Target: I can define atomic numbers, isotopes, and ions

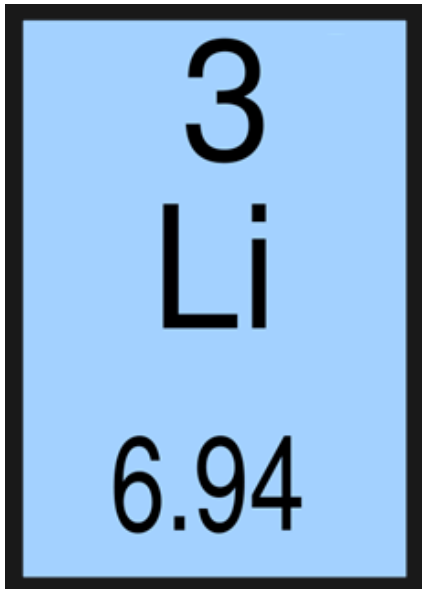
K	C	Q

Atomic Numbers, Isotopes, and Ions

Atomic Numbers

We know: Nucleus has protons (p^+), neutrons (n^0), and electrons(e^-) are on the outside of nucleus

But how many of each???



Atomic Number
# of protons

Atomic Mass Number
(round to the nearest whole #)
# of protons + # of neutrons

# of electrons = # of protons

M.= Mass

minus

A.= Atomic #

equals

N.= #of Neutrons

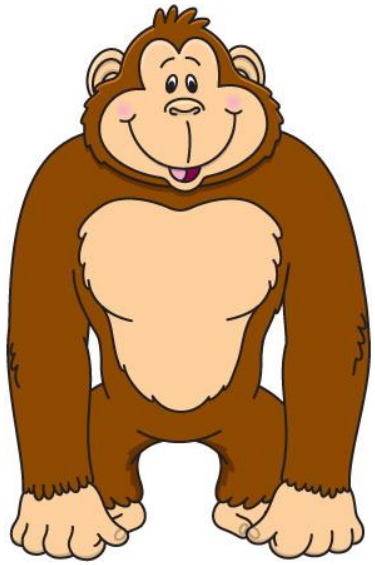
A.= Atomic #

is the same as

P.= #of PROTONS

is the same as

E.= #of ELECTRONS



11

Na

Sodium

22.99

Atomic Number = 11

Mass Number = 23

 # Protons = Atomic # = **11**

 # Electrons = # of protons = **11**

 # Neutrons = Mass # - Atomic #

= 23 – 11 = **12**

Can you change the number of particles in an atom?

Changing Protons
makes a new
ELEMENT
with a NEW name!

Sodium has 11 protons. Take one away and it has 10 and is no longer sodium…it is now Neon!

Changing Neutrons makes a new ***ISOTOPE***

Isotopes

- Same element
- Same # of protons
- Same # of electrons
- **Different number of neutrons**

Element name-Mass #

Silver-107

Silver-108 ← 1 extra neutron

Isotopes

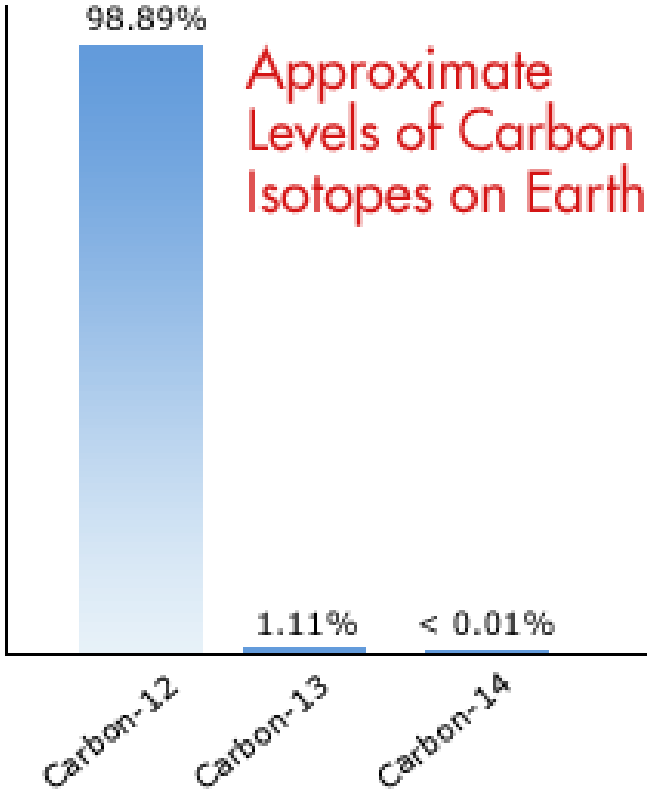
Example: Cesium with 82 neutrons

1) Look up atomic # of cesium = 55 = # protons
2) Neutrons + Protons = Atomic Mass #
   82 + 55 = 137 ← Periodic table says 133!

Cesium-137 **NOT** Cesium-133

Isotopes

Mass #'s on periodic table are the **average** of all the different isotope masses!



Isotopes

You don't need to write this

Special Examples of isotopes

- Hydrogen-1 = 1 proton, 0 neutrons → "protium"
- Hydrogen-2 = 1 proton, 1 neutron → "deuterium"
- Hydrogen-3 = 1 proton, 2 neutrons → "tritium"
- Carbon-12 = 6 protons, 6 neutrons (normal carbon)
- Carbon-14 = 6 protons, 8 neutrons (for carbon dating)

Some elements have lots of isotopes, some don't have any.

Two ways of writing isotopes:

C_{6}^{12}	C_{6}^{14}
Carbon-12	**Carbon-14**

Problem: *Opposite of how periodic table writes the symbols…*

So be careful!!!

Changing Electrons makes a new

ION

Sodium

Normally: 11 protons +11

11 electrons -11

zero charge 0

Sodium

Take away:	11 protons	+11
an electron	10 electrons	-10
	positive charge	+1

Oxygen

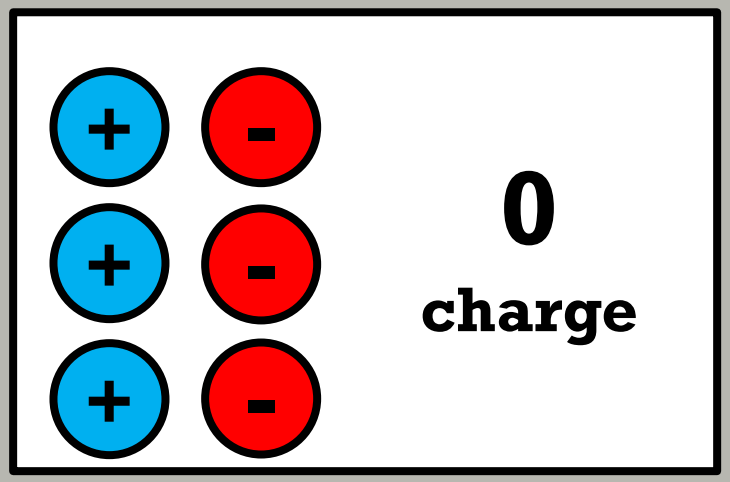
Normally:

8 protons	+8
8 electrons	-8
zero charge	0

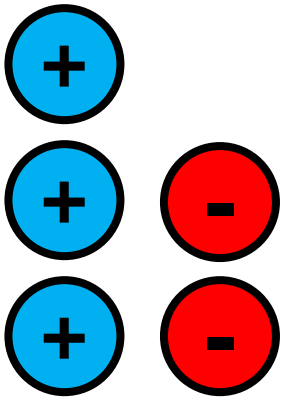
Oxygen

Give 2 extra: electrons

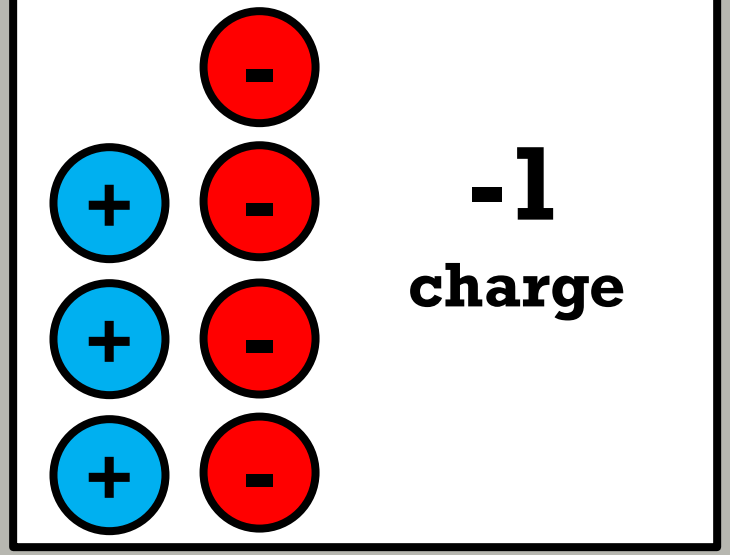
8 protons	+8
10 electrons	-10
negative charge	-2



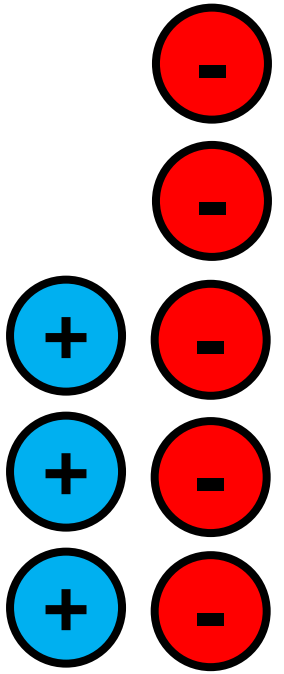
0
charge



+1
charge



-1
charge



-2
charge

IONS!

Oxygen	Sodium
O^{-2}	Na^{+1}
Negative	Positive
Anion	**Cation**
Gained electrons	Took away electrons

YouTube Link to Presentation

https://youtu.be/kugLYOQ078c

Need some extra explanation?

What are Isotopes Video

https://www.youtube.com/watch?v=EboWeWmh5Pg

What are Ions Video

https://www.youtube.com/watch?v=WWc3k2723IM