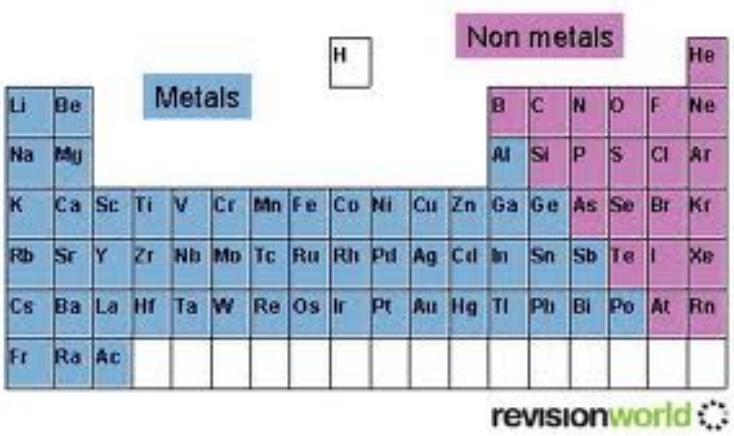
The Periodic Table



The Periodic Table was developed by Mendeleev.

It is a structured arrangement of elements that help us to explain and predict physical and chemical properties.

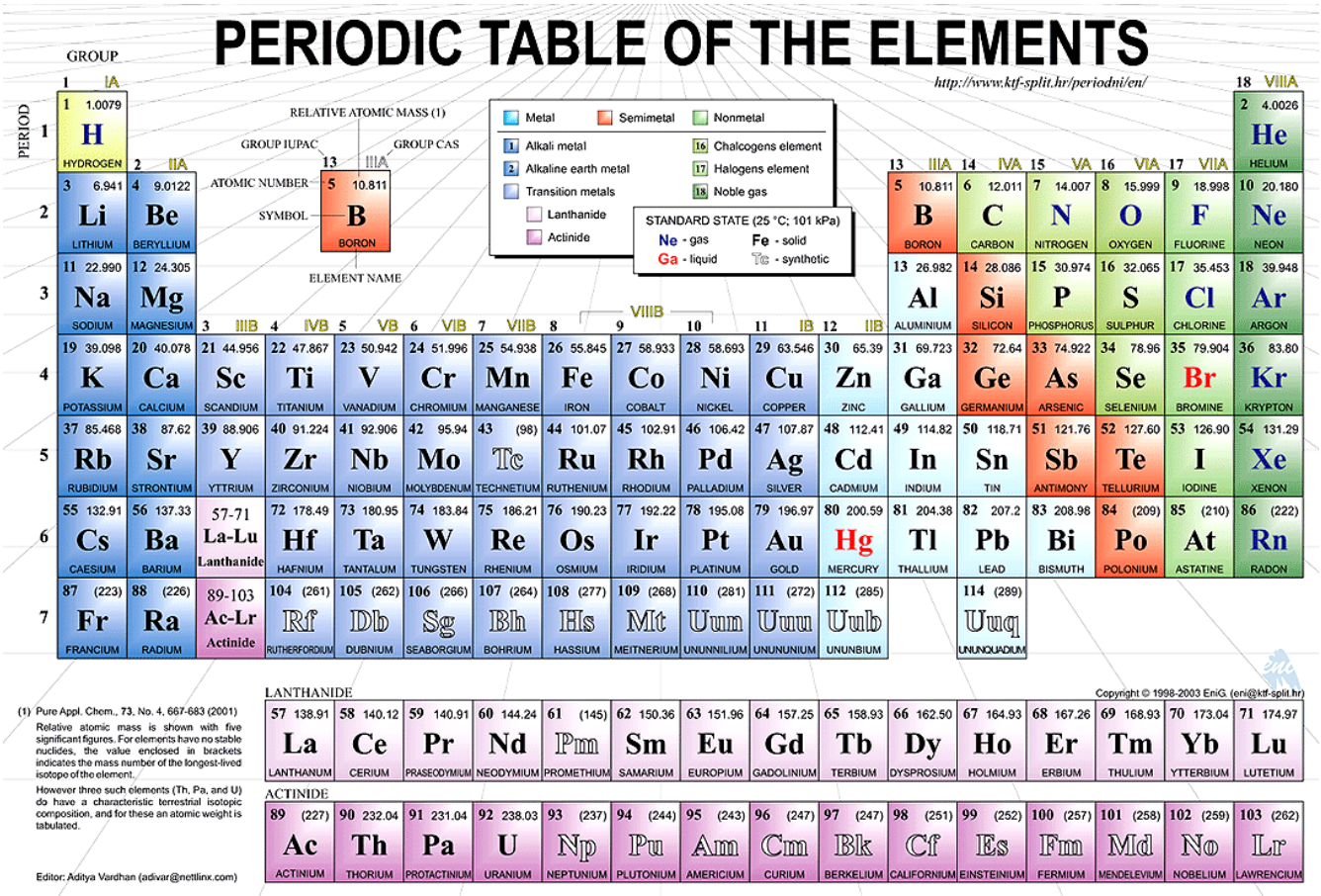
It can be divided into 2 groups:

1. Metals 2. Nonmetals

The table is highly ordered, showing:

1. There are Families or groups of elements with similar chemical properties shown in vertical columns.

2. There are Periods or horizontal rows of elements whose properties gradually change from metallic to nonmetallic.


PERIODIC TABLE OF THE ELEMENTS
http://www.ktf-split.hr/periodni/en/
GROUP
PERIOD
RELATIVE ATOMIC MASS (1)
GROUP IUPAC
GROUP CAS
ATOMIC NUMBER
SYMBOL
ELEMENT NAME
Metal
Semimetal
Nonmetal
Alkali metal
Alkaline earth metal
Transition metals
Lanthanide
Actinide
Chalcogens element
Halogens element
Noble gas
STANDARD STATE (25 °C; 101 kPa)
Ne - gas
Fe - solid
Ga - liquid
Tc - synthetic
57-71 La-Lu Lanthanide
89-103 Ac-Lr Actinide
LANTHANIDE
ACTINIDE
(1) Pure Appl. Chem., 73, No. 4, 667-683 (2001)
Relative atomic mass is shown with five significant figures. For elements have no stable nuclides, the value enclosed in brackets indicates the mass number of the longest-lived isotope of the element.
However three such elements (Th, Pa, and U) do have a characteristic terrestrial isotopic composition, and for these an atomic weight is tabulated.
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Periodic Tables show various information on each element such as:

atomic molar mass
atomic number
melting and boiling points
electronegativities

Just to get used to searching around the PT.....do the following question.

Question: Find the symbols, atomic numbers and the atomic molar masses of each of the following:

1. boron

2. aluminum

3. phosphorus

4. potassium

5. scandium

6. fluorine

7. carbon

Families and the Periodic Table

Draw out the following diagram.....

1. **Alkali Metals**
2. **Alkaline Earth Metals**
3. **Transition Metals**
4. **Noble Gases**
5. **Halogens**

Things you need to know about elements found in these "families":

1. **Alkali Metals - elements of group IA**
   - **Characteristically soft, silver colored**
   - **React violently with water**
   - **Francium (Fr) is the MOST reactive**
   - **Very reactive with the halogen family**

2. **Alkaline Earth Metals - elements of group IIA**
   - **Light weight, reactive metals**
   - **All react with oxygen**

3. **Halogens - elements of group VII**
   - **Are extremely reactive (F – fluorine) is the most reactive**

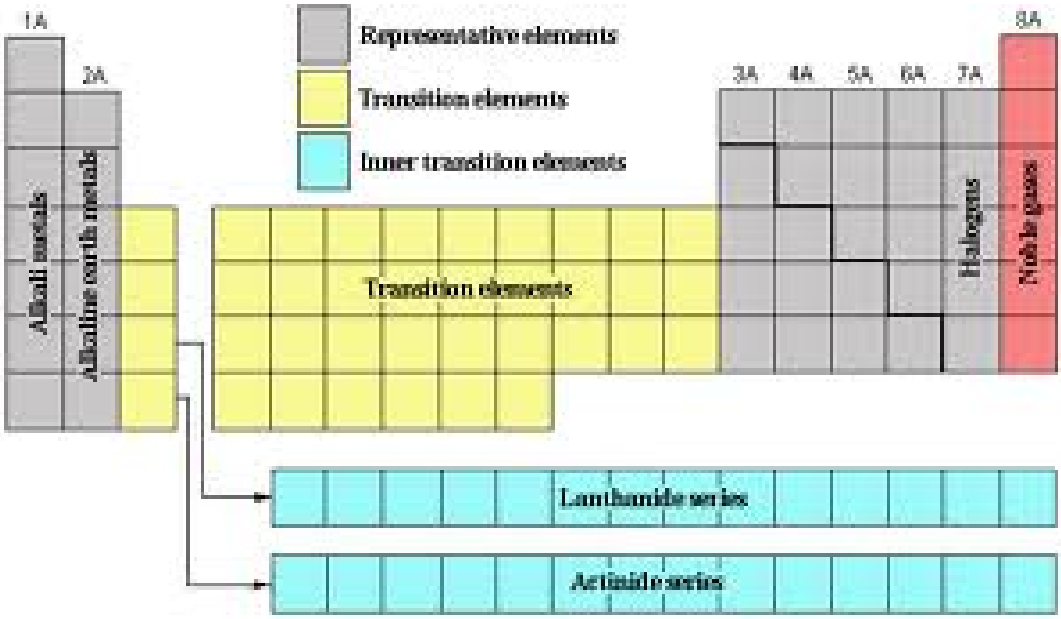
4. **Noble Gases - elements of group VIII and are sadly noted for low reactivity**

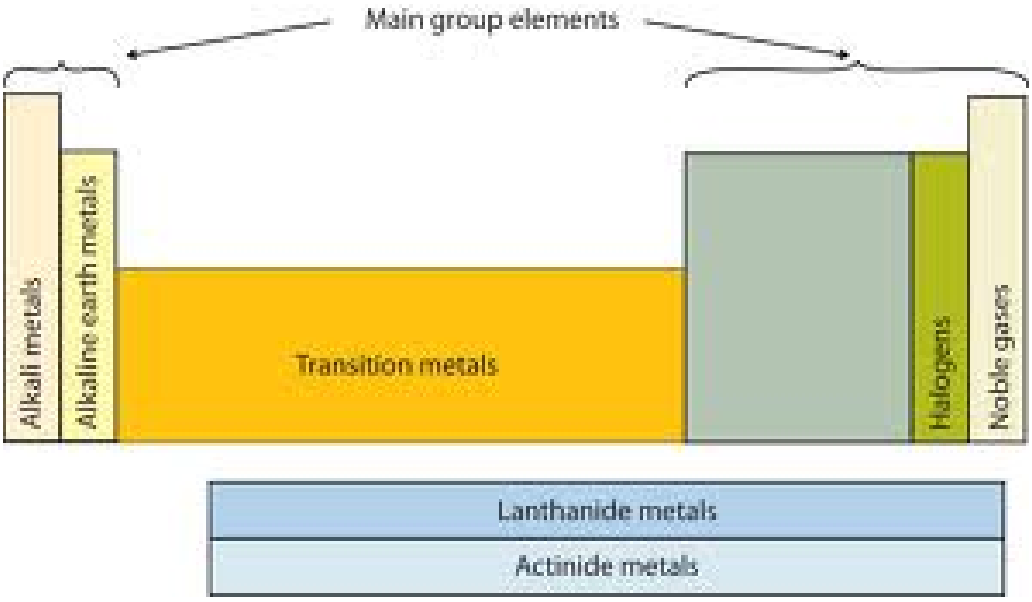
http://www.youtube.com/watch?v=mG6EG_igTGw

Halogens

http://www.youtube.com/watch?v=sS3cIK9jlB8

Alkali Metals


1A
2A
8A
3A
4A
5A
6A
7A
Representative elements
Transition elements
Inner transition elements
Alkali metals
Alkaline earth metals
Transition elements
Halogens
Noble gases
Lanthanide series
Actinide series


Main group elements
Alkali metals
Alkaline earth metals
Transition metals
Halogens
Noble gases
Lanthanide metals
Actinide metals

The Atom

The Bohr-Rutherford model of the atom was developed suggesting that atoms were composed of three types of particles:

This led to the discovery of a nucleus.

The three particles:

1. **Protons**
- **Heavy dense, positively charged particles**
- **Found in the nucleus**

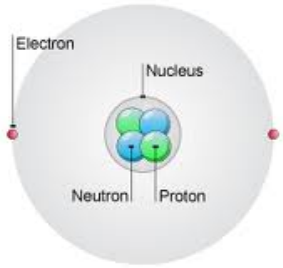
2. **Neutrons**
- **Heavy, dense, neutrally charged particles**
- **Also found in the nucleus**

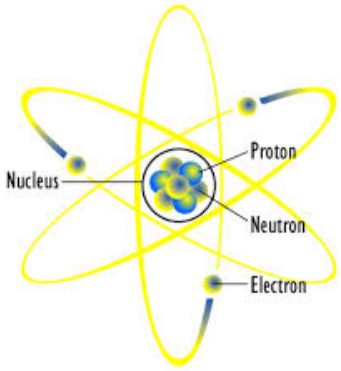
3. **Electrons**
- **Negatively charged particles, having virtually no mass.**
- **Located outside of the nucleus at different energy levels called orbitals.**

Key points:

- **Protons and neutrons make up 99.999% of the mass of the atom**
- **Electrons have virtually NO mass but make up most of an atom's volume.**

- **Think of a single green pea on a soccer field.....**


Electron
Nucleus
Neutron
Proton


Proton
Nucleus
Neutron
Electron

Bohr and Rutherford's work has led to key discoveries using the periodic table.....

1. Atoms have an equal number of protons and electrons...

#p^+ = # e^-

2. The number of protons + number of neutrons equals the rounded atomic mass number (called MASS NUMBER)

ex: Carbon

Practice: try the following three

1. magnesium **2. chlorine** **3. iodine**

There are also things called Isotopes -

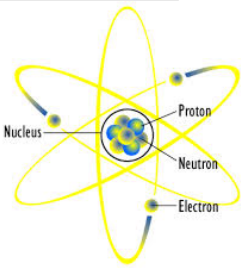
the same atom of an element containing the same number of protons and electrons, but a different number of neut

ex: Carbon-12 vs Carbon-13

Atomic Structure - Energy Level Diagrams

- as predicted by Bohr and Rutherford, electrons are located in certain specific energy levels about the nucleus...

- this diagram is a more realistic way of representing the electrons and their location.



*****Remember *****

1. # protons = # electrons (equals the atomic number)

2. the maximum number of electrons in each successive energy level equals the number of elements in that level.

****just remember the pattern.....2..8..8....****

3. the number of energy levels occupied by electrons = the period number.

4. the # of electrons in the outermost energy level (called the valence level) equals the group number (roman numerals)

try the following example: magnesium atom

chlorine atom