

Elements

Periodic Table of the Elements

Group 1 1A																	13 3A	14 4A	15 5A	16 6A	17 7A	18 8A
1 H Hydrogen 1.0079																	5 B Boron 10.806	6 C Carbon 12.009	7 N Nitrogen 14.006	8 O Oxygen 15.999	9 F Fluorine 18.998	10 Ne Neon 20.180
2 Li Lithium 6.938	4 Be Beryllium 9.0122											11 1B	12 2B	13 Al Aluminum 26.982	14 Si Silicon 28.084	15 P Phosphorus 30.974	16 S Sulfur 32.059	17 Cl Chlorine 35.444	18 Ar Argon 39.948			
3 Na Sodium 22.990	12 Mg Magnesium 24.305	3 Sc Scandium 44.956	4 Ti Titanium 47.867	5 V Vanadium 50.942	6 Cr Chromium 51.996	7 Mn Manganese 54.938	8 Fe Iron 55.845	9 Co Cobalt 58.933	10 Ni Nickel 58.693	11 Cu Copper 63.546	12 Zn Zinc 65.38	13 Ga Gallium 69.723	14 Ge Germanium 72.63	15 As Arsenic 74.912	16 Se Selenium 78.96	17 Br Bromine 79.904	18 Kr Krypton 83.798					
4 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.867	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.63	33 As Arsenic 74.912	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.798					
5 Rb Rubidium 85.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.94	43 Tc Technetium 98.9062	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.91	46 Pd Palladium 106.42	47 Ag Silver 107.87	48 Cd Cadmium 112.41	49 In Indium 114.82	50 Sn Tin 118.71	51 Sb Antimony 121.76	52 Te Tellurium 127.60	53 I Iodine 126.90	54 Xe Xenon 131.29					
6 Cs Cesium 132.91	56 Ba Barium 137.33	72 Hf Hafnium 178.49	73 Ta Tantalum 180.95	74 W Tungsten 183.84	75 Re Rhenium 186.21	76 Os Osmium 190.21	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.97	80 Hg Mercury 200.59	81 Tl Thallium 204.38	82 Pb Lead 207.2	83 Bi Bismuth 208.98	84 Po Polonium (209)	85 At Astatine (210)	86 Rn Radon (222)						
7 Fr Francium (223)	88 Ra Radium (226)	104 Rf Rutherfordium (261)	105 Db Dubnium (262)	106 Sg Seaborgium (266)	107 Bh Bohrium (264)	108 Hs Hassium (265)	109 Mt Meitnerium (268)	110 Ds Darmstadtium (268)	111 Rg Roentgenium (268)	112 Cn Copernicium (268)	113 Uut Ununtrium (268)	114 Fl Flerovium (268)	115 Uup Ununpentium (268)	116 Lv Livermorium (268)	117 Uus Ununseptium (268)	118 Uuo Ununoctium (268)						
Lanthanides		57 La Lanthanum 138.91	58 Ce Cerium 140.12	59 Pr Praseodymium 140.91	60 Nd Neodymium 144.24	61 Pm Promethium (145)	62 Sm Samarium 150.36	63 Eu Europium 151.96	64 Gd Gadolinium 157.25	65 Tb Terbium 158.93	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93	68 Er Erbium 167.26	69 Tm Thulium 168.93	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.97						
Actinides		89 Ac Actinium (227)	90 Th Thorium 232.04	91 Pa Protactinium 231.04	92 U Uranium 238.03	93 Np Neptunium (237)	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (252)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium (259)	103 Lr Lawrencium (262)						

I. Elements, the Simplest Substances

A. An **element** is a pure substance that cannot be separated into simpler substances by physical or chemical means.

B. **Only One Type of Particle:** A pure substance is a substance in which there is only one type of particle (atoms).

1. **Ex.** Every atom in a 5 g nugget of gold is like every other atom of gold.



II. Properties of Elements

- A. Each element has its own characteristic properties that don't depend on the amount of the element present.
 - 1. Ex. Physical properties such as boiling point and density.
 - 2. Ex. Chemical properties such as reactivity with acid.

III. Classifying Elements by Their Properties

A. Categories of Elements

1. Metal: An element that is shiny and conducts heat and electricity well.
2. Nonmetal: An element that is dull and conducts heat and electricity poorly.
3. Metalloid: An element that has properties of both metals and nonmetals.



The Periodic Table

The image shows a 3D periodic table of elements. The elements are color-coded based on their properties:

- Metals:** Represented by green blocks. They occupy the left and central portions of the table.
- Nonmetals:** Represented by orange blocks. They are located in the top-right corner of the main body and the entire top-right section.
- Metalloids:** Represented by purple blocks. They form a diagonal line between the metals and nonmetals.

The table is organized into rows and columns, with numbers 1 through 18 indicating the atomic number of the elements. The main body of the table has 7 rows and 12 columns. The top-right section has 3 rows and 6 columns. The bottom section has 2 rows and 18 columns.

Proton Number

Relative Atomic Mass

Metal

Semi-Metal

Non-metal

18

1 2

13 14 15 16 17

2 4
He
Helium

3 7.0 Li Lithium	4 9.0 Be Beryllium
11 23.0 Na Sodium	12 24.3 Mg Magnesium

3 4 5 6 7 8 9 10 11 12

5 10.8 B Boron	6 12.0 C Carbon	7 14.0 N Nitrogen	8 16.0 O Oxygen	9 19.0 F Fluorine	10 20.1 Ne Neon
13 27.0 Al Aluminium	14 28.1 Si Silicon	15 31.0 P Phosphorus	16 32.1 S Sulphur	17 35.5 Cl Chlorine	18 39.9 Ar Argon

19 39 K Potassium	20 40.1 Ca Calcium	21 44.9 Sc Scandium	22 47.9 Ti Titanium	23 50.9 V Vanadium	24 52.0 Cr Chromium	25 54.9 Mn Manganese	26 55.8 Fe Iron	27 58.9 Co Cobalt	28 58.7 Ni Nickel	29 63.5 Cu Copper	30 65.4 Zn Zinc	31 69.7 Ga Gallium	32 72.6 Ge Germanium	33 75.0 As Arsenic	34 79.0 Se Selenium	35 79.9 Br Bromine	36 83.8 Kr Krypton
37 85.5 Rb Rubidium	38 87.6 Sr Strontium	39 88.9 Y Yttrium	40 91.2 Zr Zirconium	41 92.9 Nb Niobium	42 95.9 Mo Molybdenum	43 98 Tc Technetium	44 101.1 Ru Ruthenium	45 102.9 Rh Rhodium	46 106.4 Pd Palladium	47 107.8 Ag Silver	48 112.4 Cd Cadmium	49 114.8 In Indium	50 118.7 Sn Tin	51 121.8 Sb Antimony	52 127.6 Te Tellurium	53 126.9 I Iodine	54 131.3 Xe Xenon
55 132.9 Cs Caesium	56 137.3 Ba Barium	57 1 La Lanthanum	72 178.5 Hf Hafnium	73 178.5 Ta Tantalum	74 183.8 W Tungsten	75 186.2 Re Rhenium	76 186.2 Os Osmium	77 192.2 Ir Iridium	78 195.1 Pt Platinum	79 197.0 Au Gold	80 200.6 Hg Mercury	81 204.4 Tl Thallium	82 207.2 Pb Lead	83 208.9 Bi Bismuth	84 209 Po Polonium	85 210 At Astatine	86 222 Rn Radon
87 223 Fr Francium	88 226 Ra Radium	89 1 Ac Actinium	104 261 Rf Rutherfordium	105 262 Db Dubnium	106 263 Sg Seaborgium	107 264 Bh Bohrium	108 267 Hs Hassium	109 268 Mt Meitnerium	110 269 Ds Darmstadtium	111 272 Rg Roentgenium	112 285 Uub Ununbium	113 284 Uut Ununtrium	114 289 Uuq Ununquadium	115 288 Uup Ununpentium	116 292 Uuh Ununhexium	117 294 Uus Ununseptium	118 294 Uuo Ununoctium

58 138.9 Ce Cerium	59 140.9 Pr Praseodymium	60 144.2 Nd Neodymium	61 147 Pm Promethium	62 150.36 Sm Samarium	63 152.0 Eu Europium	64 157.3 Gd Gadolinium	65 158.9 Tb Terbium	66 162.5 Dy Dysprosium	67 164.9 Ho Holmium	68 167.3 Er Erbium	69 168.9 Tm Thulium	70 173.0 Yb Ytterbium	71 175.0 Lu Lutetium
90 232.0 Th Thorium	91 231.0 Pa Protactinium	92 238 U Uranium	93 237 Np Neptunium	94 244 Pu Plutonium	95 243 Am Americium	96 247 Cm Curium	97 247 Bk Berkelium	98 251 Cf Californium	99 252 Es Einsteinium	100 257 Fm Fermium	101 258 Md Mendelevium	102 259 No Nobelium	103 262 Lr Lawrencium

Lanthanide

Actinide