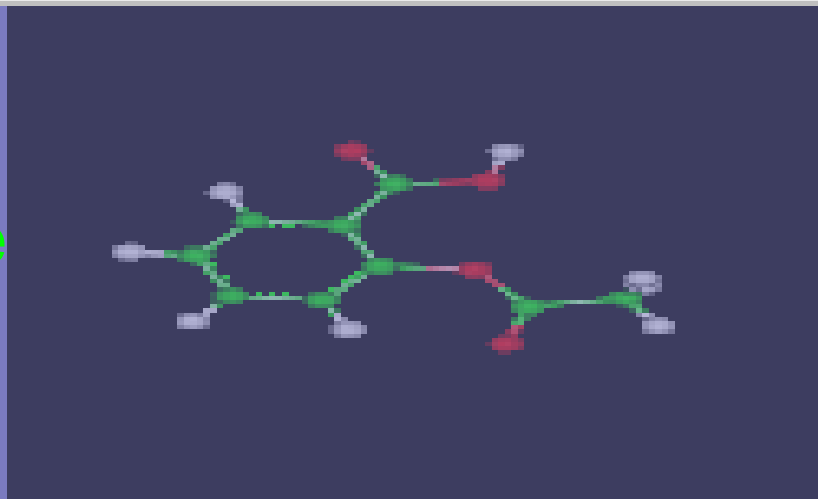


# Atoms and the Periodic Table

13
Al
26.98154
Aluminum



*Things are different from each other, and each can be reduced to very small parts of itself. - Ancient knowledge*



WE SEE THE  
ORDER OF  
GOD'S  
CREATION IN  
THE PERIODIC  
TABLE

# History of the Periodic table



"Father of the periodic table"

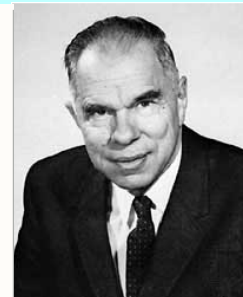
Dimitri Mendeleev

PERIODIC SYSTEM OF THE ELEMENTS IN GROUPS AND SERIES

I	GROUPS OF ELEMENTS								
	0	I	II	III	IV	V	VI	VII	VIII
1		H	Li	Na	K	Rb	Cs	Fr	
2		He	Be	Mg	Ca	Sr	Ba	Ra	
3			B	Al	Ga	In	Tl		
4			C	Si	Ge	Sn	Pb		
5			N	P	As	Sb	Bi		
6			O	S	Se	Te	Po		
7			F	Cl	Br	I	At		
8									
9									
10									
11									
12									

Periodic Table of the Elements

1	2											18							
1	H																	He	
2	Li	Be											B	C	N	O	F	Ne	
3	Na	Mg	Al	Si	P	S	Cl	Ar											
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
6	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
7	Fr	Ra	Ac	Rf	Ha	Hs	Hs	Mt	110	111	112	113							
Lanthanide Series		Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu				
Actinide Series		Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr				



Dr. Glenn T. Seaborg in 1951

Into the 1930s the heaviest elements were being put up in the body of the periodic table, and **Glenn Seaborg** "plucked those out" while working with Fermi in Chicago, naming them the Actinide series, which later permitted proper placement of subsequently 'created' elements - the Transactinides, changing the periodic table yet again. These elements were shown separate from the main body of the table.



This modern periodic table is called the Alexander Arrangement of the Elements.

*The Alexander Arrangement of the Elements, a three-dimensional periodic chart designed and patented by Roy Alexander and introduced in 1994, retains the separate Lanthanide and Actinide series, but integrates them at the same time, made possible by using all three dimensions.*

**PERIODIC TABLE OF THE ELEMENTS**

D - diatomic molecules

**GROUPS:** 1 IA, 2 II A, 3 III B, 4 IV B, 5 VB, 6 VIB, 7 VIIB, 8 VIII B, 9, 10, 11 IB, 12 IIB, 13 III A, 14 IVA, 15 VA, 16 VIA, 17 VII A, 18 VIII A

**PERIODS:** 1, 2, 3, 4, 5, 6, 7, 8, 9

**LEGEND:** ■ ...Solid ■ ...Liquid ■ ...Gas --- ...Unknown Gray Outline ... Synthetically prepared

Periods	Group 1 IA	Group 2 II A	TRANSITION ELEMENTS										Group 13 III A	Group 14 IVA	Group 15 VA	Group 16 VIA	Group 17 VII A	Group 18 VIII A												
1	H <sup>+</sup> Hydrogen																	He Helium												
2	Li <sup>+</sup> Lithium	Be <sup>2+</sup> Beryllium											B Boron	C Carbon	N <sup>3-</sup> Nitrogen	O <sup>2-</sup> Oxygen	F Fluorine	Ne Neon												
3	Na <sup>+</sup> Sodium	Mg <sup>2+</sup> Magnesium											Al <sup>3+</sup> Aluminum	Si Silicon	P <sup>3-</sup> Phosphorus	S <sup>2-</sup> Sulfur	Cl Chlorine	Ar Argon												
4	K <sup>+</sup> Potassium	Ca <sup>2+</sup> Calcium	Sc <sup>3+</sup> Scandium	Ti <sup>4+</sup> Titanium	V <sup>5+</sup> Vanadium	Cr <sup>3+</sup> Chromium	Mn <sup>2+</sup> Manganese	Fe <sup>2+</sup> Iron	Co <sup>2+</sup> Cobalt	Ni <sup>2+</sup> Nickel	Cu <sup>2+</sup> Copper	Zn <sup>2+</sup> Zinc	Ga <sup>3+</sup> Gallium	Ge <sup>4+</sup> Germanium	As <sup>3-</sup> Arsenic	Se <sup>2-</sup> Selenium	Br <sup>-</sup> Bromine	Kr Krypton												
5	Rb <sup>+</sup> Rubidium	Sr <sup>2+</sup> Strontium	Y Yttrium	Zr Zirconium	Nb Niobium	Mo Molybdenum	Tc Technetium	Ru Ruthenium	Rh Rhodium	Pd <sup>2+</sup> Palladium	Ag <sup>+</sup> Silver	Cd <sup>2+</sup> Cadmium	In <sup>3+</sup> Indium	Sn <sup>2+</sup> Tin	Sb <sup>3-</sup> Antimony	Te <sup>2-</sup> Tellurium	I <sup>-</sup> Iodine	Xe Xenon												
6	Cs <sup>+</sup> Cesium	Ba <sup>2+</sup> Barium											Hf Hafnium	Ta Tantalum	W Tungsten	Re Rhenium	Os Osmium	Ir Iridium	Pt <sup>2+</sup> Platinum	Au <sup>+</sup> Gold	Hg <sup>2+</sup> Mercury	Tl <sup>+</sup> Thallium	Pb <sup>2+</sup> Lead	Bi <sup>3-</sup> Bismuth	Po <sup>2-</sup> Polonium	At Astatine	Rn Radon			
7	Fr <sup>+</sup> Francium	Ra <sup>2+</sup> Radium											Rf Rutherfordium	Db Dubnium	Sg Seaborgium	Bh Bohrium	Hs Hassium	Mt Meitnerium	Uun Ununium	Uuu Ununium	Uub Unbinium		Uuq Unquadium		Uuh Unhassium					
8			La Lanthanum	Ce <sup>2+</sup> Cerium	Pr <sup>3+</sup> Praseodymium	Nd <sup>3+</sup> Neodymium	Pm <sup>3+</sup> Promethium	Sm <sup>2+</sup> Samarium	Eu <sup>2+</sup> Europium	Gd <sup>3+</sup> Gadolinium	Tb <sup>3+</sup> Terbium	Dy <sup>3+</sup> Dysprosium	Ho <sup>3+</sup> Holmium	Er <sup>3+</sup> Erbium	Tm <sup>3+</sup> Thulium	Yb <sup>2+</sup> Ytterbium	Lu <sup>3+</sup> Lutetium													
9			Ac <sup>3+</sup> Actinium	Th <sup>4+</sup> Thorium	Pa <sup>3+</sup> Protactinium	U <sup>3+</sup> Uranium	Np <sup>3+</sup> Neptunium	Pu <sup>3+</sup> Plutonium	Am <sup>3+</sup> Americium	Cm <sup>3+</sup> Curium	Bk <sup>3+</sup> Berkelium	Cf <sup>3+</sup> Californium	Es Einsteinium	Fm Fermium	Md Mendelevium	No Nobelium	Lr Lawrencium													

**Table 3-4c**  
**\*General characteristics of metals, nonmetals and metalloids**

Metals	Nonmetals	Metalloids
<ul style="list-style-type: none"> <li>• Hard and Shiny</li> <li>• 3 or less valence electrons</li> <li>• Form + ions by losing e-</li> <li>• Good conductors of heat and electricity</li> <li>• <i>written first when in compound</i></li> </ul>	<ul style="list-style-type: none"> <li>• Gases or dull, brittle solids</li> <li>• 5 or more valence electrons</li> <li>• Form - ions by gaining e-</li> <li>• Poor conductors of heat and electricity</li> </ul>	<ul style="list-style-type: none"> <li>• Appearance will vary</li> <li>• 3 to 7 valence electrons</li> <li>• Form + and/or - ions</li> <li>• Conduct better than nonmetals but not as well as metals</li> </ul>

**\* Remember that these are general characteristics, there are exceptions.**

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Symbol	Name	Period	Group	p+	n	e- config
K						
				82		
		3	VI A			
F						
	Nickel					
						2,8,18,18,1