

The Periodic Table



Chapter 5

Why is the Periodic Table important to me?



- The periodic table is the most useful tool to a chemist.
- You get to use it on every test.
- It organizes lots of information about all the known elements.

Pre-Periodic Table Chemistry ...

- ...was a mess!!!
- No organization of elements.
- Imagine going to a grocery store with no organization!!
- Difficult to find information.
- Chemistry didn't make sense.





Dmitri Mendeleev: Father of the Table

HOW HIS WORKED...

- Put elements in rows by increasing atomic weight.
- Put elements in columns by the way they reacted.

SOME PROBLEMS...

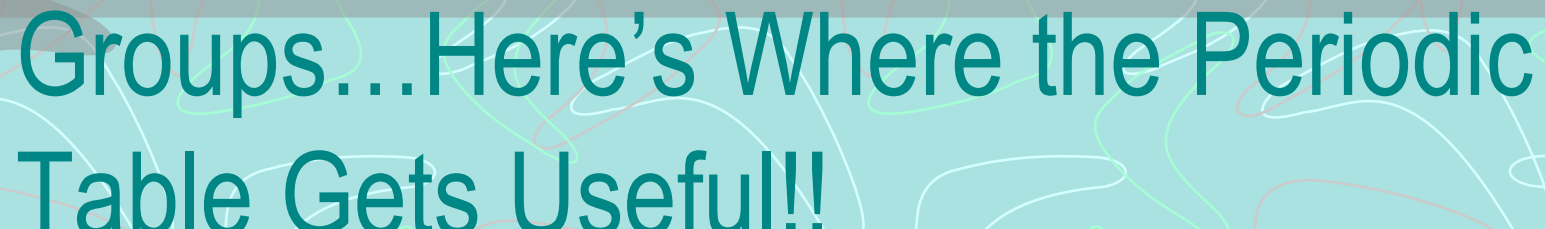
- He left blank spaces for what he said were undiscovered elements. (Turned out he was right!)
- He broke the pattern of increasing atomic weight to keep similar reacting elements together.





The Current Periodic Table

- Mendeleev wasn't too far off.
- Now the elements are put in rows by increasing **ATOMIC NUMBER!!**
- The horizontal rows are called periods and are labeled from 1 to 7.
- The vertical columns are called groups and are labeled from 1 to 18.



Groups...Here's Where the Periodic Table Gets Useful!!

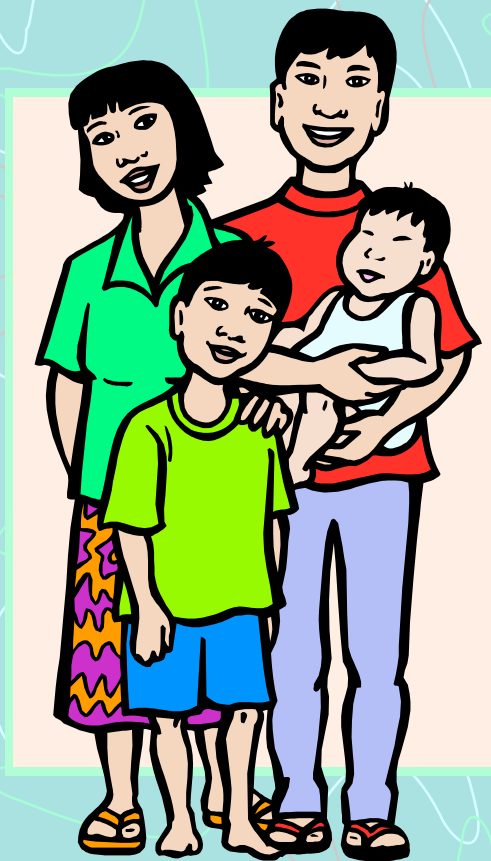
- **Elements in the same group have similar chemical and physical properties!!**
 - (Mendeleev did that on purpose.)

Why??

- They have the same number of valence electrons.
- They will form the same kinds of ions.

Families on the Periodic Table

- Columns are also grouped into families.
- Families may be one column, or several columns put together.
- Families have names rather than numbers. (Just like your family has a common last name.)



Hydrogen



- Hydrogen belongs to a family of its own.
- Hydrogen is a diatomic, reactive gas.
- Hydrogen was involved in the explosion of the Hindenberg.
- Hydrogen is promising as an alternative fuel source for automobiles



Alkali Metals

- 1st column on the periodic table (Group 1) not including hydrogen.
- Very reactive metals, always combined with something else in nature (like in salt).
- Soft enough to cut with a butter knife





Alkaline Earth Metals

- Second column on the periodic table. (Group 2)
- Reactive metals that are always combined with nonmetals in nature.
- Several of these elements are important mineral nutrients (such as Mg and Ca)



Transition Metals



- Elements in groups 3-12
- Less reactive harder metals
- Includes metals used in jewelry and construction.
- Metals used “as metal.”





Boron Family

- Elements in group 13
- Aluminum metal was once rare and expensive, not a “disposable metal.”



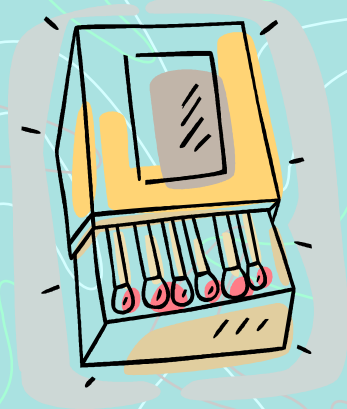
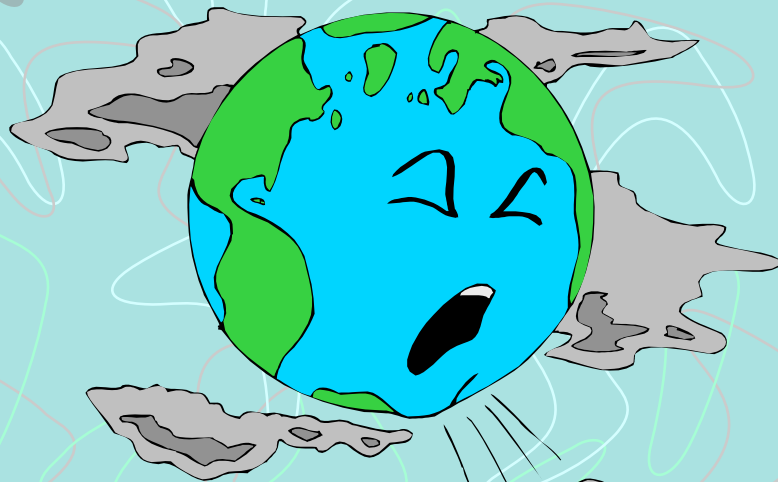


Carbon Family



- Elements in group 14
- Contains elements important to life and computers.
- Carbon is the basis for an **entire branch** of chemistry.
- Silicon and Germanium are important semiconductors.

Nitrogen Family



- Elements in group 15
- Nitrogen makes up over $\frac{3}{4}$ of the atmosphere.
- Nitrogen and phosphorus are both important in living things.
- Most of the world's nitrogen is not available to living things.
- The red stuff on the tip of matches is phosphorus.

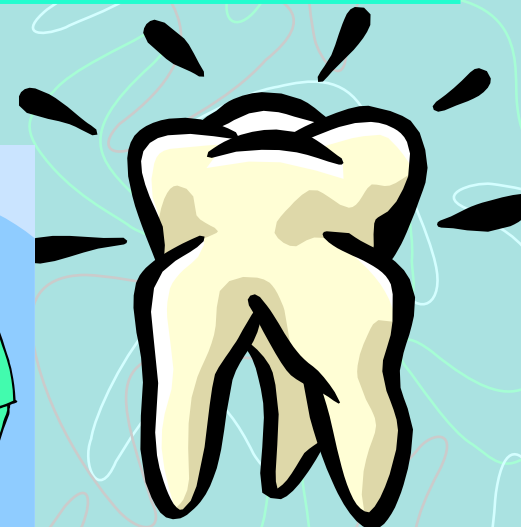
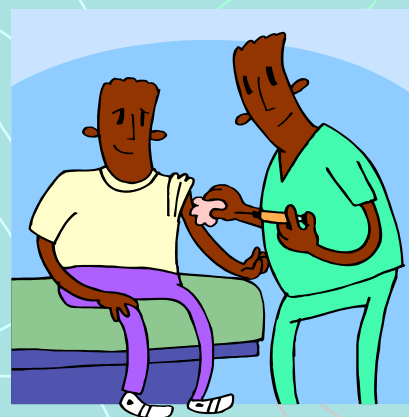
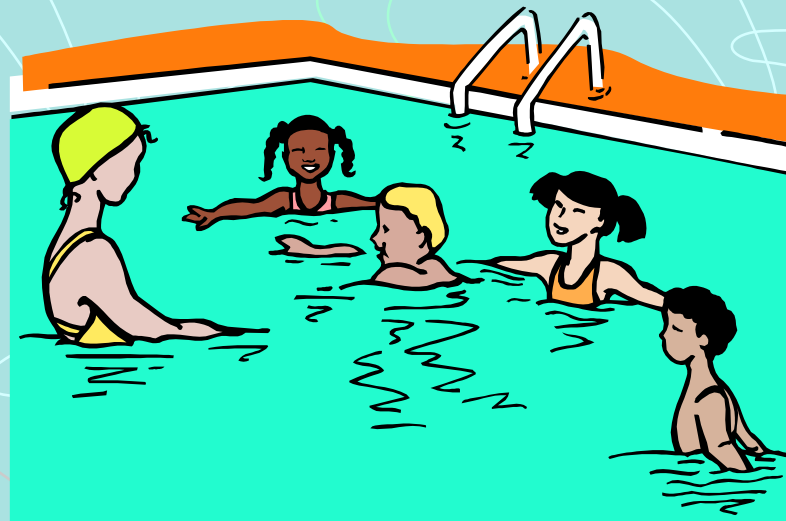
Oxygen Family or Chalcogens

- Elements in group 16
- Oxygen is necessary for respiration.
- Many things that stink, contain sulfur (rotten eggs, garlic, skunks, etc.)

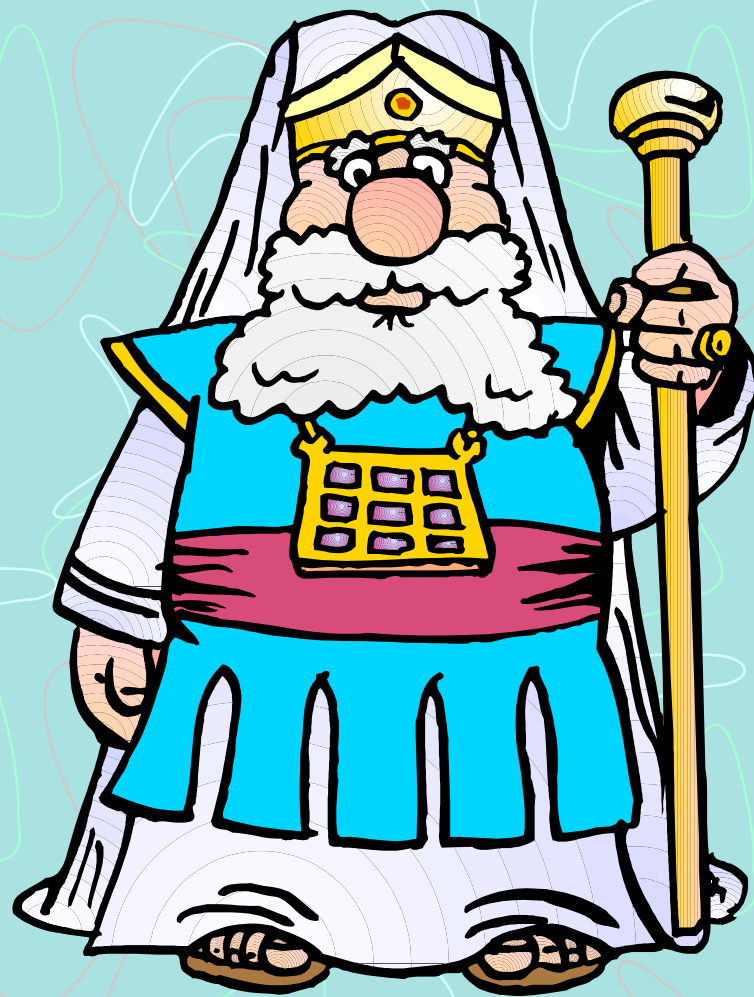


Halogens

- Elements in group 17
- Very reactive, volatile, diatomic, nonmetals
- Always found combined with other element in nature .
- Used as disinfectants and to strengthen teeth.



The Noble Gases



The Noble Gases

- Elements in group 18
- VERY unreactive, monatomic gases
- Used in lighted “neon” signs
- Used in blimps to fix the Hindenberg problem.
- Have a full valence shell.

