



Periods and Groups

The periodic table is a tabular arrangement of the chemical element, organized on the basis of their atomic numbers, electron configurations (electron shell model) and recurring chemical properties.

The first reasonably successful attempt was made by **Dimitri Mendeleev** in 1869. He had the idea of arranging elements in order of increasing atomic mass, and, most importantly, found that elements with similar chemical and physical properties occurred periodically. He placed these similar elements under each other in columns.

In 1914, **Henry Moseley** determined that a better arrangement was in order of increasing atomic number, giving us the periodic table we have today.

We can define the periodic table as an arrangement of elements in order of increasing **atomic number** placing those with similar chemical and physical properties in columns.

The basic structure of the periodic table is its division into rows and columns, or periods and groups. A **period** consists of the elements in any one horizontal row of the periodic table. A **group** consists of the elements in any one column of the periodic table. The first period of elements consists of only hydrogen (H) and helium (He). The second period has 8 elements, beginning with lithium (Li) and ending with neon (Ne). There is then another period of 8 elements, and this is followed by a period having 18 elements, beginning with potassium (K) and ending with krypton (Kr). The fifth period also has 18 elements. The sixth period actually consists of 32 elements, but in order for the row to fit on a page, part of it appears at the bottom of the table. Otherwise the table would have to be expanded, with the additional elements placed after barium (Ba, atomic number 56). The seventh period, though not complete, also has some of its elements placed as a row at the bottom of the table.



PERIODIC TABLE OF THE ELEMENTS

<http://www.kjf-split.hr/periodni/en/>

PERIOD

GROUP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
PERIOD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1.0079 H HYDROGEN																	2.0180 He HELIUM
2	3.0122 Li LITHIUM	4.0026 Be BERYLLIUM																10.811 Ne NEON
3	11.009 Na SODIUM	12.011 Mg MAGNESIUM																18.998 Ar ARGON
4	19.000 K POTASSIUM	20.018 Ca CALCIUM	21.009 Sc SCANDIUM	22.017 Ti TITANIUM	23.004 V VANADIUM	24.006 Cr CHROMIUM	25.007 Mn MANGANESE	26.009 Fe IRON	27.010 Co COBALT	28.010 Ni NICKEL	29.063 Cu COPPER	30.076 Zn ZINC	31.000 Ga GALLIUM	32.061 Ge GERMANIUM	33.009 As ARSENIC	34.080 Se SELENIUM	35.453 Br BROMINE	36.966 Kr KRYPTON
5	37.001 Rb RUBIDIUM	38.078 Sr STRONTIUM	39.098 Y YTTRIUM	40.078 Zr ZIRCONIUM	41.024 Nb NIOBIUM	42.010 Mo MOLYBDENUM	43.094 Tc TECHNETIUM	44.010 Ru RUTHENIUM	45.009 Rh RHODIUM	46.005 Pd PALLADIUM	47.026 Ag SILVER	48.024 Cd CADMIUM	49.024 In INDIUM	50.012 Sn TIN	51.008 Sb ANTIMONY	52.009 Te TELLURIUM	53.009 I IODINE	54.008 Xe XENON
6	55.008 Cs CAESIUM	56.009 Ba BARIUM	57-71 La-Lu LANTHANIDE	72.041 Hf HAFNIUM	73.043 Ta TANTALUM	74.076 W TUNGSTEN	75.075 Re RHENIUM	76.076 Os OSMIUM	77.076 Ir IRIDIUM	78.076 Pt PLATINUM	79.076 Au GOLD	80.076 Hg MERCURY	81.076 Tl THALLIUM	82.076 Pb LEAD	83.076 Bi BISMUTH	84.076 Po POLONIUM	85.076 At ASTATINE	86.076 Rn RADON
7	87.001 Fr FRANCIUM	88.001 Ra RADIUM	89-103 Ac-Lr ACTINIDE	104.076 Rf RUTHERFORDIUM	105.076 Db DUBNIUM	106.076 Sg SEABORGIUM	107.076 Bh BOHRNIUM	108.076 Hs HASSIUM	109.076 Mt MEITNERIUM	110.076 Uun UNUNNIUM	111.076 Uuh UNUNBIUM	112.076 Uub UNUNTRIUM	113.076 Uut UNUNQUADIUM	114.076 Uuq UNUNPENTIUM	115.076 Uup UNUNSEPTIUM	116.076 Uuh UNUNOCTIUM	117.076 Uus UNUNSEPTIUM	118.076 Uuo UNUNOCTIUM

Metal	Semimetal	Nonmetal
1 Alkali metal	16 Chalcogens element	17 Halogens element
2 Alkaline earth metal	18 Noble gas	
Transition metals		
Lanthanide		
Actinide		

STANDARD STATE (25 °C; 101 kPa)
Ne - gas **Fe** - solid
Ga - liquid **Tc** - synthetic

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Relative atomic mass is shown with five significant figures. For elements having no stable nuclides, the value enclosed in brackets indicates the mass number of the longest-lived isotope of the element.

However, these such elements (Fr, Pa, and U) do have a characteristic terrestrial isotopic composition, and for these an atomic weight is tabulated.

LANTHANIDE

57 138.91 La	58 140.12 Ce	59 140.91 Pr	60 144.24 Nd	61 (145) Pm	62 150.36 Sm	63 151.96 Eu	64 157.25 Gd	65 158.93 Tb	66 162.50 Dy	67 164.93 Ho	68 167.26 Er	69 168.93 Tm	70 173.04 Yb	71 174.97 Lu
LANTHANUM	CERIUM	PRASEODYMIUM	NEODYMIUM	PROMETHIUM	SAMARIUM	EUROPIUM	GADOLINIUM	TERBIUM	DYSPROSIUM	HOLMIUM	ERBIUM	THULIUM	YTTERBIUM	LUTETIUM

ACTINIDE

89 (227) Ac	90 232.04 Th	91 231.04 Pa	92 238.03 U	93 (237) Np	94 (244) Pu	95 (243) Am	96 (247) Cm	97 (247) Bk	98 (251) Cf	99 (252) Es	100 (257) Fm	101 (258) Md	102 (258) No	103 (262) Lr
ACTINIUM	THORIUM	PROTACTINIUM	URANIUM	NEPTUNIUM	PLUTONIUM	AMERICIUM	CURIUM	BERKELIUM	CALIFORNIUM	EINSTEINIUM	FERMIUM	MENDELEVIUM	NOBELIUM	LAWRENCIUM

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The groups are usually numbered. The numbering frequently seen in North America labels the groups with numerals and A's and B's. In Europe a similar convention has been used, but some columns have the A's and B's interchanged. To eliminate this confusion, the International Union of Pure and Applied Chemistry (IUPAC) suggested a convention in which the columns are numbered 1 to 18.

1. Metals

- solids at room temperature (except Hg).
- metallic luster.
- malleable and ductile.
- good conductors of heat and electricity

2. Non-metals

- gases or solids at room temperature (except Br₂).
- variety of color and appearance.
- brittle solids.
- insulators (poor conductors).



3. **Metalloids (semimetal)**

- intermediate in properties between metals and non-metals.
- solids at room temperature.
- many have more than one structure (one metallic, the other non-metallic).
- some are semi-conductors.

Main Group Elements (Vertical Groups)

- Group 1(IA) - Alkali Metals
- Group 2(IIA) - Alkaline Earth Metals
- Group 13(IIIA) - Boron Family
- Group 14(IVA) - Carbon Family
- Group 15(VA) - Nitrogen Family
- Group 16(VIA) - Oxygen Family (Chalcogens)
- Group 17(VIIA) - Halogens
- Group 18(VIIIA) - Noble Gases

Other Groups (Vertical and Horizontal Groups)

- Group 3-12(IB-8B) - Transition Metals
- Period 6 Group - Lanthanides (Rare Earth Elements)
- Period 7 Group - Actinides

Chemical bonds

A chemical bond is an attraction between atoms.

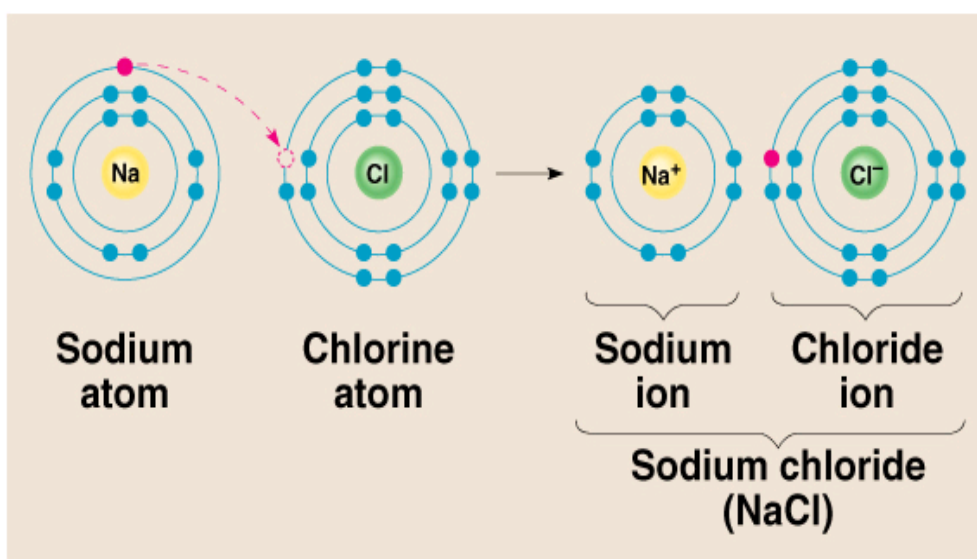
What are atoms and compounds always trying to achieve?

Atoms form chemical bonds to achieve a full valence shell of electrons. This may be achieved in two ways:

- 1- **An exchange** of electrons between metal and non-metal atoms.
- 2- **Sharing of** electrons between non-metal atoms.

Ionic Bond

- An ionic bond is the electrostatic attraction between oppositely charged ions.
- Ionic bonds involve electron transfer (one atom loses electrons and another gain them).
- The atom that loses electrons becomes a cation (a positive ion).
- The atom that gains electrons becomes an anion (a negative ion).



- An ionic bond usually occurs between a metal and a nonmetal.
- Ionic bonds are found in ionic compounds ex. NaCl, Al₂O₃, KBr, MgCl₂.

