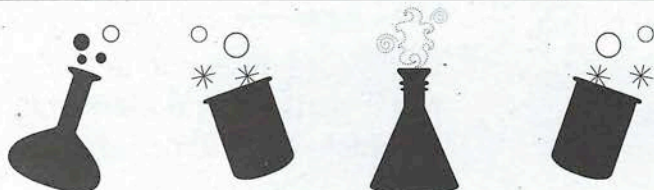


# Matter and Changes in State

What is matter? Matter is everything, and everything is matter. **Matter** is anything that takes up space and has mass. All the matter in the world can fit into one of three categories: element, compound, or mixture.

An **element** has only one ingredient. Elements can exist in nature, or humans can make them. An element is a building block for compounds and mixtures.

## The Periodic Table of Elements

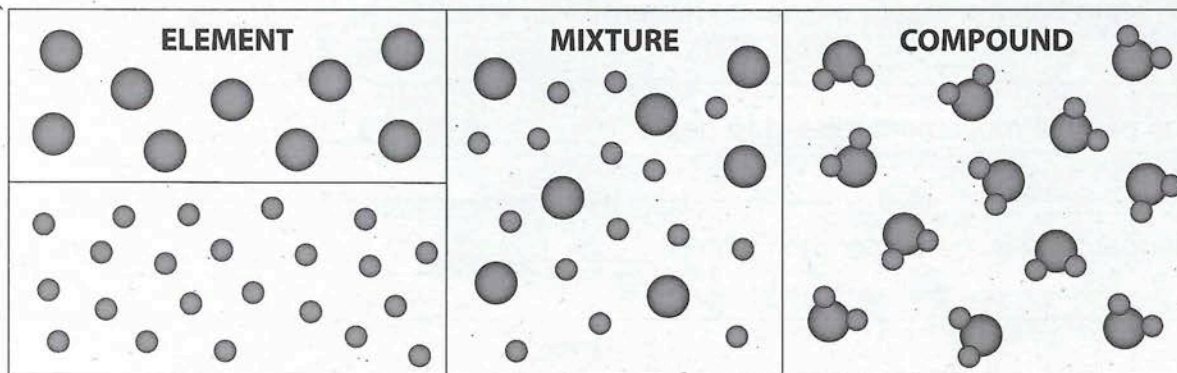


1 1A H Hydrogen 1.00794	2 IIA He Helium 4.002602	3 IIIB B Boron 10.811	4 IVA C Carbon 12.0107	5 VA N Nitrogen 14.00674	6 VIA O Oxygen 15.9994	7 VIIA F Fluorine 18.9984032	8 VIIIA Ne Neon 20.1797
3 Li Lithium 6.941	4 Be Beryllium 9.012182	5 Al Aluminum 26.981538	6 Si Silicon 28.0855	7 P Phosphorus 30.973761	8 S Sulfur 32.066	9 Cl Chlorine 35.453	10 Ar Argon 39.948
11 Na Sodium 22.989770	12 Mg Magnesium 24.3050	13 Ga Gallium 69.723	14 Ge Germanium 72.64	15 As Arsenic 74.92160	16 Se Selenium 78.96	17 Br Bromine 79.904	18 Kr Krypton 83.798
19 K Potassium 39.0983	20 Ca Calcium 40.078	21 Sc Scandium 44.955910	22 Ti Titanium 47.867	23 V Vanadium 50.9415	24 Cr Chromium 51.9961	25 Mn Manganese 54.938049	26 Fe Iron 55.8457
27 Co Cobalt 58.933200	28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.409	31 In Indium 114.818	32 Sn Tin 118.710	33 Sb Antimony 121.760	34 Te Tellurium 127.60
35 Br Bromine 79.904	36 Kr Krypton 83.798	37 Rb Rubidium 85.4678	38 Sr Strontium 87.62	39 Y Yttrium 88.90585	40 Zr Zirconium 91.224	41 Nb Niobium 92.90638	42 Mo Molybdenum 95.94
43 Tc Technetium (98)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.90550	46 Pd Palladium 106.42	47 Ag Silver 107.8682	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.710
51 Sb Antimony 121.760	52 Te Tellurium 127.60	53 I Iodine 126.90447	54 Xe Xenon 131.293	55 Cs Cesium 132.90545	56 Ba Barium 137.327	57 to 71 Lanthanides and Actinides	72 Hf Hafnium 178.49
73 Ta Tantalum 180.9479	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.222	78 Pt Platinum 195.078	79 Au Gold 196.96655	80 Hg Mercury 200.59
81 Tl Thallium 204.3833	82 Pb Lead 207.2	83 Bi Bismuth 208.9804	84 Po Polonium (209)	85 At Astatine (210)	86 Rn Radon (222)	87 Fr Francium (223)	88 Ra Radium (226)
89 to 103 Actinides	104 Rf Rutherfordium (261)	105 Db Dubnium (262)	106 Sg Seaborgium (266)	107 Bh Bohrium (264)	108 Hs Hassium (269)	109 Mt Meitnerium (268)	110 Ds Darmstadtium (271)
111 Rg Roentgenium (272)	112 Uub Ununbium (285)	113 Uut Ununtrium (284)	114 Uuq Ununquadium (289)	115 Uup Ununpentium (288)	116 Uuh Ununhexium (292)	117 Uus Ununseptium (294)	118 Uuo Ununoctium (294)
57 La Lanthanum 138.9055	58 Ce Cerium 140.116	59 Pr Praseodymium 140.90765	60 Nd Neodymium 144.24	61 Pm Promethium (145)	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25
65 Tb Terbium 158.92534	66 Dy Dysprosium 162.500	67 Ho Holmium 164.93032	68 Er Erbium 167.257	69 Tm Thulium 168.93421	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.967	89 Ac Actinium (227)
90 Th Thorium 232.0381	91 Pa Protactinium 231.03588	92 U Uranium 238.02891	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)		

Atomic masses in parentheses are those of the most stable or common isotope.

A **compound** is made of two or more elements that can be separated only chemically. For example, water is made of hydrogen and oxygen. It cannot be separated mechanically (with a hammer or by boiling), but it can be separated chemically.

A **mixture** is two or more substances mixed together. The substances combine to form one mixture, but each substance stays the same and does not change. Examples of mixtures are a salt-and-pepper mixture and trail mix (granola, nuts, berries, and so forth).



(continued)