

Si unit of energy definition

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The joule (/dʒuːl/ JOOL, or /dʒaʔl/ JOWL; symbol: J) is the unit of energy in the International System of Units (SI). It is equal to the amount of work done when a force of one newton displaces a mass through a distance of one metre in the direction of that force. It is also the energy dissipated as heat when an electric current of one ampere passes through a resistance of one ohm for one second. It is named after the English physicist James Prescott Joule (1818-1889).

In terms of SI base units and in terms of SI derived units with special names, the joule is defined as

One joule is also equivalent to any of the following:

The joule is named after James Prescott Joule. As with every SI unit named for a person, its symbol starts with an upper case letter (J), but when written in full, it follows the rules for capitalisation of a common noun; i.e., joule becomes capitalised at the beginning of a sentence and in titles but is otherwise in lower case.

The cgs system had been declared official in 1881, at the first International Electrical Congress. The erg was adopted as its unit of energy in 1882. Wilhelm Siemens, in his inauguration speech as chairman of the British Association for the Advancement of Science (23 August 1882) first proposed the joule as unit of heat, to be derived from the electromagnetic units ampere and ohm, in cgs units equivalent to 10^7 erg. The naming of the unit in honour of James Prescott Joule (1818-1889), at the time retired but still living (aged 63), followed the recommendation of Siemens:

Such a heat unit, if found acceptable, might with great propriety, I think, be called the Joule, after the man who has done so much to develop the dynamical theory of heat.

At the second International Electrical Congress, on 31 August 1889, the joule was officially adopted alongside the watt and the quadrant (later renamed to henry). Joule died in the same year, on 11 October 1889. At the fourth congress (1893), the "international ampere" and "international ohm" were defined, with slight changes in the specifications for their measurement, with the "international joule" being the unit derived from them.

The definition of the joule as $J = kg \cdot m^2 \cdot s^{-2}$ has remained unchanged since 1946, but the joule as a derived unit has inherited changes in the definitions of the second (in 1960 and 1967), the metre (in 1983) and the kilogram (in 2019).

One joule represents (approximately):

1 joule is equal to (approximately unless otherwise stated):

Units with exact equivalents in joules include:

In mechanics, the concept of force (in some direction) has a close analogue in the concept of torque (about some angle);citation needed

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