

## ELEMENTS & THE PERIODIC TABLE

**Element** - the simplest form of matter, composed of only one kind of atom

**Periodic Table** – a way of organizing the chemical elements according various patterns and properties they show. (developed by Dimitri Mendeleev)

**Horizontal Rows** are called \_\_\_\_\_ and are numbered \_\_\_\_ to \_\_\_\_\_.

**Vertical Columns** are called \_\_\_\_\_ or \_\_\_\_\_ and are numbered \_\_\_\_ to \_\_\_\_\_.  
These may be identified by a Roman numeral followed by the letter A or B (eg. Group VIA = Group 16)

All elements are classified as **METALS** or **NONMETALS**, depending on their properties.

PROPERTY	METALS	NONMETALS
LUSTRE		
MALLEABILITY / DUCTILITY		
CONDUCTIVITY OF HEAT & ELECTRICITY		
STATE AT ROOM TEMPERATURE		
LOCATION (PERIODIC TABLE)		

### **METALLOIDS (Semimetals)**

- elements that have some properties of metals and some properties of nonmetals
- include elements on either side of the staircase line (**eg. C and Si**)

### **CHEMICAL FAMILIES (GROUPS):**

Groups of elements in the same vertical column that have similar physical and chemical properties.

1. **Alkali Metals:** - Group 1, IA
  - show metallic properties (see table above)
  - highly reactive, especially with water
2. **Alkaline Earth Metals:** - Group 2, IIA
  - show metallic properties (see table above)
  - less reactive than alkali metals
3. **Halogens:** - Group 17, VIIA
  - show nonmetallic properties (see table above)
  - react with hydrogen to form compounds that dissolve in water to form acids
4. **Noble Gases:** - Group 18, VIIIA
  - show nonmetallic properties
  - extremely low chemical reactivity (very stable)

**SERIES OF ELEMENTS:**

1. **Representative Elements:** The "A" groups or groups 1, 2, 13 – 18
2. **Transition Elements:** The "B" groups or groups 3 – 12

**THE ATOM:** - all matter is composed of atoms. Atoms are the basic building blocks of all matter The atoms of one element are different from the atoms of any other element.

An atom is:

The smallest particle of an element that retains the properties of that element

Electrically neutral: # of positive charges = # of negative charges

composed of 3 types of subatomic particles:

PARTICLE	SYMBOL	RELATIVE CHARGE	LOCATION
Proton			
Neutron			
Electron			

**Atomic Number:**

- identifies the element
- equal to the number of protons in the nucleus
- since atoms are electrically neutral, # of protons = # of electrons

**Mass Number:**

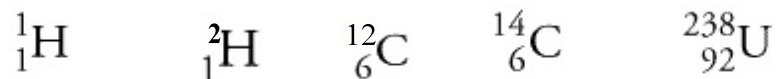
- # of protons + # of neutrons
- protons and neutrons account for most of the mass of the atom

**Isotopes:**

- two or more forms of the same element having a different number of neutrons
- same atomic number, but different mass number
- examples: C-12 and C-14, H-1 (hydrogen), H-2 (deuterium), and H-3 (tritium)

Isotope Symbols:

Top Number = Mass number (# of protons + # of neutrons)



Bottom number = Atomic number (same for all isotopes of the same element)

Isotope	Atomic Number	Mass Number	Number of Protons	Number of Electrons	Number of Neutrons
${}^{59}_{28}\text{Ni}$					

## ARRANGEMENT of ELECTRONS

The electrons in an atom move around the nucleus, but in specific regions called \_\_\_\_\_

Each shell can hold a certain number of electrons. For the first three shells the numbers are:

First Shell - Maximum of \_\_\_\_\_ electrons

Second Shell - Maximum of \_\_\_\_\_ electrons

Third Shell- Maximum of \_\_\_\_\_ electrons

**ELECTRON ENERGY LEVEL DIAGRAMS**    Shows arrangement of electrons in shells (2, 8, 8)



C atom

P atom

Ar atom

Complete the table for the first 20 elements as above.