III. 2200m/sec CROSS SECTIONS FOR NATURALLY OCCURRING ELEMENTS

[From *Reactor Physics Constants*, ANL-5800 (1963)].

Atomic No.	Element or Compound	Atomic or Mol. Wt.	Density, g/cm^3	Nuclei per Unit Vol. $\times 10^{-24}$	$1-\bar{\mu}_0$	ξ	Microscopic Cross Section, b			Macroscopic Cross Section, cm^{-1}		
							σ_a	σ_s	σ_t	Σ_a	Σ_s	Σ_t
1	H	1.008	8.9†	5.3†	0.3386	1.000	0.33	38	38	1.7†	0.002	0.002
	H_2O	18.016	1	0.0335‡	0.676	0.948	0.66	103	103	0.022	3.45	3.45
	D_2O	20.030	1.10	0.0331‡	0.884	0.570	0.001	13.6	13.6	3.3†	0.449	0.449
2	He	4.003	17.8†	2.6†	0.8334	0.425	0.007	0.8	0.807	0.02†	2.1†	2.1†
3	Li	6.940	0.534	0.0463	0.9047	0.268	71	1.4	72.4	3.29	0.065	3.35
4	Be	9.013	1.85	0.1236	0.9259	0.209	0.010	7.0	7.01	124‡	0.865	0.865
	BeO	25.02	3.025	0.0728‡	0.939	0.173	0.010	6.8	6.8	73†	0.501	0.501
5	B	10.82	2.45	0.1364	0.9394	0.171	755	4	759	103	0.346	104
6	C	12.011	1.60	0.0803	0.9444	0.158	0.004	4.8	4.80	32†	0.385	0.385
7	N	14.008	0.0013	5.3†	0.9524	0.136	1.88	10	11.9	9.9†	50†	60†
8	O	16.000	0.0014	5.3†	0.9583	0.120	20†	4.2	4.2	0.000	21†	21†
9	F	19.00	0.0017	5.3†	0.9649	0.102	0.001	3.9	3.90	0.01†	20†	20†
10	Ne	20.183	0.0009	2.6†	0.9667	0.0968	<2.8	2.4	5.2	7.3†	6.2†	13.5†
11	Na	22.991	0.971	0.0254	0.9710	0.0845	0.525	4	4.53	0.013	0.102	0.115
12	Mg	24.32	1.74	0.0431	0.9722	0.0811	0.069	3.6	3.67	0.003	0.155	0.158
13	Al	26.98	2.699	0.0602	0.9754	0.0723	0.241	1.4	1.64	0.015	0.084	0.099
14	Si	28.09	2.42	0.0522	0.9762	0.0698	0.16	1.7	1.86	0.008	0.089	0.097
15	P	30.975	1.82	0.0354	0.9785	0.0632	0.20	5	5.20	0.007	0.177	0.184
16	S	32.066	2.07	0.0389	0.9792	0.0612	0.52	1.1	1.62	0.020	0.043	0.063
17	Cl	35.457	0.0032	5.3†	0.9810	0.0561	33.8	16	49.8	0.002	80†	0.003
18	A	39.944	0.0018	2.6†	0.9833	0.0492	0.66	1.5	2.16	1.7†	3.9	5.6†
19	K	39.100	0.87	0.0134	0.9829	0.0504	2.07	1.5	3.57	0.028	0.020	0.048
20	Ca	40.08	1.55	0.0233	0.9833	0.0492	0.44	3.0	3.44	0.010	0.070	0.080
21	Sc	44.96	2.5	0.0335	0.9852	0.0438	24	24	48	0.804	0.804	1.61
22	Ti	47.90	4.5	0.0566	0.9861	0.0411	5.8	4	9.8	0.328	0.226	0.555

23	V	50.95	5.96	0.0704	0.9869	0.0387	5	5	10.0	0.352	0.352	0.704
24	Cr	52.01	7.1	0.0822	0.9872	0.0385	3.1	3	6.1	0.255	0.247	0.501
25	Mn	54.94	7.2	0.0789	0.9878	0.0359	13.2	2.3	15.5	1.04	0.181	1.22
26	Fe	55.85	7.86	0.0848	0.9881	0.0353	2.62	11	13.6	0.222	0.933	1.15
27	Co	58.94	8.9	0.0910	0.9887	0.0335	38	7	45	3.46	0.637	4.10
28	Ni	58.71	8.90	0.0913	0.9887	0.0335	4.6	17.5	22.1	0.420	1.60	2.02
29	Cu	63.54	8.94	0.0848	0.9896	0.0309	3.85	7.2	11.05	0.0326	0.611	0.937
30	Zn	65.38	7.14	0.0658	0.9897	0.0304	1.10	3.6	4.70	0.072	0.237	0.309
31	Ga	69.72	5.91	0.0511	0.9925	0.0283	2.80	4	6.80	0.143	0.204	0.347
32	Ge	72.60	5.36	0.0445	0.9909	0.0271	2.45	3	5.45	0.109	0.134	0.243
33	As	74.91	5.73	0.0461	0.9911	0.0264	4.3	6	10.3	0.198	0.277	0.475
34	Se	78.96	4.8	0.0366	0.9916	0.0251	12.3	11	23.3	0.450	0.403	0.853
35	Br	79.916	3.12	0.0235	0.9917	0.0247	6.7	6	12.7	0.157	0.141	0.298
36	Kr	83.80	0.0037	2.6†	0.9921	0.0236	31	7.2	38.2	81†	19†	99†
37	Rb	85.48	1.53	0.0108	0.9922	0.0233	0.73	12	12.7	0.008	0.130	0.138
38	Sr	87.63	2.54	0.0175	0.9925	0.0226	1.21	10	11.2	0.021	0.175	0.195
39	Yt	88.92	5.51	0.0373	0.9925	0.0223	1.313	4.3	4.3	0.049	0.112	0.160
40	Zr	91.22	6.4	0.0423	0.9927	0.0218	0.185	8	8.2	0.008	0.338	0.347
41	Nb	92.91	8.4	0.0545	0.9928	0.0214	1.16	5	6.16	0.063	0.273	0.336
42	Mo	95.95	10.2	0.0640	0.9931	0.0207	2.70	7	9.70	0.173	0.448	0.621
43	Tc	98.0	—	—	0.9932	0.0203	22	—	—	—	—	—
44	Ru	101.1	12.2	0.0727	0.9934	0.0197	2.56	6	8.56	0.186	0.436	0.622
45	Rh	102.91	12.5	0.0732	0.9935	0.0193	149	5	154	10.9	0.366	11.3
46	Pd	106.4	12.16	0.0689	0.9937	0.0187	8	3.6	11.6	0.551	0.248	0.799
47	Ag	107.88	10.5	0.0586	0.9938	0.0184	63	6	69	3.69	0.352	4.04
48	Cd	112.41	8.65	0.0464	0.9940	0.0178	2450	7	2457	114	0.325	114
49	In	114.82	7.28	0.0382	0.9942	0.0173	191	2.2	193	7.30	0.084	7.37
50	Sn	118.70	6.5	0.0330	0.9944	0.0167	0.625	4	4.6	0.021	0.132	0.152
51	Sb	121.76	6.69	0.0331	0.9945	0.0163	5.7	4.3	10.0	0.189	0.142	0.331
52	Te	127.61	6.24	0.0295	0.9948	0.0155	4.7	5	9.7	0.139	0.148	0.286
53	I	126.91	4.93	0.0234	0.9948	0.0157	7.0	3.6	10.6	0.164	0.084	0.248
54	Xe	131.30	0.0059	2.7†	0.9949	0.0152	35	4.3	39.3	95†	12†	0.001
55	Cs	132.91	1.873	0.0085	0.9950	0.0150	28	20	48	0.238	0.170	0.408
56	Ba	137.36	3.5	0.0154	0.9951	0.0145	1.2	8	9.2	0.018	0.123	0.142

Z	Element	$\bar{A}$	ρ	N	$1-\bar{\mu}_0$	ξ	σ_a	σ_s	σ_t	Σ_a	Σ_s	Σ_t
57	La	138.92	6.19	0.0268	0.9952	0.0143	8.9	15	24	0.239	0.403	0.642
58	Ce	140.13	6.78	0.0292	0.9952	0.0142	0.73	9	9.7	0.021	0.263	0.283
59	Pr	140.92	6.78	0.0290	0.9953	0.0141	11.3	4	15.3	0.328	0.116	0.444
60	Nd	144.27	6.95	0.0290	0.9954	0.0138	46	16	62	1.33	0.464	1.79
61	Pm	145.0	—	—	0.9954	0.0137	60	—	—	—	—	—
62	Sm	150.35	7.7	0.0309	0.9956	0.0133	5600	5	5605	173	0.155	173
	Sm_2O_3	348.70	7.43	0.0128‡	0.974	0.076	16,500	22.6	16,500	211	0.289	211
63	Eu	152.0	5.22	0.0207	0.9956	0.0131	4300	8	4308	89.0	0.166	89.2
	Eu_2O_3	352.00	7.42	0.0127‡	0.978	0.063	8740	30.2	8770	111	0.383	111
64	Gd	167.26	7.95	0.0305	0.9958	0.0127	46,000	—	—	1403	—	—
65	Tb	158.93	8.33	0.0316	0.9958	0.0125	46	—	—	1.45	—	—
66	Dy	162.51	8.56	0.0317	0.9959	0.0122	950	100	1050	30.1	3.17	33.3
	Dy_2O_3	372.92	7.81	0.0126‡	0.993	0.019	2200	214	2414	27.7	2.7	30.4
67	Ho	164.94	8.76	0.0320	0.9960	0.0121	65	—	—	2.08	—	—
68	Er	167.27	9.16	0.0330	0.9960	0.0119	173	15	188	5.71	0.495	6.20
69	Tm	168.94	9.35	0.0333	0.9961	0.0118	127	7	134	4.23	0.233	4.46
70	Yb	173.04	7.01	0.0244	0.9961	0.0115	37	12	49	0.903	0.293	1.20
71	Lu	174.99	9.74	0.0335	0.9962	0.0114	112	—	—	3.75	—	—
72	Hf	178.5	13.3	0.0449	0.9963	0.0112	105	8	113	4.71	0.0359	5.07
73	Ta	180.95	16.6	0.0553	0.9963	0.0110	21	5	26	1.16	0.277	1.44
74	W	183.86	19.3	0.0632	0.9964	0.0108	19.2	5	24.2	1.21	0.316	1.53
75	Re	186.22	20.53	0.0664	0.9964	0.0107	86	14	100	5.71	0.930	6.64
76	OS	190.2	22.48	0.0712	0.9965	0.0105	15.3	11	26.3	1.09	0.783	1.87
77	Ir	192.2	22.42	0.0703	0.9965	0.0104	440	—	—	30.9	—	—
78	Pt	195.09	21.37	0.0660	0.9966	0.0102	8.8	10	18.8	0.581	0.660	1.24
79	Au	197.0	19.32	0.0591	0.9966	0.0101	98.8	9.3	107.3	5.79	0.550	6.34
80	Hg	200.61	13.55	0.0407	0.9967	0.0099	380	20	400	15.5	0.814	16.3
81	Ti	204.39	11.85	0.0349	0.9967	0.0098	3.4	14	17.4	0.119	0.489	0.607
82	Pb	207.21	11.35	0.0330	0.9968	0.0096	0.170	11	11.2	0.006	0.363	0.369
83	Bi	209.0	9.747	0.0281	0.9968	0.0095	0.034	9	9	0.001	0.253	0.256
84	Po	210.0	9.24	0.0265	0.9968	0.0095	—	—	—	—	—	—
85	At	211.0	—	—	0.9968	0.0094	—	—	—	—	—	—
86	Rn	222.0	0.0097	2.6†	0.9970	0.0090	0.7	—	—	—	—	—
87	Fr	223.0	—	—	0.9980	0.0089	—	—	—	—	—	—
88	Ra	226.05	5	0.0133	0.9971	0.0088	20	—	—	0.266	—	—
89	Ac	227.0	—	—	0.9971	0.0088	510	—	—	—	—	—
90	Th	232.05	11.3	0.0293	0.9971	0.0086	7.56	12.6	20.2	0.222	0.369	0.592
91	Pa	231.0	15.4	0.0402	0.9971	0.0086	200	—	—	8.04	—	—
92	U	238.07	18.9	0.04783	0.9972	0.0084	7.68	8.3	16.0	0.367	0.397	0.765
	UO_2	270.07	10	0.0223‡	0.9887	0.036	7.6	16.7	24.3	0.169	0.372	0.542
93	Np	237.0	—	—	0.9972	0.0084	170	—	—	—	—	—
94	Pu	239.0	19.74	0.0498	0.9972	0.0083	1026	9.6	1036	51.1	0.478	51.6
95	Am	242.0	—	—	0.9973	0.0082	8.000	—	—	—	—	—

† Value has been multiplied by 10^5.
‡ Molecules/cm^3.

IV. 2200 m/sec CROSS SECTIONS OF SPECIAL INTEREST:

^{10}B:	$\sigma_a = 3837b$	
^{11}B:	$\sigma_a = 0.005$	
^{135}Xe:	$\sigma_a = 2.7 \times 10^6$	
^{233}U:	$\sigma_\gamma = 49$	$\sigma_f = 524$
^{235}U:	$\sigma_\gamma = 101$	$\sigma_f = 577$
^{238}U:	$\sigma_\gamma = 2.73$	
^{239}Pu:	$\sigma_\gamma = 274$	$\sigma_f = 741$
^{240}Pu:	$\sigma_\gamma = 286$	$\sigma_f = 0.03$
^{241}Pu:	$\sigma_\gamma = 425$	$\sigma_f = 950$
^{242}Pu:	$\sigma_\gamma = 30$	$\sigma_f < 0.2$