

Section 2A

- ✓ Chemical & Physical Properties
- ✓ Periodic Law
- ✓ Atomic Structure
- ✓ Isotopes

Properties of Matter & its Conservation

Properties of matter:

- Physical properties - observed without altering substance (density, color, melting point, solubility)

Physical Changes include state change, crushing and tearing.

- Chemical properties - observed when altering the substance (flammability, cooking, rusting)

Chemical Changes include color change, bubbling, fizzing, burning, rusting, change in temperature

Conservation of Matter:

Matter is neither created nor destroyed in any process.

Types of Elements

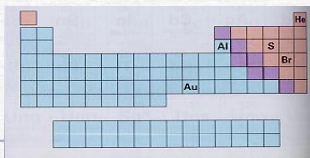
Metal Properties

- luster or shine
- good conductors of heat/electricity
- most are solids at room temp.
- malleable

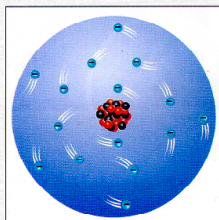
Nonmetal Properties

- no luster
- poor conductors
- not malleable
- Can be solid, liquid or gas at room temp.

Metalloids - properties of both



Modern Atomic Theory



Atoms are composed of:

- 1) protons - positively charged particles located within the nucleus.
- 2) neutrons - uncharged particles located within the nucleus.
- 3) electrons - negatively charged particles which orbit the nucleus.

Relation to the periodic table

- Atomic Number - tells the number of protons in an atom. In a neutral atom, the number of protons must equal the number of electrons.
- Atomic Mass - tells the total mass of the atom (protons and neutrons).

Size and Charge of Sub-atomic Particles

Size of sub-atomic particles:

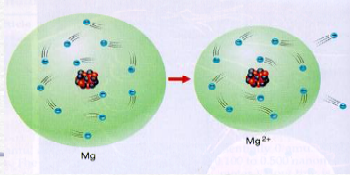
- proton $\rightarrow 1 \text{ amu} = 1.673 \times 10^{-24} \text{ g}$
 - neutron $\rightarrow \sim 1 \text{ amu}$
 - electron $\rightarrow \sim 1/2000 \text{ amu}$
- Charge of sub-atomic particles:
- proton $\rightarrow +1$
 - neutron $\rightarrow 0$
 - electron $\rightarrow -1$

Every atom has a neutral charge.

Ions

Ions - When an atom gains or loses one or more electrons, it acquires an electrical charge.

- ☞ If it loses electrons, it becomes more positive, and this is called a cation. (positive charge)
- ☞ If it gains electrons, it becomes more negative, and this is called an anion. (negative charge)



Determining ionic charge

A neutral atom has equal numbers of protons and electrons, giving it a zero charge

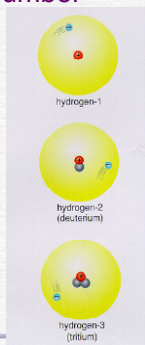
An ion's charge can be determined by the following formula:

Charge of ion = # of protons - # of electrons

Isotopes and Mass Number

☞ Every atom of a given element has the same number of protons. However, like the electrons, the amount of neutrons in any atom of that element can be different.

☞ The chemical properties of each isotope are identical, except the number of neutrons within the nucleus.



Isotopes and Mass Number

- To identify the different isotopes, scientist add a mass number after the element's name. The mass number is the sum of the number of protons and neutrons (rounded off to the nearest whole number).
- The average mass (in amu) of a group of atoms of the same element is used to find the average atomic mass.

Origins of the Periodic Table

In 1869, approximately 62 elements were known to exist. Scientists wanted a convenient way to look at these elements. Dmitri Mendeleev proposed a periodic table of elements. It was arranged by increasing mass number and similar properties.

Later, Henry Mosley working with X-ray radiation discovered that the amount of positive charge in the atom (protons) was the proper way to order the elements.

The Periodic Law

- Periodic Law - when elements are arranged in order of increasing atomic number, their physical and chemical properties show a periodic pattern.
