

Lesson #2: Families of the periodic table.

<http://www.ptable.com/>
(interactive p.table)

The Representative Elements

- Elements in groups 1, 2, and 13–18 are known as the representative elements. These elements are in the s- and p-blocks of the periodic table.
- Elements in each group have the same number of valence electrons.

The Alkali Metals (Group 1)

- they are very reactive.
- they react with water to make alkaline solutions. They are never found in nature as pure elements but are found as compounds.
- have a single valence electron; In losing its one valence electron, a stable +1 cation will form.

Applications:

- Lithium compounds: - lithium ion batteries, antidepressants/mood stabilizers
- Sodium/Potassium compounds: - Battery electrolytes, bases used in pulp and paper to soften lignin.

The Alkaline-Earth Metals (Group 2)

- The alkaline-earth metals are slightly less reactive than the alkali metals.
- The alkaline-earth metals have two valence electrons; In a reaction they form stable +2 ions.

Orally: *It takes more energy to lose two electrons than it takes to lose just the one electron that the alkali metals must give up to become stable.*

Applications:

- Beryllium-copper alloys: springs. The alloy does not spark, and so is used in tools employed in fire-hazard areas. Beryllium-nickel alloys resist corrosion by salt water so they are used in marine engine parts.
- Magnesium-aluminum alloys are often used in airplane construction.
- Magnesium hydroxide is used as milk of magnesia for upset stomachs (i.e., antacid).
- Epsom salts are magnesium sulfate (i.e., bath salt).
- Magnesium oxide is used for lining furnaces

- Calcium phosphate is a component of bones and teeth. Calcium compound found in toothpaste.
- Hydroxyapatite, calcium hydroxyphosphate, is the main component of tooth enamel.
- Barium Sulphate is used for Barium enema.

<http://www.youtube.com/watch?v=DFQPnHkQlZM>

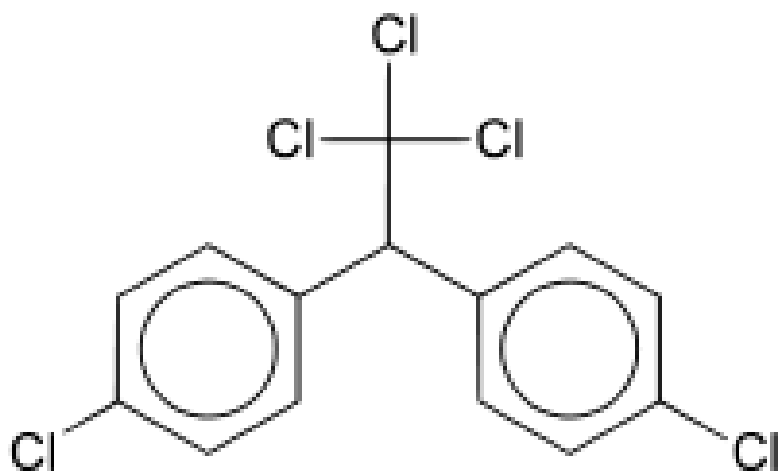
(video of Group #1 and #2 elements)

The Halogens (Group 17)

- The halogens are the most reactive group of nonmetal elements, so they never occur as elements in nature.
- When halogens react, they often gain one electron to fill the valence shell and form stable -1 anions.
- In their elemental forms (obtained by electrolysis), they exist as diatomic molecules.

Applications:

- HF is used to etch glass.
- Chlorine is used for chlorinating drinking water, and in many insecticides e.g., DDT (see vid)



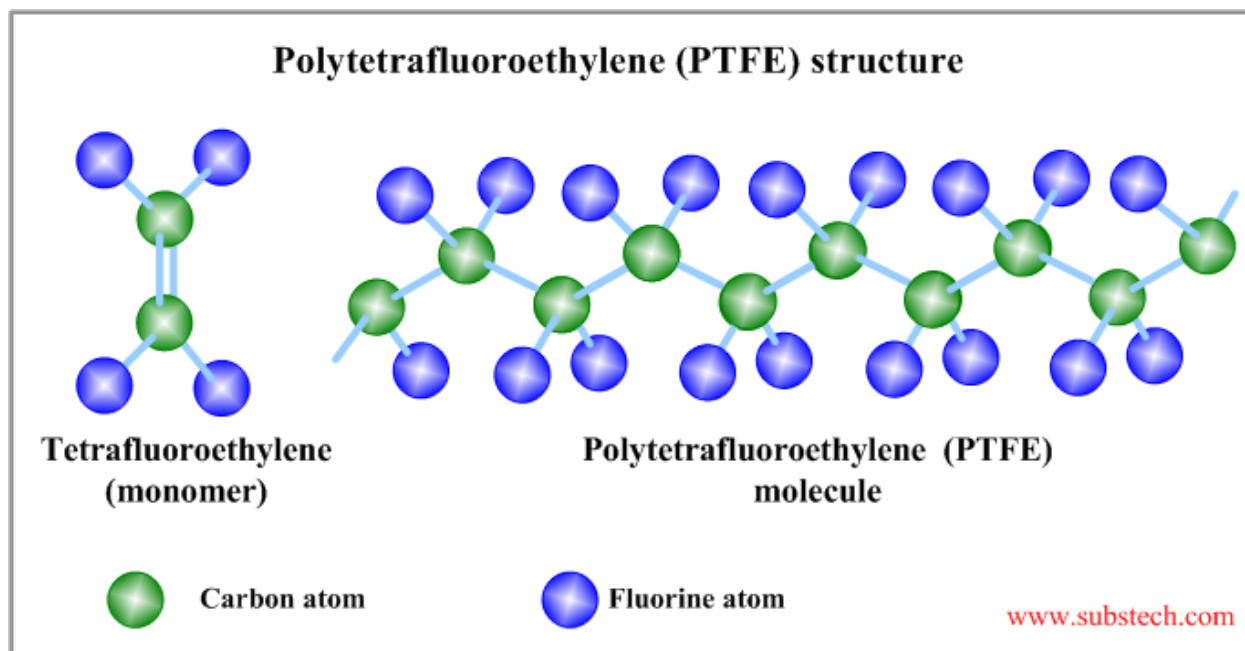
<http://www.youtube.com/watch?v=uARFfWfcV5A&NR=1>

(simpleton's guide review of ddt: Pro's ddt bias: - no evidence for cancer rates)

<http://www.youtube.com/watch?v=LQ64sV0nSVU>

(Con's ddt bias: - cancer epidemic due to ddt use)

- Plastics
- Hypochlorites are used in domestic bleaches.
- Teflon (PTFE): no stick cookware. (See picture below)
- Halogen lights
- Mustard gas (chemical warfare: Sheet attached.)



The Noble Gases (Group 18)

- The noble gas atoms have a full set of electrons in their outermost energy level making them nonreactive.
- The noble gases were once called inert gases because they were thought to be completely nonreactive.

Orally: In 1962, chemists were able to get xenon to react, making the compound XePtF_6 .

Applications:

Neon lights

Argon is used in arc welding to clear out O_2 and radiometric argon dating of geological events such as volcano eruptions.

Krypton fluoride laser used in nuclear fusion research

Xenon: used in strobe lights

Orally: In addition to the main group elements we have:

Hydrogen (A family of one)

- Hydrogen is the most common element in the universe.
- Approximately three out of every four atoms in the universe are hydrogen.

Orally: Stars are primarily composed of hydrogen gas which undergoes fusion to form helium and so on.

- Because it consists of just one proton and one electron, hydrogen may lose, gain or share one electron depending on what it reacts with.
- In elemental state it is a diatomic molecule.
- Hydrogen is very flammable!

Applications:

Fuel cell technology.

Hydrogenating oils to margarine, etc.

Orally: It was used in blimps called Zeppelins that were used in transatlantic flights.



http://www.youtube.com/watch?v=IFptgQ8GA_U&feature=related

Orally: Helium was not used due to the USA Helium Control Act. US was suspicious of Hitler and thought the Zeppelins could be used for military puposes. Hydrogen was the alternative.

Transition Metals

- Occupy Groups 3 through 12 and are sometimes called the d-block.
- Can use the inner shell before using the outer shell to bond.
- May lose one, two, or even three valence electrons depending on the element with which it reacts.
- Less reactive than group #1 and #2 metals.

Applications

- iron: for construction
- copper: electrical wiring and water pipes
- important alloys: iron in steel, zinc and copper in brass.
- make good catalysts

Actinide Series

- Only thorium and uranium occur in usable quantities in nature.

Orally: The other actinides are man-made elements.

- All are radioactive.

Orally: Elements beyond einsteinium have not been synthesized in sufficient quantity to make detailed studies of their chemistry.

Applications:

Uranium: nuclear power plants and armor penetrating ammunition

Lanthanide Series are mostly used in lasers and catalytic converters.

Atomic radii decrease across a series from left to right. **Orally:** Same rule as for a period

Assignment: Periodic table formal assignment worksheet.