TABLES FOR CONVERSION OF ATOMIC, WEIGHT, AND VOLUME PERCENTAGES IN ALLOYS OF HEAVY METALS

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The accompanying tables have been compiled to facilitate prompt and accurate conversion of atomic and weight percentages in systems involving elements of widely differing atomic weights. They are based on a published paper[1], but some typographical errors therein have been corrected and two tables[2] have been added.

Use of these tables depends on the following rearrangement of the common conversion formulae:

$$\frac{x}{100-x} = \frac{A}{B}\,\frac{y}{(100-y)}$$

where x and y are the weight and atomic percentages respectively of the element of atomic weight A in a binary alloy with elements of atomic weight B. Tables I and II give values of the function $\log\left[x/(100-x)\right]$, and Tables III and IV, values of $\log (A/B)$ for various common combinations of elements.

The tables are used in exactly the same manner as ordinary log tables. To convert from a certain weight percentage to atomic percent, the value of $\log\left[x/(100-x)\right]$ corresponding to the known weight percentage is first read from Table I or II. From this value is subtracted the appropriate log atomic weight ratio from Table III or IV, giving a resultant value of $\log\left[y/(100-y)\right]$ corresponding to the atomic percentage directly read from Table I or II. Conversions in the reverse direction, i.e. from atomic to weight percentages, are done by adding the log (A/B) value.

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1) American Institute of Mining and Metallurgical Engineers, Contribution 60, 1933. Copies obtainable from the writer.

2) Computations for Tables II and III were kindly made by the Computing Group.

For conversions of amounts less than 0.01 percent (100 ppm), the simplified formula $x = (A/B)y$, worked on a slide rule, is sufficiently accurate, and in the case of elements not differing greatly in atomic weight, this may be used to higher values.

By the use of the appropriate log molecular weight ratios, Tables I and II also serve for rapid computation of molar fractions in any binary or pseudobinary system of compounds.

Conversion of Volume Percentages

By the use of log density ratios, these tables are equally good for conversions to or from volume percentages. In case of conversion from weight to volume percentage, the factor $\log\left[(\text{density A})/(\text{density B})\right]$ is subtracted from the appropriate $\log\left[x/(100-x)\right]$ from Table I or II, where A is the element whose percentage is being converted. Conversions from atomic to volume percentage are done by subtracting the function $\log\left(\frac{\text{density A}}{\text{density B}} \times \frac{\text{atomic weight B}}{\text{atomic weight A}}\right)$. In conversions from volume percentage to either weight or atomic percentages, these functions are added. These density functions have not been computed, but the reader may easily do so for any system of sufficient interest.

Conversions in Ternary Systems

Attention is called to a graphical method given in Ref. 1, permitting rapid conversion of percentages in ternary systems. The accuracy, however, is not great in systems of elements of greatly differing atomic weights.

TABLE I. *Values of* $\text{Log}\ \frac{x}{100 - x} + 10$

x	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	
0	*	7 100	10 30	12 48	14 694	16 701	18 781	20 848	22 906	24 958	48
1	8 004	26 048	28 081	30 120	32 152	34 188	36 211	38 238	40 263	42 287	23
2	310	44 341	46 362	48 372	50 391	52 409	54 426	56 443	58 459	60 475	14
3	490	62 505	64 519	66 533	68 547	70 560	72 572	74 585	76 597	78 608	12
4	620	80 631	82 642	84 653	86 663	88 673	90 683	92 693	94 7026	96 7120	9
5	8 7212	98 7303	80 7392	82 7478	84 7565	86 7649	88 7732	90 7814	92 7894	94 7973	77
6	8050	96 8127	98 8202	80 8276	82 8349	84 8421	86 8492	88 8562	90 8631	92 8699	68
7	8766	94 8832	96 8898	98 8962	80 9026	82 9088	84 9151	86 9213	88 9274	90 9334	60
8	9393	92 9452	94 9510	96 9567	98 9624	80 9680	82 9736	84 9791	86 9845	88 9898	55
9	9952	90 0005	92 0057	94 0109	96 0160	98 0211	80 0261	82 0311	84 0360	86 0409	49
10	9.0458	88 0506	90 0553	92 0600	94 0647	96 0694	98 0740	80 0785	82 0831	84 0876	45
11	0920	86 0964	88 1008	90 1052	92 1095	94 1138	96 1180	98 1222	80 1264	82 1306	41
12	1347	84 1388	86 1429	88 1469	90 1509	92 1549	94 1588	96 1627	98 1667	80 1706	38
13	1744	82 1783	84 1821	86 1858	88 1896	90 1933	92 1970	94 2007	96 2044	98 2080	36
14	2116	80 2152	82 2188	84 2224	86 2259	88 2294	90 2329	92 2364	94 2398	96 2433	34
15	9.2467	82 2501	84 2534	86 2568	88 2602	90 2635	92 2668	94 2701	96 2734	98 2766	32
16	2798	80 2831	82 2863	84 2896	86 2928	88 2958	90 3089	92 3021	94 3052	96 3083	31
17	3114	98 3145	80 3175	82 3205	84 3236	86 3266	88 3296	90 3326	92 3356	94 3385	30
18	3415	96 3444	98 3473	80 3502	82 3531	84 3560	86 3589	88 3618	90 3646	92 3674	29
19	3703	94 3731	96 3759	98 3787	80 3815	82 3842	84 3870	86 3898	88 3925	90 3952	27
20	9.3979	92 4007	94 4034	96 4060	98 4087	80 4114	82 4141	84 4167	86 4193	88 4220	26
21	4246	90 4272	92 4298	94 4324	96 4350	98 4376	80 4401	82 4427	84 4453	86 4478	25
22	4503	88 4529	90 4554	92 4579	94 4604	96 4629	98 4654	80 4678	82 4703	84 4728	24
23	4752	86 4777	88 4801	90 4826	92 4850	94 4874	96 4898	98 4922	80 4946	82 4970	24
24	4994	84 5018	86 5042	88 5065	90 5089	92 5112	94 5136	96 5159	98 5182	80 5206	23
25	9.5229	82 5252	84 5275	86 5298	88 5321	90 5344	92 5367	94 5389	96 5412	98 5435	22
26	5457	80 5480	82 5502	84 5525	86 5547	88 5570	90 5592	92 5614	94 5636	96 5658	22
27	5680	98 5702	80 5724	82 5746	84 5768	86 5790	88 5812	90 5833	92 5855	94 5877	21
28	5898	96 5920	98 5941	80 5963	82 5984	84 6005	86 6027	88 6048	90 6069	92 6090	21
29	6111	94 6132	96 6154	98 6175	80 6196	82 6216	84 6237	86 6258	88 6279	90 6300	20
30	9.6320	92 6341	94 6362	96 6382	98 6403	80 6423	82 6444	84 6464	86 6484	88 6505	20
31	6525	90 6545	92 6566	94 6586	96 6606	98 6626	80 6646	82 6666	84 6686	86 6706	20
32	6726	90 6746	92 6766	94 6786	96 6806	98 6826	80 6846	82 6865	84 6885	86 6905	19
33	6924	90 6944	92 6964	94 6983	96 7003	98 7022	80 7042	82 7061	84 7081	86 7100	19
34	7119	90 7139	92 7158	94 7177	96 7197	98 7216	80 7235	82 7254	84 7273	86 7293	19
35	9.7312	90 7331	92 7350	94 7369	96 7388	98 7407	80 7426	82 7445	84 7463	86 7482	19
36	7501	90 7520	92 7539	94 7558	96 7576	98 7595	80 7614	82 7633	84 7651	86 7670	19
37	7689	90 7707	92 7726	94 7744	96 7763	98 7781	80 7800	82 7819	84 7837	86 7856	18
38	7874	90 7892	92 7911	94 7929	96 7948	98 7966	80 7984	82 8003	84 8021	86 8039	18
39	8057	90 8076	92 8094	94 8112	96 8130	98 8148	80 8167	82 8185	84 8203	86 8221	18
40	9.8239	90 8257	92 8275	94 8293	96 8311	98 8329	80 8347	82 8365	84 8383	86 8401	18
41	8419	90 8437	92 8455	94 8473	96 8491	98 8509	80 8527	82 8545	84 8563	86 8580	18
42	8598	90 8616	92 8634	94 8652	96 8670	98 8687	80 8705	82 8723	84 8741	86 8758	18
43	8776	90 8794	92 8811	94 8829	96 8847	98 8864	80 8882	82 8900	84 8917	86 8935	18
44	8953	90 8970	92 8988	94 9005	96 9023	98 9041	80 9058	82 9076	84 9093	86 9111	18
45	9.9129	90 9146	92 9164	94 9181	96 9199	98 9216	80 9234	82 9251	84 9269	86 9286	18
46	9304	90 9321	92 9339	94 9356	96 9374	98 9391	80 9409	82 9426	84 9443	86 9461	17
47	9478	90 9496	92 9513	94 9531	96 9548	98 9565	80 9583	82 9600	84 9618	86 9635	17
48	9652	90 9670	92 9687	94 9706	96 9722	98 9739	80 9757	82 9774	84 9792	86 9809	17
49	9826	90 9844	92 9861	94 9878	96 9896	98 9913	80 9931	82 9948	84 9965	86 9983	17

Subtract value of $\log \frac{A}{B}$ (from table 2) if converting from weight to atomic percentage.

TABLE I. *Values of* $\text{Log}\ \frac{x}{100 - x} + 10$ *(Continued)*

x	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	
50	10.0000	17 0017	18 0035	17 0052	18 0070	17 0087	17 0104	18 0122	17 0139	17 0156	
51	0174	17 0191	18 0209	17 0226	17 0243	18 0261	17 0278	17 0295	18 0313	17 0330	
52	0348	17 0365	17 0382	18 0400	17 0417	18 0435	17 0452	18 0470	17 0487	17 0504	
53	0522	17 0539	18 0557	17 0574	18 0592	17 0609	17 0626	18 0644	17 0661	18 0679	
54	0696	18 0714	17 0731	18 0749	17 0766	18 0784	17 0801	18 0819	17 0836	18 0854	
55	10.0872	17 0889	18 0907	17 0924	18 0942	17 0959	18 0977	18 0995	17 1012	18 1030	
56	1047	18 1065	18 1083	17 1100	18 1118	18 1136	17 1153	18 1171	18 1189	17 1206	
57	1224	18 1242	18 1260	17 1277	18 1295	18 1313	18 1331	17 1348	18 1366	18 1384	
58	1402	18 1420	17 1437	18 1455	18 1473	18 1491	18 1509	18 1527	18 1545	18 1563	
59	1581	18 1599	18 1617	18 1635	18 1653	18 1671	18 1689	18 1707	18 1725	18 1743	
60	10.1761	18 1779	18 1797	18 1815	18 1833	19 1852	18 1870	18 1888	18 1906	18 1924	
61	1943	18 1961	18 1979	19 1998	18 2016	18 2034	19 2053	18 2071	18 2089	19 2108	
62	2126	19 2145	18 2163	19 2182	18 2200	19 2219	18 2237	19 2256	18 2274	19 2293	
63	2311	19 2330	19 2349	18 2367	19 2386	19 2405	19 2424	18 2442	19 2461	19 2480	
64	2499	19 2518	19 2537	18 2555	19 2574	19 2593	19 2612	19 2631	19 2650	19 2669	
65	10.2688	20 2708	19 2727	19 2746	19 2765	19 2784	19 2803	20 2823	19 2842	19 2861	
66	2881	19 2900	20 2919	20 2939	19 2958	20 2978	19 2997	20 3017	19 3036	20 3056	
67	3076	19 3095	20 3115	20 3135	19 3154	20 3174	20 3194	20 3214	20 3234	20 3254	
68	3274	20 3294	20 3314	20 3334	20 3354	20 3374	20 3394	20 3414	20 3434	21 3455	
69	3475	20 3495	21 3516	20 3536	20 3556	21 3577	20 3597	21 3618	21 3639	20 3659	
70	10.3680	21 3701	20 3721	21 3742	21 3763	21 3784	21 3805	21 3826	21 3847	21 3868	
71	3888	21 3910	21 3931	21 3952	21 3973	22 3995	21 4016	21 4037	22 4059	21 4080	
72	4102	21 4123	22 4145	22 4167	21 4188	22 4210	22 4232	22 4254	22 4276	22 4298	
73	4320	22 4342	22 4364	22 4386	22 4408	22 4430	23 4453	22 4475	22 4498	22 4520	
74	4543	22 4565	23 4588	23 4611	22 4633	23 4656	23 4679	23 4702	23 4725	23 4748	
75	10.4771	23 4794	24 4818	23 4841	23 4864	24 4888	23 4911	24 4935	24 4959	23 4982	
76	5006	24 5030	24 5054	24 5078	24 5102	24 5126	24 5150	24 5174	23 5199	24 5223	
77	5248	24 5272	26 5297	26 5322	24 5346	25 5371	25 5396	26 5421	25 5446	26 5472	
78	5497	25 5522	26 5548	25 5573	26 5599	25 5624	26 5650	26 5676	26 5702	26 5728	
79	5754	26 5780	27 5807	26 5833	27 5860	26 5886	27 5913	27 5940	27 5967	27 5994	
80	10.6021	27 6048	27 6075	28 6103	27 6130	28 6158	27 6185	28 6213	28 6241	28 6269	
81	0297	29 6326	28 6354	29 6383	28 6411	29 6440	29 6469	29 6498	29 6527	29 6556	
82	6585	30 6615	30 6645	29 6674	30 6704	30 6734	30 6764	31 6795	30 6825	31 6856	
83	6886	31 6917	31 6948	31 6979	32 7011	31 7042	32 7074	31 7105	32 7137	32 7169	
84	7202	32 7234	33 7267	32 7299	33 7332	33 7365	33 7398	34 7432	34 7466	33 7499	
85	10.7533	34 7567	35 7602	34 7636	35 7671	35 7706	35 7741	35 7776	36 7812	36 7848	
86	7884	36 7920	36 7956	37 7993	37 8030	37 8067	37 8104	38 8142	38 8180	38 8218	
87	8256	38 8294	39 8333	39 8372	39 8411	40 8451	40 8491	40 8531	40 8571	41 8612	
88	8653	41 8694	42 8736	42 8778	42 8820	42 8862	43 8905	43 8948	44 8992	44 9036	
89	9080	44 9124	46 9169	46 9215	46 9260	46 9306	47 9353	47 9400	47 9447	47 9494	
90	10.9542	49 9591	49 9640	49 9689	50 9739	50 9789	51 9840	51 9891	52 9943	52 9995	
91	11.0048	53 0101	54 0155	55 0210	55 0265	55 0320	56 0376	57 0433	57 0490	58 0548	
92	0607	60 0666	60 0726	61 0787	62 0849	62 0911	63 0974	63 1038	64 1102	66 1168	
93	1234	67 1301	68 1369	69 1438	70 1508	71 1579	72 1651	73 1724	74 1798	75 1873	
94	1950	77 2027	79 2106	80 2186	82 2268	83 2351	84 2435	86 2521	87 2608	89 2697	
95	11.2788	92 2880	94 2974	96 3070	98 317	10 327	10 337	10 347	11 358	11 369	
96	380	13 392	11 403	12 415	13 428	12 440	13 453	14 467	14 481	14 495	
97	510	16 525	16 541	16 557	17 574	17 591	18 609	19 628	20 648	21 669	
98	690	23 713	24 737	25 762	27 789	28 817	31 848	32 880	36 916	38 954	
99	996	40 042	51 093	59 152	67 219	79 299	07 40	12 52	18 70	30 6.00	

Add value of $\log \frac{A}{B}$ when converting from atomic to weight percentage.

TABLE II. Values of $\log \frac{x}{100-x} + 10$

X	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	∞	6.0000	6.3011	6.4772	6.6022	6.6992	6.7784	6.8454	6.9034	6.9546
.1	7.0004	7.0419	7.0797	7.1145	7.1467	7.1767	7.2048	7.2312	7.2560	7.2796
.2	.3019	.3231	.3434	.3627	.3812	.3990	.4161	.4325	.4484	.4637
.3	.4784	.4927	.5065	.5200	.5330	.5456	.5579	.5698	.5814	.5928
.4	.6038	.6146	.6251	.6353	.6454	.6552	.6648	.6742	.6833	.6923
0.5	7.7012	7.7098	7.7183	7.7266	7.7347	7.7428	7.7506	7.7584	7.7660	7.7734
.6	.7808	.7880	.7951	.8021	.8090	.8157	.8224	.8290	.8355	.8419
.7	.8482	.8544	.8605	.8665	.8725	.8783	.8841	.8899	.8955	.9011
.8	.9066	.9120	.9174	.9227	.9279	.9331	.9382	.9433	.9483	.9534
.9	.9582	.9630	.9678	.9725	.9772	.9819	.9865	.9910	.9955	8.0000
1.0	8.0044	8.0087	8.0130	8.0173	8.0216	8.0258	8.0299	8.0340	8.0371	8.0422
.1	.0462	.0502	.0541	.0580	.0619	.0657	.0695	.0733	.0770	.0808
.2	.0844	.0881	.0917	.0953	.0988	.1024	.1059	.1094	.1128	.1162
.3	.1196	.1230	.1263	.1297	.1330	.1362	.1395	.1427	.1459	.1491
.4	.1522	.1554	.1585	.1616	.1647	.1677	.1707	.1738	.1767	.1797
1.5	8.1826	8.1856	8.1885	8.1914	8.1943	8.1971	8.2000	8.2028	8.2056	8.2084
.6	.2111	.2139	.2166	.2193	.2220	.2247	.2274	.2300	.2327	.2353
.7	.2379	.2405	.2431	.2456	.2482	.2507	.2532	.2557	.2582	.2607
.8	.2632	.2656	.2680	.2705	.2729	.2753	.2777	.2800	.2824	.2848
.9	.2871	.2894	.2917	.2940	.2963	.2986	.3009	.3031	.3054	.3076
2.0	8.3098	8.3120	8.3142	8.3164	8.3186	8.3208	8.3229	8.3250	8.3272	8.3293
.1	.3314	.3335	.3356	.3377	.3398	.3419	.3439	.3460	.3480	.3501
.2	.3521	.3541	.3561	.3581	.3601	.3621	.3640	.3660	.3680	.3699
.3	.3718	.3738	.3757	.3776	.3795	.3814	.3833	.3852	.3870	.3889
.4	.3908	.3926	.3945	.3963	.3981	.3999	.4018	.4036	.4054	.4072
2.5	8.4089	8.4107	8.4125	8.4142	8.4160	8.4178	8.4195	8.4212	8.4230	8.4247
.6	.4264	.4281	.4298	.4315	.4332	.4349	.4366	.4383	.4399	.4416
.7	.4432	.4449	.4466	.4482	.4498	.4514	.4531	.4547	.4563	.4579
.8	.4595	.4611	.4627	.4643	.4658	.4674	.4690	.4705	.4721	.4736
.9	.4752	.4767	.4782	.4798	.4813	.4828	.4843	.4858	.4874	.4888
3.0	8.4904	8.4918	8.4933	8.4948	8.4963	8.4978	8.4992	8.5007	8.5021	8.5036
.1	.5050	.5065	.5079	.5094	.5108	.5122	.5136	.5150	.5165	.5179
.2	.5193	.5207	.5221	.5235	.5248	.5262	.5276	.5290	.5304	.5317
.3	.5331	.5344	.5358	.5372	.5385	.5398	.5402	.5425	.5438	.5452
.4	.5465	.5478	.5491	.5504	.5518	.5531	.5544	.5557	.5570	.5583
3.5	8.5595	8.5608	8.5621	8.5634	8.5646	8.5659	8.5672	8.5685	8.5697	8.5710
.6	.5722	.5735	.5747	.5760	.5772	.5784	.5797	.5809	.5821	.5834
.7	.5846	.5858	.5870	.5882	.5894	.5906	.5918	.5930	.5942	.5954
.8	.5966	.5978	.5990	.6002	.6013	.6025	.6037	.6048	.6060	.6072
.9	.6083	.6095	.6107	.6118	.6130	.6141	.6152	.6164	.6175	.6186
4.0	8.6198	8.6209	8.6220	8.6232	8.6243	8.6254	8.6265	8.6276	8.6288	8.6299
.1	.6310	.6321	.6332	.6343	.6354	.6365	.6375	.6386	.6397	.6408
.2	.6419	.6430	.6440	.6451	.6462	.6472	.6483	.6494	.6504	.6515
.3	.6526	.6536	.6547	.6557	.6568	.6578	.6588	.6599	.6609	.6620
.4	.6630	.6640	.6650	.6661	.6671	.6681	.6691	.6702	.6712	.6722
4.5	8.6732	8.6742	8.6752	8.6762	8.6772	8.6782	8.6792	8.6802	8.6812	8.6822
.6	.6832	.6842	.6852	.6862	.6872	.6881	.6891	.6901	.6911	.6920
.7	.6930	.6940	.6949	.6959	.6969	.6978	.6988	.6998	.7007	.7017
.8	.7026	.7036	.7045	.7054	.7064	.7073	.7083	.7092	.7102	.7111
.9	.7120	.7130	.7139	.7148	.7157	.7167	.7176	.7185	.7194	.7203

Element A			Log atomic weight ratios		
Atomic No.	Symbol	Atomic Wt.	B=238,06 Uranium	B=235.90 75% 25	B=239,07 Plutonium
1	H	1.008	$\bar{3}$.6268	$\bar{3}$.6307	$\bar{3}$.6249
2	He	4.003	$\bar{2}$.2257	$\bar{2}$.2297	$\bar{2}$.2239
3	Li	6.940	.4647	.4686	.4628
4	Be	9.02	$\bar{2}$.5785	$\bar{2}$.5825	$\bar{2}$.5767
5	B	10.82	.6575	.6615	.6557
6	C	12.010	.7029	.7068	.7010
7	N	14.008	$\bar{2}$.7697	$\bar{2}$.7737	$\bar{2}$.7679
8	O	16.000	.8274	.8314	.8256
9	F	19.00	.9021	.9060	.9002
10	Ne	20.183	$\bar{2}$.9283	$\bar{2}$.9323	$\bar{2}$.9265
11	Na	22.997	.9850	.9889	.9832
12	Mg	24.32	$\bar{1}$.0093	$\bar{1}$.0132	$\bar{1}$.0074
13	Al	26.97	$\bar{1}$.0542	$\bar{1}$.0582	$\bar{1}$.0524
14	Si	28.06	.0714	.0754	.0696
15	P	30.98	.1144	.1184	.1126
16	S	32.06	$\bar{1}$.1293	$\bar{1}$.1332	$\bar{1}$.1274
17	Cl	35.457	.1730	.1770	.1712
18	A	39.944	.2248	.2287	.2229
19	K	39.096	$\bar{1}$.2155	$\bar{1}$.2194	$\bar{1}$.2136
20	Ca	40.08	.2262	.2302	.2244
21	Sc	45.10	.2775	.2815	.2757
22	Ti	47.90	$\bar{1}$.3037	$\bar{1}$.3076	$\bar{1}$.3018
23	V	50.95	.3305	.3344	.3286
24	Cr	52.01	.3394	.3434	.3376
25	Mn	54.93	$\bar{1}$.3631	$\bar{1}$.3671	$\bar{1}$.3613
26	Fe	55.85	.3703	.3743	.3685
27	Co	58.94	.3937	.3977	.3919
28	Ni	58.69	$\bar{1}$.3919	$\bar{1}$.3958	$\bar{1}$.3900
29	Cu	63.57	.4266	.4305	.4247
30	Zn	65.38	.4388	.4427	.4369
31	Ga	69.72	$\bar{1}$.4667	$\bar{1}$.4706	$\bar{1}$.4648
32	Ge	72.60	.4843	.4882	.4824
33	As	74.91	.4979	.5018	.4960
34	Se	78.96	$\bar{1}$.5207	$\bar{1}$.5247	$\bar{1}$.5189
35	Br	79.916	.5260	.5299	.5241
36	Kr	83.7	.5460	.5500	.5442
37	Rb	85.48	$\bar{1}$.5552	$\bar{1}$.5591	$\bar{1}$.5533
38	Sr	87.63	.5660	.5699	.5641
39	Y	88.92	.5723	.5763	.5705
40	Zr	91.22	$\bar{1}$.5834	$\bar{1}$.5874	$\bar{1}$.5816
41	Cb	92.91	.5914	.5953	.5895
42	Mo	95.95	.6054	.6093	.6035
44	Ru	101.7	$\bar{1}$.6306	$\bar{1}$.6346	$\bar{1}$.6288
45	Rh	102.91	.6358	.6397	.6339
46	Pd	106.7	.6515	.6554	.6496

Element A			Log atomic weight ratios		
Atomic No.	Symbol	Atomic Wt.	B=238.06 Uranium	B=235.90 75% 25	B=239.07 Plutonium
47	Ag	107.880	$\bar{1}$.6563	$\bar{1}$.6602	$\bar{1}$.6544
48	Cd	112.41	.6741	.6781	.6723
49	In	114.76	.6831	.6871	.6813
50	Sn	118.70	$\bar{1}$.6978	$\bar{1}$.7017	$\bar{1}$.6959
51	Sb	121.76	.7088	.7128	.7070
52	Te	127.61	.7292	.7332	.7274
53	I	126.92	$\bar{1}$.7268	$\bar{1}$.7308	$\bar{1}$.7250
54	Xe	131.3	.7416	.7455	.7397
55	Cs	132.91	.7469	.7508	.7450
56	Ba	137.36	$\bar{1}$.7612	$\bar{1}$.7651	$\bar{1}$.7593
57	La	138.92	.7661	.7700	.7642
58	Ce	140.13	.7698	.7738	.7680
59	Pr	140.92	$\bar{1}$.7723	$\bar{1}$.7762	$\bar{1}$.7705
60	Nd	144.27	.7825	.7865	.7807
62	Sm	150.43	.8007	.8046	.7988
63	Eu	152.0	$\bar{1}$.8052	$\bar{1}$.8091	$\bar{1}$.8033
64	Gd	156.9	.8189	.8229	.8171
65	Tb	159.2	.8253	.8292	.8234
66	Dy	162.46	$\bar{1}$.8341	$\bar{1}$.8380	$\bar{1}$.8322
67	Ho	164.94	.8406	.8446	.8388
68	Er	167.2	.8466	.8505	.8447
69	Tm	169.4	$\bar{1}$.8522	$\bar{1}$.8562	$\bar{1}$.8504
70	Yb	173.04	.8615	.8654	.8596
71	Lu	174.99	.8663	.8703	.8645
72	Hf	178.6	$\bar{1}$.8752	$\bar{1}$.8792	$\bar{1}$.8734
73	Ta	180.88	.8807	.8847	.8789
74	W	183.92	.8879	.8919	.8861
75	Re	186.31	$\bar{1}$.8936	$\bar{1}$.8975	$\bar{1}$.8917
76	Os	190.2	.9025	.9065	.9007
77	Ir	193.1	.9091	.9131	.9073
78	Pt	195.23	$\bar{1}$.9139	$\bar{1}$.9178	$\bar{1}$.9120
79	Au	197.2	.9182	.9222	.9164
80	Hg	200.61	.9257	.9296	.9238
81	Tl	204.39	$\bar{1}$.9338	$\bar{1}$.9377	$\bar{1}$.9319
82	Pb	207.21	.9397	.9437	.9379
83	Bi	209.00	.9435	.9474	.9416
84	Po	210.01	$\bar{1}$.9455	$\bar{1}$.9495	$\bar{1}$.9437
86	Rn	222	.9697	.9736	.9678
88	Ra	226.05	.9775	.9815	.9757
90	Th	232.12	$\bar{1}$.9890	$\bar{1}$.9930	$\bar{1}$.9873
91	Pa	231	.9869	.9909	.9853
92	U	238.06	0.0000	0.0040	$\bar{1}$.9988

TABLE IV *Values of Log Atomic Weight Ratios*

Element *B*

At. No.	Symbol	11 Na	12 Mg	13 Al	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	47 Ag
	Symbol											
	At. Wt.	22.997	24.32	26.97	52.01	54.93	55.84	58.94	58.69	63.57	65.38	107.88
	Log At. Wt.	1.3617	1.3860	1.4309	1.7101	1.7398	1.7470	1.7704	1.7680	1.8033	1.8154	2.0320
1	H	$\bar{3}$.0417	$\bar{3}$.0174	$\bar{3}$.5725	$\bar{2}$.2873	$\bar{2}$.2630	$\bar{2}$.2584	$\bar{2}$.2330	$\bar{2}$.2348	$\bar{2}$.2001	$\bar{2}$.1888	$\bar{3}$.9704
3	Li	$\bar{1}$.4797	$\bar{1}$.4554	$\bar{1}$.4105	$\bar{1}$.1353	$\bar{1}$.1016	$\bar{1}$.0944	$\bar{1}$.0710	$\bar{1}$.0728	$\bar{1}$.0388	$\bar{1}$.0259	2.8884
4	Be	5035	5083	5243	2391	2154	2083	1848	1807	1520	1308	9223
5	B	$\bar{1}$.6726	$\bar{1}$.6483	$\bar{1}$.6034	$\bar{1}$.3181	$\bar{1}$.2944	$\bar{1}$.2873	$\bar{1}$.2638	$\bar{1}$.2657	$\bar{1}$.2310	$\bar{1}$.2188	$\bar{1}$.0018
6	C	7175	0932	6483	3831	3594	3522	3288	3306	2959	2837	0402
7	N	7847	7004	7155	4303	4066	3994	3760	3778	3431	3309	1134
8	O	$\bar{1}$.8425	$\bar{1}$.8182	$\bar{1}$.7732	$\bar{1}$.4880	$\bar{1}$.4643	$\bar{1}$.4572	$\bar{1}$.4337	$\bar{1}$.4356	$\bar{1}$.4000	$\bar{1}$.3887	$\bar{1}$.1712
11	Na	0.0000	9757	9308	6450	6219	6147	5913	5931	5584	5462	3287
12	Mg	0243	0.0000	9551	6799	6462	6390	6156	6174	5827	5705	3530
13	Al	0.0892	0.0449	0.0000	$\bar{1}$.7248	$\bar{1}$.6911	$\bar{1}$.6839	$\bar{1}$.6605	$\bar{1}$.6623	$\bar{1}$.6276	$\bar{1}$.6154	$\bar{1}$.3979
14	Si	0864	0621	0172	7320	7083	7011	6777	6795	6448	6327	4152
15	P	1300	1057	0608	7756	7518	7447	7212	7231	6884	6762	4587
16	S	0.1443	0.1200	0.0751	$\bar{1}$.7899	$\bar{1}$.7662	$\bar{1}$.7590	$\bar{1}$.7356	$\bar{1}$.7374	$\bar{1}$.7027	$\bar{1}$.6905	$\bar{1}$.4730
20	Ca	2413	2170	1721	8868	8631	8560	8325	8344	7997	7875	5700
22	Ti	3187	2944	2495	9643	9405	9334	9099	9118	8771	8649	6474
23	V	0.3455	0.3212	0.2763	$\bar{1}$.9911	$\bar{1}$.9673	$\bar{1}$.9602	$\bar{1}$.9367	$\bar{1}$.9380	$\bar{1}$.9039	$\bar{1}$.8917	$\bar{1}$.6742
24	Cr	3544	3301	2852	0.0000	9763	9691	9457	9475	9128	9007	6832
25	Mn	3781	3539	3089	0237	0.0000	9929	9694	9713	9366	9244	7069
26	Fe	0.3853	0.3610	0.3161	0.0309	0.0071	0.0000	$\bar{1}$.9765	$\bar{1}$.9784	$\bar{1}$.9437	$\bar{1}$.9315	$\bar{1}$.7140
27	Co	4087	3845	3395	0543	0306	0235	0.0000	0.0019	9672	9550	7375
28	Ni	4069	3826	3377	0525	0288	0216	$\bar{1}$.9982	0000	9653	9531	7356
29	Cu	0.4416	0.4173	0.3724	0.0872	0.0634	0.0563	0.0328	0.0347	0.0000	$\bar{1}$.9878	$\bar{1}$.7703
30	Zn	4538	4295	3846	0994	0756	0685	0450	0469	0122	0.0000	7825
33	As	5130	4887	4438	1586	1349	1277	1043	1061	0714	0592	8417
34	Se	0.5371	0.5128	0.4679	0.1826	0.1589	0.1518	0.1283	0.1302	0.0955	0.0833	$\bar{1}$.8658
40	Zr	5984	5741	5292	2440	2203	2131	1897	1915	1568	1447	9272
42	Mo	6206	5963	5514	2662	2425	2353	2119	2137	1790	1668	9493
45	Rh	0.6508	0.6265	0.5816	0.3024	0.2727	0.2655	0.2421	0.2439	0.2092	0.1970	$\bar{1}$.9795
46	Pd	6665	6422	5973	3121	2884	2812	2578	2596	2249	2127	9952
47	Ag	6713	6470	6021	3169	2931	2860	2625	2644	2297	2175	0.0000
48	Cd	0.6891	0.6649	0.6199	0.3347	0.3110	0.3039	0.2804	0.2823	0.2476	0.2354	0.0179
50	Sn	7128	6885	6436	3584	3346	3275	3040	3059	2712	2590	0415
51	Sb	7238	6996	6546	3694	3457	3386	3151	3170	2823	2701	0526
52	Te	0.7438	0.7196	0.6746	0.3894	0.3657	0.3586	0.3351	0.3370	0.3023	0.2901	0.0726
56	Ba	7762	7519	7070	4218	3981	3909	3675	3693	3346	3224	1049
58	Ce	7849	7606	7157	4304	4067	3996	3761	3780	3433	3311	1136
73	Ta	0.8970	0.8727	0.8278	0.5426	0.5188	0.5117	0.4882	0.4901	0.4554	0.4432	0.2257
74	W	9032	8789	8339	5487	5250	5179	4944	4963	4616	4494	2319
77	Ir	9241	8998	8549	5697	5460	5388	5154	5172	4825	4703	2528
78	Pt	0.9289	0.9046	0.8597	0.5745	0.5507	0.5436	0.5201	0.5220	0.4873	0.4751	0.2576
79	Au	9332	9090	8640	5788	5551	5480	5245	5264	4817	4795	2620
80	Hg	9407	9164	8715	5863	5625	5554	5319	5338	4991	4869	2694
82	Pb	0.9548	0.9305	0.8856	0.6003	0.5766	0.5695	0.5460	0.5479	0.5132	0.5010	0.2835
83	Bi	9585	9342	8893	6041	5803	5732	5497	5516	5169	5047	2872

Element *A*

At. No.	Symbol	48 Cd	50 Sn	51 Sb	74 W	77 Ir	78 Pt	79 Au	80 Hg	82 Pb	83 Bi
	Symbol										
	At. Wt.	112.41	118.70	121.76	184.0	193.1	195.23	197.2	200.61	207.22	209.00
	Log At. Wt.	2.0508	2.0745	2.0855	2.2648	2.2858	2.2905	2.2949	2.3024	2.3164	2.3202
1	H	$\bar{3}$.9526	$\bar{3}$.9289	$\bar{3}$.9179	$\bar{3}$.7386	$\bar{3}$.7176	$\bar{3}$.7128	$\bar{3}$.7085	$\bar{3}$.7010	$\bar{3}$.6869	$\bar{3}$.6832
3	Li	2.7906	2.7669	2.7559	2.5765	2.5556	2.5508	2.5465	2.5390	2.5249	2.5212
4	Be	9044	8808	8697	6904	6694	6647	6603	6529	6388	6351
5	B	$\bar{2}$.9834	$\bar{2}$.9598	$\bar{2}$.9487	$\bar{2}$.7094	$\bar{2}$.6849	$\bar{2}$.7437	$\bar{2}$.7393	$\bar{2}$.7319	$\bar{2}$.7178	$\bar{2}$.7141
6	C	$\bar{1}$.0284	$\bar{1}$.0047	9937	8144	7034	7886	7843	7708	7628	7590
7	N	0950	0719	1.0609	8816	8606	8558	8515	8440	8300	8262
8	O	$\bar{1}$.1533	$\bar{1}$.1297	$\bar{1}$.1186	$\bar{2}$.9393	$\bar{2}$.9183	$\bar{2}$.9136	$\bar{2}$.9092	$\bar{2}$.9018	$\bar{2}$.8877	$\bar{2}$.8840
11	Na	3109	2872	2762	1.0969	1.0759	1.0711	1.0668	1.0593	1.0452	1.0415
12	Mg	3352	3115	3005	1211	1002	0955	0911	0836	0695	0658
13	Al	$\bar{1}$.3801	$\bar{1}$.3564	$\bar{1}$.3454	$\bar{1}$.1061	$\bar{1}$.1451	$\bar{1}$.1403	$\bar{1}$.1360	$\bar{1}$.1285	$\bar{1}$.1145	$\bar{1}$.1107
14	Si	3973	3736	3626	1833	1623	1576	1532	1457	1317	1279
15	P	4408	4172	4061	2268	2059	2011	1967	1893	1752	1715
16	S	$\bar{1}$.4552	$\bar{1}$.4315	$\bar{1}$.4205	$\bar{1}$.2411	$\bar{1}$.2202	$\bar{1}$.2154	$\bar{1}$.2111	$\bar{1}$.2036	$\bar{1}$.1895	$\bar{1}$.1858
20	Ca	5521	5285	5174	3381	3172	3124	3080	3006	2865	2828
22	Ti	6295	6059	5948	4155	3946	3898	3854	3780	3639	3602
23	V	$\bar{1}$.6563	$\bar{1}$.6327	$\bar{1}$.6216	$\bar{1}$.4423	$\bar{1}$.4214	$\bar{1}$.4166	$\bar{1}$.4122	$\bar{1}$.4048	$\bar{1}$.3907	$\bar{1}$.3870
24	Cr	6853	6616	6506	4513	4303	4256	4212	4137	3997	3959
25	Mn	6890	6654	6543	4750	4540	4493	4450	4375	4234	4197
26	Fe	$\bar{1}$.6961	$\bar{1}$.6725	$\bar{1}$.6614	$\bar{1}$.4821	$\bar{1}$.4612	$\bar{1}$.4564	$\bar{1}$.4520	$\bar{1}$.4446	$\bar{1}$.4305	$\bar{1}$.4268
27	Co	7196	6960	6849	5056	4846	4798	4755	4681	4540	4503
28	Ni	7178	6941	6831	5037	4828	4780	4337	4662	4521	4484
29	Cu	$\bar{1}$.7524	$\bar{1}$.7288	$\bar{1}$.7177	$\bar{1}$.5384	$\bar{1}$.5175	$\bar{1}$.5127	$\bar{1}$.5083	$\bar{1}$.5009	$\bar{1}$.4868	$\bar{1}$.4831
30	Zn	7046	7410	7299	5506	5297	5249	5205	5131	4990	4953
33	As	8239	8002	7892	6098	5889	5841	5798	5723	5582	5545
34	Se	$\bar{1}$.8479	$\bar{1}$.8243	$\bar{1}$.8132	$\bar{1}$.6339	$\bar{1}$.6130	$\bar{1}$.6082	$\bar{1}$.6038	$\bar{1}$.5964	$\bar{1}$.5823	$\bar{1}$.5786
40	Zr	9093	8856	8746	6953	6743	6696	6652	6577	6437	6399
42	Mo	9315	9078	8968	7175	6965	6917	6874	6799	6658	6621
45	Rh	$\bar{1}$.9617	$\bar{1}$.9380	$\bar{1}$.9270	$\bar{1}$.7476	$\bar{1}$.7267	$\bar{1}$.7219	$\bar{1}$.7176	$\bar{1}$.7101	$\bar{1}$.6960	$\bar{1}$.6923
46	Pd	9774	9537	9427	7633	7424	7376	7333	7258	7117	7080
47	Ag	9821	9585	9474	7681	7472	7424	7380	7306	7165	7128
48	Cd	0.0000	$\bar{1}$.9764	$\bar{1}$.9653	$\bar{1}$.7860	$\bar{1}$.7650	$\bar{1}$.7603	$\bar{1}$.7559	$\bar{1}$.7485	$\bar{1}$.7344	$\bar{1}$.7307
50	Sn	0236	0.0000	9889	8096	7887	7839	7795	7721	7580	7543
51	Sb	0347	0111	0.0000	8207	7997	7950	7906	7832	7691	7654
52	Te	0.0547	0.0311	0.0200	$\bar{1}$.8407	$\bar{1}$.8197	$\bar{1}$.8150	$\bar{1}$.8106	$\bar{1}$.8032	$\bar{1}$.7891	$\bar{1}$.7854
56	Ba	0871	0634	0524	8730	8521	8473	8430	8355	8214	8177
58	Ce	0957	0721	0610	8817	8608	8560	8516	8442	8301	8264
73	Ta	0.2078	0.1842	0.1731	$\bar{1}$.9938	$\bar{1}$.9729	$\bar{1}$.9681	$\bar{1}$.9637	$\bar{1}$.9563	$\bar{1}$.9422	$\bar{1}$.9385
74	W	2140	1904	1793	0.0000	9790	9743	9699	9625	9484	9447
77	Ir	2350	2113	2003	0210	0.0000	9952	9909	9834	9694	9656
78	Pt	0.2397	0.2161	0.2050	0.0257	0.0048	0.0000	$\bar{1}$.9956	$\bar{1}$.9882	$\bar{1}$.9741	$\bar{1}$.9704
79	Au	2441	2205	2094	0301	0091	0044	0.0000	9926	9785	9748
80	Hg	2515	2279	2168	0375	0166	0118	0074	0.0000	9859	9822
82	Pb	0.2656	0.2420	0.2309	0.0516	0.0307	0.0259	0.0215	0.0141	0.0000	$\bar{1}$.9963
83	Bi	2693	2457	2346	0553	0344	0296	0252	0178	0037	0.0000

At. No.	Symbol
1	H
3	Li
4	Be
5	B
6	C
7	N
8	O
11	Na
12	Mg
13	Al
14	Si
15	P
16	S
20	Ca
22	Ti
23	V
24	Cr
25	Mn
26	Fe
27	Co
28	Ni
29	Cu
30	Zn
33	As
34	Se
40	Zr
42	Mo
45	Rh
46	Pd
47	Ag
48	Cd
50	Sn
51	Sb
52	Te
56	Ba
58	Ce
73	Ta
74	W
77	Ir
78	Pt
79	Au
80	Hg
82	Pb
83	Bi

A is the element whose percentage, either weight or atomic, is being converted; *B* is the other component, usually the major one.

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