Sodium

22.989770



2-8-1

Element Name

Bohr Electron Configuration

Atomic Number

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

Letter Symbol

Atomic Mass

Cerium

140.116



Praseodymium

140.90765



Neodymium

144.24



Thorium

232.038



Promethium

(145)

**

Protactinium

231.03588



Uranium

238.0289



Neptunium

(237)



Samarium

150.36



Plutonium

(244)



Europium

151.964



Americium

(243)



Gadolinium

157.25



Curium

(247)



Terbium

158.92534



Dysprosium

162.500



Holmium

164.93032



Berkelium

(247)



Erbium

167.259



Californium

(251)



Einsteinium

(252)



Fermium

(257)

Thulium

168.93421



Mendelevium

(258)



Ytterbium

173.054



Nobelium

(259)



Lutetium

174.9668



Lawrencium

(262)



Key:

*italicized symbols* = synthetic (human made)

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

Beryllium

9.012182



2-2

Boron

10.811



2-3

Carbon

12.0107



2-4

Nitrogen

14.00674



2-5

Oxygen

15.9994



2-6

Fluorine

18.9984



2-7

Neon

20.1797



**2-8**

Lithium

6.941



2-1

Sodium

22.989770

 2-8-1

Magnesium

24.3050

2-8-2

Aluminum

26.98153



2-8-3

Silicon

28.0855



2-8-4

Phosphorus

30.973761



**2-8-5**

Sulfur

32.066



**2-8-6**

Chlorine

35.4527



2-8-7

Argon

39.948

 **2-8-8**

Potassium

39.0983



2-8-8-1

Calcium

40.078



2-8-8-2

Scandium

44.955910



2-8-9-2

Titanium

47.867

 2-8-10-2

Vanadium

50.9415



2-8-11-2

Chromium

51.9961



2-8-13-1

Manganese

54.938049



2-8-13-2

Iron

55.845



2-8-14-2



Cobalt

58.933200



2-8-15-2

Nickel

58.6934



2-8-16-2

Copper

63.546



2-8-18-1

Zinc

65.39



2-8-18-2

Gallium

69.723



2-8-18-3

Germanium

72.61



2-8-18-4

Arsenic

74.92160



2-8-18-5

Selenium

78.96



2-8-18-6

Bromine

79.904



2-8-18-7

Krypton

83.80



**2-8-18-8**

Rubidium

85.4678

 2-8-18-8-1

Strontium

87.62



2-8-18-8-2

Yttrium

88.90585

 2-8-18-9-2

Zirconium

91.224

 2-8-18-10-2

Niobium

92.90638



2-8-18-12-1

Molybdenum

95.94



2-8-18-13-1

Technetium

(98)



2-8-18-14-1

Ruthenium

101.07



2-8-18-15-1

Rhodium

102.90550



2-8-18-16-1

Palladium

106.42



2-8-18-18

Silver

107.8682



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Rutherfordium

(267)



Dubnium

(268)

Seaborgium

(271)



Bhorium

(272)



Hassium

(270)



Meitnerium

(276)



Darmstadtium

(281)



Roentgenium

(280)



Copernicium

(285)





Flerovium

(289)





Livermorium

(293)





Hydrogen

1.00794



1

Helium

4.002602



**2**

3 4 5 6 7 8 9 10 11 12

1

2

13 14 15 16 17

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Hydrogen

1.00794



1

Helium

4.002602



**2**

helium

He

2 NG

thorium

Th

90 M

protactinium

Pa

91 M

uranium

U

92 M

neptunium

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

mendelevium

Md

101 M

nobelium

No

102 M

lawrencium

Lr

103 M

hydrogen

H

1 NM

berylium

Be

4 M

magnesium

Mg

12 M

calcium

Ca

20 M

strontium

Sr

38 M

barium

Ba

56 M

radium

Ra

88 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

cerium

Ce

58 M

praeseodymium

Pr

59 M

neodymium

Nd

60 M

promethium

Pm

61 M

samarium

Sm

62 M

europium

Eu

63 M

gadolinium

Gd

64 M

terbium

Tb

65 M

dysprosium

Dy

66 M

holmium

Ho

67 M

erbium

Er

68 M

thulium

Tm

69 M

ytterbium

Yb

70 M

lutetium

Lu

71 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

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

actinum

Ac

89 M

rutherfordium

Rf

104 M

dubnium

Db

105 M

seaborgium

Sg

106 M

bohrium

Bh

107 M

hassium

Hs

108 M

meitnerium

Mt

109 M

damstadtium

Ds

110 M

roentgentium

Rg

111 M

copernicium

Cn

112 M

lithium

Li

3 M

sodium

Na

11 M

potassium

K

19 M

rubidium

Rb

37 M

cesium

Cs

55 M

francium

Fr

87 M

*boron*

*B*

*5 SM*

aluminum

Al

13 M

gallium

Ga

31 M

indium

In

49 M

thallium

Tl

81 M

Uut

carbon

C

6 NM

*silicon*

*Si*

*14 SM*

*germanium*

*Ge*

*32 SM*

tin

Sn

50 M

lead

Pb

82 M

flerovium

Fl

114 M

nitrogen

N

7 NM

**phosphorus**

P

15 NM

*arsenic*

*As*

*33 SM*

*antimony*

*Sb*

*51 SM*

bismuth

Bi

83 M

Uup

fluorine

F

9 NM

chlorine

Cl

17 NM

bromine

Br

35 NM

iodine

I

53 NM

astatine

At

85 NM

Uus

117 M

oxygen

O

8 NM

sulfur

S

16 NM

selenium

Se

34 NM

*tellurium*

*Te*

*52 SM*

polonium

Po

84 M

livermorium

Lv

116 M

neon

Ne

10 NG

argon

Ar

18 NG

krypton

Kr

36 NG

xenon

Xe

54 NG

radon

Rn

86 NG

1 2

3 4 5 6 7 8 9 10 11 12

13 14 15 16 17 18

name

symbol

atomic M

number SM

NM

NG

Metal

SemiMetal

NonMetal

Noble Gas

Table of Common Polyatomic Ions

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Formula | Name | Formula |
| Acetate | C2H3O2-1 | Hypochlorite | ClO-1 |
| Ammonium  (*not* ammonia) | NH4+1 | Iodate | IO3-1 |
| Arsenate | AsO4-3 | Nitrate | NO3-1 |
| Carbonate | CO3-2 | Nitrite | NO2-1 |
| Chlorate | ClO3-1 | Perchlorate | ClO4-1 |
| Chlorite | ClO2-1 | Peroxide | O22- |
| Chromate | CrO4-2 | Phosphate | PO4-3 |
| Cyanide | CN-1 | Sulfate | SO4-2 |
| Dichromate | Cr2O7-2 | Sulfite | SO3-2 |
| Hydrogen  Carbonate | HCO3-1 | Thiocyanate | SCN-1 |
| Hydroxide | OH-1 | Thiosulfate | S2O3 -2 |

Note1: Example: In the compound Ca(NO3)2 there are 2 nitrate groups 2 (NO3-1) groups for every 1 Ca2+

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

*-ite* = 1 fewer oxygen

*per* = 1 more oxygen

*hypo* = 2 fewer oxgyen

Table of Common Acids

|  |  |  |
| --- | --- | --- |
| Name | Formula | Descriptors |
| hydrochloric acid | HCl(aq) | strong & inorganic |
| hydrosulfuric acid | H2S(aq) | weak & inorganic |
| hydrobromic acid | HBr(aq) | strong & inorganic |
|  |  |  |
| carbonic acid | H2CO3(aq) | weak & inorganic |
| ethanoic acid | CH3COOH(aq) | weak & organic |
| hypochlorous acid | HClO(aq) | weak & inorganic |
| nitric acid | HNO3(aq) | strong & inorganic |
| oxalic acid | H2C2O4(aq) | weak & organic |
| phosphoric acid | H3PO4(aq) | weak & inorganic |
| sulfuric acid | H2SO4(aq) | strong & inorganic |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | **The Hydrocarbons** | | | | |
|  |  | | Examples | | | | |
| Family | General  Formula | | Formula | Name | Structure  H H H H  | | | |  H—C—C—C—C—H  | | | |  H H H H | Other Views | |
| alkane | CnH2n+2 | | C4H10 | butane |  | http://www.edinformatics.com/interactive_molecules/3D/butane_structure.jpg  http://upload.wikimedia.org/wikipedia/commons/7/79/Butane_Molecule_3D.jpg | |
| alkene | CnH2n | | C4H8 | 1-butene | H H  | |  H—C—C—C C—H  | | | |  H H H H  H H  | |  H—C—C—C C—H  | |  H H | butene_1.gif | |
| alkyne | CnH2n-2 | | C4H6 | 1-butyne |  | http://wtt-lite.nist.gov/images/107006.gif  CH3CH2CCH | |
| arene  (aromatic  hydrocarbon)  note: the term *aromatic* refers to a closed ring with C or N with alternating double bonds | CnH2n-6 | | C6H6 | benzene |  | http://t0.gstatic.com/images?q=tbn:ANd9GcTA0vA4dsvP1DxQV0StQMnR52KV2DFqwYA2n2zbba1lYpE5aBcB | |
|  | | 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 C3H7OH  b C4H9OH | a1-propanol  H H H  | | |  H—C—C—C—O-H  | | |  H H H | b 2-butanol  H H H H  | | | |  H—C—C—C—C—H  | | | |  H OH H H |
| Alcohol  (Glycol or Dihydroxy) | 2 O-H groups (or OH groups ) bonded to carbon. Soluble in water (polar molecule) | a C2H4(OH)2  b C3H6(OH)2 | a1,2-ethanediol (ethylene glycol)  H H  | |  H—C—C—H  | |  OH OH | b1,2-propanediol (propylene glycol)  H H H  | | |  H—C—C—C—H  | | |  H O-H O-H |
| Ester | O  ||  R—O—C—R'  The product of an alcohol & organic acid reaction. | a CH3OOCCH3  b C2H5OOCC2H5 | a methyl ethanoate  H O H  | || |  H—C—O—C—C—H  | |  H H | b ethyl propanoate  H H O H H  | | || | |  H—C— C—O—C—C—C—H  | | | |  H H H H |
| Ketone | O  ||  R— C—R**'**  A **carbonyl group** on an "interior" or non-terminal carbon | a C3H6O  b C6H12O | a 2-propanone (acetone)  H O H  | || |  H—C—C—C—H  | |  H H | b 3-hexanone  H H H O H H  | | | || | |  H—C—C—C—C—C—C—H  | | | | |  H H H H H |
| Carboxylic  Acid  (the most common form of organic acid) | O  ||  R—C—O-H  A **carboxyl**  **group** (COOH) bonded to a carbon. Soluble in water | a CH3COOH  b C2H5COOH | a ethanoic acid (acetic acid)  H O  | ||  H—C—C—O—H  |  H | b propanoic acid    H H O  | | ||  H—C—C—C—O—H  | |  H H |
| Amine  (simple) | R⎯N⎯H  |  H  An organic derivative of NH3 (at least one H is replaced with an organic group. A weak base (B-L) | a C3H7NH2  b C6H5NH2 | a 1-propanamine (1-propylamine)  H H H  | | |  H⎯C⎯C⎯C⎯N⎯H  | | | |  H H H H | b aniline    ••  N⎯H  |  H |
| Halide  (Halocarbon) | R-X  Halogen(s) substituted onto a hydrocarbon, by removing hydrogen(s) | a C3H7Br  b C3H6F2 | a1-bromopropane    **Br** H H  | | |  H—C—C—C—H  | | |  H H H | b1,2-difluoropropane  H H **F**  | | |  H—C—C—C—H  | | |  H **F**  H |