

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 = 1×10^{-10} m |
| 1 cm = 0.3937 in | 1 m = 39.37 in |
| 1 m = 1.094 yd | 1 km = 0.6214 mi |
| 1 μ = 1×10^{-6} m | 1 nautical mi = 6076 ft |
| 1 ly = 9.4605×10^{12} km | 1 pc = 3.086×10^{13} km |
| 1 pc = 3.26 ly | 1 mil = .001 in |
| 1 fermi = 1×10^{-15} m | 1 AU = 1.495×10^8 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 ³ = 1728 in ³ | 1 m ³ = 1.3079 yd ³ |
| 1 yd ³ = 27 ft ³ = 46656 in ³ | 1 in ³ = 16.39 cm ³ |
| 1 ft ³ = 28.32 dm ³ | 1 yd ³ = 0.7646 m ³ |
| 1 m ³ = 1 000 000 cm ³ | 1 m ³ = 35.31 ft ³ |
| 1 cm ³ = 0.06102 in ³ | 1 dm ³ = 61.02 in ³ |
| 1 bu = 4 pecks | 8 qt = 1 peck |

VOLUME (LIQUID)

| | |
|---|------------------------------|
| 1 L = 1 dm ³ = 1000 cm ³ = 0.001 m ³ = 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 ³ |
| 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 ³ = 35.31 ft ³ | 1 ft ³ = 7.48 gal |

AREA

| | |
|--|---|
| 1 acre = 43560 ft ² | 1 in ² = 6.4516 cm ² |
| 1 m ² = 10.76 ft ² | 1 barn = 1×10^{-28} m ² |
| 1 hectare = 2.471 acres | |

ENERGY

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

PRESSURE

| |
|--|
| 1 atm = 760 mm Hg (torr) = 101.3 kPa = 14.70 lb/in ² (psi) = 1.013×10^5 N/m ² = 33.9 ft (water) |
| 1 Pa = 1 N/m ² = 1 kg/m-s ² |

TIME

| | |
|---------------------------------------|--------------|
| 1 y = 365.25 d = 3.16×10^7 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 π radians | |

USEFUL EQUATIONS:

AREA

| |
|-----------------------|
| Circle = πr^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 = $\pi r(h/12)$ |
| Pyramid = (area base)(h/3) |
| Doughnut = 2.4674 (D) (d ²) |
| 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 ⁻¹⁸ | deka | da | 10 ¹ |
| femto | f | 10 ⁻¹⁵ | hecto | h | 10 ² |
| pico | p | 10 ⁻¹² | kilo | k | 10 ³ |
| nano | n | 10 ⁻⁹ | mega | M | 10 ⁶ |
| micro | μ | 10 ⁻⁶ | giga | G | 10 ⁹ |
| milli | m | 10 ⁻³ | tera | T | 10 ¹² |
| centi | c | 10 ⁻² | peta | P | 10 ¹⁵ |
| deci | d | 10 ⁻¹ | exa | E | 10 ¹⁸ |

FUNDAMENTAL PHYSICAL CONSTANTS

| | | |
|---------------------|----------------|--|
| 1 amu | u | 1.6605655 x 10 ⁻²⁷ kg |
| Avogadro | N _A | 6.022045 x 10 ²³ /mol |
| Boltzmann | k | 1.380662 x 10 ⁻²³ J/K |
| Coulomb Force | K | 8.9877 x 10 ⁹ N m ² /kg ² |
| Elementary Charge | e | 1.602 x 10 ⁻¹⁹ C |
| Electron Mass | m _e | 9.109 x 10 ⁻³¹ kg |
| Gravitation | G | 6.67 x 10 ⁻¹¹ N m ² /kg ² |
| Mass Energy/amu | ... | 931.5016 MeV |
| Molar gas | R | 8.31441 J/mol K |
| Neutron mass | m _n | 1.6749 x 10 ⁻²⁷ kg |
| Planck | h | 6.626176 x 10 ⁻³⁴ Js |
| Proton mass | m _p | 1.6726 x 10 ⁻²⁷ kg |
| Speed (Light) | c | 2.9979 x 10 ⁸ 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 ² or 32.2 ft/s ² |
| Atm. Pres (sea level) | 1.013 x 10 ⁵ Pa = 14.70 lb/in ² |
| Density of air (STP) | 1.29 kg/m ³ |
| Speed of sound in air (20°C) | 343 m/s |
| Water | |
| Density (4°C) | 1.000 x 10 ³ kg/m ³ |
| H _f | 3.35 x 10 ⁵ J/kg |
| H _v | 2.26 x 10 ⁶ J/kg |
| c | 4186 J/kg °C |
| Earth | |
| Mass | 5.98 x 10 ²⁴ kg |
| Radius (eq) | 6.38 x 10 ⁶ m |
| Earth-Sun Dist | 1.50 x 10 ¹¹ m |
| Moon | |
| Mass | 7.35 x 10 ²² kg |
| Radius | 1.74 x 10 ⁶ m |
| Earth-Moon Dist | 3.85 x 10 ⁸ m |
| Sun | |
| Mass | 1.99 x 10 ³⁰ kg |
| Radius | 6.96 x 10 ⁸ 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.