Energy Conversion Chart

Joules, kWh, calories, BTU and therms

For: Engineers, students, energy auditors and nutrition

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EXACT DEFINITION	FORMULA	REVERSE	WORKED EXAMPLE
1 kWh = 3.6 MJ; 1 kcal = 4.184 kJ; 1 BTU = 1,055.055 852 62 J	MJ = kWh × 3.6; kJ = kcal × 4.184	kWh = MJ ÷ 3.6; kcal = kJ ÷ 4.184	1 therm = 100,000 BTU = 29.307 kWh

Matrix values use 6 significant figures. Calories are thermochemical (4.184 J); food labels use kcal.

Factor matrix — 1 unit in every other unit

1 unit =	J	kJ	MJ	kcal	Wh	kWh	BTU	thm
1 J	1	0.001	1×10^{-6}	2.39006×10^{-4}	2.77778×10^{-4}	2.77778×10^{-7}	9.47817×10^{-4}	9.47817×10^{-9}
1 kJ	1,000	1	0.001	0.239006	0.277778	2.77778×10^{-4}	0.947817	9.47817×10^{-6}
1 MJ	1×10^{6}	1,000	1	239.006	277.778	0.277778	947.817	0.00947817
1 kcal	4,184	4.184	0.004184	1	1.16222	0.00116222	3.96567	3.96567×10^{-5}
1 Wh	3,600	3.6	0.0036	0.860421	1	0.001	3.41214	3.41214×10^{-5}
1 kWh	3.6×10^{6}	3,600	3.6	860.421	1,000	1	3,412.14	0.0341214
1 BTU	1,055.06	1.05506	0.00105506	0.252164	0.293071	2.93071×10^{-4}	1	1×10^{-5}
1 thm	1.05506×10^{8}	105,506	105.506	25,216.4	29,307.1	29.3071	100,000	1

Kilowatt-hours to megajoules, BTU and therms

Kilowatt-hours (kWh)	Megajoules (MJ)	British thermal units (BTU)	Therms (thm)
1	3.6	3,412	0.034
2	7.2	6,824	0.068
3	10.8	10,236	0.102
4	14.4	13,649	0.136
5	18.0	17,061	0.171
6	21.6	20,473	0.205
7	25.2	23,885	0.239
8	28.8	27,297	0.273
9	32.4	30,709	0.307
10	36.0	34,121	0.341
15	54.0	51,182	0.512
20	72.0	68,243	0.682
25	90.0	85,304	0.853
50	180.0	170,607	1.706
100	360.0	341,214	3.412
250	900.0	853,035	8.530
500	1,800.0	1,706,071	17.061
1,000	3,600.0	3,412,142	34.121

Food energy: kilocalories to kilojoules

Kilocalories (kcal)	Kilojoules (kJ)
50	209
100	418

Kilocalories (kcal)	Kilojoules (kJ)
350	1,464
400	1,674

Kilocalories (kcal)	Kilojoules (kJ)
1,000	4,184
1,500	6,276

Kilocalories (kcal)	Kilojoules (kJ)
150	628
200	837
250	1,046
300	1,255

Kilocalories (kcal)	Kilojoules (kJ)
450	1,883
500	2,092
600	2,510
750	3,138

Kilocalories (kcal)	Kilojoules (kJ)
2,000	8,368
2,500	10,460
3,000	12,552

Sources and method

- **NIST Special Publication 811** — Guide for the Use of the International System of Units (www.nist.gov/pml/special-publication-811)
- **BIPM SI Brochure, 9th edition** — Definitions of the SI units, including the kelvin (www.bipm.org/en/publications/si-brochure)

Conversion values on this sheet are generated by the AllUnitConversions conversion library and automatically checked against the exact definitions above before the PDF is produced; reference tables are taken from the sources listed. Interactive version, corrections and more charts: **allunitconversions.com/energy-conversion-chart**