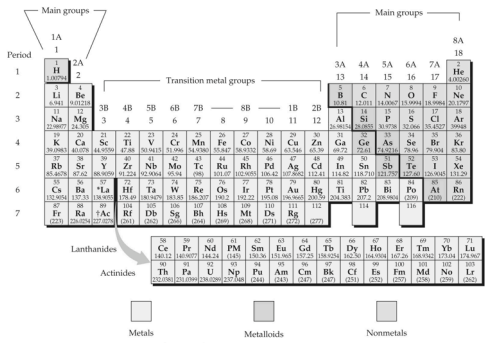
Characteristics of Elements

Types of Elements and Their Positions in the Periodic Table

Chapter Seven



The Periodic Table

3.4 The Periodic Table

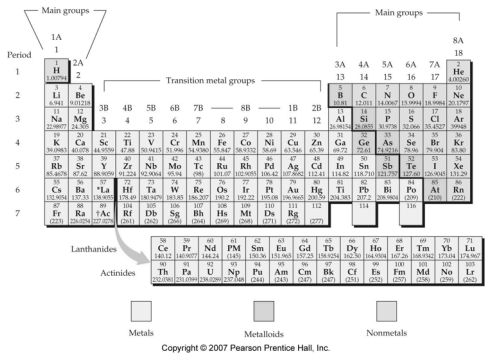
- Beginning at the upper left corner of the periodic table, elements are arranged by increasing atomic number into seven horizontal rows, called **periods**, and 18 vertical columns, called **groups**.
- The elements in a given group have similar chemical properties. Lithium, sodium, potassium, and other elements in group 1A (or 1) have similar properties. Similarly, chlorine, bromine, iodine, and other elements in group 7A (or 17) behave similarly.

The groups on the periodic table are divided into three main categories.

►**Main Groups:** The two groups on the far left (1-2) and the six on the far right (13-18) are the main groups.

►**Transition Metal Groups:** Elements in the groups numbered 3 through 12.

►**Inner Transition Metal Groups:** The 14 groups shown at the bottom of the table that are not numbered containing the Lanthanides and the Actinides.



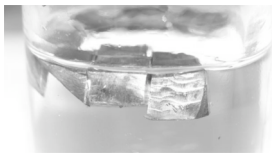
The Periodic Table

3.5 Characteristics of Different Groups

Group 1A or 1 **Alkali metals:**

- Li, Na, K, Rb, Cs, and Fr
- Shiny, soft, and low melting point metals
- All react rapidly with water to form flammable H_2 gas and alkaline or basic solutions.

Images of Lithium and Sodium Metals



-Lithium Foil under paraffin and sodium. Both need to be kept away from oxygen or they will react. (The lithium used to treat bipolar disorder is lithium ion and is not this reactive.

Reactivity of the Alkali Metals

Li (3)	Lithium
Na (11)	Sodium
K (19)	Potassium
Rb (37)	Rubidium
Cs (55)	Cesium
Fr (87)	Francium

-http://www.metacafe.com/watch/178735/alkali_metals_and_water/

Alkali Metals

All alkali metals are reactive.

They are not found as metals in nature. Human must separate the elements from compounds in order to study them.

Their reactivity increases as you go down their column on the periodic table.

They are metals but they are so soft that you can cut them with a knife.

Alkaline Earth Metals

Alkaline Metals are right next to the alkali metals. They have similar reactivity, but in general they are less reactive.

-Magnesium

-Calcium

Noble Gases

Noble gases are placed in the column on the periodic table that is the farthest to the right.

These gasses are uniquely non-reactive.

At room temperature and pressure they are gasses composed of a single atom.

They are colorless, odorless, tasteless, and non-flammable.

There boiling point and melting point are very close to each other.

Noble Gasses-Uses

They are useful because they are non-reactive.

Radon, Xenon, and Helium are used in medicine.

- Helium is used to treat asthmas.
- Xenon is used when anesthesia is given.
- Radon is used in radiation therapy.

Helium is also used to hold up balloons and blimps.

Noble Gasses are also used in lights. Neon lights are the most obvious example but they are found in regular light bulbs and in halogen lights.

Halogens

Halogens are just to the left of the noble gasses.

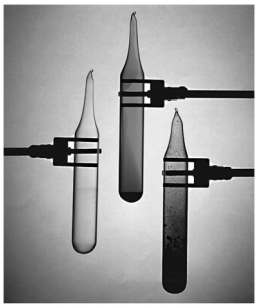
They react with Alkali and Alkaline Metals to form salts. (

Unlike the Alkali and Alkaline Metals their reactivity decreases as you go down their column in the periodic table.

Most are colorful and corrosive in their elemental form.

Halogens

Halogens exist as solids, liquids, gasses at room temperature and pressure. Flourine (F_2) and Chlorine (Cl_2) are gasses. Bromine (Br_2) is a liquid, and iodine(I_2) is a solid. Not much is known about Astatine, because it is so rare.



Halogens - Uses

Flourine reacts even with gas, so it is not used in day to day life.

Chlorine, Bromine, and Iodine are all used as disinfectants. Chlorine is corrosive enough that it quickly burns tissue. Iodine can be harmful to tissues but not so dramatically.

Halogens and Alkali Metals

Both Halogens and Alkali metals are reactive. When elements from these two groups come in contact they quickly, and sometimes explosively, form salts.

http://www.youtube.com/watch?v=Ftw7a5ccubs&feature=related

Note that the sodium is burning in chlorine gas not in air.

Transition Metals

These metals get their name because they transition between the two groups of main group elements.

Transition metals

- Conduct electricity very well
- Are often Brittle
- Have high melting points. (Iron's melting point is 1535 º C.)

Transition Metals-Many Oxidation States

There are many forms of iron in nature, and it oxidizes to many different forms of iron. Iron oxidation is frequently called rust.

Transition Metals and Colors

Transition metals easily form compounds with wonderful colors

Transition Metals and Colors

-Glass Containing Cobalt (Cobalt is a transition metal)

Non-Metals

Halogens and Noble Gasses are non-metals but there are many more.

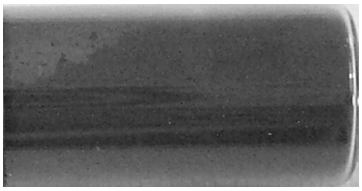
Non-Metals do not conduct electricity very well.

They are not bendable, and they cannot be pulled out into a wire.

Lower boiling points than other elements on the periodic table.

Semimetal-Germanium

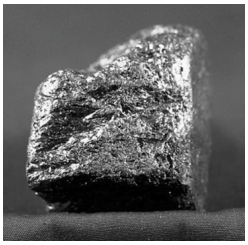
Boron



Sulfur

-It usually looks like yellow powder or flakes.

Carbon



-Graphite

-Diamond

-Both of these are elemental Carbon—They only contain carbon atoms.

Periodic Trends

- The trends seen in the table reflect characteristics of the element and its reactions.
- That sulfur us yellow crystals and that iron can make a disgusting mess in water is determine by the electronic structure of the elements.
- In the next lecture we will begin to look at the electronic structure of the elements in a bit more detail in order to make sense of the periodic table.