X-Ray Data Booklet Table 5-2. *Properties of the elements.*

Z	Element	Atomic weight	Density	Melting point (°C)	Boiling point (°C)	Ground-state configuration	Ground level	Ionization energy (eV)	Specific heat (J/g·K)
1	Hydrogen	1.00794	0.0708	–259.34	–252.87	$1s$	$^2S_{1/2}$	13.598	14.304
2	Helium	4.002602	0.122	—	–268.93	$1s^2$	$^1S_0$	24.587	5.193
3	Lithium	6.941	0.534	180.50	1342	$1s^2\ 2s$	$^2S_{1/2}$	5.392	3.582
4	Beryllium	9.012182	1.848	1287	2471	$1s^2\ 2s^2$	$^1S_0$	9.323	1.825
5	Boron	10.811	2.34	2075	4000	$1s^2\ 2s^2\ 2p$	$^2P°_{1/2}$	8.298	1.026
6	Carbon	12.0107	1.9–2.3 (graph)	4492[10.3 MPa]	3825[b]	$1s^2\ 2s^2\ 2p^2$	$^3P_0$	11.260	0.709
7	Nitrogen	14.00674	0.808	–210.00	–195.79	$1s^2\ 2s^2\ 2p^3$	$^4S°_{3/2}$	14.534	1.040
8	Oxygen	15.9994	1.14	–218.79	–182.95	$1s^2\ 2s^2\ 2p^4$	$^3P_2$	13.618	0.918
9	Fluorine	18.9984032	1.50	–219.62	–188.12	$1s^2\ 2s^2\ 2p^5$	$^2P°_{3/2}$	17.423	0.824
10	Neon	20.1797	1.207	–248.59	–246.08	$1s^2\ 2s^2\ 2p^6$	$^1S_0$	21.565	1.030
11	Sodium	22.989770	0.971	97.80	883	[Ne] $3s$	$^2S_{1/2}$	5.139	1.228
12	Magnesium	24.3050	1.738	650	1090	[Ne] $3s^2$	$^1S_0$	7.646	1.023
13	Aluminum	26.981538	2.6989	660.32	2519	[Ne] $3s^2\ 3p$	$^2P°_{1/2}$	5.986	0.897
14	Silicon	28.0855	2.33[25]	1414	3265	[Ne] $3s^2\ 3p^2$	$^3P_0$	8.152	0.705
15	Phosphorus	30.973761	1.82	44.15	280.5	[Ne] $3s^2\ 3p^3$	$^4S°_{3/2}$	10.487	0.769
16	Sulfur	32.066	2.07	119.6	444.60	[Ne] $3s^2\ 3p^4$	$^3P_2$	10.360	0.710
17	Chlorine	35.4527	1.56[–33.6]	–101.5	–34.04	[Ne] $3s^2\ 3p^5$	$^2P°_{3/2}$	12.968	0.479
18	Argon	39.948	1.40	–189.35	–185.85	[Ne] $3s^2\ 3p^6$	$^1S_0$	15.760	0.520
19	Potassium	39.0983	0.862	63.5	759	[Ar] $4s$	$^2S_{1/2}$	4.341	0.757
20	Calcium	40.078	1.55	842	1484	[Ar] $4s^2$	$^1S_0$	6.113	0.647
21	Scandium	44.955910	2.989[25]	1541	2836	[Ar] $3d\ 4s^2$	$^2D_{3/2}$	6.562	0.568
22	Titanium	47.867	4.54	1668	3287	[Ar] $3d^2\ 4s^2$	$^3F_2$	6.828	0.523
23	Vanadium	50.9415	6.11[18.7]	1910	3407	[Ar] $3d^3\ 4s^2$	$^4F_{3/2}$	6.746	0.489
24	Chromium	51.9961	7.18–7.20	1907	2671	[Ar] $3d^5\ 4s$	$^7S_3$	6.766	0.449
25	Manganese	54.938049	7.21–7.44	1246	2061	[Ar] $3d^5\ 4s^2$	$^6S_{5/2}$	7.434	0.479
26	Iron	55.845	7.874	1538	2861	[Ar] $3d^6\ 4s^2$	$^5D_4$	7.902	0.449

Table 5-2. *Properties of the elements (continued).*

Z	Element	Atomic weight	Density	Melting point (°C)	Boiling point (°C)	Ground-state configuration	Ground level	Ionization energy (eV)	Specific heat (J/g·K)
27	Cobalt	58.933200	8.9	1495	2927	[Ar] $3d^7$ $4s^2$	$^4F_{9/2}$	7.881	0.421
28	Nickel	58.6934	8.902[25]	1455	2913	[Ar] $3d^8$ $4s^2$	$^3F_4$	7.640	0.444
29	Copper	63.546	8.96	1084.62	2562	[Ar] $3d^{10}$ $4s$	$^2S_{1/2}$	7.726	0.385
30	Zinc	65.39	7.133[25]	419.53	907	[Ar] $3d^{10}$ $4s^2$	$^1S_0$	9.394	0.388
31	Gallium	69.723	5.904[29.6]	29.76	2204	[Ar] $3d^{10}$ $4s^2$ $4p$	$^2P°_{1/2}$	5.999	0.371
32	Germanium	72.61	5.323[25]	938.25	2833	[Ar] $3d^{10}$ $4s^2$ $4p^2$	$^3P_0$	7.899	0.320
33	Arsenic	74.92160	5.73	817[3.7 MPa]	603[b]	[Ar] $3d^{10}$ $4s^2$ $4p^3$	$^4S°_{3/2}$	9.789	0.329
34	Selenium	78.96	4.79	220.5	685	[Ar] $3d^{10}$ $4s^2$ $4p^4$	$^3P_2$	9.752	0.321
35	Bromine	79.904	3.12	–7.2	58.8	[Ar] $3d^{10}$ $4s^2$ $4p^5$	$^2P°_{3/2}$	11.814	0.226
36	Krypton	83.80	2.16	157.38[73.2 kPa]	–153.22	[Ar] $3d^{10}$ $4s^2$ $4p^6$	$^1S_0$	14.000	0.248
37	Rubidium	85.4678	1.532	39.30	688	[Kr] $5s$	$^2S_{1/2}$	4.177	0.363
38	Strontium	87.62	2.54	777	1382	[Kr] $5s^2$	$^1S_0$	5.695	0.301
39	Yttrium	88.90585	4.469[25]	1522	3345	[Kr] $4d$ $5s^2$	$^2D_{3/2}$	6.217	0.298
40	Zirconium	91.224	6.506	1855	4409	[Kr] $4d^2$ $5s^2$	$^3F_2$	6.634	0.278
41	Niobium	92.90638	8.57	2477	4744	[Kr] $4d^4$ $5s$	$^6D_{1/2}$	6.759	0.265
42	Molybdenum	95.94	10.22	2623	4639	[Kr] $4d^5$ $5s$	$^7S_3$	7.092	0.251
43	Technetium	(98)	11.50[a]	2157	4265	[Kr] $4d^5$ $5s^2$	$^6S_{5/2}$	7.28	—
44	Ruthenium	101.07	12.41	2334	4150	[Kr] $4d^7$ $5s$	$^5F_5$	7.360	0.238
45	Rhodium	102.90550	12.41	1964	3695	[Kr] $4d^8$ $5s$	$^4F_{9/2}$	7.459	0.243
46	Palladium	106.42	12.02	1554.9	2963	[Kr] $4d^{10}$	$^1S_0$	8.337	0.246
47	Silver	107.8682	10.50	961.78	2162	[Kr] $4d^{10}$ $5s$	$^2S_{1/2}$	7.576	0.235
48	Cadmium	112.411	8.65	321.07	767	[Kr] $4d^{10}$ $5s^2$	$^1S_0$	8.994	0.232
49	Indium	114.818	7.31	156.60	2072	[Kr] $4d^{10}$ $5s^2$ $5p$	$^2P°_{1/2}$	5.786	0.233
50	Tin	118.710	7.31	231.93	2602	[Kr] $4d^{10}$ $5s^2$ $5p^2$	$^3P_0$	7.344	0.228
51	Antimony	121.760	6.691	630.73	1587	[Kr] $4d^{10}$ $5s^2$ $5p^3$	$^4S°_{3/2}$	8.608	0.207
52	Tellurium	127.60	6.24	449.51	988	[Kr] $4d^{10}$ $5s^2$ $5p^4$	$^3P_2$	9.010	0.202
53	Iodine	126.90447	4.93	113.7	184.4	[Kr] $4d^{10}$ $5s^2$ $5p^5$	$^2P°_{3/2}$	10.451	0.145
54	Xenon	131.29	3.52	–111.79[81.6 kPa]	–108.12	[Kr] $4d^{10}$ $5s^2$ $5p^6$	$^1S_0$	12.130	0.158

Table 5-2. *Properties of the elements (continued).*

Z	Element	Atomic weight	Density	Melting point (°C)	Boiling point (°C)	Ground-state configuration	Ground level	Ionization energy (eV)	Specific heat (J/g·K)
55	Cesium	132.90545	1.873	28.5	671	[Xe] $6s$	$^2S_{1/2}$	3.894	0.242
56	Barium	137.327	3.5	727	1897	[Xe] $6s^2$	$^1S_0$	5.212	0.204
57	Lanthanum	138.9055	6.145[25]	918	3464	[Xe] $5d$ $6s^2$	$^2D_{3/2}$	5.577	0.195
58	Cerium	140.116	6.770[25]	798	3443	[Xe] $4f$ $5d$ $6s^2$	$^1G°_4$	5.539	0.192
59	Praseodymium	140.90765	6.773	931	3520	[Xe] $4f^3$ $6s^2$	$^4I°_{9/2}$	5.473	0.193
60	Neodymium	144.24	7.008[25]	1021	3074	[Xe] $4f^4$ $6s^2$	$^5I_4$	5.525	0.190
61	Promethium	(145)	7.264[25]	1042	3000	[Xe] $4f^5$ $6s^2$	$^6H°_{5/2}$	5.582	—
62	Samarium	150.36	7.520[25]	1074	1794	[Xe] $4f^6$ $6s^2$	$^7F_0$	5.644	0.197
63	Europium	151.964	5.244[25]	822	1529	[Xe] $4f^7$ $6s^2$	$^8S°_{7/2}$	5.670	0.182
64	Gadolinium	157.25	7.901[25]	1313	3273	[Xe] $4f^7$ $5d$ $6s^2$	$^9D°_2$	6.150	0.236
65	Terbium	158.92534	8.230	1356	3230	[Xe] $4f^9$ $6s^2$	$^6H°_{15/2}$	5.864	0.182
66	Dysprosium	162.50	8.551[25]	1412	2567	[Xe] $4f^{10}$ $6s^2$	$^5I_8$	5.939	0.170
67	Holmium	164.93032	8.795[25]	1474	2700	[Xe] $4f^{11}$ $6s^2$	$^4I°_{15/2}$	6.022	0.165
68	Erbium	167.26	9.066[25]	1529	2868	[Xe] $4f^{12}$ $6s^2$	$^3H_6$	6.108	0.168
69	Thulium	168.93421	9.321[25]	1545	1950	[Xe] $4f^{13}$ $6s^2$	$^2F°_{7/2}$	6.184	0.160
70	Ytterbium	173.04	6.966	819	1196	[Xe] $4f^{14}$ $6s^2$	$^1S_0$	6.254	0.155
71	Lutetium	174.967	9.841[25]	1663	3402	[Xe] $4f^{14}$ $5d$ $6s^2$	$^2D_{3/2}$	5.426	0.154
72	Hafnium	178.49	13.31	2233	4603	[Xe] $4f^{14}$ $5d^2$ $6s^2$	$^3F_2$	6.825	0.144
73	Tantalum	180.9479	16.654	3017	5458	[Xe] $4f^{14}$ $5d^3$ $6s^2$	$^4F_{3/2}$	7.550	0.140
74	Tungsten	183.84	19.3	3422	5555	[Xe] $4f^{14}$ $5d^4$ $6s^2$	$^5D_0$	7.864	0.132
75	Rhenium	186.207	21.02	3186	5596	[Xe] $4f^{14}$ $5d^5$ $6s^2$	$^6S_{5/2}$	7.834	0.137
76	Osmium	190.23	22.57	3033	5012	[Xe] $4f^{14}$ $5d^6$ $6s^2$	$^5D_4$	8.438	0.130
77	Iridium	192.217	22.42[17]	2446	4428	[Xe] $4f^{14}$ $5d^7$ $6s^2$	$^4F_{9/2}$	8.967	0.131
78	Platinum	195.078	21.45	1768.4	3825	[Xe] $4f^{14}$ $5d^9$ $6s$	$^3D_3$	8.959	0.133
79	Gold	196.96655	~19.3	1064.18	2856	[Xe] $4f^{14}$ $5d^{10}$ $6s$	$^2S_{1/2}$	9.226	0.129
80	Mercury	200.59	13.546	–38.83	356.73	[Xe] $4f^{14}$ $5d^{10}$ $6s^2$	$^1S_0$	10.438	0.140
81	Thallium	204.3833	11.85	304	1473	[Xe] $4f^{14}$ $5d^{10}$ $6s^2$ $6p$	$^2P°_{1/2}$	6.108	0.129
82	Lead	207.2	11.35	327.46	1749	[Xe] $4f^{14}$ $5d^{10}$ $6s^2$ $6p^2$	$^3P_0$	7.417	0.129

Table 5-2. *Properties of the elements (continued).*

Z	Element	Atomic weight	Density	Melting point (°C)	Boiling point (°C)	Ground-state configuration	Ground level	Ionization energy (eV)	Specific heat (J/g·K)
83	Bismuth	208.98038	9.747	271.40	1564	[Xe] $4f^{14}\ 5d^{10}\ 6s^2\ 6p^3$	$^4S°_{3/2}$	7.286	0.122
84	Polonium	(209)	9.32	254	962	[Xe] $4f^{14}\ 5d^{10}\ 6s^2\ 6p^4$	$^3P_2$	8.417 ?	—
85	Astatine	(210)	—	302	—	[Xe] $4f^{14}\ 5d^{10}\ 6s^2\ 6p^5$	$^2P°_{3/2}$	—	—
86	Radon	(222)	—	–71	–61.7	[Xe] $4f^{14}\ 5d^{10}\ 6s^2\ 6p^6$	$^1S_0$	10.748	0.094
87	Francium	(223)	—	27	—	[Rn] $7s$	$^2S_{1/2}$	4.073	—
88	Radium	(226)	—	700	—	[Rn] $7s^2$	$^1S_0$	5.278	—
89	Actinium	(227)	—	1051	3198	[Rn] $6d\ 7s^2$	$^2D_{3/2}$	5.17	0.120
90	Thorium	232.0381	11.72	1750	4788	[Rn] $6d^2\ 7s^2$	$^3F_2$	6.307	0.113
91	Protactinium	231.03588	15.37[a]	1572	—	[Rn] $5f^2(^3H_4)\ 6d\ 7s^2$	$(4,^3/_2)_{11/2}$	5.89	—
92	Uranium	238.0289	~18.95	1135	4131	[Rn] $5f^3(^4I°_{9/2})\ 6d\ 7s^2$	$(^9/_2,^3/_2)°_6$	6.194	0.116
93	Neptunium	(237)	20.25	644	—	[Rn] $5f^4(^5I_4)\ 6d\ 7s^2$	$(4,^3/_2)_{11/2}$	6.266	—
94	Plutonium	(244)	19.84[25]	640	3228	[Rn] $5f^6\ 7s^2$	$^7F_0$	6.026	—
95	Americium	(243)	13.67	1176	2011	[Rn] $5f^7\ 7s^2$	$^8S°_{7/2}$	5.974	—
96	Curium	(247)	13.51[a]	1345	3100	[Rn] $5f^7\ 6d\ 7s^2$	$^9D°_2$	5.992	—
97	Berkelium	(247)	14 (est.)	1050	—	[Rn] $5f^9\ 7s^2$	$^6H°_{15/2}$	6.198	—
98	Californium	(251)	—	900	—	[Rn] $5f^{10}\ 7s^2$	$^5I_8$	6.282	—
99	Einsteinium	(252)	—	860	—	[Rn] $5f^{11}\ 7s^2$	$^4I°_{15/2}$	6.42	—
100	Fermium	(257)	—	1527	—	[Rn] $5f^{12}\ 7s^2$	$^3H_6$	6.50	—
101	Mendelevium	(258)	—	827	—	[Rn] $5f^{13}\ 7s^2$	$^2F°_{7/2}$	6.58	—
102	Nobelium	(259)	—	827	—	[Rn] $5f^{14}\ 7s^2$	$^1S_0$	6.65	—
103	Lawrencium	(262)	—	1627	—	[Rn] $5f^{14}\ 7s^2\ 7p$?	$^2P°_{1/2}$?	4.9 ?	—
104	Rutherfordium	(261)	—	—	—	[Rn] $5f^{14}\ 6d^2\ 7s^2$?	$^3F_2$?	6.0 ?	—
105	Dubnium	(262)	—	—	—	—	—	—	—
106	Seaborgium	(266)	—	—	—	—	—	—	—
107	Bohrium	(264)	—	—	—	—	—	—	—
108	Hassium	(269)	—	—	—	—	—	—	—
109	Meitnerium	(268)	—	—	—	—	—	—	—

[a]Calculated [b]Sublimes