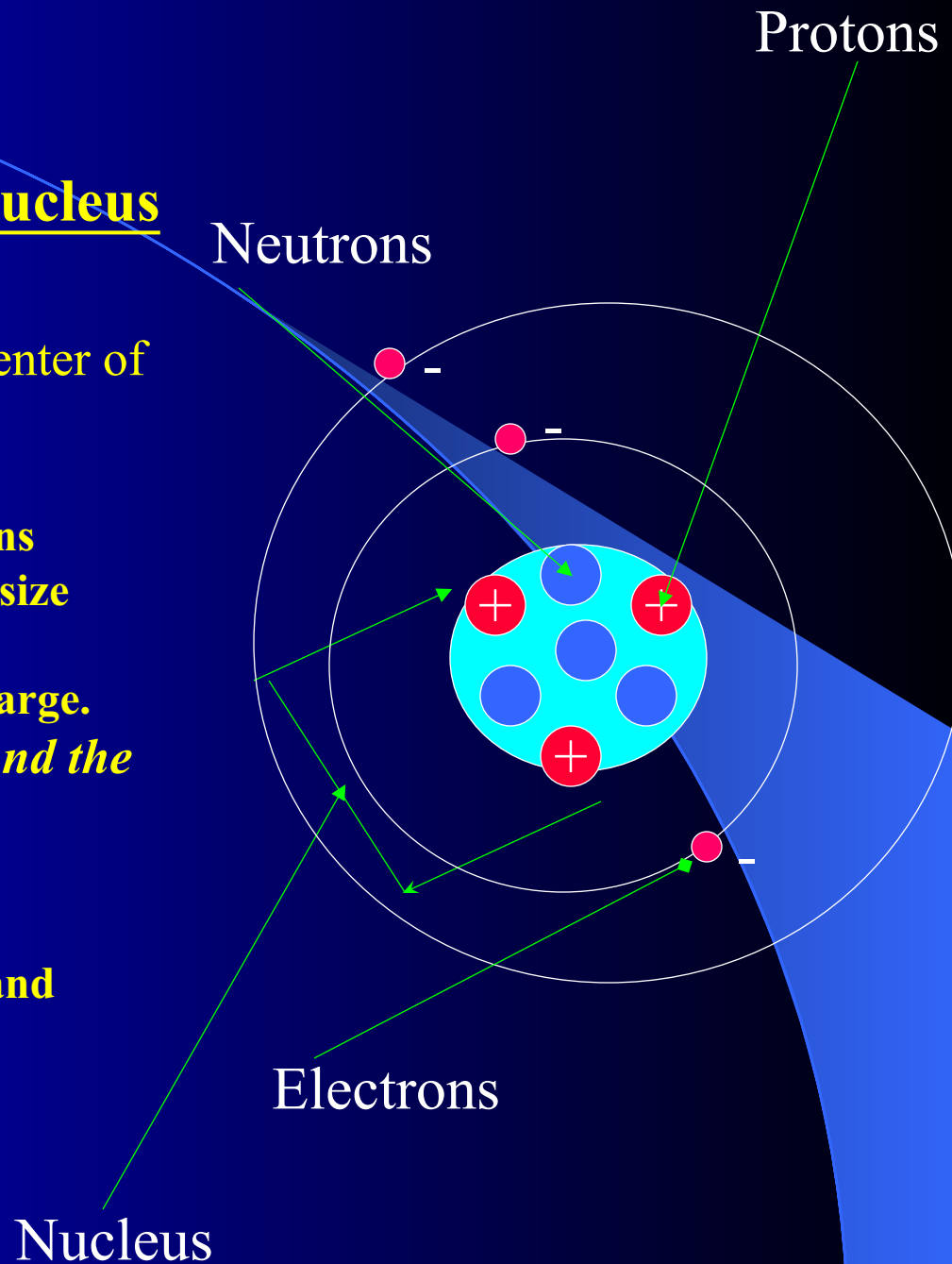
Neutrons have a neutral charge.

2. *Electron Cloud* – area around the nucleus

Contains electrons or e^-

Negative (-) charge

Smaller than protons and neutrons



- Electrons move around in the electron cloud.
 - There is a lot of space between the electrons.

Higher energy— takes more energy to be here than it takes to be on lower level.

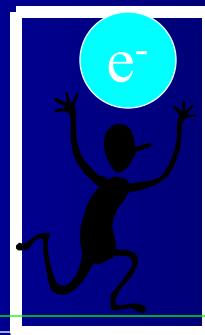
3rd energy level

Electrons have even more energy. (The higher levels are also closer together)

2nd energy level

electrons with a little more energy

Lower energy--
1st energy level "floor"



Energy level: electrons with the least (lowest) energy stay closest to the ← nucleus

Nucleus

Atomic Apartment building

- Think of it like an apartment building, the basement is the cheapest, the penthouse (top floor) is the most expensive. The electrons pay in energy.
- The electrons are spread out, a lot of space. (this is a luxury apartment, lots of space)
- The basement is packed full of stuff, it is dense
- The apartment building is a sphere and the basement is in the center of it. A weird atomic apartment building!!! Very futuristic!

Atomic Apartment buildings: apartments for rent





B. Atoms have no overall charge.
Equal number of protons and
electrons

- Equal number of (+) and (-); they cancel each other out.

$$+ \quad - \quad = \quad 0$$

**(A NEUTRON HAS NO CHARGE SO IT DOES NOT
ALTER THE CHARGE OF THE ATOM)**

Sub atomic particle mass

Sub atomic means smaller than the atom

What particles are smaller than an atom?

(CAN YOU NAME THE 3 PARTS?)

- Electrons, the smallest particle, it takes almost 2,000 e- to equal the mass of just one proton (no wonder the nucleus is so massive!)
- Protons and neutrons have about the same mass. Together they make up almost the whole mass of the ATOM.
- Because atoms are so small they are too small to be measured with normal SI units, so they get their own mass unit, the AMU or atomic mass unit.
- A proton is 1 AMU and electron is $1 / 2,000$ AMU

The number of protons identifies what kind of atom it is! This is known as the Atomic Number. All oxygen atoms have the same number of protons, or the same Atomic Number. All aluminum atoms have the same number of protons.....but the number of protons in aluminum is different from the number of protons in oxygen.

The Atomic Number is always a whole number. There are a specific number of protons

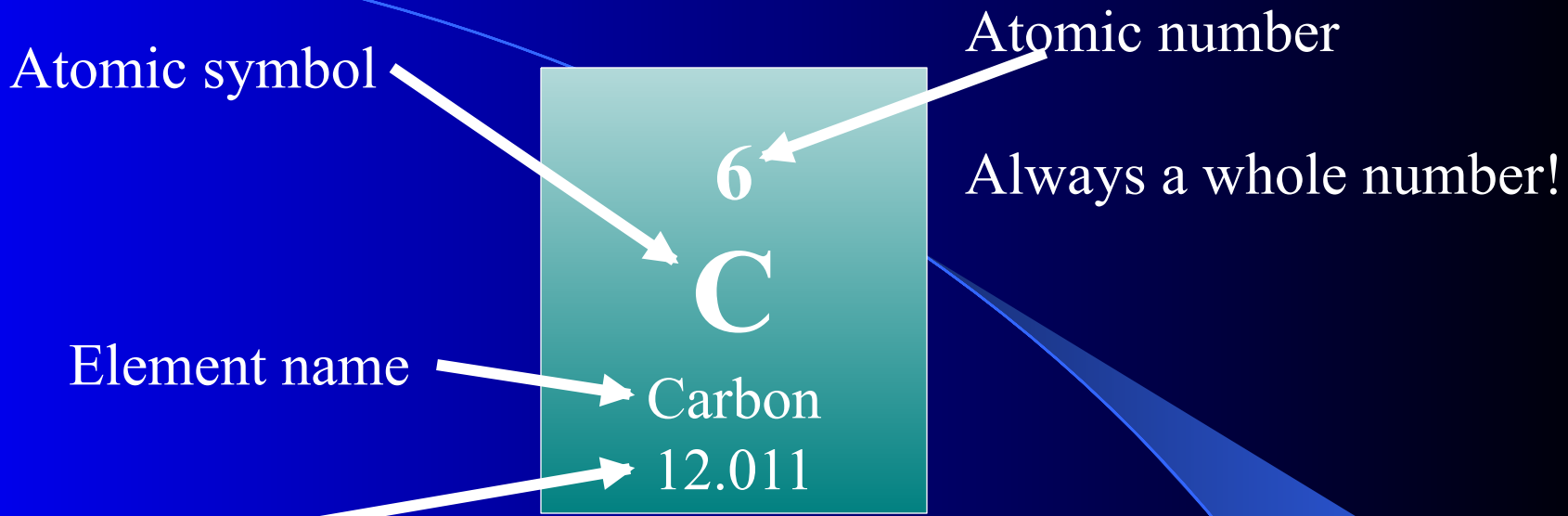
The atomic mass is a decimal, it is an average of all the isotopes, think of it as a weight, your weight can be part of a pound, so it is a decimal (pounds and ounces) too. (in science we use mass not weight)

ISOTOPES

- All atoms of the same element have the same number of protons but they may have a different number of NEUTRONS. The number of neutrons will make the atomic mass change, the more neutrons the heavier the atom. These atoms with the same number of protons but different number of neutrons are called ISOTOPES.

ISOTOPES

- Think of isotopes like clones of the same element but some are fat and some are skinny.
- Isotopes are identified by their mass number.



Average atomic mass – it has a decimal

- *To find the number of protons, see the atomic number. (whole #)
- *To find the number of electrons, see the atomic number(in the future adjust for charge if there is one)

*To find the number of neutrons, subtract the atomic number from the atomic mass. Estimate

Atomic mass --	12
To the nearest whole number. Atomic #	- <u>6</u>
	6 neutrons

Atomic Models

- Atoms are very very small. This makes them hard to study. A piece of dust can have 10 Billion atoms!
- Scientists use many diagrams to understand atoms, mathematical equations, drawings, and other things.
- Models are safer than real atoms.
 - Think of atomic bombs! Splitting an atom to see inside it is not only hard it is dangerous! **KABOOM!**

End of section 1

- What are the 3 main parts of the atom?
- What are the charges of these parts?
- If the parts of an atom have charges why are atoms have no charge?
- What is the atomic number?
- How do we identify atoms and tell them apart from each other?
- Why do we use models to explore atoms?