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Heat Unit Conversion Chart

Quick reference guide for temperature and heat energy conversions

Temperature Scale Conversions

From	To	Conversion Formula
Celsius (°C)	Fahrenheit (°F)	°F = (°C × 9/5) + 32
Fahrenheit (°F)	Celsius (°C)	°C = (°F - 32) × 5/9
Celsius (°C)	Kelvin (K)	K = °C + 273.15
Kelvin (K)	Celsius (°C)	°C = K - 273.15
Fahrenheit (°F)	Kelvin (K)	K = (°F - 32) × 5/9 + 273.15
Kelvin (K)	Fahrenheit (°F)	°F = (K - 273.15) × 9/5 + 32
Fahrenheit (°F)	Rankine (°R)	°R = °F + 459.67
Rankine (°R)	Fahrenheit (°F)	°F = °R - 459.67
Kelvin (K)	Rankine (°R)	°R = K × 9/5
Rankine (°R)	Kelvin (K)	K = °R × 5/9

Common Temperature Points

Temperature Point	Celsius (°C)	Fahrenheit (°F)	Kelvin (K)	Rankine (°R)
Absolute Zero	-273.15	-459.67	0	0
Freezing Point of Water	0	32	273.15	491.67
Room Temperature	20	68	293.15	527.67
Human Body Temperature	37	98.6	310.15	558.27
Boiling Point of Water	100	212	373.15	671.67
Melting Point of Aluminum	660.3	1220.5	933.45	1680.2

Heat Energy Conversions

From	To	Multiply By	Example
Joule (J)	British Thermal Unit (BTU)	0.000947817	1000 J = 0.9478 BTU
British Thermal Unit (BTU)	Joule (J)	1055.06	1 BTU = 1055.06 J
Joule (J)	Calorie (cal)	0.239006	100 J = 23.9 cal
Calorie (cal)	Joule (J)	4.184	1 cal = 4.184 J
British Thermal Unit (BTU)	Calorie (cal)	252.164	1 BTU = 252.164 cal
Calorie (cal)	British Thermal Unit (BTU)	0.003966	1000 cal = 3.966 BTU
Joule (J)	Kilow att-hour (kWh)	2.778×10^{-7}	3,600,000 J = 1 kWh
Kilow att-hour (kWh)	Joule (J)	3,600,000	1 kWh = 3,600,000 J
British Thermal Unit (BTU)	Kilow att-hour (kWh)	0.000293071	3412.14 BTU = 1 kWh
Kilow att-hour (kWh)	British Thermal Unit (BTU)	3412.14	1 kWh = 3412.14 BTU

Heat Transfer Unit Conversions

From	To	Multiply By
W/(m·K) [SI]	BTU·in/(h·ft²·°F) [Imperial]	6.93347
BTU·in/(h·ft²·°F)	W/(m·K)	0.1442279
W/(m²·K) [SI]	BTU/(h·ft²·°F) [Imperial]	0.1761102
BTU/(h·ft²·°F)	W/(m²·K)	5.678263
J/(kg·K) [SI]	BTU/(lb·°F) [Imperial]	0.000238846
BTU/(lb·°F)	J/(kg·K)	4186.8
W/m² [SI]	BTU/(h·ft²) [Imperial]	0.3170064
BTU/(h·ft²)	W/m²	3.154591

Key Heat Transfer Equations

- **Sensible Heat:** $Q = m \times c_p \times \Delta T$ (Q = heat energy, m = mass, c_p = specific heat capacity, ΔT = temperature change)
- **Latent Heat:** $Q = m \times L$ (L = latent heat of fusion or vaporization)
- **Conduction:** $Q/t = k \times A \times (T_1 - T_2) / d$ (k = thermal conductivity, A = area, d = thickness)
- **Convection:** $Q/t = h \times A \times (T_s - T_\infty)$ (h = convection coefficient, T_s = surface temperature, T_∞ = fluid temperature)
- **Radiation:** $Q/t = \varepsilon \times \sigma \times A \times (T_1^4 - T_2^4)$ (ε = emissivity, σ = Stefan-Boltzmann constant)
- **Overall Heat Transfer:** $U = 1 / (1/h_1 + \Sigma(d/k) + 1/h_2)$ (U = overall heat transfer coefficient)

Practical Examples of Heat Conversions

Home Heating

A home heating system supplies 70,000 BTU/hr. Converting to SI units: 70,000 BTU/hr × (1055.06 J/BTU) / (3600 s/hr) = 20.52 kW. This helps when comparing to electric heating options.

Cooking Temperature

A recipe calls for baking at 350°F. Converting to Celsius: (350°F - 32) × 5/9 = 176.7°C. Most European ovens would be set to 175°C or 180°C.

Insulation Rating

An insulation has an R-value of R-19 (ft²·°F·h/BTU). Converting to RSI (metric): R-19 × 0.1761 = 3.35 m²·K/W. This value can be used in buildings designed with metric specifications.

Heat Capacity

A 2 kg aluminum component needs to be heated from 20°C to 150°C. The specific heat of aluminum is 900 J/(kg·K). Heat required: Q = 2 kg × 900 J/(kg·K) × (150-20)K = 234,000 J or 234 kJ.

For more conversion tools and resources, visit allunitconversions.com/heat-conversion