

# Elements

## Objectives:

Use a periodic table to name elements, given their symbols.

Use a periodic table to write the symbols of elements, given their names.

Describe the arrangement of the periodic table.

List the characteristics that distinguish metals, nonmetals, and metalloids.

# Elements

- Definition: Pure substances that cannot be decomposed by chemical changes.
- Building blocks of matter.
- Grouped based on similar chemical properties.

# Groups

Group→1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

- Each group has similar chemical properties.

# Periods

↓Period

- 1
  - 2
  - 3
  - 4
  - 5
  - 6
  - 7
- Properties change widely throughout a period.
  - Elements closer together will have similar properties rather than elements farther apart.

# Periodic Table of the Elements

1 IA H Hydrogen 1.008	2 IIA He Helium 4.003																	13 IIIA B Boron 10.811	14 IVA C Carbon 12.011	15 VA N Nitrogen 14.007	16 VIA O Oxygen 15.999	17 VIIA F Fluorine 18.998	18 VIIIA Ne Neon 20.180
3 Li Lithium 6.941	4 Be Beryllium 9.012																	5 Al Aluminum 26.982	6 Si Silicon 28.086	7 P Phosphorus 30.974	8 S Sulfur 32.065	9 Cl Chlorine 35.453	10 Ar Argon 39.948
11 Na Sodium 22.990	12 Mg Magnesium 24.305	3 III Sc Scandium 44.956	4 IV Ti Titanium 47.88	5 V Vanadium 50.942	6 VI Cr Chromium 51.996	7 VII Mn Manganese 54.938	8 VIII Fe Iron 55.845	9 VIII Co Cobalt 58.933	10 VIII Ni Nickel 58.693	11 IX Cu Copper 63.546	12 X Zn Zinc 65.38	13 Ga Gallium 69.723	14 Ge Germanium 72.61	15 As Arsenic 74.922	16 Se Selenium 78.96	17 Br Bromine 79.904	18 Kr Krypton 83.80						
19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.88	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 72.61	33 As Arsenic 74.922	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.80						
37 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 98.906	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.905	46 Pd Palladium 106.42	47 Ag Silver 107.868	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.71	51 Sb Antimony 121.757	52 Te Tellurium 127.6	53 I Iodine 126.905	54 Xe Xenon 131.29						
55 Cs Cesium 132.905	56 Ba Barium 137.327	57-71 Lanthanide Series	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.22	78 Pt Platinum 195.084	79 Au Gold 196.967	80 Hg Mercury 200.59	81 Tl Thallium 204.387	82 Pb Lead 207.2	83 Bi Bismuth 208.980	84 Po Polonium (209)	85 At Astatine 208.980	86 Rn Radon 222.018						
87 Fr Francium 223.018	88 Ra Radium 226.025	89-103 Actinide Series	104 Rf Rutherfordium (261)	105 Db Dubnium (262)	106 Sg Seaborgium (263)	107 Bh Bohrium (264)	108 Hs Hassium (265)	109 Mt Meitnerium (266)	110 Ds Darmstadtium (268)	111 Rg Roentgenium (269)	112 Cn Copernicium (284)	113 Uut Ununtrium (285)	114 Fl Flerovium (289)	115 Uup Ununpentium (288)	116 Lv Livermorium (293)	117 Uus Ununseptium (288)	118 Uuo Ununoctium (289)						

Lanthanide Series	57 La Lanthanum 138.905	58 Ce Cerium 140.12	59 Pr Praseodymium 140.908	60 Nd Neodymium 144.24	61 Pm Promethium 144.913	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.925	66 Dy Dysprosium 162.50	67 Ho Holmium 164.930	68 Er Erbium 167.26	69 Tm Thulium 168.934	70 Yb Ytterbium 173.054	71 Lu Lutetium 174.967
Actinide Series	89 Ac Actinium 227.033	90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	93 Np Neptunium 237.048	94 Pu Plutonium 244.064	95 Am Americium 243.061	96 Cm Curium 247.070	97 Bk Berkelium 247.070	98 Cf Californium 251.083	99 Es Einsteinium 252.083	100 Fm Fermium 257.103	101 Md Mendelevium 258.103	102 No Nobelium 259.103	103 Lr Lawrencium 260.103

# “Extra Rows”

## Lanthanide Series

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
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## Actinide Series

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
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- Placed below to keep the table from being too wide.

# Types of Elements

- Metals
- Nonmetals
- Metalloids
- Noble Gases

# Metals

- Definition:
  - an element that is a good electrical conductor and a good heat conductor.
- Characteristics:
  - Most are solids at room temperature
  - Malleability: physically changed into thin sheets
  - Ductile: formed into thin wire
  - Tensile Strength: resist breaking when pulled



# Metals

- Exceptions:
  - Mercury is a liquid at room temperature
  - Tungsten has the highest melting point of any element
  - Metals in group 1 can be cut with a knife
  - Manganese are brittle
  - Most are grayish except gold and copper

# Nonmetals

- Definition:
  - an element that is a poor of heat and electricity.
- Characteristics:
  - Most are gases at room temperature
  - Brittle: easily broken

# Metalloids

- Definition:
  - an element that has characteristics of metals and nonmetals
- Characteristics:
  - Most are solids at room temperature
  - Malleability: less than metals
  - Brittle: less than nonmetals
  - Semiconductors of electricity

# Noble Gases

- Definition:
  - an element that is a gas at room temperature
- Characteristics:
  - Most are gases at room temperature
  - Low reactivity