Conversions & Formulas

Metric Prefixes

PREFIX	SYMBOL	MEANING
exa-	E	1×10^{18}
peta-	P	1×10^{15}
tera-	T	1×10^{12}
giga-	G	1×10^{9}
meg-	M	1×10^{6}
kilo-	k	1×10^{3}
hecto-	h	1×10^{2}
deka-	da	1×10
meter, liter, gram		1
deci-	d	1×10^{-1}
centi-	c	1×10^{-2}
milli-	m	1×10^{-3}
micro-	µ	1×10^{-6}
nano-	n	1×10^{-9}
pico-	p	1×10^{-12}
femto-	f	1×10^{-15}
atto-	a	1×10^{-18}

[Note: the power number after each 10 is the number of zeros to add to the number e.g. $1 \times 10^{6} = 1{,}000{,}000$; and for the negative side you add 1 less zero than the number behind the zero e.g. 1×10^{-6} equals 0.000001]

The unit of measure for length is meter, volume is liter and mass is gram. Examples of the more common units are:

Kilometer = km = 1,000 meters

milliliter = ml = 0.001 liters

nanogram = ng = 0.000,000,001 grams

Length Conversions

1 m = 10 dm = 100 cm = 1000 mm

1 m = 3.281 feet

1 m = 1.094 yards

1 cm = 0.3937 inches

1 mm = 0.03937 inches

1 inch = 25.4 mm = 2.54 cm

1 foot = 30.48 cm

1 yard = 3 feet = 0.9144 m

Concentration Formulas

Molar (M) = Moles of solute/Liters of solution

Parts-per-million (ppm) = mg of solute/Liters of water

Density Conversions

Specific Gravity x 1 = g/mL

g/L x 8.345404 = lb/gal

Pressure Conversions

1 bar = 14.50 psi = 750.06 mm of Hg

1 psi = 51.715 mm of Hg

Flow Rate Conversions

GPM = 3.785 L/min

GPH = 0.0167 GPM = 63.1 mL/min

Temperature Conversions

Celsius = (°F - 32) x 5/9 = °C

Fahrenheit = (°C x 1.8) + 32 = °F

Kelvin = °C + 273.2

Volume Conversions

1 gallon = 3.785 liters = 133.376 ounces

1 gallon = 0.0037854 m^3 = 3784.5 cm^3

1 quart = 0.25 gallons = 0.9464 liters

1 cup = 0.2642 gallons = 0.24 Liters

1 fluid ounce = 29.57353 mL

1 teaspoon = 5 mL

1 tablespoons = 15 mL

1 liters = 1.057 quarts = 0.2642 gallons

1 cc = 1 mL

Weight Conversions

Pounds = lbs

1 grain (troy) = 0.0648 grams (g)

1 ounce (oz) = 28.3495 g

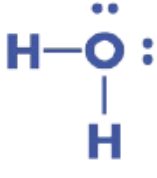
1 lbs = 0.45359 kg

1 stone = 6.35026 kg

1 ton (2,000 lbs) = 0.9072 Mg (metric ton)

Water Facts

Water has a simple molecular structure. It is composed of one oxygen atom and two hydrogen atoms. Each hydrogen atom is covalently bonded to the oxygen via a shared pair of electrons. Oxygen also has two unshared pairs of electrons. Thus there are 4 pairs of electrons surrounding the oxygen atom, two pairs involved in covalent bonds with hydrogen, and two unshared pairs on the opposite side of the oxygen atom. Oxygen is an electronegative or electron "loving" atom compared with hydrogen.



Water is a polar molecule, meaning that there is an uneven distribution of electron density. Water has a partial negative charge (Delta-) near the oxygen atom due the unshared pairs of electrons, and partial positive charges (Delta+) near the hydrogen atoms.

An electrostatic attraction between the partial positive charge near the hydrogen atoms and the partial negative charge near the oxygen results in the formation of a hydrogen bond. The strength of strong acids and bases is dominated by the autoionization of water. In aqueous solutions, the strongest acid and base are the hydronium ion, H_3O^+, and the hydroxide ion OH^- respectively.

Acids HCl, HBr, HI, HNO_3, $HClO_3$, $HClO_4$, and H_2SO_4 completely ionize in water, making them as strong as H_3O^+ due to the leveling effect of water. Furthermore, strong acids, strong bases, and salts completely ionize in their aqueous solutions.

For example, HCl is a stronger acid than H_2O, and the reaction takes place as HCl dissolves in water.

$HCl + H_2O = Cl^- + H_3O^+$

On the other hand, a stong base also react with water to give the stong base species, OH^-.

$H_2O + B^- = OH^- + HB$

For example, O_2^- [superoxide], CH_3O^-, and NH_3 are strong bases.