

History Behind the Development of the Periodic Table

As chemists began to use scientific methods to search for elements, the rate of discovery increased!

- Prior to 1650, only eleven elements were known (Ag, As, Au, C, Cu, Fe, Hg, Pb, S, Sb, Sn).
- By 1800, about 30 elements were known.
- By 1850, about 60 elements were known
- By 1900, about 80 elements were known.
- By 1950, about 90 elements were known.
- Now- over 100 elements are known.

In 1850, chemists began attempting to arrange the elements.

John Newlands (1864)

Dmitri Mendeleev (1869)

но въ ней, мнѣ кажется, уже ясно выражается применимость вы-
ставляемаго мною начала ко всей совокупности элементовъ, паче
которыхъ извѣстны съ достовѣрностію. На этотъ разъ я желаю
преимущественно найти общую систему элементовъ. Вотъ этотъ
опытъ:

			Ti=50	Zr=90	?=180.
			V=51	Nb=94	Ta=182.
			Cr=52	Mo=96	W=186.
			Mn=55	Rh=104,4	Pt=197,4
			Fe=56	Ru=104,4	Ir=198.
			Ni=Co=59	Pt=106,6	Os=199.
			Cu=63,4	Ag=108	Hg=200.
II=1			Zn=65,2	Cd=112	
	Be=9,4	Mg=24	?=68	Ur=116	Au=197?
	B=11	Al=27,4	?=70	Su=118	
	C=12	Si=28	As=75	Sb=122	Bi=210
	N=14	P=31	Se=79,4	Te=128?	
	O=16	S=32	Br=80	I=127	
	F=19	Cl=35,5	Rb=85,4	Cs=133	Tl=204
Li=7	Na=23	K=39	Sr=87,6	Ba=137	Pb=207
		Ca=40	?=45	Ce=92	
		?=45	?Er=56	La=94	
		?Yt=60	?Yt=60	Di=95	
		?In=75,6	Th=118?		

Henry Mosely

Today's Periodic Table

Mendeleev developed his periodic table before scientists knew about the structure of atoms. He didn't know that the atoms of each element contains unique number of protons.

The atomic mass of iodine (I) is 126.90.

The atomic mass of tellurium (Te) is 127.60.

If we used Mendeleev's periodic table that is based on atomic mass, these two elements should come one right after the other; however, they have very different chemical properties! Iodine belongs grouped with elements like bromine and chlorine which have similar properties.

How is the modern periodic table arranged?

Periodic Table of the Elements

Group=

Period =

Noble Gases

Nonmetals

Metalloids/Semi-metals

Metals

Periodic Table of the Elements

The image shows a blank periodic table grid. The main grid consists of 7 rows and 18 columns. The first two rows have gaps in the middle, representing the first and second periods. The third row has 18 cells. The fourth, fifth, sixth, and seventh rows each have 18 cells. Below the main grid is a separate 2x14 grid, representing the lanthanide and actinide series.

Periodic Law

The properties of the elements within a _____ change as you move across the period from _____ to _____.

The pattern of properties within a period repeats as you move from one period to the next.

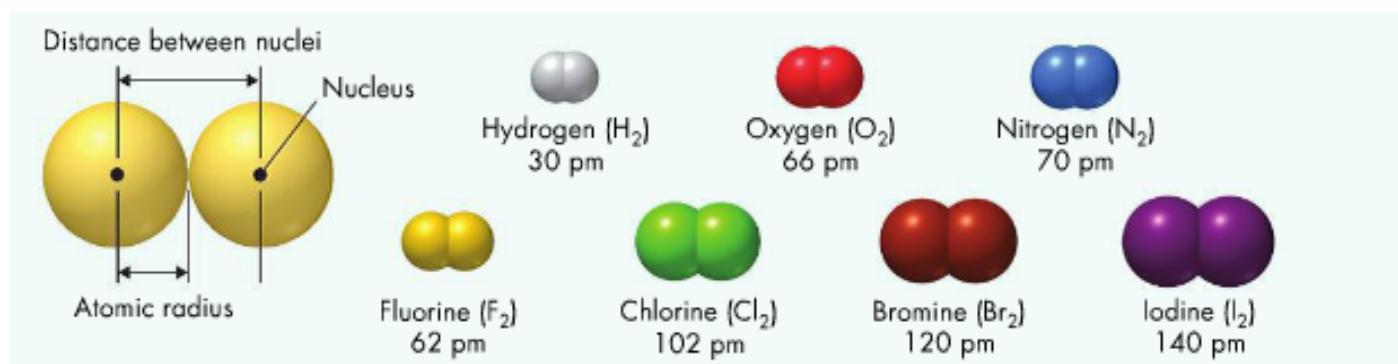
Octet Rule

Obtaining a Stable Octet

Periodic Trends**Trends in Atomic Size**

One way to think about size is to look at the units that form when atoms of the same element are joined to one another (molecules). Since the atoms in each molecule are identical, the distance between the nuclei of these atoms can be used to estimate the size of the atoms.

- The size is expressed as an atomic radius



Atomic Radius (A.R.) = “size” of the atom

Direction	Trend	Reason

Trends in Ionization Energy

Remember, electrons can move to higher energy levels when atoms absorb energy. Sometimes the electron has enough energy to overcome the attraction of the protons in the nucleus. The energy required to remove an electron from an atom is called _____.

- The energy required to remove the first electron from an atom is called the first ionization energy. The cation now has a _____ charge.

Direction	Trend	Reason

Trends in Electron Affinity

- How much an atom "wants" an electron.
- Results in the formation of anions.

Direction	Trend	Reason

How do anions and cations compare in size to their parent atoms?

Trends in Electronegativity

Electrons are involved in two types of bonds, ionic and covalent, there is a property that can be used to predict the type of bond that will form during a reaction.

- This property is called _____

Table 6.2

Electronegativity Values for Selected Elements

H 2.1						
Li 1.0	Be 1.5	B 2.0	C 2.5	N 3.0	O 3.5	F 4.0
Na 0.9	Mg 1.2	Al 1.5	Si 1.8	P 2.1	S 2.5	Cl 3.0
K 0.8	Ca 1.0	Ga 1.6	Ge 1.8	As 2.0	Se 2.4	Br 2.8
Rb 0.8	Sr 1.0	In 1.7	Sn 1.8	Sb 1.9	Te 2.1	I 2.5
Cs 0.7	Ba 0.9	Tl 1.8	Pb 1.9	Bi 1.9		

Electronegativity Trends

Direction	Trend