

## CONVERSION FACTORS

AREA						
from/to	cm <sup>2</sup>	m <sup>2</sup>	km <sup>2</sup>	in. <sup>2</sup>	ft <sup>2</sup>	mile <sup>2</sup>
cm <sup>2</sup>	1	0.0001	1x10 <sup>-10</sup>	0.1550	0.0010	3.86x10 <sup>-11</sup>
m <sup>2</sup>	1X10 <sup>4</sup>	1	1x10 <sup>-4</sup>	1550	10.76	3.86x10 <sup>-7</sup>
km <sup>2</sup>	1X10 <sup>10</sup>	1x10 <sup>6</sup>	1	1.55x10 <sup>-9</sup>	1.0810 <sup>7</sup>	0.3861
in <sup>2</sup>	6.452	6.45x10 <sup>-4</sup>	6.45x10 <sup>-10</sup>	1	0.00694	2.49x10 <sup>-10</sup>
ft <sup>2</sup>	929.0	0.09290	9.29x10 <sup>-4</sup>	144	1	3.59x10 <sup>-3</sup>
mile	2.59X10 <sup>10</sup>	2.59x10 <sup>4</sup>	2.590	4.01x10 <sup>9</sup>	2.79x10 <sup>7</sup>	1

VOLUME							
from/to	cm <sup>3</sup>	liter	m <sup>3</sup>	in. <sup>3</sup>	ft <sup>3</sup>	yd <sup>3</sup>	fl oz
cm <sup>3</sup>	1	0.001	1x10 <sup>-6</sup>	0.06102	3.53x10 <sup>-5</sup>	1.31x10 <sup>-6</sup>	0.03381
liter	1000	1	0.001	61.02	0.03532	0.00131	33.81
m <sup>3</sup>	1X10 <sup>4</sup>	1000	1	6.10x10 <sup>4</sup>	35.31	1.308	3.38x10 <sup>4</sup>
in <sup>3</sup>	16.39	0.01639	1.64x10 <sup>-5</sup>	1	5.79x10 <sup>-4</sup>	2.14x10 <sup>-5</sup>	0.5541
ft <sup>3</sup>	2.83X10 <sup>4</sup>	28.32	0.02832	1728	1	0.03704	957.5
yd <sup>3</sup>	7.65X10 <sup>5</sup>	764.5	0.7646	4.67x10 <sup>4</sup>	27	1	2.59x10 <sup>4</sup>
fl oz	29.57	0.02957	2.96x10 <sup>-5</sup>	1.805	0.00104	3.87x10 <sup>-5</sup>	1

FLOW RATE						
from/to	lit/sec	gal/min	ft <sup>3</sup> /sec	ft <sup>3</sup> /min	bbl/hr	bbl/day
lit/sec	1	15.85	0.03532	2.119	22.66	543.8
gal/min	0.06309	1	0.00223	0.1337	1.429	34.30
ft <sup>3</sup> /sec	28.32	448.8	1	60	641.1	1.54x10 <sup>4</sup>
ft <sup>3</sup> /min	0.4719	7.481	0.01667	1	10.69	256.5
bbl/hr	0.04415	0.6997	0.00156	0.09359	1	24
bbl/day	0.00184	0.02917	6.50x10 <sup>-5</sup>	0.00390	0.04167	1

PRESSURE							
from/to	mm Hg	in Hg	in H <sub>2</sub> O	ft H <sub>2</sub> O	atm	lb/in <sup>2</sup>	kg/cm <sup>2</sup>
mm Hg	1	0.03937	0.5353	0.04460	0.00132	0.01934	0.00136
in Hg	25.40	1	13.60	1.133	0.03342	0.4912	0.03453
in H <sub>2</sub> O	1.868	0.07355	1	0.08333	0.00246	0.03613	0.00254
ft H <sub>2</sub> O	22.42	0.8826	12	1	0.02950	0.4355	0.03048
atm	760	29.92	406.08	33.90	1	14.70	1.033
lb/in <sup>2</sup>	51.71	2.036	27.67	2.307	0.06805	1	0.07031
kg/cm <sup>2</sup>	735.6	28.96	393.7	32.81	0.9678	14.22	1

## CONVERSION FACTORS (CON'T)

LENGTH								
multiply	Å	micron	mm	cm	m	inch	feet	yard
Å	1	1X10 <sup>-3</sup>	1X10 <sup>-4</sup>	1X10 <sup>-8</sup>	1X10 <sup>-10</sup>	3.937X10 <sup>-9</sup>	3.2808X10 <sup>-10</sup>	1.0936X10 <sup>-10</sup>
micron	10000	1	0.001	0.0001	1X10 <sup>-6</sup>	3.937X10 <sup>-5</sup>	3.2808X10 <sup>-6</sup>	1.0936X10 <sup>-6</sup>
mm	1X10 <sup>7</sup>	1X10 <sup>3</sup>	1	0.1	0.001	0.03937	0.0032808	0.0010936
cm	1X10 <sup>8</sup>	1X10 <sup>4</sup>	10	1	0.01	0.3937	0.032808	0.0109361
m	1X10 <sup>10</sup>	1X10 <sup>6</sup>	1000	100	1	39.37008	3.2808	1.0836
inch	2.54X10 <sup>8</sup>	2.54X10 <sup>4</sup>	25.4	2.54	0.0254	1	0.08333	0.027778
feet	3.048X10 <sup>9</sup>	3.048X10 <sup>5</sup>	304.8	30.48	0.3048	12	1	0.333333
yard	9.144X10 <sup>9</sup>	9.144X10 <sup>5</sup>	914.4	91.44	09144	36	3	1

WEIGHT							
multiply	mg	g	kg	oz	lbs	ton, US	ton, metric
mg	1	0.001	0.000001	3.5274X10 <sup>-5</sup>	2.2046X10 <sup>-8</sup>	1.1020X10 <sup>-9</sup>	1.0000EX10 <sup>-9</sup>
g	1000	1	0.001	0.03527	0.0022046	1.1020X10 <sup>-6</sup>	1.0000X10 <sup>-6</sup>
kg	1000000	1000	1	35.27396	2.2046226	0.001102	0.001
oz	28349.5	28.3495	0.02834	1	0.0625	3.1250X10 <sup>-5</sup>	2.8300X10 <sup>-5</sup>
lbs	453592	453.592	0.45359	16	1	0.0005	4.5350X10 <sup>-4</sup>
ton, US	9.0719X10 <sup>8</sup>	907.185	907.1847	32000	2000	1	0.907
ton, metric	1X10 <sup>9</sup>	1X10 <sup>6</sup>	1000	35274	2205	1.102	1

DENSITY					
multiply	lb/cu. in	lb/cu. ft.	lb/gal.	gram/cu. cm.	gram/liter
lb/cu. in	1	1728	231	27.68	27680
lb/cu. ft.	-	1	0.1337	0.016	16.019
lb/gal.	0.00433	7.481	1	0.1198	119.83
gram/cu. cm.	0.03613	62.43	8.345	1	1000
gram/liter	-	0.06243	0.008345	0.001	1

CONCENTRATION EQUIVALENTS				
multiply	ppt	ppb	ppm	percent, %
parts per trillion, ppt	1	0.001	0.000001	1X10 <sup>-10</sup>
parts per billion, ppb	1,000	1	0.001	0.0000001
parts per million, ppm	1,000,000	1,000	1	0.0001
percent, %	10,000,000,000	10,000,000	10,000	1

## CONVERSION FACTORS (CON'T)

TEMPERATURE CONVERSIONS							
°C	°F	°C	°F	°C	°F	°C	°F
-273.15	-459.67	25	77	240	464	540	1004
-260	-436	30	86	250	482	550	1022
-240	-400	35	95	260	500	560	1040
-220	-364	40	104	270	518	570	1058
-200	-328	45	113	280	536	580	1076
-180	-292	50	122	290	554	590	1094
-160	-256	55	131	300	572	600	1112
-140	-220	60	140	310	590	610	1130
-120	-184	65	149	320	608	620	1148
-100	-148	70	158	330	626	630	1166
-80	-112	75	167	340	644	640	1184
-70	-94	80	176	350	662	650	1202
-65	-85	85	185	360	680	660	1220
-60	-76	90	194	370	698	670	1238
-55	-67	95	203	380	716	680	1256
-50	-58	100	212	390	734	690	1274
-45	-49	110	230	400	752	700	1292
-40	-40	120	248	410	770	710	1310
-35	-31	130	266	420	788	720	1328
-30	-22	140	284	430	806	730	1346
-25	-13	150	302	440	824	740	1364
-20	-4	160	320	450	842	750	1382
-15	5	170	338	460	860	760	1400
-10	14	180	356	470	878	770	1418
-5	23	190	374	480	896	780	1436
0	32	200	392	490	914	790	1454
5	41	210	410	500	932	800	1472
10	50	212	414	510	950	810	1490
15	59	220	428	520	968	820	1508
20	68	230	446	530	986	830	1526

TEMPERATURE CONVERSIONS				
multiply	°C, Celsius	°F, Fahrenheit	°K, Kelvin	°R, Rankin
Celsius, °C	1	$9/5(^{\circ}\text{C}) + 32$	$^{\circ}\text{C} + 273.15$	$(^{\circ}\text{C} + 273.15)1.8$
Fahrenheit, °F	$(^{\circ}\text{F}-32)(5/9)$	1	$(^{\circ}\text{F}-32)(5/9)+273.115$	$^{\circ}\text{F} + 459.67$
Kelvin, °K	$^{\circ}\text{K} - 273.15$	$(^{\circ}\text{K}-273.15)1.8+32$	1	$(^{\circ}\text{K})1.8$
Rankin, °R	$(^{\circ}\text{R}/1.8)-273.15$	$^{\circ}\text{R}-459.67$	$^{\circ}\text{R}/1.8$	1

## CONVERSION FACTORS (CON'T)

DEW POINT VS. PARTS PER MILLION MOISTURE								
Dew Point		Moisture	Dew Point		Moisture	Dew Point		Moisture
F	C	ppm (vol/vol)	F	C	ppm (vol/vol)	F	C	ppm (vol/vol)
-130.00	-90.00	0.10	-96.00	-71.00	2.15	-84.00	-64.00	5.70
-120.00	-84.00	0.25	-95.00	-71.00	2.35	-83.00	-64.00	6.20
-110.00	-79.00	0.63	-94.00	-70.00	2.54	-82.00	-63.00	6.60
-105.00	-76.00	1.00	-93.00	-69.00	2.76	-81.00	-63.00	7.20
-104.00	-76.00	1.06	-92.00	-69.00	3.00	-80.00	-62.00	7.80
-103.00	-75.00	1.18	-91.00	-68.00	3.28	-79.00	-62.00	8.40
-102.00	-74.00	1.29	-90.00	-68.00	3.53	-78.00	-61.00	9.10
-101.00	-74.00	1.40	-89.00	-67.00	3.84	-77.00	-61.00	9.80
-100.00	-73.00	1.53	-88.00	-67.00	4.15	-76.00	-60.00	10.50
-99.00	-73.00	1.66	-87.00	-66.00	4.50	-75.00	-59.00	11.40
-98.00	-72.00	1.81	-86.00	-66.00	4.78	-74.00	-59.00	12.30
-97.00	-72.00	1.96	-85.00	-65.00	5.30	-73.00	-58.00	13.30

SOME USEFUL GAS CONSTANTS		
Numerical Constant	Value	Units of Measurement
Volume of Ideal Gas at STP	22.414L	Liters, 0°C, 1 atm
Volume of Ideal Gas at NTP	24.146 L	Liters, 70°F, 1 atm
Avogadro's Number	$6.22045 \times 10^{23}$	molecules/gm-mole
Gas Law Constant, R	1.98719	cal/(gm-mol)(°K)
	82.568	(cm <sup>3</sup> )(atm)/(gm-mol)(°K)
Density of Air (STP)	$1.293 \times 10^{-3} \text{ g/cm}^3$	0°C, 760 mm Hg