

The Atom

Atom: the smallest unit of an element having the chemical properties of the element

- Matter → Substance → Compound → Molecule → Element → Atom
- atomic diameter is about 10^{-11} meter = 0.00000000001 m
- If an atom were the size of a period at the end of a sentence, a human being would be about 1000 miles tall!

Atom Model History:

- **Democritus** a fifth century B.C. Greek philosopher proposed that all matter was composed of indivisible particles called atoms.

Billiard Ball Model (1803)

- **John Dalton**: viewed the atom as a small solid sphere.
 - Elements are made of tiny particles called atoms
 - All atoms of a given element are identical.
 - The atoms of a given element are different from those of any other element.
 - Atoms of one element can combine with atoms of other elements to form compounds.
 - A given compound always has the same relative numbers of types of atoms.
 - Atoms cannot be created, divided into smaller particles, nor destroyed in the chemical process.

Plumb Pudding Model (1897)

- **Joseph John Thomson** after discovering the electron proposed that the atom was a sphere of positive electricity (which was diffuse) with negative particles imbedded throughout.

Solar System Model (1913)

- **Ernest Rutherford** discovered that the atom is mostly empty space with a dense positively charged nucleus surrounded by negative electrons.
- **Neils Bohr** proposed that electrons traveled in circular orbits and that only certain orbits were allowed.

Electron Cloud Model (1920's)

- An atom consists of a dense nucleus composed of protons and neutrons surrounded by electrons that exist in different clouds at the various energy levels.
- **Erwin Schrodinger** and **Werner Heisenburg** developed probability functions to determine the regions or clouds in which electrons would most likely be found.

Atom Structure

- Nucleus contains
 - **Protons**
 - Positive (+) charge
 - = atomic #
 - **Neutrons**
 - No charge (neutral)
 - = atomic mass (rounded) - atomic #
- **Electrons**
 - Orbit the nucleus in energy levels.
 - Negative (-) charge
 - = # of protons (in an electrically neutral atom)

Valence Electrons: the electrons in the outermost electron shell of an atom.

Bohr Diagram

- Aluminum
 - P: 13
 - N: 14
 - E: 13
- Bohr Diagram:

