Table A–3. Conversion Factors for Absorption Coefficients (9)

The absorption coefficient a is defined by the equation

$$I_t = I_0 e^{-abl} \quad \text{or} \quad I_t = I_0 10^{-abl}$$

where I_t and I_0 are the transmitted and incident light intensities, b denotes either pressure or concentration, and l is the path length in centimeters. Depending on whether b is given in pressure units (torr or atm) or in concentration units (mol dm^{-3}), a is designated as k or ϵ. If k (pressure^{-1} cm^{-1}) is used, it is necessary to specify the temperature to which the pressure is referred. At 25°C k is 9% less than that at 0°C.

Sometimes the absorption cross section σ, defined as $\sigma = k$ (atm^{-1} cm^{-1} at 0°C)/$n_0 = k/2.687 \times 10^{19}$ cm^2 $molec^{-1}$ is used instead of k or ϵ, where n_0 is the Loshmidt number. The absorption cross section is sometimes expressed in megabarns; 1 Mb = 10^{-18} cm^2. The absorption cross section is nearly temperature independent between 0°C and room temperature, but may change at much higher and lower temperatures.

To Convert From	Base	to	Base	Multiply By
k (atm, 298°K)$^{-1}$ cm^{-1}	e	σ (cm^2 $molec^{-1}$)	e	4.06×10^{-20}
k (atm, 298°K)$^{-1}$ cm^{-1}	e	k (atm, 273°K)$^{-1}$ cm^{-1}	e	1.09
k (atm, 298°K)$^{-1}$ cm^{-1}	e	ϵ (dm^3 mol^{-1} cm^{-1})	10	10.6
k (atm, 298°K)$^{-1}$ cm^{-1}	10	σ	e	9.35×10^{-20}
k (atm, 298°K)$^{-1}$ cm^{-1}	10	k (atm, 273°K)$^{-1}$ cm^{-1}	e	2.51
k (atm, 298°K)$^{-1}$ cm^{-1}	10	ϵ	10	24.4
k (mm Hg, 298°K)$^{-1}$ cm^{-1}	10	σ	e	7.11×10^{-17}
k (mm Hg, 298°K)$^{-1}$ cm^{-1}	10	k (atm, 273°K)$^{-1}$ cm^{-1}	e	1.91×10^{3}
k (mm Hg, 298°K)$^{-1}$ cm^{-1}	10	ϵ	10	1.86×10^{4}
k (atm, 273°K)$^{-1}$ cm^{-1}	e	σ	e	3.72×10^{-20}
k (atm, 273°K)$^{-1}$ cm^{-1}	e	ϵ	10	9.73
k (atm, 273°K)$^{-1}$ cm^{-1}	10	σ	e	8.57×10^{-20}
k (atm, 273°K)$^{-1}$ cm^{-1}	10	k (atm, 273°K)$^{-1}$ cm^{-1}	e	2.303
k (atm, 273°K)$^{-1}$ cm^{-1}	10	ϵ	10	22.4
ϵ (dm^3 mol^{-1} cm^{-1})	10	σ	e	3.82×10^{-21}
ϵ (dm^3 mol^{-1} cm^{-1})	10	k (atm, 273°K)$^{-1}$ cm^{-1}	e	0.103
σ (cm^2 $molec^{-1}$)	e	k (atm, 273°K)$^{-1}$ cm^{-1}	e	2.69×10^{19}
σ (cm^2 $molec^{-1}$)	e	ϵ	10	2.6×10^{20}