Dmitri Mendeleev

- Mendeleev noticed that when the elements were arranged in order of ***increasing atomic mass,*** similarities in their chemical properties appeared at regular intervals
- Mendeleev placed all the known elements in his periodic table but several empty spaces were left.
- In 1871 Mendeleev predicted the existence and properties of elements that would fill three of the spaces.

Mendeleev's Periodic Table

Group / Period	I	II	III	IV	V	VI	VII	VIII
1	H=1							
2	Li=7	Be=9.4	B=11	C=12	N=14	O=16	F=19	
3	Na=23	Mg=24	Al=27.3	Si=28	P=31	S=32	Cl=35.5	
4	K=39	Ca=40	?=44	Ti=48	V=51	Cr=52	Mn=55	Fe=56,Co=59 Ni=59
5	Cu=63	Zn=65	?=68	?=72	As=75	Se=78	Br=80	
6	Rb=85	Sr=87	?Yt=88	Zr=90	Nb=94	Mo=96	?=100	Ru=104,Rh=104 Pd=106
7	Ag=108	Cd=112	In=113	Sn=118	Sb=122	Te=125	J=127	
8	Cs=133	Ba=137	?Di=138	?Ce=140				
9								
10			?Er=178	?La=180	Ta=182	W=184		Os=195,Ir=197 Pt=198
11	Au=199	Hg=200	Tl=204	Pb=207	Bi=208			
12				Th=231		U=240		

Henry Moseley

- In 1911, the English scientist Henry Moseley discovered that the elements fit into patterns better when they were arranged according to ***atomic number***, rather than atomic weight.
- **Periodic Law:** there is a periodic repetition of physical and chemical properties of the elements when arranged in atomic number order

What we already know about the Periodic Table

- Classified as metals, non-metals, and metalloids
- Rows = PERIODS
- Columns = GROUPS or FAMILIES
- Separated into blocks indicating sublevels being occupied: s, p, d, and f
- Each member of a specific group have the same number of valence electrons

Certain sections or families on the periodic table are given specific names.

Representative Elements: the *s* and *p* blocks combined (groups 1-2, 13-18 or designated with an A)

Transition Elements: the *d* block elements (groups 3-12 or designated with a B)

Inner Transition Elements: the *f* block elements

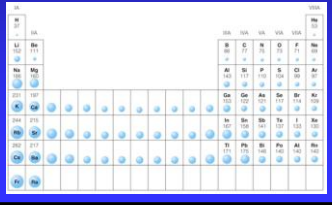
- The elements of Group 1 are known as the **alkali metals.**
- The elements of Group 2 are called the **alkaline-earth metals.**
- The elements of Group 17 are called the **halogens.**
- The elements of Group 18 are called the **noble gases.**
- The elements of Group 11are called the **coinage elements.**

- The first row of the *f* block, the ***lanthanides***, are shiny metals similar in reactivity to the Group 2 alkaline metals.
- The second row of the *f* block, the ***actinides***. The actinides are all radioactive.

Periodic Trends

Atomic Radius: defined as one-half the distance between the nuclei of identical atoms that are bonded together

- The decrease across a period is caused by the increasing positive charge of the nucleus with electrons being added to the **same** energy level.
- The increase down a group is caused by the increasing size of the electron cloud with electrons added to higher energy levels.



Ionic Radius:

Atoms can gain or lose one or more electrons to form ions.

- An ion is an atom or group of bonded atoms that has a positive or negative charge.
- When atoms lose electrons (and form a positive ion called a **cation**) they always become smaller.
- When atoms gain electrons (and form a negative ion called an **anion**) they always become larger.

Ionization Energy

- The energy required to remove one electron from a neutral atom of an element is the **ionization energy.**
- Energy to remove additional electrons from the same element is referred to as: 2nd ionization energy, 3rd ionization energy, and so on. Each one takes more and more energy.

Octet Rule: states that atoms tend to gain, lose or share electrons in order to acquire a full set of valence electrons (they want to be like a noble gas)

Electronegativity (Electron affinity)

- Electronegativity: a measure of the ability of an atom in a chemical *compound* to attract electrons from another atom.
- Arbitrary values assigned by Linus Pauling used to explain covalent bonding (sharing of electrons).
  - Fluorine is the most electronegative element, assigned a value of 4.