

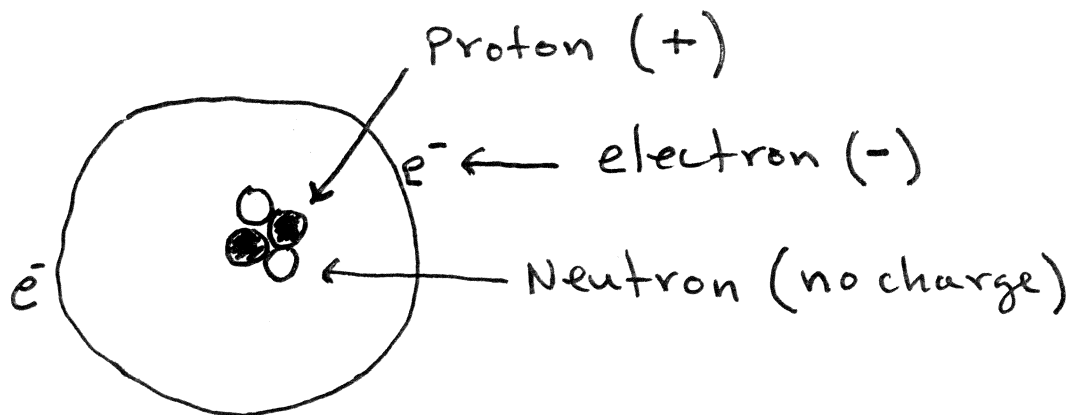
Basic Structure of the Atom

All matter is composed of atoms.

- The chemical elements are fundamental building materials of matter, and all matter can be understood in terms of the arrangement of atoms.
- These atoms retain their identity in chemical reactions.

Basic Structure of the atom:

Helium atom as model



Three basic particles:

proton (+) } over 99%
neutron (0) } of the mass
electron (-)

- Dalton's Atomic Theory 1766 - 1844

1. All matter is made of atoms
2. Atoms are indestructable
3. All atoms of all one type of element are the same. Atoms of different elements are not the same.
4. Compounds form when different atoms are combined in specific ratios by chemical bonds.

- Dalton's Theory is wrong on two counts:

Point 2: Atoms can be broken down into smaller particles.

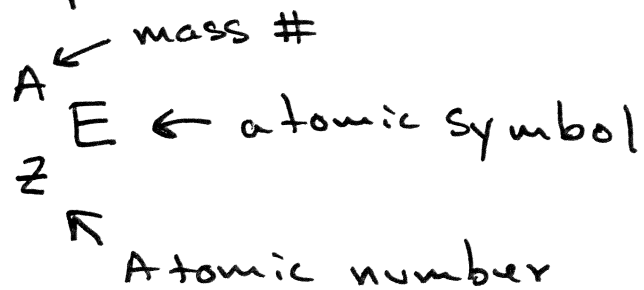
Point 3: Atoms of a specific element ~~are~~ have the same physical and chemical properties except for mass. The neutrons can vary between neighboring atoms of the same element.

- Isotope: Two or more atoms of the same element with different numbers of neutrons.

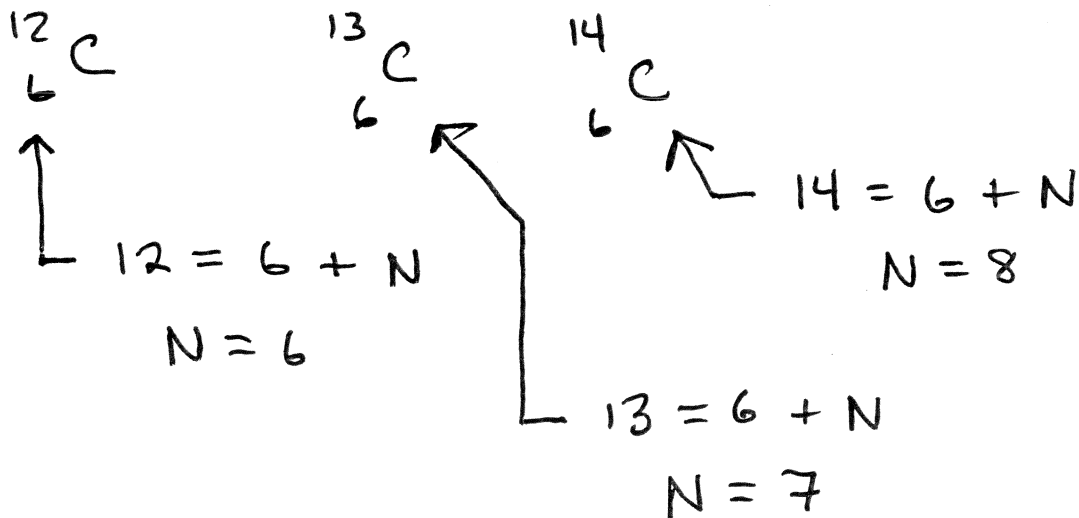
- Mass Number: concept used to describe the mass of a specific isotope defined as:

$$\text{mass \#} = \# \text{ protons} + \# \text{ neutrons}$$

- A Z E notation: A notation used to symbolize a specific isotope.



Examples



- So ^{12}C has 6 neutrons. ^{13}C is heavier by one neutron and ^{14}C is heavier by 2 neutrons.
- What does this mean from a practical perspective? A sample of carbon from the earth's crust contains different amounts of each isotope of carbon by mass:
98.9% ^{12}C 1.1% ^{13}C trace ^{14}C

- In terms of basic chemistry, isotopes have little impact and you should focus on a basic understanding - know the AZE symbols and how to use them to determine mass number, protons, and neutrons.
- Also know the following notation:

Lithium - 6



$$6 = 3 + N$$

$$N = 3$$

Lithium 7



$$7 = 3 + N$$

$$N = 4$$

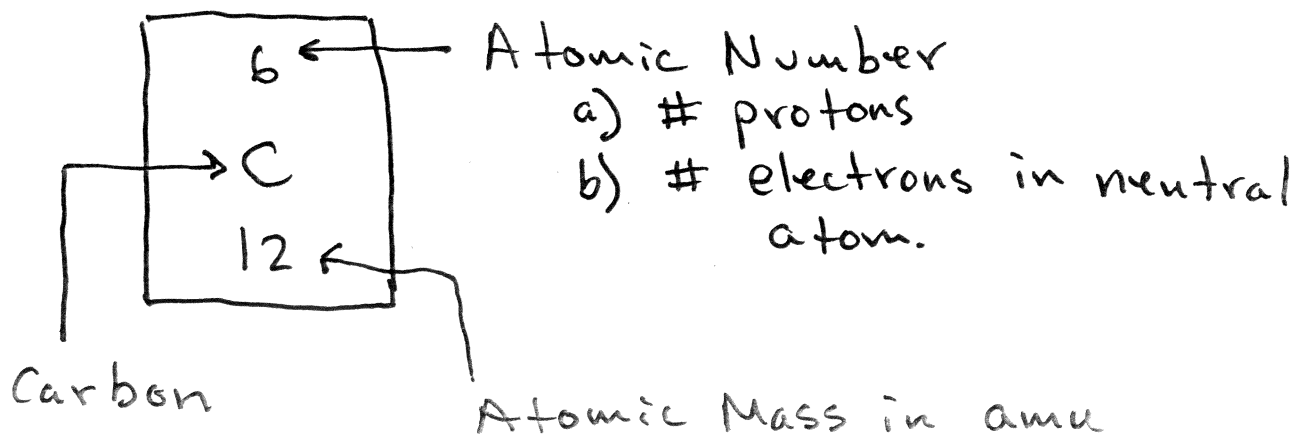
Carbon - 13



$$13 = 6 + N$$

$$N = 7$$

- Basic Symbolism Periodic Table.

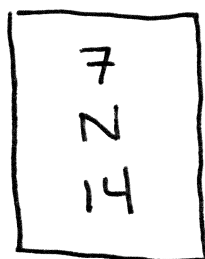


- Basic Symbolism - continued

amu = atomic mass unit

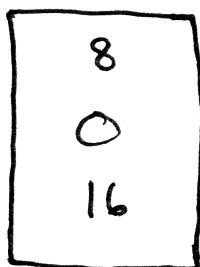
1 amu = mass of one proton or one neutron

Examples



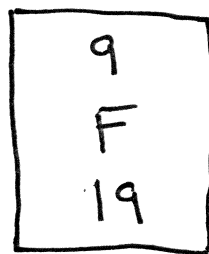
7 protons

14 amu



8 protons

16 amu



9 protons

19 amu

- The number of protons is unique and identifies the element.

- Know: names and symbols H = hydrogen
through Br = bromine.