a single collision involving two or more particles. But collisions involving more than two particles are sufficiently infrequent that they can be neglected. Under this assumption some macrostates cannot be reached from others by a single collision. However, the net collision probabilities remain representative.

As a specific illustration, consider two particle collisions occurring in a system of 6 Boltzons with 4 energy levels (3, 6, 9 and 12 B_o with degeneracies 1, 3, 3, and 1, respectively). The total energy of the 6 particle system is 54 B_o, and the average energy per particle is 9 B_o. The 7 macrostate distributions of this system, along with their probabilities and relative probabilities are listed in Table IIIA-8.[35] It also presents the *transition probability matrix* for this system. The elements of this matrix are the probabilities that a two-particle collision occurring to the system while it is in the macrostate of that row will result in the macrostate of that column. Thus the probability of transition from macrostate I to II is $p_{I-II} = 0.172$ and that from macrostate I to III is $p_{I-III} = 0.030$, etc. The elements of each row add to one.[36] The diagonal elements represent the probabilities of two particle collisions that leave the system in its original macrostate. Zeros represent the fact that macrostates of that column cannot be reached by a single two-particle collision from the macrostate of that row.

TABLE IIIA-8: MACROSTATES AND TRANSITION PROBABILITIES OF A SYSTEM OF 6 BOLTZONS

	INITIAL MACROSTATE						PROBABILITY OF OUTCOME OF TWO PARTICLE COLLISION						
i	$n_{1,i}$	$n_{2,i}$	$n_{3,i}$	$n_{4,i}$	P_i	R_i	I	II	III	IV	V	VI	VII
I	0	1	4	1	.390	2.73	.746	.172	.030	0	.043	0	0
II	0	2	2	2	.390	2.73	.185	.713	.031	.042	0	.030	0
III	1	0	3	2	.087	0.61	.215	.162	.515	.108	0	0	0
IV	1	1	1	3	.058	0.40	0	.323	.162	.449	0	.054	.012
V	0	0	6	0	.039	0.27	.400	0	0	0	.600	0	0
VI	0	3	0	3	.029	0.20	0	.443	0	.098	0	.459	0
VII	2	0	0	4	.008	0.06	0	0	0	.864	0	0	.136

$\epsilon_1 = 3B_o$ $\epsilon_2 = 6B_o$ $\epsilon_3 = 9B_o$ $\epsilon_4 = 12B_o$
$g_1 = 1$ $g_2 = 3$ $g_3 = 3$ $g_4 = 1$

[35]This system is an abbreviation of the 6 particle system considered earlier with the original fourth level, 11 B_o, eliminated. Macrostates with this level occupied (I, II, and III of Table IIIA-5) cannot be reached from the other macrostates by 2 particle collisions. The 7 macrostates of Table IIIA-8 are the last 7 of Table IIIA-5.

[36]The probabilities are the proportion of ways a two-particle collision can produce each possible type of macrostate. In row 1, for example, there are 156 two-particle collisions which leave macrostate I unchanged, 36 which produce macrostate II, 8-III, 0-IV, 9-V, 0-VI, and 0-VII, total is 209. Thus, $p_{I-I} = 156/209 = 0.746$ etc.