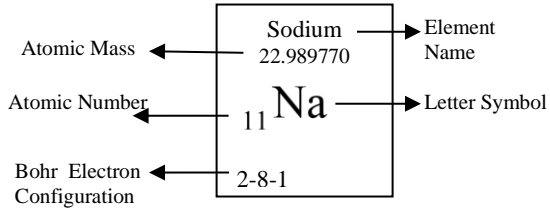


1												18						
Hydrogen 1.00794 1_1H												Helium 4.002602 2_2He						
2												13	14	15	16	17		
Lithium 6.941 3_3Li 2-1	Beryllium 9.012182 4_4Be 2-2												Boron 10.811 5_5B 2-3	Carbon 12.0107 6_6C 2-4	Nitrogen 14.00674 7_7N 2-5	Oxygen 15.9994 8_8O 2-6	Fluorine 18.9984 9_9F 2-7	Neon 20.1797 10_{10}Ne 2-8
Sodium 22.989770 11_{11}Na 2-8-1	Magnesium 24.3050 12_{12}Mg 2-8-2	3	4	5	6	7	8	9	10	11	12	Aluminum 26.98153 13_{13}Al 2-8-3	Silicon 28.0855 14_{14}Si 2-8-4	Phosphorus 30.973761 15_{15}P 2-8-5	Sulfur 32.066 16_{16}S 2-8-6	Chlorine 35.4527 17_{17}Cl 2-8-7	Argon 39.948 18_{18}Ar 2-8-8	
Potassium 39.0983 19_{19}K 2-8-8-1	Calcium 40.078 20_{20}Ca 2-8-8-2	Scandium 44.955910 21_{21}Sc 2-8-9-2	Titanium 47.867 22_{22}Ti 2-8-10-2	Vanadium 50.9415 23_{23}V 2-8-11-2	Chromium 51.9961 24_{24}Cr 2-8-13-1	Manganese 54.938049 25_{25}Mn 2-8-13-2	Iron 55.845 26_{26}Fe 2-8-14-2	Cobalt 58.933200 27_{27}Co 2-8-15-2	Nickel 58.6934 28_{28}Ni 2-8-16-2	Copper 63.546 29_{29}Cu 2-8-18-1	Zinc 65.39 30_{30}Zn 2-8-18-2	Gallium 69.723 31_{31}Ga 2-8-18-3	Germanium 72.61 32_{32}Ge 2-8-18-4	Arsenic 74.92160 33_{33}As 2-8-18-5	Selenium 78.96 34_{34}Se 2-8-18-6	Bromine 79.904 35_{35}Br 2-8-18-7	Krypton 83.80 36_{36}Kr 2-8-18-8	
Rubidium 85.4678 37_{37}Rb 2-8-18-8-1	Strontium 87.62 38_{38}Sr 2-8-18-8-2	Yttrium 88.90585 39_{39}Y 2-8-18-9-2	Zirconium 91.224 40_{40}Zr 2-8-18-10-2	Niobium 92.90638 41_{41}Nb 2-8-18-12-1	Molybdenum 95.94 42_{42}Mo 2-8-18-13-1	Technetium (98) 43_{43}Tc 2-8-18-14-1	Ruthenium 101.07 44_{44}Ru 2-8-18-15-1	Rhodium 102.90550 45_{45}Rh 2-8-18-16-1	Palladium 106.42 46_{46}Pd 2-8-18-18	Silver 107.8682 47_{47}Ag 2-8-18-18-1	Cadmium 112.411 48_{48}Cd 2-8-18-18-2	Indium 114.818 49_{49}In 2-8-18-18-3	Tin 118.710 50_{50}Sn 2-8-18-18-4	Antimony 121.760 51_{51}Sb 2-8-18-18-5	Tellurium 127.60 52_{52}Te 2-8-18-18-6	Iodine 126.90447 53_{53}I 2-8-18-18-7	Xenon 131.29 54_{54}Xe 2-8-18-18-8	
Cesium 132.90545 55_{55}Cs ** -18-8-1	Barium 137.327 56_{56}Ba -18-8-2	Lanthanum 138.9055 57_{57}La -18-9-2	Hafnium 178.49 72_{72}Hf -32-10-2	Tantalum 180.9479 73_{73}Ta -32-11-2	Tungsten 183.84 74_{74}W -32-12-2	Rhenium 186.207 75_{75}Re -32-13-2	Osmium 190.23 76_{76}Os -32-14-2	Iridium 192.217 77_{77}Ir -32-15-2	Platinum 195.078 78_{78}Pt -32-17-1	Gold 196.96655 79_{79}Au -32-18-1	Mercury 200.59 80_{80}Hg -32-18-2	Thallium 204.3833 81_{81}Tl -32-18-3	Lead 207.2 82_{82}Pb -32-18-4	Bismuth 208.98038 83_{83}Bi -32-18-5	Polonium (209) 84_{84}Po -32-18-6	Astatine (210) 85_{85}At -32-18-7	Radon (222) 86_{86}Rn -32-18-8	
Francium (223) 87_{87}Fr -32-18-8-1	Radium (226) 88_{88}Ra -32-18-8-2	Actinium (227) 89_{89}Ac -32-18-9-2	<i>Rutherfordium</i> (267) 104_{104}Rf	<i>Dubnium</i> (268) 105_{105}Db	<i>Seaborgium</i> (271) 106_{106}Sg	<i>Bhорий</i> (272) 107_{107}Bh	<i>Hassium</i> (270) 108_{108}Hs	<i>Meitnerium</i> (276) 109_{109}Mt	<i>Darmstadtium</i> (281) 110_{110}Ds	<i>Roentgenium</i> (280) 111_{111}Rg	<i>Copernicium</i> (285) 112_{112}Cn	<i>Uut</i> 113_{113}Uut	<i>Flerovium</i> (289) 114_{114}Fl	<i>Uup</i> 115_{115}Uup	<i>Livermorium</i> (293) 116_{116}Lv	<i>Uus</i> 117_{117}Uus		



These ** indicate that there are energy levels of 2-8-18 for elements 55 & above

Key:
italicized symbols = synthetic (human made)

an entry in () indicates the longest lived isotope of an element for which the atomic mass is indeterminate

Cerium 140.116 58_{58}Ce	Praseodymium 140.90765 59_{59}Pr	Neodymium 144.24 60_{60}Nd	Promethium (145) 61_{61}Pm	Samarium 150.36 62_{62}Sm	Europium 151.964 63_{63}Eu	Gadolinium 157.25 64_{64}Gd	Terbium 158.92534 65_{65}Tb	Dysprosium 162.500 66_{66}Dy	Holmium 164.93032 67_{67}Ho	Erbium 167.259 68_{68}Er	Thulium 168.93421 69_{69}Tm	Ytterbium 173.054 70_{70}Yb	Lutetium 174.9668 71_{71}Lu
Thorium 232.038 90_{90}Th	Protactinium 231.03588 91_{91}Pa	Uranium 238.0289 92_{92}U	Neptunium (237) 93_{93}Np	Plutonium (244) 94_{94}Pu	Americium (243) 95_{95}Am	Curium (247) 96_{96}Cm	Berkelium (247) 97_{97}Bk	Californium (251) 98_{98}Cf	Einsteinium (252) 99_{99}Es	Fermium (257) 100_{100}Fm	Mendelevium (258) 101_{101}Md	Nobelium (259) 102_{102}No	Lawrencium (262) 103_{103}Lr

hydrogen
H
1 NM

helium
He
2 NG

name
symbol
atomic number M
SM
NM
NG

Metal
SemiMetal
NonMetal
Noble Gas

1		2										13	14	15	16	17	18
lithium Li 3 M	beryllium Be 4 M									<i>boron</i> B 5 SM	carbon C 6 NM	nitrogen N 7 NM	oxygen O 8 NM	fluorine F 9 NM	neon Ne 10 NG		
sodium Na 11 M	magnesium Mg 12 M	3	4	5	6	7	8	9	10	11	12	aluminum Al 13 M	<i>silicon</i> Si 14 SM	<i>phosphorus</i> P 15 NM	sulfur S 16 NM	chlorine Cl 17 NM	argon Ar 18 NG
potassium K 19 M	calcium Ca 20 M	scandium Sc 21 M	titanium Ti 22 M	vanadium V 23 M	chromium Cr 24 M	manganese Mn 25 M	iron Fe 26 M	cobalt Co 27 M	nickel Ni 28 M	copper Cu 29 M	zinc Zn 30 M	gallium Ga 31 M	<i>germanium</i> Ge 32 SM	<i>arsenic</i> As 33 SM	selenium Se 34 NM	bromine Br 35 NM	krypton Kr 36 NG
rubidium Rb 37 M	strontium Sr 38 M	yttrium Y 39 M	zirconium Zr 40 M	niobium Nb 41 M	molybdenum Mo 42 M	technetium Tc 43 M	ruthenium Ru 44 M	rhodium Rh 45 M	palladium Pd 46 M	silver Ag 47 M	cadmium Cd 48 M	indium In 49 M	tin Sn 50 M	<i>antimony</i> Sb 51 SM	<i>tellurium</i> Te 52 SM	iodine I 53 NM	xenon Xe 54 NG
cesium Cs 55 M	barium Ba 56 M	lanthanum La 57 M	hafnium Hf 72 M	tantalum Ta 73 M	tungsten W 74 M	rhenium Re 75 M	osmium Os 76 M	iridium Ir 77 M	platinum Pt 78 M	gold Au 79 M	mercury Hg 80 M	thallium Tl 81 M	lead Pb 82 M	bismuth Bi 83 M	polonium Po 84 M	astatine At 85 NM	radon Rn 86 NG
francium Fr 87 M	radium Ra 88 M	actinium Ac 89 M	<i>rutherfordium</i> Rf 104 M	dubnium Db 105 M	<i>seaborgium</i> Sg 106 M	bohrium Bh 107 M	hassium Hs 108 M	meitnerium Mt 109 M	damstadtium Ds 110 M	roentgenium Rg 111 M	copernicium Cn 112 M	Uut	flerovium Fl 114 M	Uup	livermorium Lv 116 M	Uus 117 M	

<i>cerium</i> Ce 58 M	<i>praseodymium</i> Pr 59 M	neodymium Nd 60 M	<i>promethium</i> Pm 61 M	samarium Sm 62 M	europium Eu 63 M	gadolinium Gd 64 M	terbium Tb 65 M	<i>dysprosium</i> Dy 66 M	holmium Ho 67 M	erbium Er 68 M	thulium Tm 69 M	ytterbium Yb 70 M	lutetium Lu 71 M
thorium Th 90 M	<i>protactinium</i> Pa 91 M	uranium U 92 M	<i>neptunium</i> Np 93 M	plutonium Pu 94 M	americium Am 95 M	curium Cm 96 M	berkelium Bk 97 M	californium Cf 98 M	einsteinium Es 99 M	fermium Fm 100 M	<i>mendelevium</i> Md 101 M	nobelium No 102 M	<i>lawrencium</i> Lr 103 M

Table of Common Polyatomic Ions

<u>Name</u>	<u>Formula</u>	<u>Name</u>	<u>Formula</u>
Acetate	$C_2H_3O_2^{-1}$	Hypochlorite	ClO^{-1}
Ammonium <i>(not ammonia)</i>	NH_4^{+1}	Iodate	IO_3^{-1}
Arsenate	AsO_4^{-3}	Nitrate	NO_3^{-1}
Carbonate	CO_3^{-2}	Nitrite	NO_2^{-1}
Chlorate	ClO_3^{-1}	Perchlorate	ClO_4^{-1}
Chlorite	ClO_2^{-1}	Peroxide	O_2^{2-}
Chromate	CrO_4^{-2}	Phosphate	PO_4^{-3}
Cyanide	CN^{-1}	Sulfate	SO_4^{-2}
Dichromate	$Cr_2O_7^{-2}$	Sulfite	SO_3^{-2}
Hydrogen Carbonate	HCO_3^{-1}	Thiocyanate	SCN^{-1}
Hydroxide	OH^{-1}	Thiosulfate	$S_2O_3^{-2}$

Note₁: Example: In the compound $Ca(NO_3)_2$ there are 2 nitrate groups 2 (NO_3^{-1}) groups for every 1 Ca^{2+}

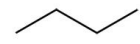


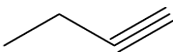
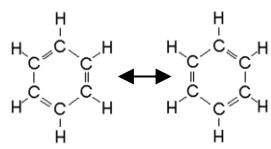
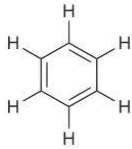


Note₂: Using the suffix *-ate* as the standard:

-ite = 1 fewer oxygen
per = 1 more oxygen
hypo = 2 fewer oxygen

Table of Common Acids

<u>Name</u>	<u>Formula</u>	<u>Descriptors</u>
hydrochloric acid	$HCl_{(aq)}$	strong & inorganic
hydrosulfuric acid	$H_2S_{(aq)}$	weak & inorganic
hydrobromic acid	$HBr_{(aq)}$	strong & inorganic
carbonic acid	$H_2CO_{3(aq)}$	weak & inorganic
ethanoic acid	$CH_3COOH_{(aq)}$	weak & organic
hypochlorous acid	$HClO_{(aq)}$	weak & inorganic
nitric acid	$HNO_{3(aq)}$	strong & inorganic
oxalic acid	$H_2C_2O_{4(aq)}$	weak & organic
phosphoric acid	$H_3PO_{4(aq)}$	weak & inorganic
sulfuric acid	$H_2SO_{4(aq)}$	strong & inorganic

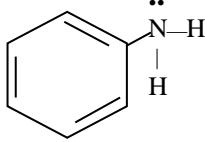
The Hydrocarbons

Family	General Formula	Examples			
		Formula	Name	Structure	Other Views
alkane	C_nH_{2n+2}	C_4H_{10}	butane	$ \begin{array}{cccc} & H & H & H & H \\ & & & & \\ H & -C & -C & -C & -C-H \\ & & & & \\ & H & H & H & H \end{array} $	 
alkene	C_nH_{2n}	C_4H_8	1-butene	$ \begin{array}{cccc} & H & H & & \\ & & & & \\ H & -C & -C & =C & -H \\ & & & & \\ & H & H & H & H \end{array} $	 $H_3C-CH_2-CH=CH_2$
alkyne	C_nH_{2n-2}	C_4H_6	1-butyne	$ \begin{array}{cccc} & H & H & & \\ & & & & \\ H & -C & -C & \equiv C & -H \\ & & & & \\ & H & H & & \end{array} $	 CH_3CH_2CCH
arene (aromatic hydrocarbon) <small>note: the term aromatic refers to a closed ring with C or N with alternating double bonds</small>	C_nH_{2n-6}	C_6H_6	benzene		  

where "n" equals the number of carbons in the longest (parent) chain

Organic Prefixes	
# of carbons	Prefix
1	meth
2	eth
3	prop pron: prōp
4	but (pron like beaut-y)
5	pent
6	hex
7	hept
8	oct
9	non
10	dec
12	dodec (laur-yl)
16	Hexadec (cet-yl or myrist-ic)
18	octadec (stear-yl)
20	eicos (arachid-ic)

Organic Compounds & Functional Groups

Class	Description	Examples of molecular or condensed formula	^a Example / Structure	^b Example / Structure
Alcohol (Mono-hydroxy)	R-OH 1 (O-H) group bonded to a carbon. Soluble in water (polar molecule)	^a C ₃ H ₇ OH ^b C ₄ H ₉ OH	^a 1-propanol $\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{O}-\text{H} \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array}$	^b 2-butanol $\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{OH} \quad \text{H} \quad \text{H} \end{array}$
Alcohol (Glycol or Dihydroxy)	2 O-H groups (or OH groups) bonded to carbon. Soluble in water (polar molecule)	^a C ₂ H ₄ (OH) ₂ ^b C ₃ H ₆ (OH) ₂	^a 1,2-ethanediol (ethylene glycol) $\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{H} \\ \quad \\ \text{OH} \quad \text{OH} \end{array}$	^b 1,2-propanediol (propylene glycol) $\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \text{O}-\text{H} \quad \text{O}-\text{H} \end{array}$
Ester	$\begin{array}{c} \text{O} \\ \\ \text{R}-\text{O}-\text{C}-\text{R}' \end{array}$ The product of an alcohol & organic acid reaction.	^a CH ₃ COOCH ₃ ^b C ₂ H ₅ OOCC ₂ H ₅	^a methyl ethanoate $\begin{array}{c} \text{H} \quad \text{O} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{O}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \quad \text{H} \end{array}$	^b ethyl propanoate $\begin{array}{c} \text{H} \quad \text{H} \quad \text{O} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \quad \\ \text{H} \quad \text{H} \quad \quad \text{H} \quad \text{H} \end{array}$
Ketone	$\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{R}' \end{array}$ A carbonyl group on an "interior" or non-terminal carbon	^a C ₃ H ₆ O ^b C ₆ H ₁₂ O	^a 2-propanone (acetone) $\begin{array}{c} \text{H} \quad \text{O} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \quad \text{H} \end{array}$	^b 3-hexanone $\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \quad \text{O} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \quad \text{H} \quad \text{H} \end{array}$
Carboxylic Acid (the most common form of organic acid)	$\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{O}-\text{H} \end{array}$ A carboxyl group (COOH) bonded to a carbon. Soluble in water	^a CH ₃ COOH ^b C ₂ H ₅ COOH	^a ethanoic acid (acetic acid) $\begin{array}{c} \text{H} \quad \text{O} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{H} \\ \\ \text{H} \end{array}$	^b propanoic acid $\begin{array}{c} \text{H} \quad \text{H} \quad \text{O} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{O}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array}$
Amine (simple)	$\begin{array}{c} \text{R}-\text{N}-\text{H} \\ \\ \text{H} \end{array}$ An organic derivative of NH ₃ (at least one H is replaced with an organic group. A weak base (B-L))	^a C ₃ H ₇ NH ₂ ^b C ₆ H ₅ NH ₂	^a 1-propanamine (1-propylamine) $\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{N}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$	^b aniline 
Halide (Halocarbon)	R-X Halogen(s) substituted onto a hydrocarbon, by removing hydrogen(s)	^a C ₃ H ₇ Br ^b C ₃ H ₆ F ₂	^a 1-bromopropane $\begin{array}{c} \text{Br} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array}$	^b 1,2-difluoropropane $\begin{array}{c} \text{H} \quad \text{H} \quad \text{F} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \text{F} \quad \text{H} \end{array}$