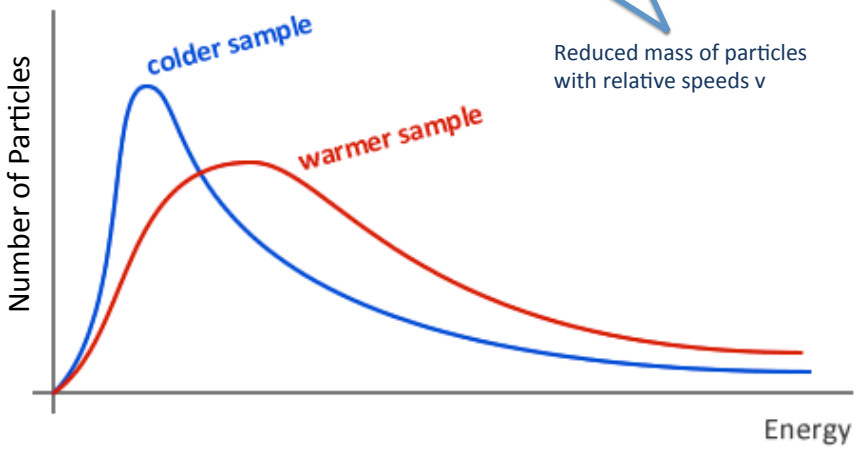
Maxwell Boltzmann Distribution

$$f(v) = 4\pi \left[\frac{m}{2\pi kT} \right]^{3/2} v^2 e^{-mv^2/2kT}$$

Reduced mass of particles with relative speeds v



Example Neutral (H or H_2) Collision Rates

Table 4.2. Rate Coefficients ($cm^3 s^{-1}$) for Deexcitation by H and H_2

Temperature T (°K)	10°	30°	100°	300°	1000°
$10^{11} \times \gamma_{kj}$ for H–H	0.23	3.0	9.5	16	25
$10^{10} \times \gamma_{kj}$ for H–C^+	6.9	7.4	8.0	8.4	9.7
$10^{12} \times \gamma_{20}$ for H–H_2	0.96	1.37	3.0	9.1	42
$10^{11} \times \gamma_{10}$ for H_2–CO	1.8	3.2	3.7		

Spitzer - Physical Processes in the ISM

Table of Collision Strengths with e-

Table 4.1. Collision Strengths for Excitation by Electrons

Number of p electrons	Ion	Levels Lower	Levels Upper	E_{jk}(eV)	$\Omega(j,k)$	$\Sigma_j A_{kj}(s^{-1})$
1,5	C II	$^2P_{1/2}$	$^2P_{3/2}$	0.0079	1.33	2.4×10^{-6}
	Ne II	$^2P_{3/2}$	$^2P_{1/2}$	0.097	0.37	8.6×10^{-3}
	Si II	$^2P_{1/2}$	$^2P_{3/2}$	0.036	7.7	2.1×10^{-4}
2	N II	$^3P_0$	$^3P_1$	0.0061	0.41	2.1×10^{-6}
		$^3P_0$	$^3P_2$	0.0163	0.28	7.5×10^{-6}
		$^3P_1$	$^3P_2$	0.0102	1.38	7.5×10^{-6}
		^3P	$^1D_2$	1.90	2.99	4.0×10^{-3}
		^3P	$^1S_0$	4.05	0.36	1.1
	O III	$^3P_0$	$^3P_1$	0.014	0.39	2.6×10^{-5}
		$^3P_0$	$^3P_2$	0.038	0.21	9.8×10^{-5}
		$^3P_1$	$^3P_2$	0.024	0.95	9.8×10^{-5}
		^3P	$^1D_2$	2.51	2.50	2.8×10^{-2}
		^3P	$^1S_0$	5.35	0.30	1.8
3	O II	$^4S_{3/2}$	$^2D_{5/2}$	3.32	0.88	4.2×10^{-5}
		$^4S_{3/2}$	$^2D_{3/2}$	3.32	0.59	1.8×10^{-4}
		$^2D_{3/2}$	$^2D_{5/2}$	0.0025	1.16	4.2×10^{-5}

Spitzer - Physical Processes in the ISM

Leiden Collision Rate Database