

## Conversion Factors/Data

### LENGTH

1 mi = 5280 ft	1 in = 2.540 cm
1 ft = 30.48 cm	1 yd = 0.9144 m
1 mi = 1.609 km	1 Å = $1 \times 10^{-10}$ m
1 cm = 0.3937 in	1 m = 39.37 in
1 m = 1.094 yd	1 km = 0.6214 mi
1 $\mu$ = $1 \times 10^{-6}$ m	1 nautical mi = 6076 ft
1 ly = $9.4605 \times 10^{12}$ km	1 pc = $3.086 \times 10^{13}$ km
1 pc = 3.26 ly	1 mil = .001 in
1 fermi = $1 \times 10^{-15}$ m	1 AU = $1.495 \times 10^8$ km
1 m = 3.28 ft	1 fathom = 2 yards
1 league = 3 nautical mi	

### MASS OR WEIGHT

1 lb = 16 oz	1 oz = 28.23 g
1 lb = 453.6 g = 0.4536 kg	1 metric ton = 1000 kg
1 g = 0.03527 oz	1 lb = 96 drams
1 kg = 35.27 oz = 2.205 lb	3 scruple = 1 dram
20 grains = 1 scruple	1 grain = 1 carat
1 ton = 2000 lb	

### VOLUME (SOLID)

1 ft <sup>3</sup> = 1728 in <sup>3</sup>	1 m <sup>3</sup> = 1.3079 yd <sup>3</sup>
1 yd <sup>3</sup> = 27 ft <sup>3</sup> = 46656 in <sup>3</sup>	1 in <sup>3</sup> = 16.39 cm <sup>3</sup>
1 ft <sup>3</sup> = 28.32 dm <sup>3</sup>	1 yd <sup>3</sup> = 0.7646 m <sup>3</sup>
1 m <sup>3</sup> = 1 000 000 cm <sup>3</sup>	1 m <sup>3</sup> = 35.31 ft <sup>3</sup>
1 cm <sup>3</sup> = 0.06102 in <sup>3</sup>	1 dm <sup>3</sup> = 61.02 in <sup>3</sup>
1 bu = 4 pecks	8 qt = 1 peck

### VOLUME (LIQUID)

1 L = 1 dm <sup>3</sup> = 1000 cm <sup>3</sup> = 0.001 m <sup>3</sup> = 1000 mL	
1 qt = 32 fl oz = 4 c = 2 pt	1 L = 1.057 qt
1 fl oz = 29.57 mL	1 qt = 946.3 mL
1 qt = 0.9463 L	1 mL = 1 cm <sup>3</sup>
1 mL = 0.03381 fl oz	1 L = 33.81 fl oz
1 c = 16 tbs = 8 fl oz	1 pt = 2 c
1 gal = 4 qt	1 mL = 20 drops
1 ts = 4.93 mL	1 Tbs = 14.79 mL
1 m <sup>3</sup> = 35.31 ft <sup>3</sup>	1 ft <sup>3</sup> = 7.48 gal

### AREA

1 acre = 43560 ft <sup>2</sup>	1 in <sup>2</sup> = 6.4516 cm <sup>2</sup>
1 m <sup>2</sup> = 10.76 ft <sup>2</sup>	1 barn = $1 \times 10^{-28}$ m <sup>2</sup>
1 hectare = 2.471 acres	

## ENERGY

1 cal = 4.184 J
1 J = 1 N-m = 1 kg-m <sup>2</sup> /s <sup>2</sup> = $1 \times 10^7$ erg
1 J = 0.10197 kg-m = 0.009869 L-atm = 0.2390 cal = 0.738 ft-lb = $9.478 \times 10^{-4}$ BTU
1 L-atm = 101.3 J = 10.33 kg-m = 24.22 cal
1 eV = $1.602 \times 10^{-19}$ J
1 amu = 931.5 MeV (relativistic)

### PRESSURE

1 atm = 760 mm Hg (torr) = 101.3 kPa = 14.70 lb/in <sup>2</sup> (psi) = $1.013 \times 10^5$ N/m <sup>2</sup> = 33.9 ft (water)
1 Pa = 1 N/m <sup>2</sup> = 1 kg/m-s <sup>2</sup>

### TIME

1 y = 365.25 d = $3.16 \times 10^7$ s	1 d = 24 hr
1 h = 60 min = 3600 s	1 min = 60 s
1 week = 7 days	

### SPEED

1 km/hr = .9113 ft/s = .2777 m/s = .6213 mi/hr
1 mi/hr = 1.4666 ft/s = .8689 knot = .4470 m/s
1 rad/s = 9.549 rpm

### POWER

1 hp = 746 watts	1 watt = 1 J/s = 680 lm
1 cp = 12.56 lm	

### ANGLE

1 radian = 57.30°	1° = 0.01745 radian
360° = 2 $\pi$ radians	

### USEFUL EQUATIONS:

#### AREA

Circle = $\pi r^2$
Triangle = 0.5 bh
Sphere = $4\pi r^2$
Rectangle = lw
Ellipse = 0.7854 d D
Cone = $\pi r(l+r)$
Doughnut = 9.8696 d D

#### VOLUME

Sphere = $4/3\pi r^3$
Cylinder = $\pi r^2 h$
Cone = $\pi r(h/3)$
Pyramid = (area base)(h/3)
Doughnut = 2.4674 (D) (d <sup>2</sup> )
Rectangular solid = lwh

## SI BASE UNITS

Quantity	Unit	Abbr.	Apparatus
length	meter	m	ruler
mass	kilogram	kg	balance
time	second	s	stopwatch
amount of substance	mole	mol	.....
temperature	kelvin	K	thermometer
electric current	ampere	A	ammeter
luminous intensity	candela	cd	light meter

## METRIC PREFIXES

atto	a	10 <sup>-18</sup>	deka	da	10 <sup>1</sup>
femto	f	10 <sup>-15</sup>	hecto	h	10 <sup>2</sup>
pico	p	10 <sup>-12</sup>	kilo	k	10 <sup>3</sup>
nano	n	10 <sup>-9</sup>	mega	M	10 <sup>6</sup>
micro	μ	10 <sup>-6</sup>	giga	G	10 <sup>9</sup>
milli	m	10 <sup>-3</sup>	tera	T	10 <sup>12</sup>
centi	c	10 <sup>-2</sup>	peta	P	10 <sup>15</sup>
deci	d	10 <sup>-1</sup>	exa	E	10 <sup>18</sup>

## FUNDAMENTAL PHYSICAL CONSTANTS

1 amu	u	1.6605655 x 10 <sup>-27</sup> kg
Avogadro	N <sub>A</sub>	6.022045 x 10 <sup>23</sup> /mol
Boltzmann	k	1.380662 x 10 <sup>-23</sup> J/K
Coulomb Force	K	8.9877 x 10 <sup>9</sup> N m <sup>2</sup> /kg <sup>2</sup>
Elementary Charge	e	1.602 x 10 <sup>-19</sup> C
Electron Mass	m <sub>e</sub>	9.109 x 10 <sup>-31</sup> kg
Gravitation	G	6.67 x 10 <sup>-11</sup> N m <sup>2</sup> /kg <sup>2</sup>
Mass Energy/amu	...	931.5016 MeV
Molar gas	R	8.31441 J/mol K
Neutron mass	m <sub>n</sub>	1.6749 x 10 <sup>-27</sup> kg
Planck	h	6.626176 x 10 <sup>-34</sup> Js
Proton mass	m <sub>p</sub>	1.6726 x 10 <sup>-27</sup> kg
Speed (Light)	c	2.9979 x 10 <sup>8</sup> m/s
Standard Vol. (gas)	...	22.4136 L

## ROUNDING RULES

XY-----> X

When Y > 5, increase X by 1

When Y < 5, don't change X

When Y = 5,

if X is odd, increase X by 1

if X is even, don't change X

## USEFUL PHYSICAL DATA

Earth Gravity	9.8 m/s <sup>2</sup> or 32.2 ft/s <sup>2</sup>
Atm. Pres (sea level)	1.013 x 10 <sup>5</sup> Pa = 14.70 lb/in <sup>2</sup>
Density of air (STP)	1.29 kg/m <sup>3</sup>
Speed of sound in air (20°C)	343 m/s

### Water

Density (4°C)	1.000 x 10 <sup>3</sup> kg/m <sup>3</sup>
H <sub>f</sub>	3.35 x 10 <sup>5</sup> J/kg
H <sub>v</sub>	2.26 x 10 <sup>6</sup> J/kg
c	4186 J/kg °C

### Earth

Mass	5.98 x 10 <sup>24</sup> kg
Radius (eq)	6.38 x 10 <sup>6</sup> m
Earth-Sun Dist	1.50 x 10 <sup>11</sup> m

### Moon

Mass	7.35 x 10 <sup>22</sup> kg
Radius	1.74 x 10 <sup>6</sup> m
Earth-Moon Dist	3.85 x 10 <sup>8</sup> m

### Sun

Mass	1.99 x 10 <sup>30</sup> kg
Radius	6.96 x 10 <sup>8</sup> m

## RULES FOR SIGNIFICANT FIGURES

Significant figures are the digits in any measurement that are known with certainty plus one digit that is uncertain. [an estimated digit]

Rule 1: In numbers that do not contain zeros, all the digits are significant.

3.1428	[5]	3.14	[3]
469	[3]		

Rule 2: All zeros between significant digits are significant

7.053	[4]	7053	[4]
302	[3]		

Rule 3: Zeros to the left of the first nonzero digit serve only to fix the position of the decimal point and are not significant

0.0056	[2]	0.0789	[3]
0.000001	[1]		

Rule 4: In a number with digits to the right of a decimal point, zeros to the right of the last nonzero digit are significant

43	[2]	43.0	[3]
43.00	[4]	0.00200	[3]
0.40050	[5]		

Rule 5: In a number that has no decimal point, and that ends in zeros (such as 3600), the zeros at the end may or may not be significant (it is ambiguous). To avoid ambiguity express the number in scientific notation showing in the coefficient the number of significant digits.