## Matter

1.1

All living and non-living things are composed of **matter**. Using one of its most simple definitions, "Matter is anything that occupies space and has mass". Mass is simply the amount of matter that an object contains. Matter is composed of elements. Elements are substances that cannot be broken down into simpler materials by ordinary chemical processes. Some common elements that you have probably heard of are carbon, hydrogen, oxygen, and nitrogen. The building blocks for elements are atoms, which we will discuss in more detail later. In nature, there are 92 naturally occurring elements. In addition to these natural occurring elements, 26 "new" elements have been artificially produced. Based on their chemical properties, these elements can be organized into what is referred to as the periodic table of the elements. We will refer to this table frequently as we discuss the basic chemistry of the elements.

1 <b>H</b> 1.007						_					1						2 <b>He</b> 4.002
3 Li 6.941	4 Be 9.012		P	eri	••••	c Ta	5 <b>B</b> 10.811	6 C 12.010	7 <b>N</b> 14.006	8 0 15.999	9 <b>F</b> 8.998	10 Ne 20.179					
11 Na 22.989	12 Mg 24.305	Licificitio											14 Si 28.085	15 <b>P</b> 30.973	16 <b>S</b> 32.065	17 CI 35.453	18 <b>Ar</b> 39.948
19 <b>K</b> 39.098	20 Ca 40.078	21 Sc 44.955	22 <b>Ti</b> 47.867	23 V 50.941	24 Cr 51.996	25 Mn 54.938	Fe 55.845	26 27 Co 58.933	28 <b>Ni</b> 58.693	29 Cu 63.546	30 <b>Zn</b> 65.38	31 Ga 69.723	32 Ge 72.64	33 As 74.921	34 Se 78.96	35 <b>Br</b> 79.904	36 Kr 83.798
37 Rb 85.467	38 Sr 87.62	39 <b>Y</b> 88.905	40 Zr 91.224	41 Nb 92.906	42 Mo 95.96	43 <b>TC</b> 97.907	<b>Ru</b> 101.07	44 45 <b>Rh</b> 102.905	46 Pd 106.42	47 Ag 107.868	48 Cd 112.411	49 <b>In</b> 114.818	50 <b>Sn</b> 118.710	51 Sb 121.760	52 <b>Te</b> 127.60	53   126.904	54 Xe 131.293
55 Cs 132.905	56 Ba 137.327	v	72 <b>Hf</b> 178.49	73 <b>Ta</b> 180.947	74 W 183.84	75 <b>Re</b> 186.207	Os 190.23	76 77 Ir 192.217	78 Pt 195.084	79 Au 196.966	80 Hg 200.59	81 <b>TI</b> 204.383	82 Pb 207.2	83 Bi 208.980	84 Po 208.982	85 At 209.987	86 <b>Rn</b> 222.017
87 Fr 223	88 <b>Ra</b> 226		104 Rf 261	105 262	106 Sg 266	107 Bh 264	1 Hs 277	08 109 Mt 268	110 Ds 271	111 <b>Rg</b> 272	112 Uub 285	113 Uut 284	114 Uuq 289	115 Uup 288	116 Uuh 292	Uus <sup>117</sup>	118 Uuo 294
		57 <b>La</b> 138.905	58 <b>Ce</b> 140.116	59 <b>Pr</b> 140.907	60 Nd 144.242	61 <b>Pm</b> 145	<b>Sm</b> 150.36	62 63 Eu 151.964	64 Gd 157.25	65 <b>Tb</b> 158.925	66 Dy 162:500	67 <b>Ho</b> 164.930	68 Er 167.259	69 <b>Tm</b> 168.934	70 <b>Yb</b> 173.054	71 Lu 174.966	
		89 AC 227	90 <b>Th</b> 232.038	91 Pa 231.035	92 U 238.028	93 Np 237	<b>Pu</b> 244	94 95 <b>Am</b> 243	96 Cm 247	97 <b>Bk</b> 247	98 Cf 251	99 Es 252	100 Fm 257	101 Md 258	102 No 259	103 Lr 262	

## Periodic Table of the Elements, created by BYU-I student Hannah Crowder, Spring 2011

The figure above is a "Periodic Table of the Elements." The elements highlighted in yellow make up 96% of living matter namely Carbon (C), Hydrogen (H), Oxygen (O) and Nitrogen (N). The nine elements highlighted in green: Phosphorus (P), Sodium (Na), Potassium (K), Calcium (Ca), Magnesium (Mg), Sulfur (S), Chlorine (Cl), Iron (Fe), and Iodine (I) are considered major essential elements for living matter. The elements highlighted in blue, Vanadium (V), Chromium (Cr), Manganese (Mn), Cobalt (Co), Molybdenum (Mo), Zinc (Zn), Silicon (Si), Fluorine (F), Selenium (Se) and Tin (Sn) are considered minor or trace essential elements for living matter. Major elements are simply found in higher

concentrations in body systems than the minor elements. They are considered essential because the must be consumed and are "essential" for biochemical processes.

Notice that each element is represented by a 1 or 2 letter symbol. Often, these symbols are the first letter or letters in the name of the element: **H** for hydrogen, **C** for carbon, and **He** for helium. Occasionally, however, the symbols represent the Latin name for the element; hence, the symbol for sodium is **Na** for the Latin Natrium, and the symbol for Potassium is **K** for the Latin Kalium.

Subatomic Particles

Radioisotopes





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