CONVERSION FACTORS FOR CHEMICAL KINETICS

Equivalent Second Order Rate Constants

A \ B	$cm^3\,mol^{-1}s^{-1}$	$dm^3\,mol^{-1}s^{-1}$	$m^3\,mol^{-1}s^{-1}$	$cm^3\,molecule^{-1}s^{-1}$	$(mm\,Hg)^{-1}s^{-1}$	$atm^{-1}s^{-1}$	$ppm^{-1}min^{-1}$	$m^2kN^{-1}s^{-1}$
$1\ cm^3\,mol^{-1}s^{-1} =$	1	10^{-3}	10^{-6}	1.66×10^{-24}	$1.604 \times 10^{-5}\,T^{-1}$	$1.219 \times 10^{-2}\,T^{-1}$	2.453×10^{-9}	$1.203 \times 10^{-4}\,T^{-1}$
$1\ dm^3\,mol^{-1}s^{-1} =$	10^3	1	10^{-3}	1.66×10^{-21}	$1.604 \times 10^{-2}\,T^{-1}$	$12.19\,T^{-1}$	2.453×10^{-6}	$1.203 \times 10^{-1}\,T^{-1}$
$1\ m^3\,mol^{-1}\,s^{-1} =$	10^6	10^3	1	1.66×10^{-18}	$16.04\,T^{-1}$	$1.219 \times 10^4\,T^{-1}$	2.453×10^{-3}	$120.3\,T^{-1}$
$1\ cm^3\,molecule^{-1}s^{-1} =$	6.023×10^{23}	6.023×10^{20}	6.023×10^{17}	1	$9.658 \times 10^{18}T^{-1}$	$7.34 \times 10^{21}\,T^{-1}$	1.478×10^{15}	$7.244 \times 10^{19}T^{-1}$
$1\ (mm\,Hg)^{-1}\,s^{-1} =$	$6.236 \times 10^4\,T$	$62.36\,T$	$6.236 \times 10^{-2}\,T$	$1.035 \times 10^{-19}\,T$	1	760	4.56×10^{-2}	7.500
$1\ atm^{-1}s^{-1}$	$82.06\,T$	$8.206 \times 10^{-2}\,T$	$8.206 \times 10^{-5}\,T$	$1.362 \times 10^{-22}\,T$	1.316×10^{-3}	1	6×10^{-5}	9.869×10^{-3}
$1\ ppm^{-1}\,min^{-1} =$ at 298 K, 1 atm total pressure	4.077×10^8	4.077×10^5	407.7	6.76×10^{-16}	21.93	1.667×10^4	1	164.5
$1\ m^2kN^{-1}s^{-1} =$	$8314\,T$	$8.314\,T$	$8.314 \times 10^{-3}\,T$	$1.38 \times 10^{-20}\,T$	0.1333	101.325	6.079×10^{-3}	1

To convert a rate constant from one set of units A to a new set B find the conversion factor for the row A under column B and multiply the old value by it, e.g.. to convert $cm^3\ molecule^{-1}\ s^{-1}$ to $m^3\ mol^{-1}\ s^{-1}$ multiply by 6.023×10^{17}.

Table adapted from High Temperature Reaction Rate Data No. 5, The University, Leeds (1970).

Equivalent Third Order Rate Constants

A \ B	$cm^6\,mol^{-2}s^{-1}$	$dm^6\,mol^{-1}s^{-1}$	$m^6\,mol^{-2}s^{-1}$	$cm^6\,molecule^{-2}s^{-1}$	$(mm\,Hg)^{-2}s^{-1}$	$atm^{-2}s^{-1}$	$ppm^{-2}min^{-1}$	$m^4kN^{-2}s^{-1}$
$1\ cm^6\,mol^{-2}s^{-1} =$	1	10^{-6}	10^{-12}	2.76×10^{-48}	$2.57 \times 10^{-10}T^{-2}$	$1.48 \times 10^{-4}\,T^{-2}$	1.003×10^{-19}	$1.477 \times 10^{-8}T^{-2}$
$1\ dm^6\,mol^{-2}s^{-1} =$	10^6	1	10^{-6}	2.76×10^{-42}	$2.57 \times 10^{-4}T^{-2}$	$148\,T^{-2}$	1.003×10^{-13}	$1.477 \times 10^{-2}T^{-2}$
$1\ m^6\,mol^{-2}\,s^{-1} =$	10^{12}	10^6	1	2.76×10^{-36}	$257\,T^{-2}$	$1.48 \times 10^8T^{-2}$	1.003×10^{-7}	$1.477 \times 10^4T^{-2}$
$1\ cm^6\,molecule^{-2}s^{-1} =$	3.628×10^{47}	3.628×10^{41}	3.628×10^{35}	1	$9.328 \times 10^{37}T^{-2}$	$5.388 \times 10^{43}T^{-2}$	3.64×10^{28}	$5.248 \times 10^{39}T^{-2}$
$1\ (mm\,Hg)^{-2}\,s^{-1} =$	$3.89 \times 10^9\,T^2$	$3.89 \times 10^3\,T^2$	$3.89 \times 10^{-3}\,T^2$	$1.07 \times 10^{-38}T^2$	1	5.776×10^5	3.46×10^{-5}	56.25
$1\ atm^{-2}s^{-1} =$	$6.733 \times 10^3\,T^2$	$6.733 \times 10^{-3}\,T^2$	$6.733 \times 10^{-9}\,T^2$	$1.86 \times 10^{-44}T^2$	1.73×10^{-6}	1	6×10^{-11}	9.74×10^{-5}
$1\ ppm^{-2}\,min^{-1} =$ at 298K, 1 atm total pressure	9.97×10^{18}	9.97×10^{12}	9.97×10^6	2.75×10^{-29}	2.89×10^4	1.667×10^{10}	1	1.623×10^6
$1\ m^1kN^{-2}s^{-1} =$	$6.91 \times 10^7\,T^2$	$6.91\,T^2$	$69.1 \times 10^{-5}\,T^2$	$1.904 \times 10^{-40}\,T^2$	0.0178	1.027×10^4	6.16×10^{-7}	1

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