

# APPENDIX A

## MEASUREMENT AND UNITS

**Table A.1**

Common Units and Their Abbreviations

*Note that the abbreviation for inch (in.) is the only abbreviation that ends in a period.*

Type of measurement	Unit	Abbreviation
English mass	ton	ton
	pound	lb
	ounce	oz
English length	mile	mi or mile
	yard	yd
	foot	ft
	inch	in.
English volume	gallon	gal
	quart	qt
	pint	pt
	fluid ounce	fl oz
	cubic foot	cu ft
	cubic inch	cu in.
Time	year	yr or year
	day	d or day
	hour	h or hr
	minute	min
	second	s or sec
Temperature	degree Celsius	°C
	degree Fahrenheit	°F
	kelvin	K
Energy	joule	J
	calorie	cal
	dietary calorie	Cal

**Table A.2**

English-English Conversion Factors

Type of Measurement	Conversion Factors		
Length	$\frac{12 \text{ in.}}{1 \text{ ft}}$	$\frac{3 \text{ ft}}{1 \text{ yd}}$	$\frac{5280 \text{ ft}}{1 \text{ mi}}$
Mass	$\frac{16 \text{ oz}}{1 \text{ lb}}$	$\frac{2000 \text{ lb}}{1 \text{ ton}}$	
Volume	$\frac{4 \text{ qt}}{1 \text{ gal}}$	$\frac{32 \text{ fl oz}}{1 \text{ qt}}$	$\frac{2 \text{ pt}}{1 \text{ qt}}$

**Table A.3**

The Relationship Between English and Metric Length Units

*Both four and eight digits are given for each relationship. Four digits will be used for nearly all of the English-metric conversions done in this text.*

Metric length	English length
kilometer (km)	0.6214 mi or 0.62137119 mi 3281 ft or 3280.8399 ft
meter (m)	3.281 ft or 3.2808399 ft 39.37 in. or 39.370079 in. 1.094 yd or 1.0936133 yd
centimeter (cm)	0.3937 in. or 0.39370079 in. 0.03281 ft or 0.032808399 ft
millimeter (mm)	$3.937 \times 10^{-2}$ in. or $3.9370079 \times 10^{-2}$ in.
micrometer ( $\mu\text{m}$ )	$3.937 \times 10^{-5}$ in. or $3.9370079 \times 10^{-5}$ in.
nanometer (nm)	$3.937 \times 10^{-8}$ in. or $3.9370079 \times 10^{-8}$ in.

English length	Metric length
mile (mi)	1.609 km or 1.609344 km (exact) 1609 m or 1609.344 m (exact)
yard (yd)	0.9144 m (exact) or 91.44 cm (exact)
foot (ft)	30.48 cm (exact) or 0.3048 m (exact)
inch (in.)	2.54 cm (exact) or 0.0254 m (exact)

**Table A.4**

The Relationship Between English and Metric Mass Units

*Both four and eight digits are given for each relationship. Four digits will be used for nearly all of the English-metric conversions done in this text.*

Metric Mass	English Mass
metric ton (t)	1.102 ton (short) or 1.1023113 ton (short) 2205 lb or 2204.6226 lb
kilogram (kg)	2.205 lb or 2.2046226 lb 0.001102 ton or 0.0011023113 ton
gram (g)	0.002205 lb or 0.0022046226 lb 0.03527 oz or 0.035273962 oz
milligram (mg)	$3.527 \times 10^{-5}$ oz or $3.5273962 \times 10^{-5}$ oz
microgram ( $\mu\text{g}$ )	$3.527 \times 10^{-8}$ oz or $3.5273962 \times 10^{-8}$ oz

English Mass	Metric Mass
ton (ton)	0.9072 metric tons or 0.90718474 metric tons 907.2 kg or 907.18474 kg
pound (lb)	453.6 g or 453.59237 g 0.4536 kg or 0.45359237 kg
ounce (oz)	28.35 g or 28.349523 g $2.835 \times 10^4$ mg or $2.8349523 \times 10^4$ mg

**Table A.5**

The Relationship Between English and Metric Volume Units

*Both four and eight digits are given for each relationship. Four digits will be used for nearly all of the English-metric conversions done in this text.*

Metric volume	English volume
liter (L)	1.057 qt or 1.056718 qt
	0.2642 gal or 0.2641795 gal
	33.81 fl oz or 33.81498 fl oz
	61.03 cu in. or 61.02545 cu in.
milliliter (mL)	0.03381 fl oz or 0.03381497 fl oz
	0.06103 cu in. or 0.06102545 cu in.
microliter ( $\mu\text{L}$ )	$3.381 \times 10^{-5}$ fl oz or $3.381497 \times 10^{-5}$ fl oz
cubic centimeter ( $\text{cm}^3$ )	0.03381 fl oz or 0.03381497 fl oz
	0.06103 cu in. or 0.06102545 cu in.

English volume	Metric volume
gallon* (gal)	3.785 L or 3.785306 L
	3785 mL or 3785.306 mL
quart* (qt)	0.9463 L or 0.9463264 L
	946.3 mL or 946.3264 mL
fluid ounce* (fl oz)	0.02957 L or 0.02957270 L
	29.57 mL or 29.57270 mL
cubic inch (cu in.)	16.39 $\text{cm}^3$ or 16.387064 $\text{cm}^3$ (exact)
	16.39 mL or 16.387064 mL (exact)
	0.1634 L or 0.16387064 L (exact)

\* There are three kinds of gallons, quarts, and fluid ounces: British, U.S. dry, and U.S. liquid. The values given here are for U.S. liquid gallons, quarts, and fluid ounces.