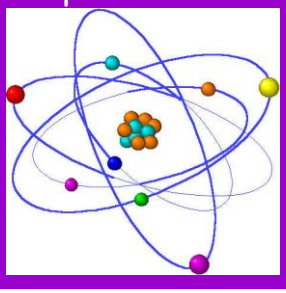
THE ATOM

CHM 090 with Dr. Kim
GCC

An element is made of tiny, indestructible particles called _____.

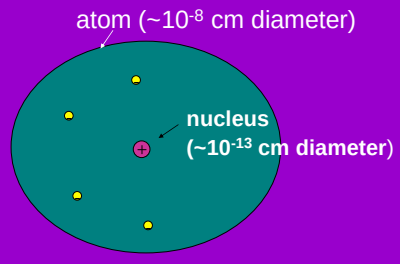


Nuclear Model

1) The atom is mostly empty space with _____ moving around the nucleus.

2) Each atom has a small, dense nucleus containing the _____ & _____.

Atom model



If nucleus = size of a small marble, then atom is the size of Cardinal's stadium!

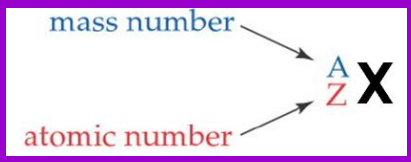
Subatomic Particles

Particles	Symbol	Charge	Relative Mass (amu)
Electrons	e^-	-1	1/1836
Protons	p^+	+1	1
Neutrons	n	0	1

Atomic Mass

- The electron is tiny compared to the protons and neutrons.
- So the mass of an atom is only _____.
- It is similar to me being on the scale at the doc's office and removing a penny from my pocket before getting weighed. The penny won't change my weight! The electron won't change the weight of an atom. Electron mass is _____!

Atomic Notation



Example:

ATOMIC NUMBER

=the # of protons

Every atom of an element has the same # of protons!
Carbon atoms ALWAYS have____protons
Nitrogen (N) atoms have how many protons?
What about magnesium (Mg)?

Mass number

Mass number = # protons + neutrons

Why not electrons?

So how calculate # neutrons?

 # neutrons = _____

Isotopes

Isotopes of an element have the same atomic number (# pro), but a different mass number (# neu).

Ex: carbon-12, carbon-13 and carbon-14

How many protons do the above have?
Neutrons?

Ex. 1: a. Write the atomic notation for sodium-23.

b. How many neutrons are there?

_____

Ex. 2: a. Write the atomic notation for chlorine-37.

b. How many neutrons are there?

_____

Electrons

- # electrons = # _____ in a neutral atom

Isotopes of Carbon – Fill In

Isotope	mass #	# protons	# neutrons	# electrons
carbon-12				
carbon-13				
carbon-14				

Fill in this table

atom	mass	# proton	# neutron	# electron
^{1}H				
^{23}Na				
^{29}Si				

Units for Atomic Mass

Masses of atoms are so small that we define the _____

- Mass of proton & neutron ≈ _____ amu.
- Mass of electron ≈ _____ amu

- Again this is why the mass of **one** atom is the sum of protons + neutrons, but not _____.

Atomic mass

Atomic Mass in the Periodic Table is the average of all atoms for that element in the world, so that is why it is NOT a whole number. (The mass of one atom must be a whole number.)

Chemical formulas *tell us*

type of atoms = element symbols

# of those atoms = subscripts (don't show 1)

-But NOT their bonding order

Ex: water = H_2O _____

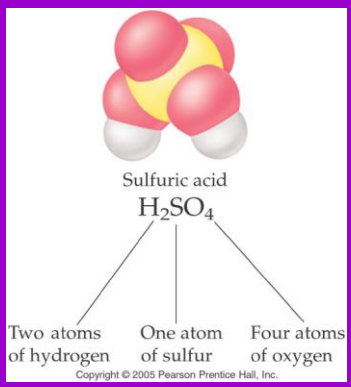
but water is not bonded H-H-O

Ex: How many atoms in potassium nitrate = KNO_3

___ K, ___ N, __ O atoms

but it is not bonded K-N-O-O-O

Another Example



How many atoms?

H_3PO_4

$MgCl_2$

$Ba_3(PO_4)_2$