

## Metals

Approximately 80% of the elements on the periodic table are classified as metals. The elements that are considered metals are shown in the following diagram.

3 <b>Li</b> Lithium 6.9	4 <b>Be</b> Beryllium 9.0											13 <b>Al</b> Aluminum 27.0															
11 <b>Na</b> Sodium 23.0	12 <b>Mg</b> Magnesium 24.3																										
19 <b>K</b> Potassium 39.1	20 <b>Ca</b> Calcium 40.1	21 <b>Sc</b> Scandium 45.0	22 <b>Ti</b> Titanium 47.9	23 <b>V</b> Vanadium 50.9	24 <b>Cr</b> Chromium 52.0	25 <b>Mn</b> Manganese 54.9	26 <b>Fe</b> Iron 55.8	27 <b>Co</b> Cobalt 58.9	28 <b>Ni</b> Nickel 58.7	29 <b>Cu</b> Copper 63.5	30 <b>Zn</b> Zinc 65.4	31 <b>Ga</b> Gallium 69.7															
37 <b>Rb</b> Rubidium 85.5	38 <b>Sr</b> Strontium 87.6	39 <b>Y</b> Yttrium 88.9	40 <b>Zr</b> Zirconium 91.2	41 <b>Nb</b> Niobium 92.9	42 <b>Mo</b> Molybdenum 95.9	43 <b>Tc</b> Technetium (98)	44 <b>Ru</b> Ruthenium 101.1	45 <b>Rh</b> Rhodium 102.9	46 <b>Pd</b> Palladium 106.4	47 <b>Ag</b> Silver 107.9	48 <b>Cd</b> Cadmium 112.4	49 <b>In</b> Indium 114.8	50 <b>Sn</b> Tin 118.7	81 <b>Tl</b> Thallium 204.4	82 <b>Pb</b> Lead 207.2	83 <b>Bi</b> Bismuth 209.0	84 <b>Po</b> Polonium (209)										
55 <b>Cs</b> Cesium 132.9	56 <b>Ba</b> Barium 137.3	57 <b>La</b> Lanthanum 138.9	72 <b>Hf</b> Hafnium 178.5	73 <b>Ta</b> Tantalum 180.9	74 <b>W</b> Tungsten 183.8	75 <b>Re</b> Rhenium 186.2	76 <b>Os</b> Osmium 190.2	77 <b>Ir</b> Iridium 192.2	78 <b>Pt</b> Platinum 195.1	79 <b>Au</b> Gold 197.0	80 <b>Hg</b> Mercury 200.6	81 <b>Tl</b> Thallium 204.4	82 <b>Pb</b> Lead 207.2	83 <b>Bi</b> Bismuth 209.0	84 <b>Po</b> Polonium (209)												
87 <b>Fr</b> Francium (223)	88 <b>Ra</b> Radium (226)	89 <b>Ac</b> Actinium (227)	104 <b>Rf</b> Rutherfordium (261)	105 <b>Db</b> Dubnium (262)	106 <b>Sg</b> Seaborgium (263)	107 <b>Bh</b> Bohrium (262)	108 <b>Hs</b> Hassium (265)	109 <b>Mt</b> Meitnerium (266)																			
58 <b>Ce</b> Cerium 140.1	59 <b>Pr</b> Praseodymium 140.9	60 <b>Nd</b> Neodymium 144.2	61 <b>Pm</b> Promethium (145)	62 <b>Sm</b> Samarium 150.4	63 <b>Eu</b> Europium 152.0	64 <b>Gd</b> Gadolinium 157.3	65 <b>Tb</b> Terbium 158.9	66 <b>Dy</b> Dysprosium 162.5	67 <b>Ho</b> Holmium 164.9	68 <b>Er</b> Erbium 167.3	69 <b>Tm</b> Thulium 168.9	70 <b>Yb</b> Ytterbium 173.0	71 <b>Lu</b> Lutetium 175.0	90 <b>Th</b> Thorium 232.0	91 <b>Pa</b> Protactinium 231.0	92 <b>U</b> Uranium 238.0	93 <b>Np</b> Neptunium (237)	94 <b>Pu</b> Plutonium (244)	95 <b>Am</b> Americium (243)	96 <b>Cm</b> Curium (247)	97 <b>Bk</b> Berkelium (247)	98 <b>Cf</b> Californium (251)	99 <b>Es</b> Einsteinium (252)	100 <b>Fm</b> Fermium (257)	101 <b>Md</b> Mendelevium (258)	102 <b>No</b> Nobelium (259)	103 <b>Lr</b> Lawrencium (262)

### Chemical Properties

Metals react with oxygen to form oxides (compounds consisting of 2 elements: the metal and oxygen) that are basic. In some metals, this reaction can take years (e.g. iron rusting), while in others it can occur in seconds (burning potassium). Some metals form a layer of oxides on their surface, protecting them from further oxidation.

Many metals will react with acids to produce hydrogen gas and basic solutions.

### Physical Properties

Most metals are solids at room temperature. They are generally good conductors of electricity and heat, though some are better than others. Metals are opaque (not see-through), shiny and **lustrous** (glossy).

Most metals have higher densities than nonmetals. There is, however, great variation in the density of individual metals.

Most metals are **ductile**, which means they can be stretched into a wire. They are also **malleable**, which means they can be compressed into thin sheets by hammering or rolling.

## Nonmetals

Approximately 14% of the elements on the periodic table are classified as nonmetals, as shown in the following diagram.

1 <b>H</b> Hydrogen 1.0				2 <b>He</b> Helium 4.0
6 <b>C</b> Carbon 12.0	7 <b>N</b> Nitrogen 14.0	8 <b>O</b> Oxygen 16.0	9 <b>F</b> Fluorine 19.0	10 <b>Ne</b> Neon 20.2
	15 <b>P</b> Phosphorus 31.0	16 <b>S</b> Sulphur 32.1	17 <b>Cl</b> Chlorine 35.5	18 <b>Ar</b> Argon 39.9
		34 <b>Se</b> Selenium 79.0	35 <b>Br</b> Bromine 79.9	36 <b>Kr</b> Krypton 83.8
			53 <b>I</b> Iodine 126.9	54 <b>Xe</b> Xenon 131.3
				86 <b>Rn</b> Radon (222)

### Chemical Properties

Nonmetals react with oxygen to form oxides that are acidic.

### Physical Properties

Some nonmetals are gases, some are solids, and one (bromine) is a liquid at room temperature. Nonmetals tend to be poor conductors of heat and electricity when compared to metals. In solid form, they are dull and brittle (they tend to break, rather than bend or flatten).

Nonmetals tend to have lower densities, melting points, and boiling points than metals.

Only seventeen elements are considered nonmetals, compared to over 90 metals. However, nonmetals make up most of the crust, atmosphere and oceans of the earth. In addition, most of the tissues of living things are made up of nonmetals.

## Metalloids

Most elements can be classified as either metal or nonmetal based on their properties. However, some elements have properties of both metals and nonmetals. These elements are classified as **metalloids**, or semimetals.

The elements that are classified as metalloids are shown in the following diagram.

5 <b>B</b> Boron 10.8				
	14 <b>Si</b> Silicon 28.1			
	32 <b>Ge</b> Germanium 72.6	33 <b>As</b> Arsenic 74.9		
		51 <b>Sb</b> Antimony 121.8	52 <b>Te</b> Tellurium 127.6	
				85 <b>At</b> Astatine (210)

### Chemical Properties

Metalloids react to form oxides that are weak acids.

### Physical Properties

Metalloids are solids at room temperature, and often have a shiny or lustrous appearance. They tend to be brittle, and are average conductors of electricity and heat.

The metalloids have higher densities than nonmetals, but lower densities than metals.

On most periodic tables, a diagonal line drawn from boron (B) to polonium (Po) separates the metals from the nonmetals. Most of the elements that are on the line are metalloids.

