

# Conversion Factors

## Mass

1 gram (g) = 0.035 ounce  
= 0.002 lb  
1 kilogram (kg) = 1000 g  
= 2.2 lb

## Energy

1 erg = 1 dyne per cm  
=  $2.388 \times 10^{-8}$  cal  
1 joule (J) = 1 newton meter  
= 0.239 cal  
=  $10^7$  erg  
1 calorie (cal) = 4.186 J  
=  $4.186 \times 10^7$  erg

## Pressure

1 millibar (mb) = 1000 dynes/cm<sup>2</sup>  
= 0.75 millimeter of mercury (mm Hg)  
= 0.02953 inch of mercury (in. Hg)  
= 0.01450 pound per square inch (lb/in.<sup>2</sup>)  
= 100 pascals (Pa)  
1 standard atmosphere = 1013.25 mb  
= 760 mm Hg  
= 29.92 in. Hg  
= 14.7 lb/in.<sup>2</sup>  
1 inch of mercury = 33.865 mb  
1 millimeter of mercury = 1.3332 mb  
1 pascal = 0.01 mb  
= 1 N/m<sup>2</sup>  
1 hectopascal (hPa) = 1 mb  
1 kilopascal (kPa) = 10 mb

## Power

1 watt (W) = 1 J/sec  
= 14.3353 cal/min  
1 cal/min = 0.06973 W  
1 horse power (hp) = 746 W

## Powers of Ten

### Prefix

nano one-billionth =  $10^{-9}$  = 0.000000001  
micro one-millionth =  $10^{-6}$  = 0.000001  
milli one-thousandth =  $10^{-3}$  = 0.001  
centi one-hundredth =  $10^{-2}$  = 0.01  
deci one-tenth =  $10^{-1}$  = 0.1  
hecto one hundred =  $10^2$  = 100  
kilo one thousand =  $10^3$  = 1000  
mega one million =  $10^6$  = 1,000,000  
giga one billion =  $10^9$  = 1,000,000,000

## Temperature

$$^{\circ}\text{C} = \frac{5}{9} (^{\circ}\text{F} - 32)$$

To convert degrees Fahrenheit (°F) to degrees Celsius (°C): Subtract 32 degrees from °F, then divide by 1.8.

To convert degrees Celsius (°C) to degrees Fahrenheit (°F): Multiply °C by 1.8, then add 32 degrees.

To convert degrees Celsius (°C) to Kelvins (K): Add 273 to Celsius temperature, as

$$\text{K} = ^{\circ}\text{C} + 273.$$

TABLE A.1 Temperature Conversions

°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C
-40	-40	-20	-28.9	0	-17.8	20	-6.7	40	4.4	60	15.6	80	26.7	100	37.8
-39	-39.4	-19	-28.3	1	-17.2	21	-6.1	41	5.0	61	16.1	81	27.2	101	38.3
-38	-38.9	-18	-27.8	2	-16.7	22	-5.6	42	5.6	62	16.8	82	27.8	102	38.9
-37	-38.3	-17	-27.2	3	-16.1	23	-5.0	43	6.1	63	17.2	83	28.3	103	39.4
-36	-37.8	-16	-26.7	4	-15.6	24	-4.4	44	6.7	64	17.8	84	28.9	104	40.0
-35	-37.2	-15	-26.1	5	-15.0	25	-3.9	45	7.2	65	18.3	85	29.4	105	40.6
-34	-36.7	-14	-25.6	6	-14.4	26	-3.3	46	7.8	66	18.9	86	30.0	106	41.1
-33	-36.1	-13	-25.0	7	-13.9	27	-2.8	47	8.3	67	19.4	87	30.6	107	41.7
-32	-35.6	-12	-24.4	8	-13.3	28	-2.2	48	8.9	68	20.0	88	31.1	108	42.2
-31	-35.0	-11	-23.9	9	-12.8	29	-1.7	49	9.4	69	20.6	89	31.7	109	42.8
-30	-34.4	-10	-23.3	10	-12.2	30	-1.1	50	10.0	70	21.1	90	32.2	110	43.3
-29	-33.9	-9	-22.8	11	-11.7	31	-0.6	51	10.6	71	21.7	91	32.8	111	43.9
-28	-33.3	-8	-22.2	12	-11.1	32	0.0	52	11.1	72	22.2	92	33.3	112	44.4
-27	-32.8	-7	-21.7	13	-10.6	33	0.6	53	11.7	73	22.8	93	33.9	113	45.0
-26	-32.2	-6	-21.1	14	-10.0	34	1.1	54	12.2	74	23.3	94	34.4	114	45.6
-25	-31.7	-5	-20.6	15	-9.4	35	1.7	55	12.8	75	23.9	95	35.0	115	46.1
-24	-31.1	-4	-20.0	16	-8.9	36	2.2	56	13.3	76	24.4	96	35.6	116	46.7
-23	-30.6	-3	-19.4	17	-8.3	37	2.8	57	13.9	77	25.0	97	36.1	117	47.2
-22	-30.0	-2	-18.9	18	-7.8	38	3.3	58	14.4	78	25.6	98	36.7	118	47.8
-21	-29.4	-1	-18.3	19	-7.2	39	3.9	59	15.0	79	26.1	99	37.2	119	48.3

# Conversion Factors

## Length

1 kilometer (km)	= 1000 m
	= 3281 ft
	= 0.62 mi
1 mile (mi)	= 5280 ft
	= 1609 m
	= 1.61 km
1 meter (m)	= 100 cm
	= 3.28 ft
	= 39.37 in.
1 foot (ft)	= 12 in.
	= 30.48 cm
	= 0.305 m
1 centimeter (cm)	= 0.39 in.
	= 0.01 m
	= 10 mm
1 inch (in.)	= 2.54 cm
	= 0.08 ft
1 millimeter (mm)	= 0.1 cm
	= 0.001 m
	= 0.039 in.
1 micrometer ( $\mu\text{m}$ )	= 0.0001 cm
	= 0.000001 m
1 degree latitude	= 111 km
	= 60 nautical mi
	= 69 statute mi

## Area

1 square centimeter ( $\text{cm}^2$ )	= 0.15 in. <sup>2</sup>
1 square inch (in. <sup>2</sup> )	= 6.45 cm <sup>2</sup>
1 square meter (m <sup>2</sup> )	= 10.76 ft <sup>2</sup>
1 square foot (ft <sup>2</sup> )	= 0.09 m <sup>2</sup>

## Volume

1 cubic centimeter ( $\text{cm}^3$ )	= 0.06 in. <sup>3</sup>
1 cubic inch (in. <sup>3</sup> )	= 16.39 cm <sup>3</sup>
1 liter (l)	= 1000 cm <sup>3</sup>
	= 0.264 gallon (gal) U.S.

## Speed

1 knot	= 1 nautical mi/hr
	= 1.15 statute mi/hr
	= 0.51 m/sec
	= 1.85 km/hr
1 mile per hour (mi/hr)	= 0.87 knots
	= 0.45 m/sec
	= 1.61 km/hr
1 kilometer per hour (km/hr)	= 0.54 knots
	= 0.62 mi/hr
	= 0.28 m/sec
1 meter per second (m/sec)	= 1.94 knots
	= 2.24 mi/hr
	= 3.60 km/hr

## Force

1 dyne	= 1 gram centimeter per second per second
	= 2.2481 $\times 10^{-6}$ pound (lb)
1 newton (N)	= 1 kilogram meter per second per second
	= 10 <sup>5</sup> dynes
	= 0.2248 lb

■ TABLE A.2 SI Units\* and Their Symbols

QUANTITY	NAME	UNITS	SYMBOL
length	meter	m	m
mass	kilogram	kg	kg
time	second	sec	sec
temperature	Kelvin	K	K
density	kilogram per cubic meter	kg/m <sup>3</sup>	kg/m <sup>3</sup>
speed	meter per second	m/sec	m/sec
force	newton	m   kg/sec <sup>2</sup>	N
pressure	pascal	N/m <sup>2</sup>	Pa
energy	joule	N · m	J
power	watt	J/sec	W

\*SI stands for *Système International*, which is the international system of units and symbols.