

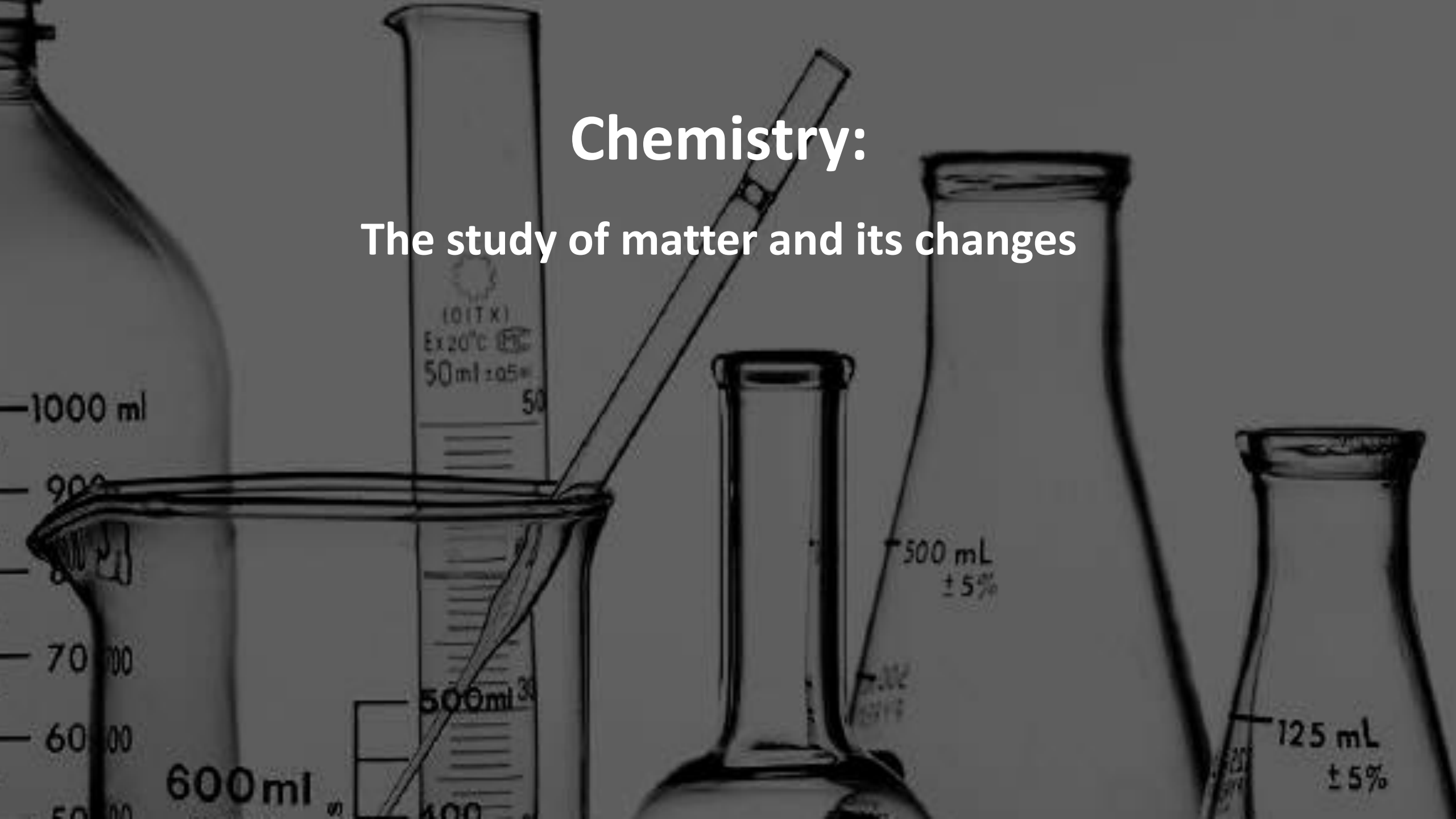


Matter

Atoms and Elements

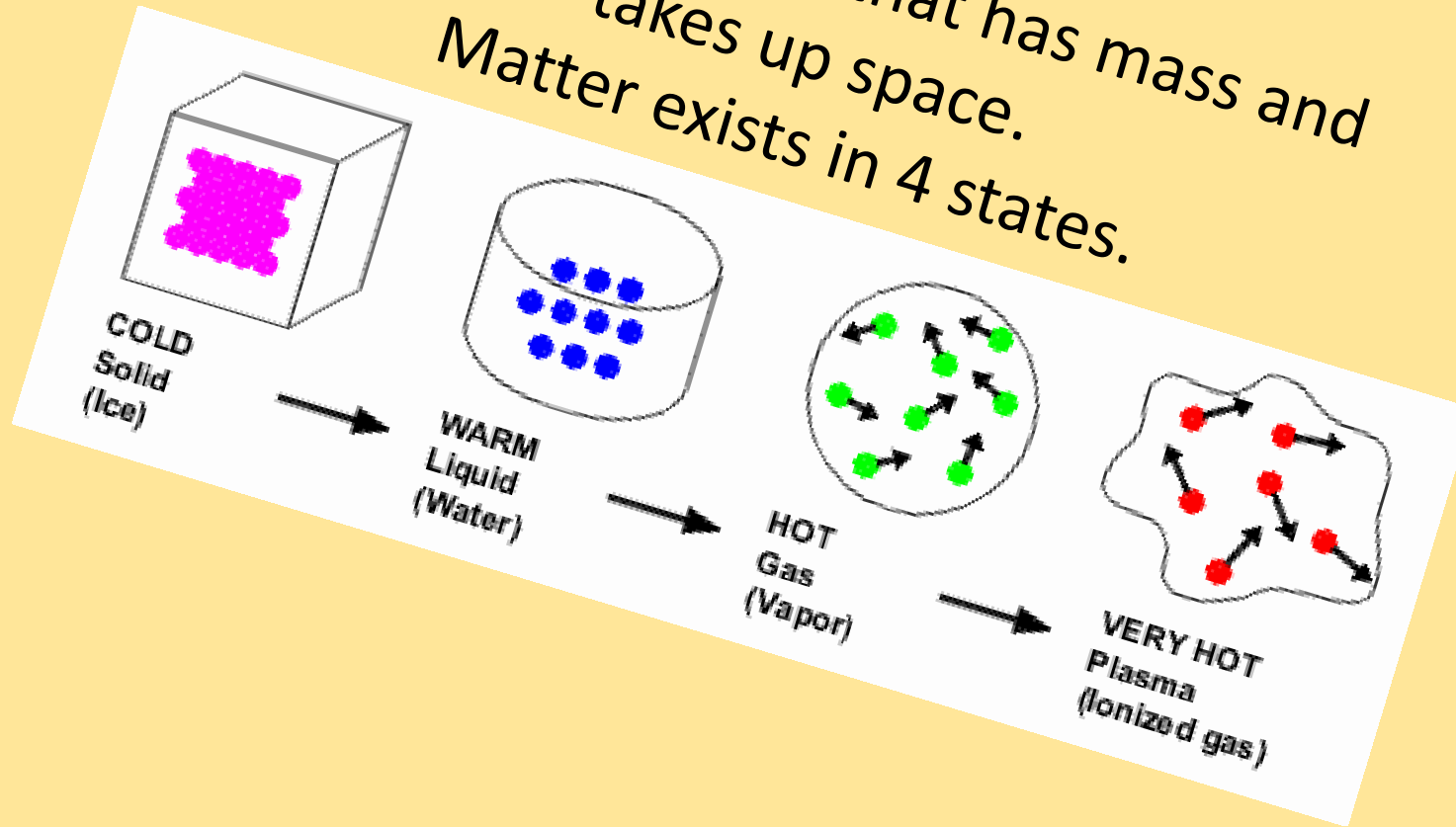
Chemistry:

The study of matter and its changes



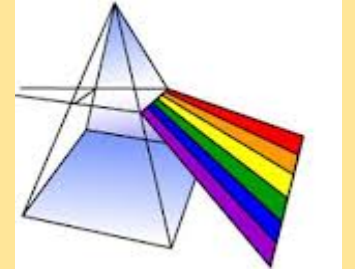
So, what is matter and what isn't?

Matter is anything that has mass and takes up space.
Matter exists in 4 states.



Matter isn't:

Energy in the form
of waves-- Light,
Electricity,
Heat,
Magnetic Fields,
Sound,
Time,
Empty Space in a Vacuum
Emotions and Feelings



Atoms: The Smallest Unit of Matter

- All matter is made of atoms
- These tiny units determine the properties of all matter because the an atom of a specific element maintains the properties of the specific element.



Atoms are building blocks of matter

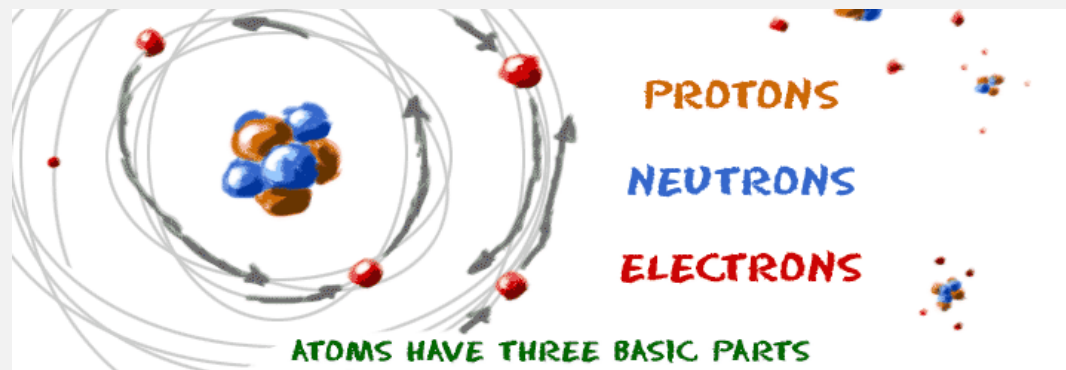


as to bricks are building blocks of houses.



Parts of an Atom

- All atoms consist of smaller parts: Protons, Neutrons, and Electrons
- Elements are made of atoms.
- All atoms of the same element are exactly alike.
- Atoms can join together with other atoms to make molecules.
- While the atoms may have different weights and organization, they are all built in the same way.



Protons, Neutrons, and Electrons. Oh my!

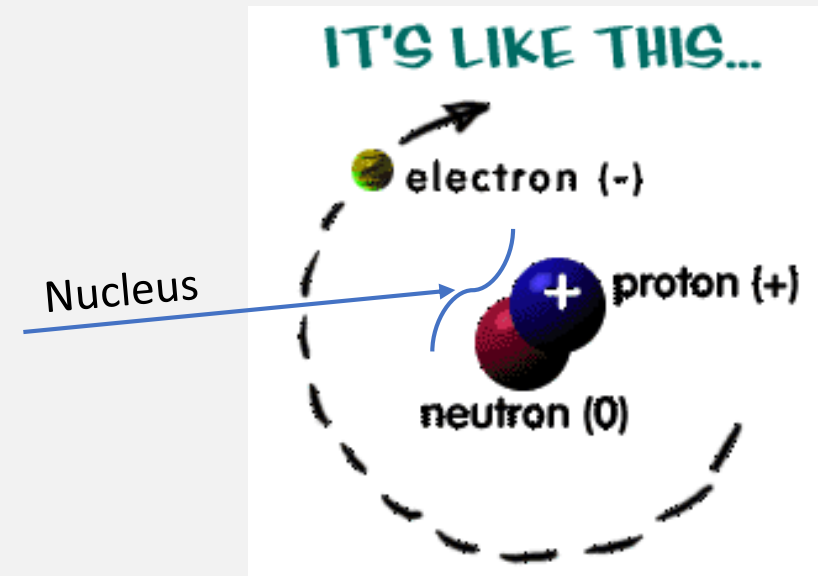
The three basic parts of the atom

1. Protons

- Have a positive charge
- Located in the nucleus
- Have a mass of 1.67×10^{-27} (very tiny!)

2. Neutrons

- Have a neutral charge (no charge)
- Located in the nucleus
- Have a mass of 1.67×10^{-27} (very tiny!)

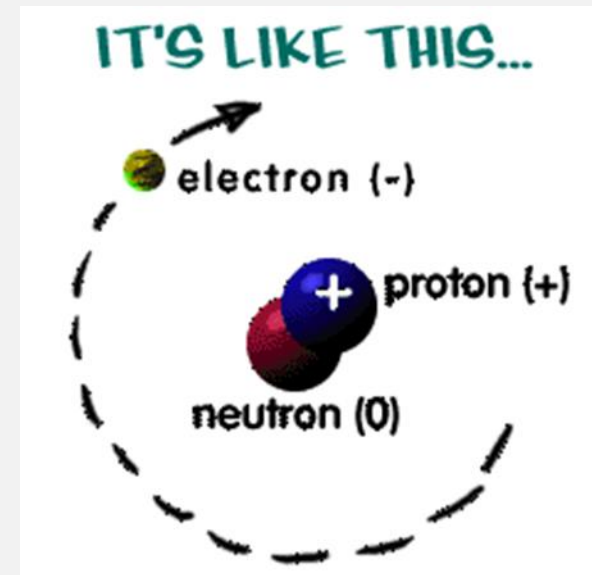


The Nucleus is the small, dense area in the center of the atom held together with a strong force. The Nucleus has an overall positive charge.

Protons, Neutrons, and Electrons. Oh my!

3. Electrons

- Have a negative charge
- Move around or orbit outside the nucleus of the atom in an orbital shell, which is also called energy level
- Have a mass of 9.11×10^{-31} (very, very, very tiny!)



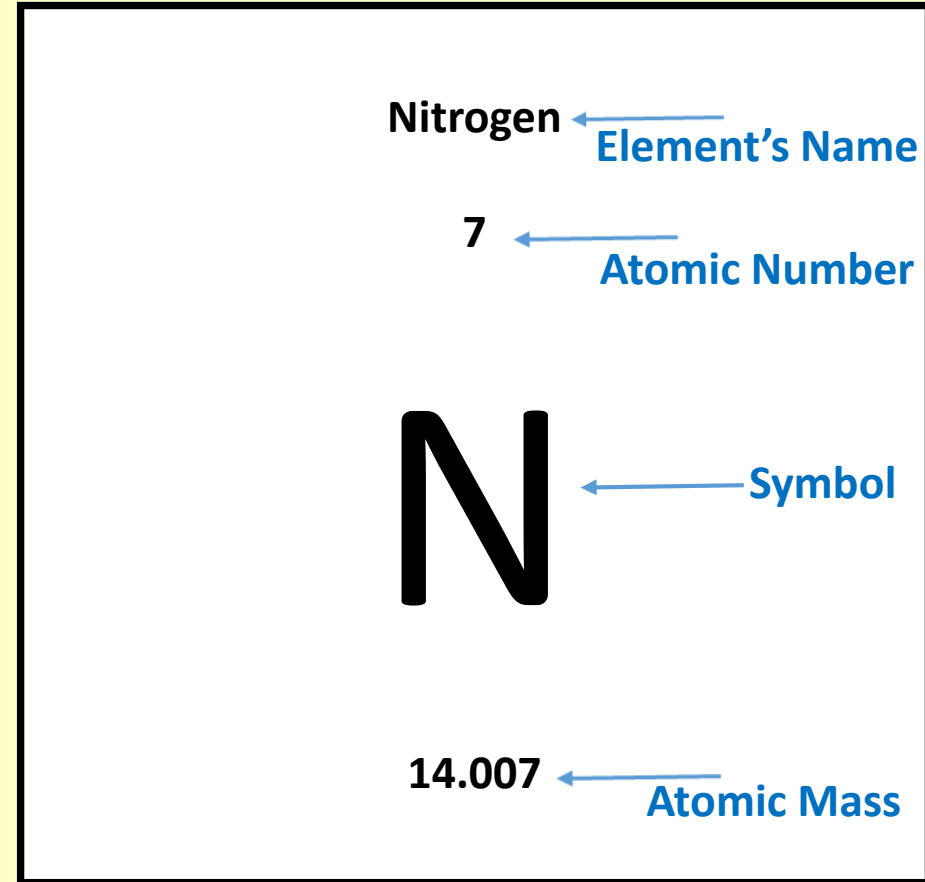
Elements: The Simplest form of Matter

- **Elements** are made of only one kind of atom.
- There are at least 112 known elements with 90 elements occurring naturally on Earth.
- The periodic table is a list of all of the elements that can build matter.
- The periodic table tells us several things...



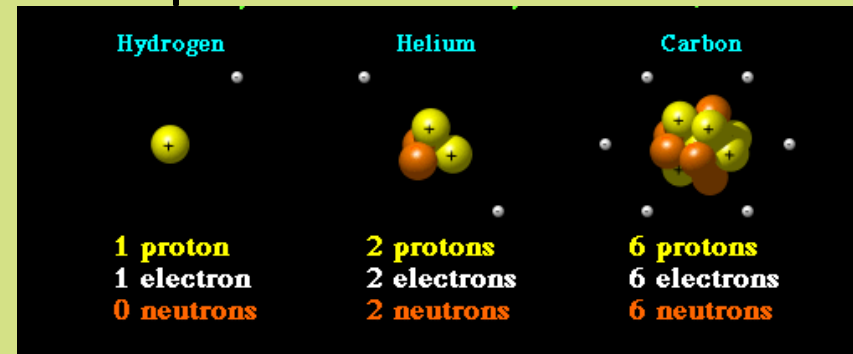
The Periodic Table of Elements tells us...

- The element's **Symbol** or abbreviation of the element's name
- The element's **Atomic Number** or the number of protons the element contains. The number of protons distinguishes one element from another
- The element's **Atomic Mass** in atomic mass units (AMU). The AMU is the sum of protons and neutrons in an atom



Building Elemental Atoms

- **Neutral Atoms** always have equal numbers of protons and electrons.
- Adding a proton makes a new element

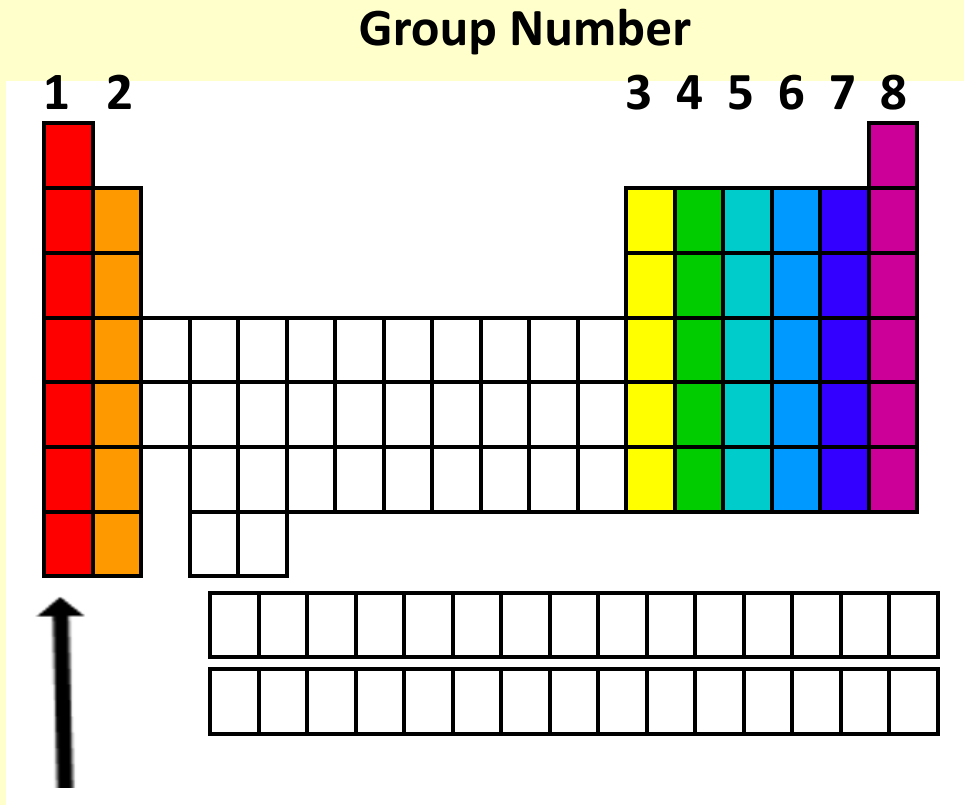


Isotopes

Atoms of the same element with a different number of neutrons

Example: Carbon 12 and Carbon 14 are both isotopes of carbon, one with 6 neutrons and one with 8 neutrons (both with 6 protons).

The Periodic Table of Elements tells us...



- **Columns are called Groups or Family Groups.**
- Each group has similar physical and chemical properties
- Groups indicate the number of electrons in the elements outer shell
- The outer electrons are called **valence electrons**
- Valence electrons determine chemical bonding behaviors with other elements

Groups are the colored columns and are numbered 1 through 8. Group numbers tell us that Group 1 has one electron in its outer shell, Group 2 has two electrons in its outer shell, Group 3 has three electrons in the outer shell, and so on to Group 8 with 8 electrons in the outer shell.

The Periodic Table of Elements tells us...

PERIODS

1

2

3

4

5

6

7

- Horizontal **Rows** are called **Periods**.
- Unlike family groups, elements in a period **DO NOT** have similar properties and properties greatly change as you move from left to right across the row
- As you move from left to right
 - The number of protons in an element increase, as does the diameter of the atom
 - The reactivity of an atom decreases. The first element in the row is extremely active solid and the last element is a particularly inactive gases.

Elements of the same period have the same number of energy levels or electron shells. Period 1 has one energy level, period 2 had two energy levels, and so on through period 7 having seven energy levels.

To Review

- What is and what is not matter?
- What are the parts of an atom, where the particles is located in the atom, and what is the particles charge?
- What are the meanings of an element's symbol, atomic number, and atomic mass?
- Compare and contrast family groups and periods.

What's next: Further examination of the Periodic Table of Elements