

# Conversion Factors

## Mass and Density

$$\begin{aligned}1 \text{ kg} &= 2.2046 \text{ lb} \\1 \text{ g/cm}^3 &= 10^3 \text{ kg/m}^3 \\1 \text{ g/cm}^3 &= 62.428 \text{ lb/ft}^3 \\1 \text{ lb} &= 0.4536 \text{ kg} \\1 \text{ lb/ft}^3 &= 0.016018 \text{ g/cm}^3 \\1 \text{ lb/ft}^3 &= 16.018 \text{ kg/m}^3\end{aligned}$$

## Length

$$\begin{aligned}1 \text{ cm} &= 0.3937 \text{ in.} \\1 \text{ m} &= 3.2808 \text{ ft} \\1 \text{ in.} &= 2.54 \text{ cm} \\1 \text{ ft} &= 0.3048 \text{ m}\end{aligned}$$

## Velocity

$$\begin{aligned}1 \text{ km/h} &= 0.62137 \text{ mile/h} \\1 \text{ mile/h} &= 1.6093 \text{ km/h}\end{aligned}$$

## Volume

$$\begin{aligned}1 \text{ cm}^3 &= 0.061024 \text{ in.}^3 \\1 \text{ m}^3 &= 35.315 \text{ ft}^3 \\1 \text{ L} &= 10^{-3} \text{ m}^3 \\1 \text{ L} &= 0.0353 \text{ ft}^3 \\1 \text{ in.}^3 &= 16.387 \text{ cm}^3 \\1 \text{ ft}^3 &= 0.028317 \text{ m}^3 \\1 \text{ gal} &= 0.13368 \text{ ft}^3 \\1 \text{ gal} &= 3.7854 \times 10^{-3} \text{ m}^3\end{aligned}$$

## Force

$$\begin{aligned}1 \text{ N} &= 1 \text{ kg} \cdot \text{m/s}^2 \\1 \text{ N} &= 0.22481 \text{ lbf} \\1 \text{ lbf} &= 32.174 \text{ lb} \cdot \text{ft/s}^2 \\1 \text{ lbf} &= 4.4482 \text{ N}\end{aligned}$$

## Pressure

$$\begin{aligned}1 \text{ Pa} &= 1 \text{ N/m}^2 \\&= 1.4504 \times 10^{-4} \text{ lbf/in.}^2 \\1 \text{ bar} &= 10^5 \text{ N/m}^2 \\1 \text{ atm} &= 1.01325 \text{ bar} \\1 \text{ lbf/in.}^2 &= 6894.8 \text{ Pa} \\1 \text{ lbf/in.}^2 &= 144 \text{ lbf/ft}^2 \\1 \text{ atm} &= 14.696 \text{ lbf/in.}^2\end{aligned}$$

## Energy and Specific Energy

$$\begin{aligned}1 \text{ J} &= 1 \text{ N} \cdot \text{m} = 0.73756 \text{ ft} \cdot \text{lbf} \\1 \text{ kJ} &= 737.56 \text{ ft} \cdot \text{lbf} \\1 \text{ kJ} &= 0.9478 \text{ Btu} \\1 \text{ kJ/kg} &= 0.42992 \text{ Btu/lb} \\1 \text{ ft} \cdot \text{lbf} &= 1.35582 \text{ J} \\1 \text{ Btu} &= 778.17 \text{ ft} \cdot \text{lbf} \\1 \text{ Btu} &= 1.0551 \text{ kJ} \\1 \text{ Btu/lb} &= 2.326 \text{ kJ/kg} \\1 \text{ kcal} &= 4.1868 \text{ kJ}\end{aligned}$$

## Energy Transfer Rate

$$\begin{aligned}1 \text{ W} &= 1 \text{ J/s} = 3.413 \text{ Btu/h} \\1 \text{ kW} &= 1.341 \text{ hp} \\1 \text{ Btu/h} &= 0.293 \text{ W} \\1 \text{ hp} &= 2545 \text{ Btu/h} \\1 \text{ hp} &= 550 \text{ ft} \cdot \text{lbf/s} \\1 \text{ hp} &= 0.7457 \text{ kW}\end{aligned}$$

## Specific Heat

$$\begin{aligned}1 \text{ kJ/kg} \cdot \text{K} &= 0.238846 \text{ Btu/lb} \cdot ^\circ\text{R} \\1 \text{ kcal/kg} \cdot \text{K} &= 1 \text{ Btu/lb} \cdot ^\circ\text{R} \\1 \text{ Btu/lb} \cdot ^\circ\text{R} &= 4.1868 \text{ kJ/kg} \cdot \text{K}\end{aligned}$$

## Others

$$\begin{aligned}1 \text{ ton of refrigeration} &= 200 \text{ Btu/min} = 211 \text{ kJ/min} \\1 \text{ volt} &= 1 \text{ watt per ampere}\end{aligned}$$

# Constants

## Universal Gas Constant

$$\bar{R} = \begin{cases} 8.314 \text{ kJ/kmol} \cdot \text{K} \\ 1545 \text{ ft} \cdot \text{lbf/lbmol} \cdot ^\circ\text{R} \\ 1.986 \text{ Btu/lbmol} \cdot ^\circ\text{R} \end{cases}$$

## Standard Acceleration of Gravity

$$g = \begin{cases} 9.80665 \text{ m/s}^2 \\ 32.174 \text{ ft/s}^2 \end{cases}$$

## Standard Atmospheric Pressure

$$1 \text{ atm} = \begin{cases} 1.01325 \text{ bar} \\ 14.696 \text{ lbf/in.}^2 \\ 760 \text{ mm Hg} = 29.92 \text{ in. Hg} \end{cases}$$

## Temperature Relations

$$\begin{aligned}T(^{\circ}\text{R}) &= 1.8 T(\text{K}) \\T(^{\circ}\text{C}) &= T(\text{K}) - 273.15 \\T(^{\circ}\text{F}) &= T(^{\circ}\text{R}) - 459.67\end{aligned}$$