**Atomic Structure 9/12 & 13/11**

***The Atom***

- Smallest particles of an element that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the properties of that element

- Three main subatomic particles

 - Proton

 - Neutron

 - Electron

***Subatomic Particles***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Particle** | **Symbol** | **Charge** | **Relative Mass** | **Location** |
| **Electron** |  |  |  |  |
| **Proton** |  |  |  |  |
| **Neutron** |  |  |  |  |

***Distinguishing Atoms***

**- Atomic Number**

 - Number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the nucleus

 - Determines the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 - Since atoms are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the atomic number also tells us the number of

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ !

**- Mass Number**

 - Number of protons \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Mass # =

 - These are the two particles that really make up the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the atom

**More on Mass**

- The mass of an atom comes from particles in *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*- The electron is sooooo small, we ignore its mass*

**Notation**

Oxygen - 15



***How to get Atomic and Mass #s***

- If you are ***not*** given the *atomic* number, simply look at the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

- If you are ***not*** given the *mass* number

 - If have protons and neutrons, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ them

 - If don’t have protons and neutrons, take the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from the periodic table and

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_to the nearest whole number

***Practice***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Name** | **Symbol** | **Atomic number** | **Mass Number** |  | **# of Protons** | **# of Neutrons** | **# of electrons** |
| **Sodium** |  |  |  |  |  |  |  |
|  | **Br** |  |  |  |  |  |  |

How many protons are there in Lithium-7? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How many neutrons are there in Lithium-7? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How many protons are there in Mg? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How many electrons are there in Mg? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How many neutrons are there in ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How many neutrons are there in Oxygen-18? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Isotopes***

- Atoms of the same element (same # of protons), but with different numbers of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

- Have different \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ numbers (and ***masses***)

- Isotopes behave the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ chemically because the still have the same number of protons and electrons

**Ex.** Isotopes of Neon

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **Protons** |  |  |  |
| **Electrons** |  |  |  |
| **Neutrons** |  |  |  |

***Ions***

- So far, we have focused on ***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*** atoms

 - Have an ***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***number of protons and electrons

- We know the protons are tightly held in the nucleus

 - Held there by ***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*** forces

- Electrons are scattered outside the nucleus

 - Less ***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*** and able to change

 - When an atom gains or loses electrons, it is called an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



**Gain Electrons Ex.**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ charge

Called an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



**Lose Electrons Ex.**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ charge

Called a ***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

***Summary of Changes to Subatomic Particles***

|  |  |
| --- | --- |
| ***Particle Changed*** | ***Result*** |
|  |  |
|  |  |
|  |  |

##### *Atomic Mass*

- The ***actual*** masses of protons, neutrons and electrons are all very \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

- Therefore, we compare the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ masses of atoms

 - All relative to a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ isotope as a standard

 - Scientists picked \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ as the reference isotopes

 - Carbon-12 has a standardized mass of 12 amu (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mass units)

***Average Atomic Mass*** – The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ average mass of the atoms in a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ occurring sample of the element

 \*\*have to take \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and their relative \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ into account

Isotope Abundance Mass

Boron-10 19.0% 10 amu

Boron-11 81.0% 11 amu

**Ex.**

 ***Boron-10***: 0.190 x 10 =

 ***Boron-11:*** 0.810 x 11 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Ex.** What is the atomic mass of chlorine given the information below?

Isotope Abundance Mass

Chlorine-35 77.5% 35 amu

Chlorine-37 22.5% 37 amu