

Appendix C

Units, Dimensions, Conversions

C.1 Quantities, Dimensions, & Units (SI / cgs / Imperial equivalents)

Quantity	Dimensions	SI	cgs / CGS	Imperial
<i>Basic</i>				
Length	L	1 m	= 10 ² cm	= 3.281 ft
Mass	M	1 kg	= 10 ³ g	= 2.205 lb
Time	T	1 s	= 1 s	= 2.778 × 10 ⁻⁴ h
Temperature	θ	1 K	= 1 K	= 1.8 °F
<i>Derived</i>				
Area	L ²	1 m ²	= 10 ⁴ cm ²	= 10.76 ft ²
Volume	L ³	1 m ³	= 10 ⁶ cm ³	= 35.31 ft ³
Density	ML ⁻³	1 kg m ⁻³	= 10 ⁻³ g cm ⁻³	= 6.243 × 10 ⁻² lb ft ⁻³
Velocity	L T ⁻¹	1 m s ⁻¹	= 10 ² cm s ⁻¹	= 3.281 ft s ⁻¹
Acceleration	L T ⁻²	1 m s ⁻²	= 10 ² cm s ⁻²	= 3.281 ft s ⁻²
Force	MLT ⁻²	1 kg m s ⁻² = 1 N (Newton)	= 10 ⁵ g cm s ⁻² = 10 ⁵ dynes	= 0.225 lb f (lb force)
Pressure	ML ⁻¹ T ⁻²	1 kg m ⁻¹ s ⁻² = 1 Pa (Pascal)	= 10 g cm ⁻¹ s ⁻² = 10 ⁻² hPa (or mb)	= 0.021 lb f ft ⁻²
Work, energy	ML ² T ⁻²	1 kg m ² s ⁻² = 1 J (Joule)	= 10 ⁷ g cm ² s ⁻² = 10 ⁷ ergs	= 0.738 ft lb f
Power	ML ² T ⁻³	1 kg m ² s ⁻³ = 1 J s ⁻¹ = 1 W (Watt)	= 10 ⁷ g cm ² s ⁻³ = 10 ⁷ ergs s ⁻¹	= 0.738 ft lb f s ⁻¹
Heat, energy	Q (= ML ² T ⁻²)	1 J	= 0.2388 cal	= 9.487 × 10 ⁻⁴ BTU
Heat flux	QT ⁻¹	1 W	= 0.2388 cal s ⁻¹	= 3.412 BTU h ⁻¹
Heat flux density	QL ⁻² T ⁻¹	1 W m ⁻²	= 2.388 × 10 ⁻⁵ cal cm ⁻² s ⁻¹	= 0.317 BTU ft ⁻² h ⁻¹
Latent heat	QM ⁻¹	1 J kg ⁻¹	= 2.388 × 10 ⁻⁴ cal g ⁻¹	4.29 × 10 ⁻⁴ BTU lb ⁻¹
Specific heat	QM ⁻¹ θ ⁻¹	1 J kg ⁻¹ K ⁻¹	= 2.388 × 10 ⁻⁴ cal g ⁻¹ K ⁻¹	= 2.388 × 10 ⁻⁴ BTU lb ⁻¹ °F ⁻¹
Thermal conductivity	QL ⁻¹ θ ⁻¹ T ⁻¹	1 W m ⁻¹ K ⁻¹	= 2.388 × 10 ⁻³ cal cm ⁻¹ s ⁻¹ K ⁻¹	= 0.578 BTU ft ⁻¹ h ⁻¹ °F ⁻¹
Thermal diffusivity	L ² T ⁻¹	1 m ² s ⁻¹	= 10 ⁴ cm ² s ⁻¹	= 10.8 ft ² s ⁻¹

C.2 Useful Metric to Imperial Conversions

Length:	1 kilometer (km) = 1000 meters (m) = 0.6214 miles (mi) = 3281 feet (ft) 1 meter = 100 centimeters (cm) = 1.0936 yards (yd) = 3.281 feet = 39.37 inches (in) 1 centimeter = 10 millimeters (mm) = 0.3937 inches 1 micron (μm) = 10^{-6} meters = 10^{-4} centimeters = 3.937×10^{-5} inches
Area:	1 square kilometer (1 km^2) = 10^6 sq. meters (m^2) = 0.3861 sq. miles (mi^2) = 247.1 acres 1 m^2 = 10^4 sq. centimeters (cm^2) = 1.196 sq. yards = 10.764 sq. feet = 1550.0 sq. inches
Volume:	1 cubic kilometer = 10^9 cubic meters (m^3) = 0.2399 cubic miles 1 cubic meter = 10^6 cubic centimeters = 1.308 cubic yards = 35.31 cubic feet = 61024 cubic inches 1 litre (l) = 1000 cm^3 = 10^{-3} cubic meters = 0.264 US gallons (US gal) = 61.024 in^3
Mass:	1 metric ton (tonne) = 1000 kilograms = 2204.6 avoirdupois pounds (means pound of mass not force) 1 kilogram (kg) = 1000 grams (g) = 2.2046 avoirdupois pounds
Time:	1 day = 86400 seconds (s) 1 year (yr) = 3.156×10^7 seconds
Velocity / Speed:	1 meter/second (same as m/s, read meter per second) = 3.281 feet/second = 2.24 miles/hour 1 m/s = 3.6 kilometers /hour = 2.237 miles/hour 1 kilometer/hour = 0.62 miles/hour (mi/hr) 1 knot = 1 nautical mile/hour = 1.151 miles/hour = 0.51 m/s = 1.85 km/hr
Force:	1 newton (N) = 1 kilogram meter/(sq. second) 1 newton (N) = $1 \text{ kg m}^{-1} \text{ s}^{-2}$ = 0.2248 pounds force
Pressure:	1 atmosphere = 1013.2 hectopascals (hPa) = 101.32 kilopascals (kPa) 1 atmosphere = 14.7 pounds/ sq. inch (lb/in^2) 1 atmosphere = 760 millimeters of mercury (mm Hg) = 29.92 inches of mercury 10 millibars (hPa) = 1 kilopascal (kPa) 1 Pascal (Pa) = 1 newton /meter ² = 0.01 millibars (mb) = 0.01 hectopascals (hPa) 1 millibar (mb) = 1 hectopascal (hPa)
Temperature:	Temperature in $^{\circ}\text{C}$ = $5/9(\text{temperature in } ^{\circ}\text{F} - 32)$ Temperature in $^{\circ}\text{F}$ = $9/5(\text{temperature in } ^{\circ}\text{C}) + 32$ Temperature in K = temperature in $^{\circ}\text{C}$ + 273.15
Energy:	1 joule (J) = 1 newton meter (N m) = $1 \text{ kg m}^2 \text{ s}^{-2}$ = 0.239 calories = 1 watt sec (W s) 1 calorie (cal) = 4.186 joules (J) 1 langley = 1 calorie /square centimeter 1 kilowatt hour = 3.6×10^6 J
Power:	1 watt (W) = 1 joule / second (J / s) = 14.3353 calories /minute (cal/min) 1 calorie/second = 4.186 joules /second (J/s) = 4.186 watts (W) 1 calorie/minute = 0.06973 watts (W) 1 horsepower (hp) = 746 watts (W)