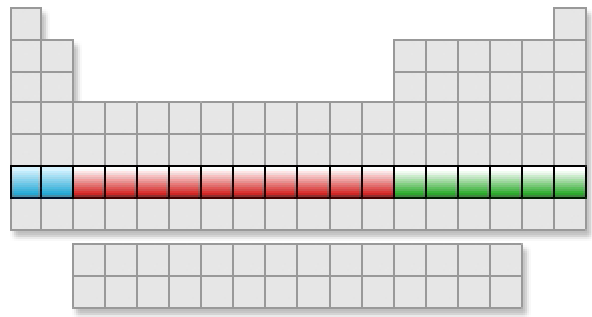
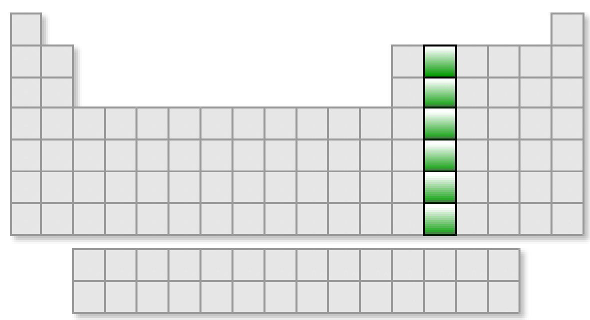
What's in the Box



The Periodic Table of the Elements can be a very useful tool for you in both school and life, if you understand how to read it. The table is organized into horizontal rows called **periods** that read from left to right, just like a book. When there is a space in the middle, just jump across it as if you were reading around a picture inserted in the text on a page. When you read a page in a book from left to right, you have to drop down a line to continue. The same is true for the periodic table. There is something very exciting happening when you move down on the table to a new line. You are moving to a row of elements with another energy level for the atoms' electrons to fill. This means that the top row has only one energy level. The second row (period) adds a level to have a total of two energy levels that the electrons must fill. The third period contains three energy levels for electrons, and so on. The most energy levels currently found in an atom of an element at this time is seven. We have seven periods in the periodic table (the two bottom rows are actually continuations of the 6th and 7th periods.) The period number is usually found to the left of the first element box for each row.

So much for the rows. What about the columns? In the Periodic Table, they're known as Groups.

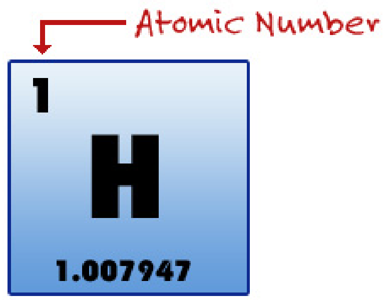
Periods



Let's look at the table another way. There are 18 vertical columns of varying length going across the table. These columns are commonly known as **groups**, or families of elements. The groups are numbered according to several different conventions, but the most commonly accepted method is the IUPAC (International Union of Pure and Applied Chemistry) system, which labels the groups from left to right with numbers 1 through 18. This is the system we will be using in this Web site. The numbers 1 through 18 are found above the top row of the table for easy reference. We will be looking at some of the groups of the periodic table in more detail later.

So that covers columns and rows. What about individual elements? For that, we have atomic numbers.

Look very carefully at the boxes in the periodic table. Notice that no matter what form of the table you are using, there are always three very specific items that appear for each element. First, there is an integer (whole number) in some part of the box. This is the **atomic number** of the element. It represents the number of protons found in the nucleus of one atom of that particular element. See how the atomic number increases by one for each box as you move across the table in a period? This means that each element has its own special number of protons in each atom. For example, every atom of hydrogen has one proton in its nucleus -- always. Every atom of helium has two protons in its nucleus. Every atom of lithium contains three protons in its nucleus. This is very important to know, because it is the number of protons in the nucleus that determines what element you are working with. If you add a proton to a carbon atom, you will not have carbon anymore -- it will be nitrogen! If you take a proton away from a calcium atom, it will not be calcium anymore. The new atom is an atom of potassium instead. The elements change as you move across the table from block to block, left to right, because you are changing the number of protons in each new block.



Symbol

The second item you will find in the box on any periodic table is the symbol for the element. It may be either one capital letter or a combination of one capital and one lowercase letter. The letter(s) usually have something to do with some form of the name of the element. Some are very easy to figure out, like H for hydrogen or O for oxygen. Others refer to older names for the element in different languages like Greek or Latin. This can be very confusing unless you know the original names. Here is a list of several elements and their original names to try to make learning the symbols easier.

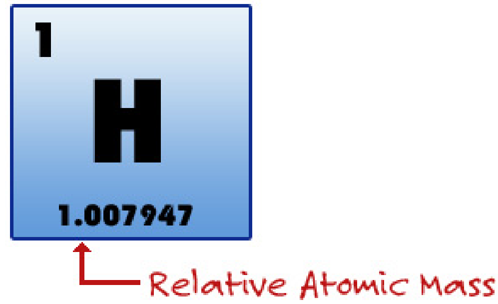
Atomic #	current name	original name	symbol
13	sodium	Natrium	Na
26	iron	Ferrum	Fe
29	copper	Cuprum	Cu
47	silver	Argent	Ag
50	tin	Stannum	Sn
51	antimony	Stibnum	Sb
74	tungsten	Wolfram	W
79	gold	Aurum	Au
80	mercury	Hydrargyrum (liquid silver)	Hg
82	lead	Plumbum	Pb

There are some sentences we can use to try to learn and remember the symbols for these elements that are way off from their element name today. I have listed them below for you. If you don't like these sentences, you can always make up your own. It might even help you learn them better.

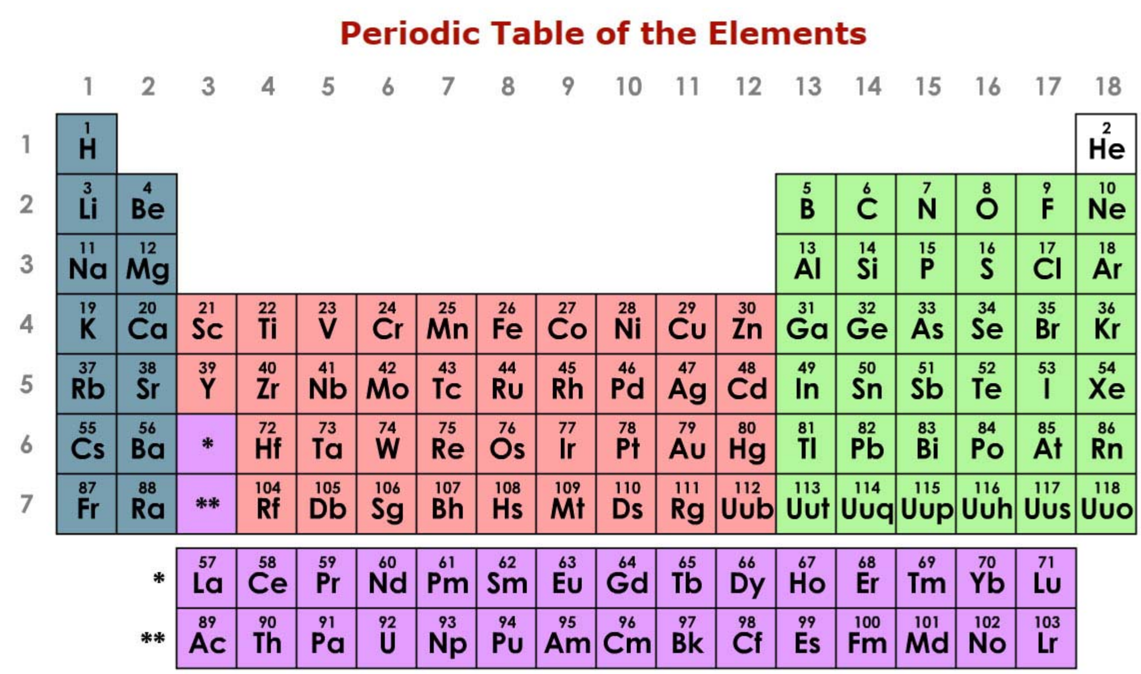
Na*tron* is the **Sodium** salt the ancient Egyptians used to make mummies.
Fe - Fi -Fo *Ferrum*, **Iron** in steel makes a better weapon.
I "**Cu**" have a **Copper** cup of rum *(Cuprum)* .
We will mine the **Silver** **Ag**ain in *Argent-ina.*
Sneak a peak at the **Tin** in your stannous *(Stannum)* fluoride toothpaste.
Sb *Stibnum* does not believe in paying his **Antimony.**
Wee Willie *Wolfram* got his **Tung-sten-d** with an electric shock.

The **Gold**-en goddess of the dawn is **Au***rum.*
Mercury is the liquid silver from **H***ydrar***g***yrum* of old.
"**Pb**" the *Plumbum* plumber uses **Lead** pipes only in his work.

The third item found in each box of any periodic table of the elements is the **Relative Mass** of the element. By accepted use, the mass of an atom is that of the protons and the neutrons found in the nucleus. Remember that the mass of one electron is so small relative to the mass of a proton or neutron that it would take more than 1,800 electrons to equal the mass of one proton. The number in the box is the mass of one atom compared to one atom of carbon-12. It is also the average of all the masses of all the isotopes of that particular atom, calculated according to the actual abundance of the isotope. We will spend more time on this "weighty" matter in the next chapter.



Finally, some periodic tables may also provide the name of the element, its electron configuration, the various oxidation states the element may exist in, and its electronegativity, boiling point, and state of matter under general conditions. These extras are specific to individual tables and are useful to have but not absolutely necessary.



Periodic Table of the Elements

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1 H																	2 He
2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55 Cs	56 Ba	*	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra	**	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Uub	113 Uut	114 Uuq	115 Uup	116 Uuh	117 Uus	118 Uuo
		*	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu	
		**	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr	

http://www.learner.org/interactives/periodic/box.html