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## The Periodic Table of Elements

A Russian chemist attempted to atomic mass, and melting point to the properties vorder, certain chemical properties	organize the elements based on information such as do After much work he determined that there was a when the elements were arranged in order of increasing as of the elements were " " mean. There were still some missing elements, but he prediction.	atomic mass. In this aning that they had a
elements yet to be discovered.	determined that the elements should be arran and the periodic table was rearrange	
which greatly improved the arrar which looks like	ngement of elements. So, we arrive at the modern versi	on of the periodic table
You've got your Peri Periods = From What do elements in a row have The same number of Every element in Period 1 (1st in shell for its electrons (H & He) elements in period 2 have 2 she electrons. It continues like this a down the table. The elements in	n left to right e in common?  Tow) has 1 All of the Ils for their Il the way	PERIODS
Groups or Families	And you've got your Groups  Column = = What do elements in a group have in common? The same number of  (electrons in the outer shell) Every element in group 1 (1st column) has 1 valence electron. Every element in group 2 has 2 valence electrons. In fact, if you know the group's number, you automatically know how many valence electrons it has!	
elements. The transition elemen other elements are "A" elements	ups can be confusing because the rules change with the ts get grouped together as the "B" elements, or groups with groups #1A - 8A. Using this labeling system will the atoms. However, sometimes the groups are just labeled	#1B - 8B. All of the ell you exactly how
elements. Hydrogen can have the & sometime it is missing an electron different from all of the other electron though it only has two, it is gases). Hydrogen Stands Alon Hydrogen does not match proper	(H) and (He) are special ne talents and electrons of two groups, one and seven tron, and sometimes it has an extra. Helium is ments. It can only have two electrons in its outer shell. It is still grouped with elements that have eight (inert nee: Gas, Reactive, 1 electron in outer level. In order of any single group so it is placed above Group with ionic bonding, or share it's electron in covalent	HYDROGEN 2Nd HELIUM

**Group Labels:** Labeling the groups can be confusing because the rules change with the middle transition elements. The transition elements get grouped together as the "B" elements, or groups #1B - 8B. All of the other elements are "A" elements, with groups #1A -8A. Using this labeling system will tell you exactly how many valence electrons are in the atoms. However, sometimes the groups are just labeled #1-18.

bonding

#### 3 classes of elements:



**Metals** are elements that are shiny and are good conductors of thermal energy and electric current. They are easily shaped into different forms because they are *malleable* (they can be hammered into thin sheets) and *ductile* (they can be drawn into thin wires). Iron has many uses in building and automobile construction. Copper is used in wires and coins.



# Sulfur Nonmetals are and that are po electric current. and unmalleable

**Nonmetals** are elements that are dull (not shiny) and that are poor conductors of thermal energy and electric current. Solid nonmetals tend to be brittle and unmalleable. Few familiar objects are made of only nonmetals. The neon used in lights is a nonmetal, as is the graphite (carbon) used in pencils.

Neon

#### **Metalloids**

**Metalloids**, also called semiconductors, are elements that have properties of both metals and nonmetals. Some metalloids are shiny, while others are dull. Metalloids are somewhat malleable and ductile. Some metalloids conduct thermal energy and electric current well. Other metalloids can become good conductors when they are mixed with other elements. Silicon is used to make computer chips. However, other elements must be mixed with silicon to make a working chip.

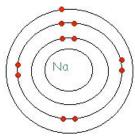
Bromine



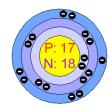
#### Atoms of most metals have few electrons in their outer energy level

electron

Sodium has 1 extra electron in it's outer shell



## Atoms of most nonmetals have an almost complete set of electrons in their outer level



Chlorine only needs 1 electron to have a full outer energy shell

# Atoms of metalloids have about a half-complete set of electrons in their outer energy level

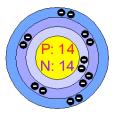
Silicon: In need of 4 electrons

24 25 26 27 28 29 30 31 32 33 Cr Mn Fe Co Ni Cu Zn Ga Ge As

Elements farther to the right,

like germanium, are less

metallic in their properties.



Elements at the far right end of

a period, such as bromine, are

nonmetallic in their properties.

Metals, Metalloids, & Nonmetals: Another pattern on the periodic table is that all of the metals are grouped together on the left & the nonmetals are on the right. The metalloids fall in between, near the zigzag line. This trend isn't a coincidence. The number of

electrons in the outer shell, determines how an element acts. For example, metals have valence electrons. This causes

them to possess metallic properties such as, conductivity & reactivity . Conversely,

the nonmetals on the right of the periodic table have \_\_\_\_\_ complete sets of electrons in their outer level. Therefore, they possess nonmetallic traits such as dullness, poor conductivity, and brittleness. We can summarize all of this just by saying: Elements get \_\_\_\_ metallic as you move from left to right

Elements at the left end of a

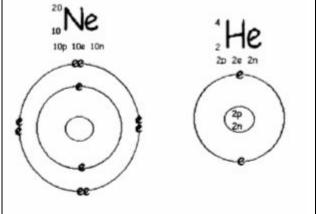
period, such as titanium, are

very metallic in their properties.

Families Stick Together: Scientists group families of elements by their \_\_\_\_\_\_. Each family reacts a different way with the outside world. BUT, elements within a family are similar to one another. Metals behave differently than gases and there are even different types of metals. Some don't react, others are very reactive, and some are metallic. Let's go over the periodic table families...

Family 1: Metals	Family 2:	: N	/letals
Li , Na , K , Rb, Cs, Fr : Metals		, Sr, Ba, Ra : Metals	
Reactive		reactive, but less than alkali n	
electron in outer energy level available		electrons (e-) in outer energy level ava	
for bonding. All have ONE outer electron to lose. This makes them highly reactive, since they are		<ul> <li>Not as reactive as the Alkali metals is harder to give two electrons away</li> </ul>	
looking to combine with another element to		e elements are typically what are lost	•
become stable and have that outer level filled		n which is why people buy special spe	
and complete (or happy!). Most reactive of all		contain these elements!	
metals Soft and can be cut with a knife.			
- " 0.40 T " 11 15 1			
Family 3-12: Transition Metal	S		ries:
electrons in outer energy level	atala bassuss	15 elements that start with lanthar at atomic number 57 and finishing	. ,
reactive than alkaline earth me they don't give away their electrons as easily	etais because	lutetium (Lu) at number 71.	up with
In these " the properties	are very much	shiny reactive metals, Most found	in
alike. Most have high melting points and are har	d.	nature	
They all have 1 or 2 properties like the alkali or			ries:
families.		15 elements that start with actiniur	` '
Group 11 = The Family: are th	e coinage metals	at atomic number 89 and finishing	up with
(Cu, Ag, Au) used to make currency.		lawrencium (Lr) at number 103.  Radioactive and unstable. Most ar	o man
In periods (rows) 6 & 7, notice how the periodic t goes into the two rows referred to as series:	able skips and	made & not stable in nature	e man-
goes into the two rows referred to as series.		made a not stable in nature	
13: Family		_The Chemical Famili	i o e
One metalloid and 4 metals B, Al, Ga, In, Tl		Λ	
in the outer energy level		A C N O	a N
Reactiveat room temperature		k k a a Transition r B Q g	1 0 b
Most common element in this group is Boron is most commonly found as borax and bor		I i Florente O C °	g I
are used in cleaning compounds. Aluminum is the		i n n n n n	e e
common element in the earth's crust. It is used a			
agent, to prevent oxidation. It is an excellent con		The Lanthanoid Series	
electricity and heat and can be found in many co	oking utensils.	The Actinoid Series	
<b>14: Family</b> C, Si, 1 metal, 1 metalloid, and 2 nonmetals.	Ge, Sn, Pb	<b>Family 17:</b> F, Cl, Br,	I, At
		These are reactive no	onmetals
electrons_in its outer energy shell. N	o other group	electrons in the outermost energy	level.
has a greater range of properties. They have the		They are very reactive because have	7
to form compounds. This fam important in the field of		valence electrons, this means they are	
important in the field of		ALMOST full and can combine with	many
15: Family N.P.	As Sh Bi	elements.	
<b>15:</b> Family N, P, 2 nonmetals, 2 metalloids, 1 metal	7.10, 00, 51	Halogen elements combine with meta	als to
electrons in outer energy level		form compounds called <b>salts</b> .	
Reactivity varies		Halogen means "salt-producer".	
		The combine with a metal by <b>ionic_</b> bo	
<b>16:</b> Family O, S, S a nonmetals, 1 metalloid, 1 metal		They are the most reactive of the non	metals
		families.	1 ,
electrons in outer energy level reactive	e . IVIOST	As you move down the column, the e	elements
members form compout Each atom has 6 electrons in its outer energy lev	unus, vel Therefore it	get less reactive.	
must share 2 electrons with other elements to fo		A is when a halogen	
Oxygen is one of the most reactive nonmetallic		combines with another element (NaC	1)

Family 18:	20 1
He, Ne, Ar, Kr, Xe Nonmetals	10
gases	10p 10e
NO bonding with other elements	-00
valence electrons (except He which only has 2)	
With the exception of He, these elements have 8 electrons in	1
their outer energy level. Very stable	1/ -
They are, meaning they don't react with	£ ( (
anything. Why? Because they're happy! All of these	11
elements have full outer shells_Colorless, odorless gases at	1
room temperature Often used in neon products/neon lights	
All are found in Earth's atmosphere. Only in laboratories can	e
scientists force these to bond with other elements.	



### **Using the Periodic Table**

Complete the following chart from your Periodic Table.

Element symbol	Name of Element	atomic number	# of protons	# of electrons	# of neutrons	Metal or Nonmetal	Solid, Liquid or Gas	# of electrons in outer shell (valence electrons)
Rn								
Li								
Fe								
Hg								
Xe								
Mg								
٧								
Br								
Cr								
Н								
K								
Sn								
Cu								
8								
Bi								
Fe								
Ва								
Sb								
Ρ								
S								
Ti								
Ni								
Au								
Ar								
Cs								