



## Atomic Structure

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## The Atom

What is an atom?

- Atom: the smallest unit of matter that retains the identity of the substance
- Atoms are composed of 2 regions:
  - Nucleus: the center of the atom that contains the mass of the atom
  - Electron cloud: region that surrounds the nucleus that contains most of the space in the atom

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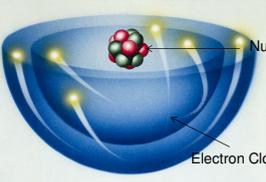
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## The nucleus and electron cloud.



- The nucleus contains 2 of the 3 subatomic particles:
  - Protons: positively charged (+) subatomic particles.
  - Neutrons: neutrally charged subatomic particles.
- The 3<sup>rd</sup> subatomic particle resides outside of the nucleus in the electron cloud.
  - Electron: the subatomic particle with a negative charge (-) and relatively no mass.

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## Where do they reside?

- Outside the nucleus protons and neutrons live compacted in the tiny positively charged nucleus accounting for most of the mass of the atom.
  - Protons = (+)
  - Neutron = no charge
- The negatively charged electrons are small and have a relatively small mass but occupy a large volume of space.
  - Electrons = (-)

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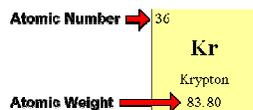


## How do the numbers relate?

- Matter is neutral therefore,  
Number of (+) protons = Number of (-) electrons.

**Atomic number = number of protons**

If # of protons = # of electrons then, atomic # also = # of electrons.



For Krypton there are 36 protons and 36 electrons for a neutral atom of Krypton.

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## Atomic mass vs. mass number

- **Atomic mass** is the average mass of all the naturally occurring isotopes.
- **Mass number** is the equivalent of protons + neutrons in an atom.
- The mass number of an isotope would differ from the atomic mass for the element.
- **An isotope** is defined as 2 or more atoms of an element that are chemically alike but have different masses.  
The mass of an isotope differs due to the differences in # of neutrons.

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## What about the neutron?

**Mass number =**

**Number of protons + number of neutrons.**

To determine the # of neutrons:

Mass number – atomic # (# of protons) =

Atomic Number → 36

Kr

Krypton

Atomic Weight → 83.80

# of neutrons

$$84 - 36 = 48$$

neutrons of Krypton

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