Energy Equivalents†

	Relevant unit			
	J	kg	$[\mathrm{m}^{-1}]^*$	Hz
1 J	$(1\ \mathrm{J}) =$ 1 J	$(1\ \mathrm{J})/c^2 =$ $1.112\,650\,056\ldots \times 10^{-17}$ kg	$(1\ \mathrm{J})/hc =$ $5.034\,116\,567\ldots \times 10^{24}\ \mathrm{m}^{-1}$	$(1\ \mathrm{J})/h =$ $1.509\,190\,179\ldots \times 10^{33}$ Hz
1 kg	$(1\ \mathrm{kg})c^2 =$ $8.987\,551\,787\ldots \times 10^{16}$ J	$(1\ \mathrm{kg}) =$ 1 kg	$(1\ \mathrm{kg})c/h =$ $4.524\,438\,335\ldots \times 10^{41}\ \mathrm{m}^{-1}$	$(1\ \mathrm{kg})c^2/h =$ $1.356\,392\,489\ldots \times 10^{50}$ Hz
1 $[\mathrm{m}^{-1}]^*$	$(1\ \mathrm{m}^{-1})hc =$ $1.986\,445\,857\ldots \times 10^{-25}$ J	$(1\ \mathrm{m}^{-1})h/c =$ $2.210\,219\,094\ldots \times 10^{-42}$ kg	$(1\ \mathrm{m}^{-1}) =$ $1\ \mathrm{m}^{-1}$	$(1\ \mathrm{m}^{-1})c =$ 299 792 458 Hz
1 Hz	$(1\ \mathrm{Hz})h =$ $6.626\,070\,15 \times 10^{-34}$ J	$(1\ \mathrm{Hz})h/c^2 =$ $7.372\,497\,323\ldots \times 10^{-51}$ kg	$(1\ \mathrm{Hz})/c =$ $3.335\,640\,951\ldots \times 10^{-9}\ \mathrm{m}^{-1}$	$(1\ \mathrm{Hz}) =$ 1 Hz
1 K	$(1\ \mathrm{K})k =$ $1.380\,649 \times 10^{-23}$ J	$(1\ \mathrm{K})k/c^2 =$ $1.536\,179\,187\ldots \times 10^{-40}$ kg	$(1\ \mathrm{K})k/hc =$ $69.503\,480\,04\ldots\ \mathrm{m}^{-1}$	$(1\ \mathrm{K})k/h =$ $2.083\,661\,912\ldots \times 10^{10}$ Hz
1 eV	(1 eV) = $1.602\,176\,634 \times 10^{-19}$ J	$(1\ \mathrm{eV})/c^2 =$ $1.782\,661\,921\ldots \times 10^{-36}$ kg	$(1\ \mathrm{eV})/hc =$ $8.065\,543\,937\ldots \times 10^{5}\ \mathrm{m}^{-1}$	$(1\ \mathrm{eV})/h =$ $2.417\,989\,242\ldots \times 10^{14}$ Hz
1 u	$(1\ \mathrm{u})c^2 =$ $1.492\,418\,087\,68(46) \times 10^{-10}$ J	(1 u) = $1.660\,539\,068\,92(52) \times 10^{-27}$ kg	$(1\ \mathrm{u})c/h =$ $7.513\,006\,6209(23) \times 10^{14}\ \mathrm{m}^{-1}$	$(1\ \mathrm{u})c^2/h =$ $2.252\,342\,721\,85(70) \times 10^{23}$ Hz
1 E_h	$(1\ E_\mathrm{h}) =$ $4.359\,744\,722\,2060(48) \times 10^{-18}$ J	$(1\ E_\mathrm{h})/c^2 =$ $4.850\,870\,209\,5419(53) \times 10^{-35}$ kg	$(1\ E_\mathrm{h})/hc =$ $2.194\,746\,313\,6314(24) \times 10^{7}\ \mathrm{m}^{-1}$	$(1\ E_\mathrm{h})/h =$ $6.579\,683\,920\,4999(72) \times 10^{15}$ Hz

† The values of some energy equivalents derived from the relations $E = mc^2 = hc/\lambda = h\nu = kT$, and based on the 2022 CODATA adjustment of the values of the constants; 1 eV $= (e/\mathrm{C})$ J, 1 u $= m_\mathrm{u} = \frac{1}{12}m(^{12}\mathrm{C})$, and $E_\mathrm{h} = 2R_\infty hc = \alpha^2 m_\mathrm{e} c^2$ is the Hartree energy (hartree).

* The symbol [m] denotes m/(Hz s). If angles are dimensionless, as in the current SI, then Hz s = 1. If angles have a dimension, then Hz s = cycle.

Energy Equivalents[†]

	Relevant unit			
	K	eV	u	E_h
1 J	(1 J)/k = $7.242\,970\,516\ldots \times 10^{22}$ K	(1 J) = $6.241\,509\,074\ldots \times 10^{18}$ eV	(1 J)/c^2 = $6.700\,535\,2471(21) \times 10^{9}$ u	(1 J) = $2.293\,712\,278\,3969(25) \times 10^{17}\ E_\mathrm{h}$
1 kg	(1 kg)c^2/k = $6.509\,657\,260\ldots \times 10^{39}$ K	(1 kg)c^2 = $5.609\,588\,603\ldots \times 10^{35}$ eV	(1 kg) = $6.022\,140\,7537(19) \times 10^{26}$ u	(1 kg)c^2 = $2.061\,485\,788\,7415(22) \times 10^{34}\ E_\mathrm{h}$
1 [m^{-1}]*	(1 m^{-1})hc/k = $1.438\,776\,877\ldots \times 10^{-2}$ K	(1 m^{-1})hc = $1.239\,841\,984\ldots \times 10^{-6}$ eV	(1 m^{-1})h/c = $1.331\,025\,048\,24(41) \times 10^{-15}$ u	(1 m^{-1})hc = $4.556\,335\,252\,9132(50) \times 10^{-8}\ E_\mathrm{h}$
1 Hz	(1 Hz)h/k = $4.799\,243\,073\ldots \times 10^{-11}$ K	(1 Hz)h = $4.135\,667\,696\ldots \times 10^{-15}$ eV	(1 Hz)h/c^2 = $4.439\,821\,6590(14) \times 10^{-24}$ u	(1 Hz)h = $1.519\,829\,846\,0574(17) \times 10^{-16}\ E_\mathrm{h}$
1 K	(1 K) = 1 K	(1 K)k = $8.617\,333\,262\ldots \times 10^{-5}$ eV	(1 K)k/c^2 = $9.251\,087\,2884(29) \times 10^{-14}$ u	(1 K)k = $3.166\,811\,563\,4564(35) \times 10^{-6}\ E_\mathrm{h}$
1 eV	(1 eV)/k = $1.160\,451\,812\ldots \times 10^{4}$ K	(1 eV) = 1 eV	(1 eV)/c^2 = $1.073\,544\,100\,83(33) \times 10^{-9}$ u	(1 eV) = $3.674\,932\,217\,5665(40) \times 10^{-2}\ E_\mathrm{h}$
1 u	(1 u)c^2/k = $1.080\,954\,020\,67(34) \times 10^{13}$ K	(1 u)c^2 = $9.314\,941\,0372(29) \times 10^{8}$ eV	(1 u) = 1 u	(1 u)c^2 = $3.423\,177\,6922(11) \times 10^{7}\ E_\mathrm{h}$
1 E_h	($1\ E_\mathrm{h}$)/k = $3.157\,750\,248\,0398(34) \times 10^{5}$ K	($1\ E_\mathrm{h}$) = $27.211\,386\,245\,981(30)$ eV	($1\ E_\mathrm{h}$)/c^2 = $2.921\,262\,317\,97(91) \times 10^{-8}$ u	($1\ E_\mathrm{h}$) = $1\ E_\mathrm{h}$

[†] The values of some energy equivalents derived from the relations $E = mc^2 = hc/\lambda = h\nu = kT$, and based on the 2022 CODATA adjustment of the values of the constants; 1 eV = (e/C) J, 1 u = $m_\mathrm{u} = \frac{1}{12}m(^{12}\mathrm{C})$, and $E_\mathrm{h} = 2R_\infty hc = \alpha^2 m_\mathrm{e} c^2$ is the Hartree energy (hartree).

[*] The symbol [m] denotes m/(Hz s). If angles are dimensionless, as in the current SI, then Hz s = 1. If angles have a dimension, then Hz s = cycle.