Conversion Factors

Length

Multiply → to get	←	to get / Divide
Multiply	→	to get
to get	←	Divide
inch	2.54	cm
ft	12	inch
ft	0.305	meter
yard	1.094	meter
Angstrom	10^{10}	meter

Flow Rate

Multiply	→	to get
to get	←	Divide
cc/min	1	mL/min
cfm (ft³/min)	28.31	L/min
cfm (ft³/min)	1.699	m³/hr
cfh (ft³/hr)	472	mL/min
cfh (ft³/hr)	0.125	GPM
GPH	63.1	mL/min
GPH	0.134	cfh
GPM	0.227	m³/hr
GPM	3.785	L/min
oz/min	29.57	mL/min

Pressure/Vacuum

Multiply	→	to get
to get	←	Divide
atm	33.9	ft H₂O
atm	760	mm Hg
atm	1033.2	g/cm²
atm	14.70	psi
atm	1.013	bar
atm	101.3	kPa
bar	14.5	psi
bar	0.9869	atm
bar	100	kPa
ft H₂O	0.4335	psi
kPa	0.01	dyne/cm²
kPa	0.1450	psi
kPa	7.5	mm Hg
psi	0.0703	kg/cm²

(Pressure column, with LaTeX units: ft H_2O, g/cm², dyne/cm², kg/cm²)

Miscellaneous

Multiply	→	to get
to get	←	Divide
hp	0.746	kW
hp	42.44	Btu/min
hp	396,000	lb in/min
hp	1.014	metric hp
watts	0.7376	lb ft/sec
watts	44.25	lb ft/min
lb-ft	0.1368	kg-m
oz-in	0.072	kg-cm
oz-in	70,600	dyne-cm
oz-in	0.00706	Nm
gauss	0.0001	tesla

Volume

Multiply	→	to get
to get	←	Divide
cubic cm (cc)	1	mL
oz (fluid)	29.57	mL
cubic ft (ft³)	7.48	gal
cubic ft (ft³)	0.0283	m³
cubic meters	1000	liters
gal	128	oz (fl)
gal	3.785	liters
gal	0.8333	imp gal
quart	0.25	gal
quart	0.9464	liters
cup	236.59	mL
cup	8	oz (fl)
pint	0.125	gal
pint	0.4732	liters
bushel	9.3092	gal
bushel	35.239	liters
bushel	64	pints (fl)

Mass

Multiply	→	to get
to get	←	Divide
Apoth dram	60	grains
Apoth dram	0.1371	Avdp oz
Apoth dram	0.008571	Avdp lb
Apoth dram	3.88794	grams
Apoth lb	5760	grains
Apoth lb	13.1657	Avdp oz
Apoth lb	0.822857	Avdp lb
Apoth lb	373.242	grams
Apoth oz	480	grains
Apoth oz	1.09714	Avdp oz
Apoth oz	0.068571	Avdp lb
Apoth oz	31.1035	grams
Avdp drams	27.344	grains
Avdp drams	0.0625	Avdp oz
Avdp drams	0.003906	Avdp lb
Avdp drams	1.77185	grams
Avdp lb	7000	grains
Avdp lb	16	Avdp oz
Avdp lb	453.592	grams
Avdp oz	437.5	grains
Avdp oz	0.0625	Avdp lb
Avdp oz	28.3495	grams
carats	3.0865	grains
carats	0.2	grams
grams	15.432	grains
grams	0.0353	oz
lb	0.4536	kg
oz	28.35	grams

Important Metric Prefixes

Prefix	Abbreviation	Meaning
tera-	T	$\times 10^{12}$
giga-*	G	$\times 10^{9}$
mega-	M	$\times 10^{6}$
kilo-	k	$\times 10^{3}$
deci-	d	$\times 10^{-1}$
centi-	c	$\times 10^{-2}$
milli-	m	$\times 10^{-3}$
micro-	μ	$\times 10^{-6}$
nano-*	n	$\times 10^{-9}$
pico-*	p	$\times 10^{-12}$

*In older literature, certain double prefixes are used: kilomega (kM) for 10^9; millimicro (mμ) for 10^{-9}; micromicro (μμ) for 10^{-12}.

Equations

► Relative Centrifugal Force

$rcf = (11.18 \times 10^{-6})\, RN$

R = rotating radius in cm
N = rotation speed in rpm

► Concentration

$\text{Molar (M)} = \dfrac{\text{Moles of solute}}{\text{Liters of solution}}$

$\text{Weight \%} = \dfrac{\text{Grams of solute} \times 100\%}{\text{Grams of solute + grams of solvent}}$

$\text{Volume \%} = \dfrac{\text{Liters of solute} \times 100\%}{\text{Liters of solution}}$

$ppm = \dfrac{\text{mg of solute}}{\text{kg of solution}} = \dfrac{\text{mg of solute}}{\text{Liters of water}}$

► Flow

C_v factor

$Q = \dfrac{C_v}{(G/\Delta P)^{1/2}}$

Q = flow rate (GPM)
C_V = flow coefficient
G = specific gravity
ΔP = pressure drop (psi)

► Heating and Cooling

Cooling capacity of chillers

$\text{Btu/hr} = \dfrac{\Delta T\,(°F) \times \text{Specific heat of fluid}}{\text{flow rate (GPM)}}$

Specific heat of water = 500 Btu/hr/GPM/°F
Specific heat of oil = 350 Btu/hr/GPM/°F

Heating water in tanks

$kW = \dfrac{\text{Volume (gallons)} \times \Delta T\,(°F)}{325 \times \text{Heat-up time (hours)}}$

Heating oil in tanks

$kW = \dfrac{\text{Volume (gallons)} \times \Delta T\,(°F)}{800 \times \text{Heat-up time (hours)}}$

Heating flowing water

$kW = \text{Flow (GPM)} \times \Delta T\,(°F) \times 0.16$

► Humidity

Absolute humidity (as g/m³)

$$D = \frac{804}{1 + 0.00633t} \times \frac{e}{P_O}$$

$$= \frac{H}{100} \times \frac{804}{1 + 0.00633t} \times \frac{e}{P_O}$$

H = relative humidity (% RH)
P_O = standard air pressure (mm Hg)
D = absolute humidity (g/m³)
e = water steam pressure (mm Hg)
D_S = absolute humidity in saturation (g/m³)
e_S = saturated water steam pressure (mm Hg)
t = temperature (°C)
T = dew point temperature

Dew point temperature (as °C)

$$T = \frac{237.3/75}{\log e - 0.786} - 1$$

$$e = \frac{H}{100} \times e_S; \quad e_S = 6.1078 \times 10^{7.5t/(237.3 + t)}$$

Relative humidity (as % RH)

$$RH = \frac{e_S}{e} \times 100 = \frac{D}{D_S} \times 100$$

► Viscosity

Absolute viscosity = kinematic viscosity x density
density = units of specific gravity or g/mL
(e.g. poise = stokes x g/mL)

► Density Conversions

Specific Gravity x 1 = g/mL
g/L x 8.345404 = lb/gal
lb/gal x 0.119826 = g/mL

► Temperature

$°F = (1.8 \times °C) + 32$
$°C = (°F - 32) \times 0.555$
$°\text{Kelvin} = °C + 273.2$