Chapter 6-The Periodic Table

Dmitri Mendeleev was the Russian Chemist who is known as the chief architect of the Periodic Table. He was born in Siberia on February 7, 1834. He devised his periodic table in the late 1800's. The cool thing about this is that he set up this table almost THIRTY years before the electron was discovered and almost 60 years before the true nature of the atom was discovered! He passed away on January 20, 1907.

Tabelle II.

Reihen	Gruppe I. — R^1O	Gruppe II. — RO	Gruppe III. — R^2O^3	Gruppe IV. RH^4 RO^2	Gruppe V. RH^3 R^2O^5	Gruppe VI. RH^2 RO^3	Gruppe VII. RH R^2O^7	Gruppe VIII. — RO^4
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, Cu=63.
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, Ag=108.
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, Au=199.
11	(Au=199)	Hg=200	Tl=204	Pb=207	Bi=208	—	—	
12	—	—	—	Th=231	—	U=240	—	— — — —

This is a copy of Mendeleev's periodic table

Originally, the elements in the periodic table were arranged according to increasing atomic mass. Atomic Mass can be found by adding the number of protons and neutrons in an atom's nucleus. The elements are then arranged by grouping them by common physical properties.
Now, the elements are arranged not by atomic mass, but atomic number, which represents the number of protons in the atom.
Electrons are free to whiz about the nucleus at very high speeds, but they are concentrated into a few spherically shaped shells around the nucleus, called orbitals or energy levels

The best metals are in the lower left hand corner of the Periodic Table while the best non-metals are in the upper left hand corner of the Periodic Table.

Some elements have properties of both metals and non-metals: these elements are called metalloids. Two common metalloids include silicon and germanium. They are used in the production of computer chips and solar cells.

Elements in the same column of the Table have many properties in common. Theses columns are called groups or families. As you move down the column, the metallic properties of the elements become more pronounced.

The elements are also arranged by rows, these rows are called periods.

Within a family, elements that ~~are~~ follow each other will have the most similar properties. Elements in the same period do not necessarily have similar properties because they have a different number of valence electrons.

Use the periodic table to match each element in Column A with the element in Column B that has the most similar chemical properties.

Column A

H 1. Arsenic (As)
F 2. Bromine (Br)
N 3. Cadmium (Cd)
~~B~~ A 4. Gallium (Ga)
K 5. Germanium (Ge)
D 6. Iridium (Ir)
L 7. Magnesium (Mg)
O 8. Neon (Ne)
I 9. Nickel (Ni)
G 10. Osmium (Os)
B 11. Sodium (Na)
M 12. Tellurium (Te)
C 13. Tungsten (W)
J 14. Yttrium (Y)
E 15. Zirconium (Zr)

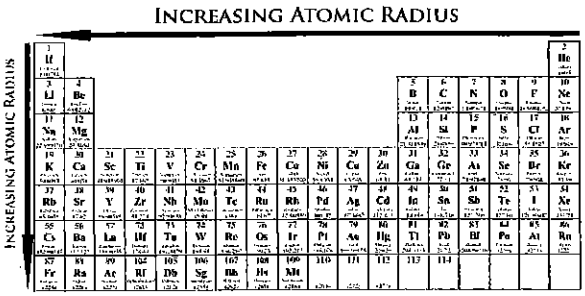
~~a~~. boron (B)
~~b~~. cesium (Cs)
~~c~~. chromium (Cr)
~~d~~. cobalt (Co)
~~e~~. hafnium (Hf)
~~f~~. iodine (I)
~~g~~. iron (Fe)
~~h~~. nitrogen (N)
~~i~~. platinum (Pt)
~~j~~. scandium (Sc)
~~k~~. silicon (Si)
~~l~~. strontium (Sr)
~~m~~. sulfur (S)
~~n~~. zinc (Zn)
~~o~~. xenon (Xe)

Look for elements in the same column.

Periodic Trends

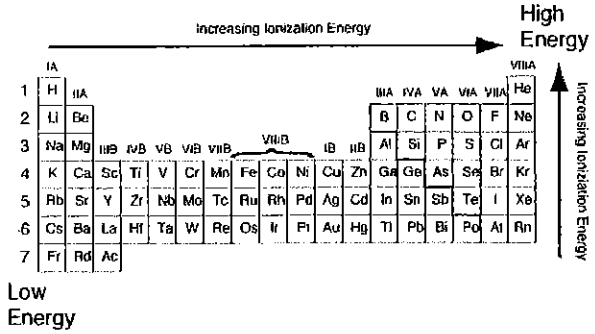
Atomic Radius: When you move down the columns on the periodic table, the electrons are located in a higher energy level. Because of this, the radius of the atom becomes larger.

decreases



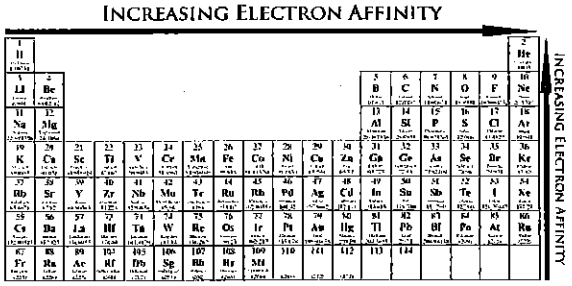
When you move across any row on the periodic table, you are increasing the #of protons & electrons. Protons are larger and stronger than electrons. This causes a "tug of war" between the protons and electrons which will be won by the protons. As you move across the row, the radius of the atom becomes smaller.

Ionization Energy:



When an atom loses an electron, it becomes a "cation" or a positive ion. The larger the atom, the easier it is to "remove" an electron to form an ion. Thus, it takes more energy to form an ion as you move across the row (ionization energy increases). It also takes less energy to form an ion to move down a column (ionization energy decreases). The trends are the opposite of the atomic radius.

Electron Affinity:



Electron affinity is the ability for an atom to accept an electron, to form an "anion" or negative ion. The larger the atom, the easier it is to accept an electron. The smaller the atom, the more difficult it is to accept an electron. The trends are the opposite of the atomic radius.

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16. Rank the following elements by increasing atomic radius: carbon, aluminum, oxygen, potassium.

smallest Oxygen < Carbon < Aluminum < potassium Largest

17. Rank the following elements by increasing electron affinity: sulfur, oxygen, neon, aluminum

Neon (noble gas) < Al < S < O

18. Why does fluorine have a higher ionization energy than iodine?

Iodine is larger, so you need less energy to remove an electron.

19. Why do elements in the same family generally have similar properties?

They have similar electron configurations.