

LINE SPECTRA OF THE ELEMENTS

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The original tables from which this table was derived were prepared under the auspices of the Committee on Line Spectra of the Elements of the National Academy of Sciences-National Research Council. The table contains the outstanding spectral lines of neutral (I) and singly ionized (II) atoms of the elements from hydrogen through plutonium ($Z=1-94$); selected strong lines from doubly ionized (III), triply ionized (IV), and quadruply ionized (V) atoms are also included. Listed are lines that appear in emission from the vacuum ultraviolet to the far infrared. These lines were selected from much larger lists in such a way as to include the stronger observed lines in each spectral region. A more extensive list may be found in Reference 1.

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All wavelengths are given in Ångstrom units (10^{-10} m). Below 2000 Å the wavelengths are in vacuum (except for the Cu II line at 1999.698 Å, which is in air); above 2000 Å the wavelengths are in air. Wavelengths given to three decimal places have an uncertainty of less than 0.001 Å and are therefore suitable for calibration purposes. In the air region, the elements used most commonly for calibration are Ne, Ar, Kr, Fe, Th, and Hg; in the vacuum region, the most common are C, N, O, Si, Cu.

All data refer to natural isotopic abundance of the elements except that Kr I and Kr II lines below 11,000 Å given to three decimal places are for ^{86}Kr . A separate table for ^{198}Hg contains accurately known wavelengths that are frequently used for calibration.

A large number of the lines for neutral and singly ionized atoms were extracted from the National Bureau of Standards (NBS) *Tables of Spectral-Line Intensities* (Reference 2). The intensities of these lines represent quantitative estimates of relative line strengths that take account of varying detection sensitivity at different wavelengths. They are on a linear scale. For nearly all of the other lines the intensities represent qualitative estimates of the relative strengths of lines not greatly separated in wavelength. Because different observers frequently use different scales for their intensity estimates, these intensities are useful only as a rough indication of the appearance of a spectrum. In some cases the intensity scale is not intended to be linear. In the first and second spectra the intensities of the lines of the singly ionized atom (II) relative to those of the neutral atom (I) should be used with caution, inasmuch as the concentration of ions in a light source depends greatly on the excitation conditions.

Descriptive symbols that follow the wavelength have the following meanings:

c — complex
d — line consists of two unresolved lines
h — hazy
l — shaded to longer wavelengths
s — shaded to shorter wavelengths
p — perturbed by a close line
r — easily reversed
w — wide

The table is arranged alphabetically by element name (not symbol); for each element the lines are listed by wavelength. References to the sources of data for each element are given at the end of the table, starting on page 10-82.

GENERAL REFERENCES

1. Reader, J., Corliss, C. H., Wiese, W. L., and Martin, G. A., *Tables of Line Spectra of the Elements, Part 1. Wavelengths and Intensities*, Nat. Stand. Ref. Data Sys.- Nat. Bur. Standards (U.S.), No. 68, 1980.
2. Meggers, W. F., Corliss, C. H., and Scribner, B. F., *Tables of Spectral Line Intensities, Part 1. Arranged by Elements*, Nat. Bur. Stand. (U.S.), Monograph 145, 1975.
3. Fuhr, J. R., Martin, W. C., Musgrove, A., Sugar, J., and Wiese, W. L., "NIST Atomic Spectroscopic Database" ver. 1.1, January 1996. *NIST Physical Reference Data*, National Institute of Standards and Technology, Gaithersburg, MD. Available at the WWW address: <http://physics.nist.gov/PhysRefData/contents.html>

Line Spectra of the Elements (continued): Actinium—Antimony

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
Actinium			100	1611.814	III	110	2637.70	II	360	6696.02	I
Ac Z = 89			800	1611.874	III	150	2652.48	I	230	6698.67	I
2000 h	2952.55	III	150	1625.627	II	200	2660.39	I	110	7361.57	I
2000 h	3392.78	III	800	1639.06	IV	160	2669.17	II	140	7362.30	I
3000	3487.59	III	100	1644.235	II	650	2816.19	II	230	7835.31	I
2000 s	3863.12	II	100	1644.809	II	150	3041.28	II	290	7836.13	I
3000 s	4088.44	II	1000	1670.787	II	360	3050.07	I	110	8075.35	I
3000 s	4168.40	II	100	1686.250	II	450	3057.14	I	290	8640.70	II
100	4179.98	I	800	1719.440	II	150	3074.64	II	360	8772.87	I
20	4183.12	I	500	1721.244	II	4500 r	3082.153	I	450	8773.90	I
20	4194.40	I	900	1721.271	II	7200 r	3092.710	I	110	8828.91	I
20 l	4384.53	I	500	1724.952	II	1800 r	3092.839	I	180	8841.28	I
20	4396.71	I	900	1724.984	II	150	3428.92	II	140	8923.56	I
2000 h	4413.09	III	350	1760.104	II	150	3443.64	I	150	9290.65	II
20	4462.73	I	300	1761.975	II	900	3492.23	IV	110	9290.75	II
3000 h	4569.87	III	290	1763.00	I	800	3508.46	IV	150	10076.29	II
1000	5910.85	II	500	1763.869	II	450	3586.56	II	110	10768.36	I
20	6359.86	I	700	1763.952	II	360	3587.07	II	140	10782.04	I
20 l	6691.27	I	450	1765.64	I	290	3587.45	II	110	10872.98	I
Aluminum			300	1765.815	II	870	3601.63	III	230	10891.73	I
Al Z = 13			450	1766.38	I	220	3651.06	II	450	11253.19	I
900	125.53	V	400	1767.731	II	110	3651.10	II	570	11254.88	I
800	126.07	V	450	1769.14	I	150	3654.98	II	570	13123.41	I
800	130.41	V	1000	1818.56	IV	290	3655.00	II	450	13150.76	I
1000	130.85	V	600	1828.588	II	450	3900.68	II	230	16718.96	I
900	131.00	V	400	1832.837	II	4500 r	3944.006	I	300	16750.56	I
900	131.44	V	250	1834.808	II	9000 r	3961.520	I	140	16763.36	I
800	160.07	IV	1000	1854.716	III	110	3995.86	II	300	21093.04	I
1000	278.69	V	300	1855.929	II	290	4226.81	II	360	21163.75	I
900	281.39	V	700	1858.026	II	870	4529.19	III	Antimony		
70	486.884	III	120	1859.980	II	150	4585.82	II	Sb Z = 51		
30	486.912	III	1000	1862.311	II	110	4588.19	II	15	722.86	III
250	511.138	III	600	1862.790	III	550	4666.80	II	15	732.33	III
150	511.191	III	200	1929.978	II	110	4898.76	II		861.5	IV
500	560.317	III	150	1931.048	II	110	4902.77	II	4	876.84	II
200	560.433	III	200	1932.377	II	150	5280.21	II	4	921.07	II
100	670.068	III	400	1934.503	II	290	5283.77	II	6	983.57	II
200	671.118	III	150	1934.713	II	150	5285.85	II	15	999.62	III
500	695.829	III	300	1935.840	III	110	5312.32	II	6	1001.13	II
400	696.217	III	200	1935.949	III	220	5316.07	II	6	1009.43	II
200	725.683	III	150	1936.907	II	150	5371.84	II	40	1011.94	III
300	726.915	III	220	1939.261	II	180	5557.06	I	6	1052.21	II
400	855.034	III	700	1990.531	II	110	5557.95	I	8	1056.27	II
500	856.746	III	150	2016.052	II	450	5593.23	II	8	1057.32	II
400	892.024	III	150	2016.234	II	1200	5696.60	III	40	1065.90	III
50	893.887	III	100	2016.368	II	1000	5722.73	III	6	1073.81	II
450	893.897	III	200	2074.008	II	110	5853.62	II	30	1075.82	III
800	1042.17	IV	700	2094.264	II	220	5971.94	II		1087.6	IV
50	1191.812	II	150	2094.744	II	290	6001.76	II	8	1104.32	V
900	1237.19	IV	300	2094.791	II	220	6001.88	II	30	1151.49	III
900	1257.62	IV	100	2095.104	II	450	6006.42	II	40	1157.74	III
800	1264.18	IV	200	2095.141	II	150	6061.11	II		1199.1	IV
1000	1272.76	IV	400	2269.10	I	290	6068.43	II	50	1205.20	III
150	1350.18	II	120	2269.22	I	110	6068.53	II	50	1210.64	III
800	1384.13	III	140	2321.56	I	450	6073.23	II	12	1226.00	V
800	1447.51	IV	460	2367.05	I	110	6181.57	II	6	1230.30	II
800	1494.79	IV	110	2367.61	I	150	6181.68	II	8	1274.98	II
1000	1526.14	V	110	2368.11	I	290	6182.28	II	20	1306.69	III
800	1537.54	IV	180	2369.30	I	220	6182.45	II	8	1327.40	II
800	1539.830	II	140	2370.22	I	450 h	6183.42	II	6	1358.04	II
1000	1557.25	IV	160	2372.07	I	450	6201.52	II	8	1384.70	II
100	1569.385	II	850	2373.12	I	360	6201.70	II	20	1404.18	III
900	1582.04	IV	170	2373.35	I	290	6226.18	II	6	1407.83	II
800	1584.46	IV	110	2373.57	I	360	6231.78	II	8	1436.49	II
125	1596.059	II	240	2567.98	I	450	6243.36	II	20 r	1486.57	I
700	1605.766	III	480	2575.10	I	450	6335.74	II	40 h	1491.36	I

Line Spectra of the Elements (continued): Antimony—Argon

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
	1499.2	IV	400	2478.32	I	30 h	7648.28	I	200	666.011	II
12	1505.70	V	150	2480.44	I	80	7844.44	I	1000	670.946	II
50 r	1512.57	I	100	2510.54	I	200	7924.65	I	3000	671.851	II
12	1524.47	V	2000 r	2528.52	I	60	8411.69	I	70	676.242	II
120 r	1532.74	I	15	2528.54	II	150	8572.64	I	30	677.952	II
80 r	1535.06	I	10	2567.75	II	100	8619.55	I	30	679.218	II
6	1565.51	II	150	2574.06	I	400	9518.68	I	200	679.401	II
8	1576.11	II	15	2590.13	III	400	9949.14	I	10	683.28	IV
7	1581.36	II	1500 r	2598.05	I	200	10078.49	I	7	688.39	IV
80 r	1599.96	I	500 r	2598.09	I	300	10261.01	I	12 p	689.01	IV
10	1606.98	II	300 r	2612.31	I	200	10585.60	I	6	699.41	IV
200 w	1612.8	I	12	2617.17	III	1000	10677.41	I	8	700.28	IV
100 w	1623.3	I	200 r	2652.60	I	800	10741.94	I	3	705.35	V
20	1657.04	II	20	2669.39	III	80	10794.11	I	5	709.20	V
100 w	1662.6	I	300 r	2670.64	I	600	10839.73	I	4	715.60	V
15	1673.89	III	200 r	2682.76	I	200	10868.58	I	3	715.65	V
15	1711.84	III	120	2692.25	I	400	10879.55	I	200	718.090	II
80 r	1716.93	I	150 r	2718.90	I	300	11012.79	I	3000	723.361	II
150 r	1717.45	I	400 r	2769.95	I	150	11266.23	I	2	725.11	V
150 r	1723.43	I	1000 r	2877.92	I	5	12116.06	I	500	725.548	II
15	1725.33	III	15	2980.96	II	Argon		70	730.930	II	
100 r	1736.19	I	500 r	3029.83	I	Ar Z = 18		200	740.269	II	
100 h	1765.76	I	600 r	3232.52	I	3	336.56	V	200	744.925	II
100 r	1780.87	I	20	3241.28	II	3	337.56	V	70	745.322	II
100 r	1788.24	I	700 r	3267.51	I	6	338.00	V	4	754.20	IV
150	1800.18	I	15	3498.46	II	2	338.43	V	5	761.47	IV
50 r	1810.50	I	25	3637.80	II	2	339.01	V	12	769.15	III
80 r	1814.20	I	250	3637.83	I	3	339.89	V	5	800.57	IV
100	1829.50	I	20	3722.78	II	3	350.88	V	10	801.09	IV
50 r	1868.17	I	200 r	3722.79	I	4	396.87	IV	10	801.41	IV
300 r	1871.15	I	20	3850.22	II	4	398.55	IV	5	801.91	IV
150 r	1882.56	I	200	4033.55	I	2	436.67	V	20	802.859	I
100	1927.08	I	20	4033.56	II	5	446.00	V	100	806.471	I
200 r	1950.39	I	20	4133.63	II	8	446.95	V	60	806.869	I
60 r	2029.49	I	15	4140.54	II	4	447.53	V	30	807.218	I
70 r	2039.77	I	15	4195.17	II	18	449.06	V	40	807.653	I
150 r	2049.57	I	20	4219.07	II	4	449.49	V	50	809.927	I
1000 r	2068.33	I	20	4314.32	II	3	458.12	V	120	816.232	I
100	2079.56	I	15	4514.50	II	2	458.98	V	70	816.464	I
50 r	2098.41	I	30	4596.90	II	6 p	461.23	V	80	820.124	I
80 r	2118.48	I	20	4599.09	II	3	462.42	V	4	822.16	V
100 r	2127.39	I	15	4604.77	II	7	463.94	V	120	825.346	I
50 r	2137.05	I	30	4647.32	II	30	487.227	II	120	826.365	I
100 r	2139.69	I	20	4675.74	II	50	490.650	II	5	827.05	V
10	2141.80	II	40	4711.26	II	30	490.701	II	3	827.35	V
50 r	2141.83	I	20	4757.81	II	30	519.327	II	150	834.392	I
100 r	2144.86	I	20	4765.36	II	3	522.09	V	4 p	834.88	V
1500 r	2175.81	I	30	4784.03	II	5	524.19	V	100	835.002	I
250 r	2179.19	I	20	4802.01	II	6	527.69	V	2	836.13	V
200 r	2201.32	I	20	4832.82	II	30	542.912	II	15	840.03	IV
300 r	2208.45	I	20	4877.24	II	200	543.203	II	100	842.805	I
150 r	2220.73	I	15	4947.40	II	70	547.461	II	20	843.77	IV
100	2221.98	I	15	5044.56	II	2	554.50	V	25	850.60	IV
120 r	2224.93	I	20	5238.94	II	70	556.817	II	180	866.800	I
300 r	2262.51	I	20	5354.24	II	5	558.48	V	150	869.754	I
120	2288.98	I	40 h	5556.10	I	70	573.362	II	10	871.10	III
150 r	2293.44	I	100 l	5632.02	I	30	576.736	II	9	875.53	III
300 r	2306.46	I	30	5639.75	II	70	580.263	II	180 r	876.058	I
2500 r	2311.47	I	60 h	5830.34	I	30	583.437	II	12	878.73	III
150	2315.89	I	100	6005.21	II	70	597.700	II	8	879.62	III
400 h	2373.67	I	20	6053.41	II	30	602.858	II	180 r	879.947	I
300 h	2383.64	I	30	6079.80	II	30	612.372	II	9	883.18	III
100	2395.22	I	50	6130.04	II	6	623.77	IV	10	887.40	III
150	2422.13	I	20	6154.94	II	3	635.12	V	150	894.310	I
250	2426.35	I	20	6611.49	I	500	661.867	II	5	900.36	IV
400 r	2445.51	I	30	6647.44	II	30	664.562	II	9	901.17	IV

Line Spectra of the Elements (continued): Argon

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
1000	919.781	II	15	2640.34	IV	8	3511.12	III	100	4228.158	II			
1000	932.054	II	10	2654.63	III	70	3514.388	II	100	4237.220	II			
1000 r	1048.220	I	8	2674.02	III	70	3545.596	II	25	4251.185	I			
500 r	1066.660	I	9	2678.38	III	70	3545.845	II	200	4259.362	I			
7	1669.67	III	9	2682.63	IV	7	3554.306	I	100	4266.286	I			
7	1673.42	III	10	2724.84	III	100	3559.508	II	70	4266.527	II			
7	1675.48	III	14	2757.92	IV	100	3561.030	II	150	4272.169	I			
9	1914.40	III	7	2762.23	III	70	3576.616	II	550	4277.528	II			
7	1915.56	III	10	2776.26	IV	25	3581.608	II	20	4282.898	II			
10	2125.16	III	12	2784.47	IV	50	3582.355	II	100	4300.101	I			
15	2133.87	III	14	2788.96	IV	70	3588.441	II	25	4300.650	II			
10	2138.59	III	7	2797.11	IV	7	3606.522	I	70	4309.239	II			
10	2148.73	III	16	2809.44	IV	25	3622.138	II	200	4331.200	II			
15	2166.19	III	10	2830.25	IV	20	3639.833	II	50	4332.030	II			
10	2168.26	III	7	2842.88	III	35	3718.206	II	100	4333.561	I			
20	2170.23	III	8	2855.29	III	70	3729.309	II	50	4335.338	I			
25	2177.22	III	6	2874.40	IV	50	3737.889	II	25	4345.168	I			
8	2184.06	III	9	2884.12	III	150	3765.270	II	800	4348.064	II			
10	2188.22	III	25	2891.612	II	50	3766.119	II	50	4352.205	II			
15	2192.06	III	12	2913.00	IV	20	3770.369	I	25	4362.066	II			
7	2248.73	III	11	2926.33	IV	20	3770.520	II	50	4367.832	II			
10	2279.10	III	200	2942.893	II	25	3780.840	II	200	4370.753	II			
7	2281.22	III	100	2979.050	II	20	3795.37	III	70	4371.329	II			
7	2282.21	III	10	3010.02	III	25	3803.172	II	50	4375.954	II			
12	2293.03	III	12	3024.05	III	50	3809.456	II	150	4379.667	II			
4	2299.72	IV	50	3033.508	II	7	3834.679	I	50	4385.057	II			
10	2300.85	III	6	3037.98	IV	70	3850.581	II	70	4400.097	II			
15	2302.17	III	12	3054.82	III	10	3858.32	III	200	4400.986	II			
9	2317.00	III	10	3064.77	III	35	3868.528	II	400	4426.001	II			
15	2317.47	III	8	3077.40	IV	7	3907.84	III	150	4430.189	II			
12	2318.04	III	10	3078.15	III	35	3925.719	II	50	4430.996	II			
10	2319.13	III	50	3093.402	II	50	3928.623	II	50	4433.838	II			
10	2319.37	III	7	3110.41	III	25	3932.547	II	20	4439.461	II			
9	2345.17	III	7	3127.90	III	70	3946.097	II	35	4448.879	II			
7	2351.67	III	8	3200.37	I	7	3947.505	I	100	4474.759	II			
9	2360.26	III	20	3243.689	II	35	3948.979	I	200	4481.811	II			
10	2395.63	III	25	3285.85	III	8	3960.53	III	100	4510.733	I			
12	2399.15	III	25	3293.640	II	20	3979.356	II	20	4522.323	I			
10	2413.20	III	20	3301.88	III	35	3994.792	II	20	4530.552	II			
7	2415.61	III	20	3307.228	II	50	4013.857	II	400	4545.052	II			
10	2418.82	III	15	3311.25	III	6	4023.60	III	20	4564.405	II			
5	2420.456	II	7	3319.34	I	50	4033.809	II	400	4579.350	II			
12	2423.52	III	7	3323.59	III	20	4035.460	II	400	4589.898	II			
12	2423.93	III	25	3336.13	III	150	4042.894	II	15	4596.097	I			
7	2443.69	III	20	3344.72	III	50	4044.418	I	550	4609.567	II			
8	2447.71	IV	25	3350.924	II	100	4052.921	II	7	4628.441	I			
8	2472.95	III	15	3358.49	III	200	4072.005	II	35	4637.233	II			
7	2476.10	III	7	3361.28	III	70	4072.385	II	400	4657.901	II			
12	2488.86	III	7	3373.47	I	25	4076.628	II	15	4702.316	I			
12	2513.28	IV	25	3376.436	II	35	4079.574	II	20	4721.591	II			
10	2516.789	II	25	3388.531	II	25	4082.387	II	550	4726.868	II			
6	2518.40	IV	15	3391.85	III	150	4103.912	II	50	4732.053	II			
9	2525.69	IV	7	3393.73	I	300	4131.724	II	300	4735.906	II			
10	2534.709	II	7	3417.49	III	5	4146.70	III	800	4764.865	II			
15	2562.087	II	9	3424.25	III	35	4156.086	II	550	4806.020	II			
12	2562.17	IV	8	3438.04	III	400	4158.590	I	150	4847.810	II			
10	2568.07	IV	7	3461.07	I	50	4164.180	I	50	4865.910	II			
7	2569.53	IV	9	3471.32	III	35	4179.297	II	800	4879.864	II			
12	2599.47	IV	70	3476.747	II	50	4181.884	I	70	4889.042	II			
10	2608.06	IV	20	3478.232	II	100	4190.713	I	20	4904.752	II			
7	2608.44	IV	20	3480.55	III	50	4191.029	I	35	4933.209	II			
12	2615.68	IV	50	3491.244	II	200	4198.317	I	200	4965.080	II			
6	2619.98	IV	100	3491.536	II	400	4200.674	I	50	5009.334	II			
12	2621.36	IV	12	3499.67	III	25	4218.665	II	70	5017.163	II			
12	2624.92	IV	15	3503.58	III	25	4222.637	II	70	5062.037	II			
7	2631.90	III	70	3509.778	II	25	4226.988	II	20	5090.495	II			

Line Spectra of the Elements (continued): Argon—Arsenic

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
100	5141.783	II	7	6960.250	I	11	11078.869	I	800	1211.17	II
70	5145.308	II	10000	6965.431	I	30	11106.46	I	800	1218.10	II
5	5151.391	I	150	7030.251	I	12	11441.832	I	340	1223.15	II
15	5162.285	I	10000	7067.218	I	400	11488.109	I	760	1241.31	II
25	5165.773	II	100	7068.736	I	200	11668.710	I	965	1243.08	II
20	5187.746	I	25	7107.478	I	12	11719.488	I	870	1245.67	II
20	5216.814	II	25	7125.820	I	200	12112.326	I	800	1258.58	II
7	5221.271	I	1000	7147.042	I	50	12139.738	I	965	1263.77	II
5	5421.352	I	15	7158.839	I	50	12343.393	I	800	1266.34	II
10	5451.652	I	70	7206.980	I	200	12402.827	I	800	1267.59	II
25	5495.874	I	15	7265.172	I	200	12439.321	I	715	1280.99	II
5	5506.113	I	7	7270.664	I	100	12456.12	I	715	1287.54	II
25	5558.702	I	2000	7272.936	I	200	12487.663	I	715	1305.70	II
10	5572.541	I	35	7311.716	I	150	12702.281	I	340	1307.74	II
35	5606.733	I	25	7316.005	I	30	12733.418	I	760	1333.15	II
20	5650.704	I	5	7350.814	I	12	12746.232	I	965	1341.55	II
10	5739.520	I	70	7353.293	I	200	12802.739	I	760	1355.93	II
5	5834.263	I	200	7372.118	I	50	12933.195	I	965	1369.77	II
10	5860.310	I	20	7380.426	II	500	12956.659	I	800	1373.65	II
15	5882.624	I	10000	7383.980	I	200	13008.264	I	1000	1375.07	II
25	5888.584	I	20	7392.980	I	200	13213.99	I	760	1375.78	II
50	5912.085	I	15	7412.337	I	200	13228.107	I	800	1394.64	II
15	5928.813	I	10	7425.294	I	100	13230.90	I	800	1400.31	II
5	5942.669	I	25	7435.368	I	500	13272.64	I	500	1448.59	II
7	5987.302	I	10	7436.297	I	1000	13313.210	I	500	1558.88	II
5	5998.999	I	20000	7503.869	I	1000	13367.111	I	500	1570.99	II
5	6025.150	I	15000	7514.652	I	30	13499.41	I	100 r	1593.60	I
70	6032.127	I	25000	7635.106	I	1000	13504.191	I	500	1660.55	II
35	6043.223	I	15000	7723.761	I	11	13573.617	I	340	1860.34	II
10	6052.723	I	10000	7724.207	I	30	13599.333	I	1000 r	1890.42	I
20	6059.372	I	10	7891.075	I	400	13622.659	I	500	1912.94	II
7	6098.803	I	20000	7948.176	I	200	13678.550	I	800 r	1937.59	I
10	6105.635	I	20000	8006.157	I	1000	13718.577	I	585 r	1972.62	I
100	6114.923	II	25000	8014.786	I	10	13825.715	I	170 r	1990.35	I
10	6145.441	I	7	8053.308	I	10	13907.478	I	100 r	1991.13	I
7	6170.174	I	20000	8103.693	I	200	14093.640	I	100 r	1995.43	I
150	6172.278	II	35000	8115.311	I	100	15046.50	I	230 r	2003.34	I
10	6173.096	I	10000	8264.522	I	25	15172.69	I	100 r	2009.19	I
10	6212.503	I	20	8392.27	I	10	15329.34	I	200	2263.2	IV
5	6215.938	I	15000	8408.210	I	30	15989.49	I	350 r	2288.12	I
25	6243.120	II	20000	8424.648	I	30	16519.86	I	200	2301.0	IV
7	6296.872	I	15000	8521.442	I	500	16940.58	I	350 r	2349.84	I
15	6307.657	I	7	8605.776	I	12	18427.76	I	100 r	2370.77	I
7	6369.575	I	4500	8667.944	I	50	20616.23	I	135 r	2381.18	I
20	6384.717	I	20	8771.860	II	30	20986.11	I	250	2417.5	IV
70	6416.307	I	180	8849.91	I	20	23133.20	I	250	2454.0	IV
25	6483.082	II	20	9075.394	I	20	23966.52	I	170 r	2456.53	I
15	6538.112	I	35000	9122.967	I	Arsenic As Z = 33			200	2461.4	IV
15	6604.853	I	550	9194.638	I				340	2602.00	II
25	6638.221	II	15000	9224.499	I	510	871.7	III	170 r	2780.22	I
20	6639.740	II	400	9291.531	I	325	889.0	III	300	2830.359	II
50	6643.698	II	1600	9354.220	I	325	927.5	III	300	2831.164	II
5	6660.676	I	25000	9657.786	I	325	937.2	III	100 r	2860.44	I
5	6664.051	I	4500	9784.503	I	325	953.6	III	300	2884.406	II
25	6666.359	II	180	10052.06	I	325	963.8	III	80	2926.3	III
100	6677.282	I	30	10332.72	I	250	987.7	V	615	2959.572	II
35	6684.293	II	100	10467.177	II	340	1021.96	II	300	3003.819	II
150	6752.834	I	1600	10470.054	I	250	1029.5	V	300	3116.516	II
5	6756.163	I	13	10478.034	I	340	1082.35	II	340	3842.60	II
15	6766.612	I	180	10506.50	I	500	1139.40	II	325	3922.6	III
20	6861.269	II	200	10673.565	I	615	1149.31	II	715	4190.082	II
150	6871.289	I	11	10681.773	I	555	1181.51	II	615	4197.40	II
5	6879.582	I	7	10683.034	II	555	1189.87	II	615	4242.982	II
10	6888.174	I	30	10733.87	I	615	1196.38	II	500	4315.657	II
50	6937.664	I	30	10759.16	I	615	1196.56	II	500	4323.867	II
7	6951.478	I	7	10812.896	II	340	1207.44	II	500	4336.64	II

Line Spectra of the Elements (continued): Arsenic—Barium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
500	4352.145	II		1771.03	II	100	3576.28	II	400	4899.97	II
425	4352.864	II		1786.93	II	30	3577.62	I	15	4902.90	I
375	4371.17	II	100	1904.15	II	80 h	3579.67	I	20000	4934.09	II
615	4427.106	II	500	1924.70	II	200	3596.57	II	8	4947.35	I
615	4431.562	II		1985.60	II	40	3630.64	I	1000	4957.15	II
715	4458.469	II	300	1999.54	II	40 h	3636.83	I	300	4997.81	II
340	4461.075	II	10	2001.30	III	20 h	3688.47	I	1000	5013.00	II
715	4466.348	II		2009.20	II	400	3735.75	II	20 h	5159.94	I
500	4474.46	II	400	2023.95	II	200	3816.69	II	20	5267.03	I
800	4494.230	II		2052.68	II	200	3842.80	II	800	5361.35	II
850	4507.659	II		2054.57	II	100	3854.76	II	1000	5391.60	II
615	4539.74	II	500	2214.7	II	20	3889.33	I	200	5421.05	II
715	4543.483	II	800	2245.61	II	1400 I	3891.78	II	100	5424.55	I
615	4602.427	II	1000	2254.73	II	20	3892.65	I	200	5428.79	II
340	4629.787	II	1400	2304.24	II	40	3909.91	I	300	5480.30	II
340	4707.586	II	60	2331.10	III	500	3914.73	II	200	5519.05	I
340	4730.67	II	2000	2335.27	II	25	3926.85	III	1000 r	5535.48	I
340	4888.557	II	190	2347.58	II	50	3935.72	I	20 h	5620.40	I
340	5105.58	II	40	2512.28	III	20	3937.87	I	10	5680.18	I
500	5107.55	II	40	2523.83	III	200	3939.67	II	400	5777.62	I
425	5231.38	II	60	2528.51	II	500	3949.51	II	800	5784.18	II
500	5331.23	II	50	2559.54	III	25	3993.06	III	100	5800.23	I
340	5497.727	II	8 h	2596.64	I	80	3993.40	I	20	5805.69	I
425	5558.09	II	100	2634.78	II	30	3995.66	I	150	5826.28	I
425	5651.32	II	40	2681.89	III	300	4036.26	II	2800	5853.68	II
425	6110.07	II	8	2702.63	I	200	4083.77	II	15	5907.64	I
500	6170.27	II	18	2771.36	II	30 h	4084.86	I	100	5971.70	I
300	6511.74	II	15	2785.28	I	1500 h	4130.66	II	800	5981.25	II
300	7092.27	II	100 r	3071.58	I	20	4132.43	I	100	5997.09	I
300	7102.72	II	40	3079.14	III	200	4166.00	II	300	5999.85	II
340	7990.53	II	10 h	3108.21	I	500	4216.04	II	100	6019.47	I
300	8174.51	II	8	3132.60	I	800	4267.95	II	200	6063.12	I
200	9300.61	I	8 h	3135.72	I	100	4283.10	I	300	6110.78	I
230	9597.95	I	10	3137.70	I	300	4287.80	II	400	6135.83	II
290	9626.70	I	10	3155.34	I	200	4297.60	II	20000	6141.72	II
230	9833.76	I	10	3155.67	I	800	4309.32	II	150	6341.68	I
170	9915.71	I	12	3158.05	I	20 h	4323.00	I	500	6378.91	II
290	9923.05	I	12 h	3158.54	I	600	4325.73	II	10	6383.76	III
290	10024.04	I	25	3165.60	I	200	4326.74	II	90	6450.85	I
170	10614.07	I	15 h	3173.69	I	300	4329.62	II	150	6482.91	I
Astatine			30	3183.16	I	80	4350.33	I	12000	6496.90	II
At Z = 85			15	3183.96	I	60	4402.54	I	300	6498.76	I
8	2162.25	I	10	3193.91	I	400	4405.23	II	150	6527.31	I
10	2244.01	I	25 h	3203.70	I	40	4431.89	I	3000	6595.33	I
Barium			30	3221.63	I	60 h	4488.98	I	150	6654.10	I
Ba Z = 56			40	3222.19	I	50 h	4493.64	I	1500	6675.27	I
14	555.48	III	50	3261.96	I	40	4505.92	I	1800	6693.84	I
14	587.57	III	60 r	3262.34	I	200	4509.63	II	1000	6769.62	II
18	647.27	III	40	3281.50	I	60 h	4523.17	I	600	6865.69	I
300	719.86	V	15	3281.77	I	130	4524.93	II	300 h	6867.85	I
150	721.85	V	50	3322.80	I	65000	4554.03	II	1000	6874.09	II
1000	766.87	V	80 h	3356.80	I	40	4573.85	I	6000	7059.94	I
40000	794.89	IV	50	3368.18	III	80	4579.64	I	2400 hs	7120.33	I
300	877.41	V	60 r	3377.08	I	30	4599.75	I	600	7195.24	I
50000	923.74	IV	20	3377.39	I	20 h	4619.92	I	600 hl	7228.84	I
200	946.26	V	70 r	3420.32	I	25 h	4628.33	I	3000	7280.30	I
200	1486.72	II	25	3421.01	I	300	4644.10	II	1200	7392.41	I
400	1504.01	II	30 h	3421.48	I	30	4673.62	I	300	7417.53	I
300	1554.38	II	40	3463.74	I	35	4691.62	I	900 hl	7459.78	I
200	1572.73	II	200 r	3501.11	I	20	4700.43	I	600	7488.08	I
	1573.92	II	80 h	3524.97	I	800	4708.94	II	450 hl	7636.90	I
	1630.40	II	30 h	3531.35	I	40	4726.44	I	600 hl	7642.91	I
100	1674.51	II	80 h	3544.66	I	800	4843.46	II	1800	7672.09	I
400	1694.37	II	20 h	3547.68	I	300	4847.14	II	1200	7780.48	I
	1697.16	II	100	3552.45	II	200	4850.84	II	180 h	7839.57	I
	1761.75	II	200	3567.73	II	30 h	4877.65	I	1500	7905.75	I

Line Spectra of the Elements (continued): Barium—Beryllium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
600	7911.34	I		93.93	II		1909.0	II	10	3046.52	II
900 h	8210.24	I		94.78	II		1912.	I	30	3046.69	II
8	8308.69	III		95.76	II	3	1917.03	III		3090.3	I
1800 h	8559.97	I		96.29	I		1919.	I	10	3110.81	I
100	8710.74	II		97.24	I	5	1929.67	I	10	3110.92	I
100	8737.71	II		97.44	I	10	1943.68	I	20	3110.99	I
300 h	8799.76	I		97.86	I	60 h	1954.97	III		3120.	I
300	8860.98	I		97.97	I		1956.	I	480	3130.42	II
450	8914.99	I		98.12	I	50	1964.59	I	320	3131.07	II
300	9219.69	I		98.37	I	5	1985.13	I		3136.	I
300	9308.08	I		98.66	I		1997.95	I		3150.	I
300 h	9324.58	I		98.94	I		1997.98	I		3160.6	I
1500	9370.06	I		99.19	I	60	1998.01	I		3163.	I
300	9455.92	I	100	100.25	III		2033.25	I		3168.	I
8	9521.76	III		100.86	I		2033.28	I		3180.7	II
450	9589.37	I		101.20	I		2033.38	I		3187.	I
900	9608.88	I		102.13	I	50	2055.90	I	20	3193.81	I
300 h	9645.72	I		102.49	II	100	2056.01	I	20	3197.10	II
1500 hl	9830.37	I		104.40	II	75 h	2076.94	III	30	3197.15	II
900	10001.08	I		104.67	I	60 h	2080.38	III	20	3208.60	I
600	10032.10	I		105.80	I	25	2118.56	III		3220.	I
1200 h	10233.23	I		107.26	I	15 h	2122.27	III	60	3229.63	I
300	10471.26	I		107.38	I	10	2125.57	I	2	3233.52	II
120 hl	10791.25	I	3	509.99	III	20	2125.68	I	10	3241.62	II
180 hl	11012.69	I	2	549.31	III	15 h	2127.20	III	30	3241.83	II
150 h	11114.42	I	6	582.08	III	5	2137.25	III	15	3269.02	I
240	11303.04	I	4	661.32	III	25	2145.	I	100	3274.58	II
120 h	11697.45	I	8	675.59	III	55	2174.99	I	30	3274.67	II
120	13207.30	I		714.0	II	55	2175.10	I	30	3282.91	I
120	13810.50	I	4	725.59	III	5	2191.57	III	30	3321.01	I
120	14077.90	I	5	725.71	II		2273.5	II	30	3321.09	I
120	15000.40	I	5	743.58	II		2324.6	II	220	3321.34	I
120	20712.00	I	7	746.23	III		2337.0	I	20	3345.43	I
150	25515.70	I	2	767.75	III	950	2348.61	I	60	3367.63	I
150	29223.90	I	8	775.37	II	20	2350.66	I		3405.6	II
			20	842.06	II	60	2350.71	I	5	3451.37	I
				865.3	II	200	2350.83	I	300	3455.18	I
			2	925.25	II	2	2413.34	II	20	3476.56	I
			10	943.56	II	16	2413.46	II	300	3515.54	I
			10	973.27	II	20	2453.84	II	10	3555.	I
				981.4	II		2480.6	I	100	3720.36	III
				1020.1	II	35	2494.54	I		3720.92	III
			8	1026.93	II	35	2494.58	I		3722.98	III
1 h	76.10	III	5	1036.32	II	100	2494.73	I	100	3736.30	I
2	76.48	III	15	1048.23	II	16	2507.43	II	700	3813.45	I
3	78.53	III	1	1114.69	III	5	2617.99	II	40	3865.13	I
4	78.66	III	20	1143.03	II	20	2618.13	II	80	3865.42	I
1 h	78.92	III		1155.9	II	100	2650.45	I	1	3865.51	I
5	81.89	III	60	1197.19	II	60	2650.55	I	6	3865.72	I
10	82.38	III	2	1213.12	III	200	2650.62	I	100	3866.03	I
	82.58	II	1	1214.32	III	60	2650.69	I	90 h	4249.14	III
20	83.20	III	2	1362.25	III	100	2650.76	I	100	4253.05	I
	83.66	II	1	1401.52	III	5	2697.46	II	60	4253.76	I
30	84.76	III	10	1421.26	III	20	2697.58	II	300	4360.66	II
50	88.31	III	5	1422.86	III	20	2728.88	II	500	4360.99	II
	89.16	I		1426.12	I	30	2738.05	I	400	4407.94	I
	89.80	II	1	1435.17	III		2764.2	II	2	4485.52	III
	90.04	II	2	1440.77	III	20	2898.13	I	100 h	4487.30	III
	90.21	I		1491.76	I	10	2898.19	I	1	4495.09	III
	90.67	I	20	1512.30	II	20	2898.25	I	140 h	4497.8	III
	91.06	II	60	1512.43	II	30	2986.06	I		4526.6	I
	91.36	II	100	1661.49	I	10	2986.42	I		4548.	I
	91.74	II	2 h	1754.69	III	60	3019.33	I		4572.66	I
	92.19	I	15	1776.12	II	30	3019.49	I	700	4673.33	II
	92.61	II	20	1776.34	II	30	3019.53	I	1000	4673.42	II
	93.14	II		1907.	I	20	3019.60	I	6	4709.37	I
	93.42	II									

Line Spectra of the Elements (continued): Beryllium—Bismuth

Intensity			Wavelength/Å			Intensity			Wavelength/Å			Intensity			Wavelength/Å		
200	4828.16	II	30	12098.18	II	35	1538.06	II	2800	2989.03	I						
40	4849.16	I	100	14643.92	I	20	1563.67	II	700	2993.34	I						
2 h	4858.22	II	60	14644.75	I	40	1573.70	II	100	3012.	IV						
80	5087.75	I	200	16157.72	I	60	1591.79	II	2400	3024.64	I						
8	5218.12	II	80	17855.38	I	25	1601.58	II	60	3034.87	I						
20	5218.33	II	120	17856.63	I	60 h	1606.40	III	100	3042.	IV						
3	5255.86	II	100	18143.54	I	40	1609.70	II	9000 c	3067.72	I						
64	5270.28	II	160	31775.05	I	40	1611.38	II	140	3076.66	I						
500	5270.81	II	200	31778.70	I	20	1652.81	II	35	3115.0	III						
20	5403.04	II	Bismuth Bi Z = 83			20	1749.29	II	100	3239.	IV						
20	5410.21	II				80	1777.11	II	550 c	3397.21	I						
	5558.	I	6	420.7	IV	60	1787.47	II	10	3430.83	II						
140 h	6142.01	III	6	431.2	IV	70	1791.93	II	12	3431.23	II						
10	6229.11	I	2	488.39	V	70	1823.80	II	40 h	3451.0	III						
16	6279.43	II	3	563.62	V	100	1902.41	II	40	3473.8	III						
30	6279.73	II	5	670.76	III	9000	1954.53	I	35	3485.5	III						
30	6473.54	I	6	686.88	V	7000	1960.13	I	500 c	3510.85	I						
60	6547.89	II	5	730.71	V	25	1989.35	II	380 c	3596.11	I						
60	6558.36	II	10	738.17	V	7000	2021.21	I	45	3613.4	III						
30	6564.52	I	4	775.16	III	9000	2061.70	I	100	3643.	IV						
2 h	6636.44	II	6	790.5	IV	45 h	2068.9	II	12	3654.2	II						
1	6756.72	II	6	790.6	IV	4600	2110.26	I	100	3682.	IV						
2	6757.13	II	8	792.5	IV	2500	2133.63	I	50	3695.32	III						
30	6786.56	I	10	820.3	IV	15	2143.40	II	50	3695.68	III						
1 h	6884.22	I	9	822.9	IV	15	2143.46	II	100	3734.	IV						
6 h	6884.44	I	12	824.9	IV	60	2186.9	II	70 h	3792.5	II						
100	6982.75	I	15 d	864.45	V	40 h	2214.0	II	12	3811.1	II						
6 h	7154.40	I	15	872.6	IV	360	2228.25	I	20	3815.8	II						
40 h	7154.65	I	12	923.9	IV	1700	2230.61	I	10	3845.8	II						
100	7209.13	I	15	943.3	IV	340	2276.58	I	30	3863.9	II						
3	7401.20	II	25	1039.99	III	100	2311.	IV	100	3868.	IV						
2	7401.43	II	50 h	1045.76	III	100	2326.	IV	40 h	4079.1	II						
10	7551.90	I	30	1051.81	III	16	2368.12	II	10	4097.2	II						
10 h	7618.68	I	15	1058.88	II	12	2368.25	II	140	4121.53	I						
20 h	7618.88	I	20	1085.47	II	100	2376.	IV	140	4121.86	I						
60	8090.06	I	10	1099.20	II	190	2400.88	I	75 h	4259.4	II						
5 h	8158.99	I	24	1103.4	IV	75 h	2414.6	III	25	4272.0	II						
10 h	8159.24	I	20	1139.01	III	10	2501.0	II	70 h	4301.7	II						
4	8254.07	I	50	1224.64	III	25	2515.69	I	12 h	4339.8	II						
10 h	8287.07	I	10	1225.43	II	70	2524.49	I	25 h	4340.5	II						
30	8547.36	I	15	1232.78	II	20 h	2544.5	II	12 h	4379.4	II						
60	8547.67	I	10	1241.05	II	700	2627.91	I	25 h	4476.8	II						
300	8801.37	I	10	1265.35	II	100	2629.	IV	60 h	4705.3	II						
6	8882.18	I	15	1283.73	II	100	2677.	IV	600 c	4722.52	I						
40	9190.45	I	10	1306.18	II	12	2693.0	II	30	4730.3	II						
20 h	9243.92	I	60	1317.0	IV	280 c	2696.76	I	20	4749.7	II						
1 h	9343.89	II	20	1325.46	II	20	2713.3	II	40 h	4797.4	III						
40	9392.74	I	40	1326.84	III	140 d	2730.50	I	12	4908.2	II						
2	9476.43	II	20	1329.47	II	100	2767.	IV	10	4916.6	II						
16	9477.03	II	60	1346.12	III	100	2772.	IV	12	4969.7	II						
20	9847.32	I	20	1350.07	II	360	2780.52	I	20	4993.6	II						
10 h	9895.63	I	25	1372.61	II	100	2786.	IV	45 h	5079.3	III						
20 h	9895.96	I	15	1376.02	II	15	2803.42	II	10	5091.6	II						
80	9939.78	I	20	1393.92	II	11	2803.70	II	50 h	5124.3	II						
16	10095.52	II	35	1423.33	III	12	2805.3	II	60 h	5144.3	II						
20	10095.73	II	35	1423.52	III	140 c	2809.62	I	20	5201.5	II						
60	10119.92	II	45	1436.83	II	100	2842.	IV	75 h	5209.2	II						
80	10331.03	I	25	1447.94	II	80 h	2855.6	III	40 h	5270.3	II						
30	11066.46	I	50	1455.11	II	4000	2897.98	I	10	5397.8	II						
	11173.	II	60 h	1461.00	III	100	2924.	IV	10 c	5552.35	I						
1	11173.73	II	25	1462.14	II	100	2933.	IV	3	5599.41	I						
120	11496.39	I	35	1486.93	II	100	2936.	IV	20	5655.2	II						
2 h	11625.16	II	20	1502.50	II	15	2936.7	II	40 h	5719.2	II						
	11659.	II	40	1520.57	II	3200	2938.30	I	6	5742.55	I						
2	11660.25	II	40	1533.17	II	20	2950.4	II	12	5818.3	II						
100	12095.36	II	30	1536.77	II	12	2963.4	II	20	5860.2	II						

Line Spectra of the Elements (continued): Bismuth—Bromine

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
20	5973.0	II	160	677.14	III	40	4242.98	III	7500	1232.43	I
15	6059.1	II	40	693.95	II	70	4243.61	III	1200	1243.90	I
15	6128.0	II	40	731.36	II	110	4472.10	II	1500	1251.66	I
6	6134.82	I	40	731.44	II	110	4472.85	II	1000	1255.80	I
3	6475.73	I		749.74	V	220	4487.05	III	1500	1259.20	I
3	6476.24	I	40	758.48	III	360	4497.73	III	1200	1261.66	I
15	6497.7	II	70	758.67	III	70	4784.21	II	1200	1266.20	I
10	6577.2	II	110	882.54	II	110	4940.38	II	1000	1279.48	I
40 h	6600.2	II	110	882.68	II	110	6080.44	II	1000	1286.26	I
50 h	6808.6	II	40	984.67	II	70	6285.47	II	3000	1309.91	I
4 h	6991.12	I	110	1081.88	II	70	7030.20	II	3000	1316.74	I
12	7033.	II	110	1082.07	II	40	7031.90	II	1000	1317.37	I
2	7036.15	I	70	1112.2	IV	110	7835.25	III	2000	1317.70	I
10 h	7381.	II	450	1168.9	IV	70	7841.41	III	12000	1384.60	I
2	7502.33	I	70	1170.9	IV	20	8667.22	I	3000	1449.90	I
10 h	7637.	II	110	1230.16	II	70	8668.57	I	50000	1488.45	I
10	7750.	II	220	1362.46	II	800	11660.04	I	30000	1531.74	I
3	7838.70	I	70	1600.46	I	570	11662.47	I	25000	1540.65	I
2	7840.33	I	120	1600.73	I	125	15629.08	I	30000	1574.84	I
20	7965.	II	160	1623.58	II	200	16240.38	I	20000	1576.39	I
40	8008.	III	110	1623.77	II	250	16244.67	I	25000	1582.31	I
12 h	8050.	II	220	1624.02	II	235	18994.33	I	75000	1633.40	I
50	8070.	III	70	1624.16	II	Bromine			1000	2133.79	IV
15	8328.	II	160	1624.34	II	Br Z = 35			1000	2145.02	IV
15	8388.	II	100	1663.04	I	700	379.73	IV	1000	2257.21	IV
30	8532.	II	150	1666.87	I	700	400.37	IV	1000	2272.73	IV
2	8544.54	I	200	1667.29	I	800	482.11	V	1000	2307.40	IV
1	8579.74	I	150	1817.86	I	900	531.97	V	1000	2408.16	IV
25	8653.	II	200	1818.37	I	1000	545.43	IV	1000	2411.58	IV
2	8754.88	I	300	1825.91	I	1000	547.90	V	700	2491.14	IV
3	8761.54	I	300	1826.41	I	1000	559.76	IV	1000	2581.19	IV
25	8863.	II	110	1842.81	II	1000	569.19	IV	600	2661.40	IV
2	8907.81	I	20	1953.83	III	1000	576.59	IV	1000	2842.88	IV
2000 d	9657.04	I	550	2065.78	III	1000	585.10	IV	1100 h	2907.71	IV
40	9827.78	I	250	2066.38	I	1000	586.71	IV	500 h	2972.26	II
20	10104.5	I	250	2066.65	I	1000	597.51	IV	500	3041.18	IV
15	10138.8	I	100	2066.93	I	1000	600.09	IV	500	3074.42	III
20	10300.6	I	300	2067.19	I	1000	601.27	IV	500	3349.64	III
20	10536.19	I	450	2067.23	III	1000	607.03	IV	500	3380.56	IV
50	11072.44	I	160	2077.09	III	1000	617.85	IV	500	3540.16	III
1500 d	11710.37	I	500	2088.91	I	1000	619.87	IV	500	3562.43	III
40	11999.49	I	500	2089.57	I	1000	630.14	IV	1200	3815.65	I
200	12165.08	I	70	2220.30	II	1000	642.23	IV	1500	3992.36	I
200	12690.04	I	40	2234.09	III	1000	661.53	IV	1000	4223.89	II
100	12817.8	I	70	2234.59	III	1000	683.51	IV	2000	4365.14	I
200	14330.5	I	40	2323.03	II	1000	697.72	IV	1000	4365.60	II
50	16001.5	I	40	2328.67	II	1000	715.39	IV	1500	4425.14	I
60	22551.6	I	40	2393.20	II	1000	731.00	IV	10000	4441.74	I
Boron			220	2395.05	II	1000	800.12	IV	10000	4472.61	I
B Z = 5			40	2459.69	II	700	812.95	V	20000	4477.72	I
	41.00	V	40	2459.90	II	1000	813.66	IV	1000	4490.42	I
30	48.59	V	1000	2496.77	I	1000	850.81	V	3000	4513.44	I
10	52.68	IV	1000	2497.73	I	1000	889.23	II	15000	4525.59	I
30	60.31	IV	70	2524.7	IV	1000	948.97	II	3000	4575.74	I
	194.37	V	160	2530.3	IV	1000	1015.54	II	2500	4614.58	I
	262.37	V	450	2821.68	IV	1000	1049.00	II	2500	4752.28	I
160	344.0	IV	70	2824.57	IV	1000	1069.15	V	4000	4780.31	I
450	385.0	IV	285	2825.85	IV	900	1112.13	V	1600	4785.19	I
40	411.80	III	160	2918.08	II	1000	1143.56	V	4000	4979.76	I
285	418.7	IV	110	3032.26	II	1000	1189.28	I	1200	5395.48	I
20	510.77	III	70	3179.33	I	1000	1189.50	I	1200	5466.22	I
40	510.85	III	110	3323.18	II	1000	1210.73	I	1800	5852.08	I
	512.53	V	110	3323.60	II	1000	1221.13	I	1600	5940.48	I
150	518.24	III	450	3451.29	II	1000	1223.24	I	2400	6122.14	I
75	518.27	III	285	4121.93	II	1200	1224.41	I	40000	6148.60	I
110	677.00	III	110	4194.79	II	1200	1226.90	I	2000	6177.39	I

Line Spectra of the Elements (continued): Bromine—Cadmium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
1500	6335.48	I	9000	8964.00	I	60	567.01	IV	50	2628.979	I			
60000	6350.73	I	30000	9166.06	I	150	1118.16	IV	40	2632.190	I			
2500	6410.32	I	15000	9173.63	I	100	1164.65	IV	75	2639.420	I			
1800	6483.56	I	20000	9178.16	I	100	1183.40	IV	40	2659.23	II			
1000	6514.62	I	40000	9265.42	I	100	1256.00	II	50 h	2660.325	I			
20000	6544.57	I	15000	9320.86	I	150	1296.43	II	25	2668.20	II			
1500	6548.09	I	6000	9793.48	I	100	1326.50	II	50	2672.62	II			
50000 c	6559.80	I	10000	9896.40	I	60	1370.48	IV	100	2677.540	I			
1000	6571.31	I	3000	10140.08	I	150	1370.91	II	25	2677.748	I			
1800	6579.14	I	6000	10237.74	I	60	1418.89	IV	50	2707.00	II			
20000	6582.17	I	1000	10299.62	I	200	1514.26	II	75	2712.505	I			
1500	6620.47	I	1500	10377.65	I	50	1545.17	III	50	2733.820	I			
50000 c	6631.62	I	30000	10457.96	I	200	1571.58	II	1000	2748.54	II			
20000	6682.28	I	1000	10742.14	I	100	1668.60	II	100 h	2763.894	I			
10000	6692.13	I	3000	10755.92	I	50	1702.47	II	50 h	2764.230	I			
8000	6728.28	I	1700	13217.17	I	40	1707.16	III	50	2774.958	I			
2000	6760.06	I	1800	14354.57	I	40	1722.95	III	30	2823.19	II			
2000	6779.48	I	1250	14888.70	I	50	1724.41	II	200	2836.900	I			
2200	6786.74	I	1800	16731.19	I	40	1747.67	III	25	2856.46	II			
6500	6790.04	I	1200	18568.31	I	40	1773.06	III	100	2868.180	I			
1600 c	6791.48	I	3500	19733.62	I	100	1785.84	II	200 r	2880.767	I			
1800	6861.15	I	1000	20281.73	I	75	1793.40	III	50 r	2881.224	I			
10000	7005.19	I	1000	20624.67	I	40	1823.41	III	200	2914.67	II			
2000	7260.45	I	1200	21787.24	I	100	1827.70	II	50	2927.87	II			
10000	7348.51	I	4000	22865.65	I	50	1844.66	III	200	2929.27	II			
40000	7512.96	I	1000	23513.15	I	40	1851.13	III	1000 r	2980.620	I			
1600	7591.61	I	500	28346.50	I	40	1855.85	III	200 r	2981.362	I			
1800	7595.07	I	500	30380.85	I	200	1856.67	III	50	2981.845	I			
2000	7616.41	I	600	31630.13	I	150	1874.08	III	50	3030.60	II			
30000	7803.02	I	150	38345.75	I	300	1922.23	II	150	3080.822	I			
1200	7827.23	I	120	39964.36	I	100	1943.54	II	25	3081.48	II			
2500 s	7881.45	I	Cadmium			40	1965.54	II	30	3082.593	I			
2500	7881.57	I	Cd Z = 48			30	1986.89	II	100	3092.34	II			
2500	7925.81	I	50	427.01	IV	200	1995.43	II	200	3133.167	I			
30000 c	7938.68	I	50	447.85	IV	100	2007.49	II	50	3146.79	II			
3000	7947.94	I	60	480.90	IV	50	2032.45	II	150	3250.33	II			
3000	7950.18	I	70	493.00	IV	75	2036.23	II	300	3252.524	I			
8000	7978.44	I	70	495.13	IV	40	2039.83	III	300	3261.055	I			
10000	7978.57	I	70	498.14	IV	50	2045.61	III	50	3343.21	II			
30000	7989.94	I	70	498.53	IV	75	2087.91	III	50	3385.49	II			
2000	8026.35	I	80	504.09	IV	150	2096.00	II	30	3388.88	II			
2500	8026.54	I	70	504.20	IV	50	2111.60	III	800	3403.652	I			
30000	8131.52	I	70	504.50	IV	1000 r	2144.41	II	50	3417.49	II			
1000 c	8152.65	I	80	506.31	IV	50	2155.06	II	50	3442.42	II			
10000	8153.75	I	60	508.01	IV	100	2187.79	II	100	3464.43	II			
25000	8154.00	I	50	508.95	IV	1000	2194.56	II	1000	3466.200	I			
5000	8246.86	I	70	509.55	IV	1000	2265.02	II	800	3467.655	I			
15000	8264.96	I	70	511.40	IV	1500 r	2288.022	I	25	3483.08	II			
75000 c	8272.44	I	80	513.00	IV	1000	2312.77	II	150	3495.44	II			
20000	8334.70	I	70	514.50	IV	200	2321.07	II	25	3499.952	I			
10000	8343.70	I	60	519.42	IV	40	2376.82	II	100	3524.11	II			
1200	8384.04	I	80	524.41	IV	50	2418.69	II	100	3535.69	II			
40000	8446.55	I	70	524.47	IV	50	2469.73	II	1000	3610.508	I			
4000	8477.45	I	70	525.10	IV	40	2487.93	II	800	3612.873	I			
1500	8513.38	I	60	525.19	IV	40	2495.58	II	60	3614.453	I			
1000	8557.73	I	70	527.07	IV	50	2509.11	II	20	3649.558	I			
1000	8566.28	I	80	531.09	IV	30	2516.22	II	10	3981.926	I			
20000	8638.66	I	80	531.51	IV	25 h	2525.196	I	100	4029.12	II			
4000	8698.53	I	70	534.29	IV	50	2544.613	I	200	4134.77	II			
10000 c	8793.47	I	70	536.77	IV	50	2551.98	II	50	4141.49	II			
15000	8819.96	I	60	540.90	IV	25	2553.465	I	100	4285.08	II			
25000	8825.22	I	70	541.74	IV	3	2565.789	I	8	4306.672	I			
4000	8888.98	I	80	542.60	IV	500	2572.93	II	100	4412.41	II			
30000	8897.62	I	80	546.55	IV	50	2580.106	I	3	4412.989	I			
6000	8932.40	I	60	553.06	IV	30	2592.026	I	1000	4415.63	II			
1800	8949.39	I	80	554.05	IV	25 h	2602.048	I	30	4440.45	II			

Line Spectra of the Elements (continued): Cadmium—Carbon

Intensity			Wavelength/Å			Intensity			Wavelength/Å			Intensity			Wavelength/Å		
8	4662.352	I	400	637.93	V	20	4456.61	I	20	8020.50	II						
200	4678.149	I	300	643.12	V	20	4472.04	II	70	8133.05	II						
30	4744.69	II	400	646.57	V	20	4489.18	II	100	8201.72	II						
300	4799.912	I	750	656.00	IV	19	4499.88	III	110	8248.80	II						
50	4881.72	II	300	656.76	V	23	4526.94	I	70	8254.73	II						
50	5025.50	II	500	669.70	IV	22	4578.55	I	130	8498.02	II						
1000 h	5085.822	I	24	1341.89	II	23	4581.40	I	170	8542.09	II						
6	5154.660	I	12	1342.54	II	23	4581.47	I	160	8662.14	II						
100	5268.01	II	20	1433.75	II	24	4585.87	I	100	8912.07	II						
100	5271.60	II	20	1545.29	III	24	4585.96	I	110	8927.36	II						
1000	5337.48	II	60	1649.86	II	20	4685.27	I	110	9213.90	II						
1000	5378.13	II	20	1807.34	II	30	4716.74	II	90	9312.00	II						
200	5381.89	II	40	1814.50	II	40	4721.03	II	100	9319.56	II						
40	5843.30	II	40	1838.01	II	40	4799.97	II	110	9320.65	II						
50	5880.22	II	60	1840.06	II	25	4878.13	I	25	9416.97	I						
300	6099.142	I	20	1843.09	II	70	5001.48	II	100	9567.97	II						
100	6111.49	I	40	1850.69	II	80	5019.97	II	110	9599.24	II						
100	6325.166	I	17	2123.03	III	40	5021.14	II	80	9601.82	II						
30	6330.013	I	16	2152.43	III	23	5041.62	I	80	9854.74	II						
400	6354.72	II	16	2687.76	III	25	5188.85	I	110	9890.63	II						
500	6359.98	II	19	2881.78	III	22	5261.71	I	90	9931.39	II						
2000	6438.470	I	21	2899.79	III	23	5262.24	I	100	10223.04	II						
400	6464.94	II	19	2924.33	III	22	5264.24	I	20	10343.81	I						
25	6567.65	II	20	2988.63	III	24	5265.56	I	20	11838.99	II						
500	6725.78	II	10	3006.86	I	25	5270.27	I	25	12816.04	I						
100	6759.19	II	15	3028.59	III	60	5285.27	II	24	12823.86	I						
30	6778.116	I	3	3055.32	I	70	5307.22	II	25	12909.10	I						
50	7237.01	II	19	3119.67	III	50	5339.19	II	30	13033.57	I						
100	7284.38	II	170	3158.87	II	27	5349.47	I	21	13086.44	I						
1000	7345.670	I	180	3179.33	II	23	5512.98	I	24	13134.95	I						
50	8066.99	II	150	3181.28	II	25	5581.97	I	20	16150.77	I						
5	8200.309	I	20	3316.51	II	27	5588.76	I	22	16157.36	I						
20	9289.	I	12	3361.92	I	24	5590.12	I	21	16197.04	I						
15	11652.	I	19	3372.67	III	26	5594.47	I	20	18925.47	I						
35	14487.	I	20	3461.87	II	25	5598.49	I	24	18970.14	I						
80	15708.	I	13	3487.60	I	24	5601.29	I	30	19046.14	I						
55 d	19120.	I	18	3537.77	III	24	5602.85	I	48	19309.20	I						
25	24371.	I	20	3644.41	I	30	5857.45	I	49	19452.99	I						
35	25448.	I	30	3683.70	II	27	6102.72	I	47	19505.72	I						
	Calcium		40	3694.11	II	29	6122.22	I	50	19776.79	I						
	Ca Z = 20		170	3706.03	II	22	6161.29	I	35	19853.10	I						
250	190.46	V	180	3736.90	II	30	6162.17	I	34	19862.22	I						
250	196.97	V	20	3755.67	II	22	6163.76	I	23	19917.19	I						
300	199.55	V	30	3758.39	II	24	6166.44	I	24	19933.70	I						
250	200.51	V	230	3933.66	II	26	6169.06	I	25	22624.93	I						
265	257.98	V	220	3968.47	II	28	6169.56	I	30	22651.23	I						
400	267.77	V	50	4097.10	II	35	6439.07	I		Carbon							
300	270.31	V	60	4109.82	II	30	6449.81	I		C Z = 6							
400	280.99	V	30	4110.28	II	22	6455.60	I	110	34.973	V						
300	284.98	V	40	4206.18	II	80	6456.87	II	450	40.268	V						
450 c	286.96	V	50	4220.07	II	34	6462.57	I	110	227.19	V						
500	322.17	V	50	4226.73	I	29	6471.66	I	250	244.91	IV						
300	323.22	V	24	4283.01	I	32	6493.78	I	160	248.66	V						
300	330.94	V	22	4289.36	I	28	6499.65	I	160	248.74	V						
300	334.55	V	22	4298.99	I	23	6572.78	I	200	289.14	IV						
250 c	342.45	IV	25	4302.53	I	30	6717.69	I	250	289.23	IV						
250	343.93	IV	20	4302.81	III	33	7148.15	I	570	312.42	IV						
450	352.92	V	23	4307.74	I	31	7202.19	I	500	312.46	IV						
250	377.18	V	22	4318.65	I	33	7326.15	I	250	371.69	III						
200	387.08	V	20	4355.08	I	30	7575.81	II	250	371.75	III						
750	425.00	V	19	4399.59	III	60	7581.11	II	150	371.78	III						
600	434.57	IV	25	4425.44	I	80	7601.30	II	650	384.03	IV						
250	437.77	IV	26	4434.96	I	20	7602.32	II	700	384.18	IV						
750	443.82	IV	25	4435.69	I	40	7820.78	II	500	386.203	III						
500	450.57	IV	30	4454.78	I	60	7843.38	II	400	419.52	IV						
500	558.60	V	28	4455.89	I	20	8017.50	II	500	419.71	IV						

Line Spectra of the Elements (continued): Carbon—Cerium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
200	450.734	III	900	1550.774	IV	300	5380.34	I	12	16559.66	I
400	459.46	III	150	1560.310	I	250	5648.07	II	50	16890.38	I
500	459.52	III	400	1560.683	I	350	5662.47	II	10	17338.56	I
570	459.63	III	400	1560.708	I	450	5695.92	III	11	17448.60	I
250	511.522	III	100	1561.341	I	250	5801.33	IV	13	18139.80	I
250	535.288	III	400	1561.438	I	200	5811.98	IV	23	19721.99	I
300	538.080	III	150	1656.266	I	150	5826.42	III			
350	538.149	III	120	1656.928	I	570	5889.77	II			
400	538.312	III	300	1657.008	I	350	5891.59	II	300	399.36	V
350	574.281	III	120	1657.380	I	200	6001.13	I	200	482.96	V
9	595.022	II	120	1657.907	I	250	6006.03	I	40	741.79	IV
30	687.053	II	150	1658.122	I	110	6007.18	I	30	754.60	IV
50	687.345	II	500	1751.823	I	150	6010.68	I	75	1332.16	IV
10	858.092	II	1000	1930.905	I	300	6013.22	I	75	1372.72	IV
20	858.559	II	250	2162.94	III	250	6014.84	I	100	2000.42	IV
30	903.624	II	40	2270.91	V	800	6578.05	II	100	2009.94	IV
60	903.962	II	5	2277.25	V	570	6582.88	II	10000	2318.64	III
150	904.142	II	20	2277.92	V	200	6587.61	I	10000	2372.34	III
30	904.480	II	800	2296.87	III	150	6744.38	III	10000	2380.12	III
800	977.03	III	800	2478.56	I	250	6783.90	II	10000	2431.45	III
9	1009.86	II	250	2509.12	II	150 h	7037.25	III	15000	2439.80	III
10	1010.08	II	350	2512.06	II	250	7113.18	I	10000	2454.32	III
10	1010.37	II	200 l	2524.41	IV	250	7115.19	I	10000	2469.95	III
80	1036.337	II	300 s	2529.98	IV	250	7115.63	II	10000	2483.82	III
150	1037.018	II	250 h	2574.83	II	200	7116.99	I	10000	2497.50	III
150	1157.910	I	150	2697.75	III	350	7119.90	II	20000	2531.99	III
150	1158.019	I	110 l	2724.85	III	800	7231.32	II	10000	2603.59	III
150	1158.035	I	150 l	2725.30	III	1000	7236.42	II	340	2651.01	II
370	1174.93	III	150 l	2725.90	III	150	7612.65	III	270	2830.90	II
350	1175.26	III	350 l	2741.28	II	90 w	7726.2	IV	250	2874.14	II
330	1175.59	III	250	2746.49	II	200	7860.89	I	10000	2923.81	III
500	1175.71	III	1000	2836.71	II	200	8058.62	I	10000	2931.54	III
350	1175.99	III	800	2837.60	II	300 h	8196.48	III	400	2976.91	II
370	1176.37	III	200	2982.11	III	150	8332.99	III	10000	3022.75	III
150	1188.992	I	800 h	2992.62	II	520	8335.15	I	50000	3031.58	III
150	1189.447	I	350	3876.19	II	300	8500.32	III	95000	3055.59	III
200	1189.631	I	350	3876.41	II	250	9061.43	I	20000	3056.56	III
300	1193.009	I	350	3876.66	II	200	9062.47	I	40000	3057.23	III
300	1193.031	I	570	3918.98	II	200	9078.28	I	20000	3057.58	III
300	1193.240	I	800	3920.69	II	250	9088.51	I	680	3063.01	II
300	1193.264	I	150	4056.06	III	450	9094.83	I	40000	3085.10	III
100	1193.393	I	200	4067.94	III	300	9111.80	I	20000	3106.98	III
150	1193.649	I	250	4068.91	III	800	9405.73	I	30000	3110.53	III
150	1193.679	I	250	4070.26	III	150	9603.03	I	30000	3121.56	III
100	1194.064	I	250	4074.52	II	250	9620.80	I	20000	3141.29	III
100	1194.488	I	350 l	4075.85	II	300	9658.44	I	20000	3143.96	III
100	1261.552	I	150	4162.86	III	200	10683.08	I	20000	3147.06	III
250	1277.245	I	250 h	4186.90	III	300	10691.25	I	710	3194.83	II
250	1277.282	I	800	4267.00	II	12	11619.29	I	990	3201.71	II
300	1277.513	I	1000	4267.26	II	23	11628.83	I	710	3218.94	II
300	1277.550	I	200	4325.56	III	13	11658.85	I	880	3221.17	II
200	1280.333	I	600	4647.42	III	47	11659.68	I	710	3227.11	II
100	1311.363	I	520	4650.25	III	24	11669.63	I	20000	3228.57	III
9	1323.951	II	375	4651.47	III	85	11748.22	I	710	3234.16	II
120	1329.578	I	200 w	4658.30	IV	142	11753.32	I	990	3272.25	II
120	1329.600	I	200	4665.86	III	114	11754.76	I	20000	3353.29	III
150	1334.532	II	200	4771.75	I	11	11777.54	I	10000	3395.77	III
300	1335.708	II	200	4932.05	I	17	11892.91	I	30000	3427.36	III
100	1354.288	I	5	4943.88	V	30	11895.75	I	40000	3443.63	III
150	1355.84	I	5	4944.56	V	26	12614.10	I	30000	3454.39	III
120	1364.164	I	200	5052.17	I	20	13502.27	I	40000	3459.39	III
100	1459.032	I	350	5132.94	II	38	14399.65	I	60000	3470.92	III
200	1463.336	I	350	5133.28	II	16	14403.25	I	710	3485.05	II
120	1467.402	I	350	5143.49	II	61	14420.12	I	50000	3497.81	III
150	1481.764	I	570	5145.16	II	12	14429.03	I	60000	3504.64	III
1000	1548.202	IV	400	5151.09	II	13	14442.24	I	770	3539.08	II

Line Spectra of the Elements (continued): Cerium—Cesium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
50000	3544.07	III	770	4227.75	II	35	6343.95	II	330	2076.43	III
1200	3560.80	II	980	4239.92	II	35	6371.11	II	540	2077.30	III
1000	3577.45	II	1100	4248.68	II	28	6386.84	I	410	2088.68	III
1800	3655.85	II	2000	4289.94	II	23	6393.02	II	210	2101.63	III
880	3660.64	II	1500	4296.67	II	35	6430.07	I	200	2141.47	III
880	3667.98	II	770	4300.33	II	23	6436.40	I	1000	2316.88	III
1000	3709.29	II	770	4306.72	II	35	6458.03	I	230	2325.95	III
1000	3709.93	II	980	4337.77	II	28	6467.39	I	390	2340.49	III
1400	3716.37	II	700	4349.79	II	35	6473.72	I	1600	2455.81	III
800	3728.42	II	910	4364.66	II	23	6513.59	II	1600	2477.57	III
860	3786.63	II	910	4382.17	II	45	6555.65	I	890	2485.45	III
2500	3801.52	II	700	4386.84	II	23	6579.10	I	410	2495.07	III
800	3803.09	II	1700	4391.66	II	22	6612.06	I	1400	2525.67	III
1000	3808.11	II	980	4418.78	II	30	6628.93	I	430	2573.05	III
1100	3838.54	II	770	4449.34	II	22	6652.72	II	16000	2596.86	III
860	3848.59	II	2400	4460.21	II	26	6700.66	I	390	2610.12	III
860	3853.15	II	1400	4471.24	II	35	6704.27	I	6200	2630.51	III
1200	3854.18	II	700	4479.36	II	30	6774.28	II	370	2700.32	III
1200	3854.31	II	700	4483.90	II	35	6775.59	I	710	2701.20	III
1100	3878.36	II	840	4486.91	II	30	6924.81	I	390	2776.44	III
1500	3882.45	II	770	4523.08	II	30	6986.02	I	270	2810.87	III
1000	3889.98	II	840	4527.35	II	35	7061.75	II	630	2845.70	III
770	3907.29	II	840	4528.47	II	35	7086.35	II	3100	2859.32	III
980	3912.44	II	840	4539.75	II	22	7238.36	II	200	2893.85	III
770	3918.28	II	2100	4562.36	II	25	7252.75	I	180	2921.13	III
770	3931.09	II	1100	4572.28	II	25	7329.91	I	3200	2976.86	III
770	3940.34	II	840	4593.93	II	25	7397.77	I	210	3001.28	III
2000	3942.15	II	1700	4628.16	II	25	7616.11	II	1700	3066.59	III
2700	3942.75	II	310	4737.28	II	25	7689.17	II	1100 c	3149.36	III
770	3943.89	II	470	5079.68	II	22	7844.94	II	1400	3152.36	III
3100	3952.54	II	280	5159.69	I	22	7857.54	II	8400	3268.32	III
980	3956.28	II	280	5161.48	I	30	8025.56	II	1300	3315.51	III
770	3960.91	II	370	5187.46	II	25	8772.14	II	550	3340.60	III
770	3967.05	II	260	5223.46	I	30	8891.20	II	430	3344.02	III
770	3978.65	II	260	5245.92	I	Cesium			1200	3349.46	III
770	3984.68	II	340	5274.23	II	Cs Z = 55			400	3463.45	III
700	3992.39	II	450	5353.53	II	10000	614.01	III	580	3476.83	III
910	3993.82	II	300	5393.40	II	2000	638.17	III	480	3559.82	III
2800	3999.24	II	280	5409.23	II	2500	666.25	III	7200	3597.45	III
910	4003.77	II	260	5512.08	II	5000	691.60	III	1300	3608.31	III
2700	4012.39	II	300	5696.99	I	3500	703.89	III	2300	3618.19	III
910	4014.90	II	370	5699.23	I	15000	718.14	II	300 c	3641.34	III
840	4024.49	II	240	5719.03	I	20000	721.79	III	520	3651.08	III
840	4028.41	II	230	5940.86	I	20000	722.20	III	4800	3661.40	III
840	4031.34	II	55	6001.90	I	5000	731.56	III	640	3699.50	III
2100	4040.76	II	55	6005.86	I	12000	740.29	III	430	3837.46	III
910	4042.58	II	55	6006.82	I	15000	808.76	II	2100 c	3876.15	I
700	4053.51	II	75	6013.42	I	15000	813.84	II	2900	3888.37	III
1100	4071.81	II	110	6024.20	I	7500	830.39	III	600 c	3888.61	I
1800	4073.48	II	10000	6032.54	III	35000	901.27	II	2700	3925.60	III
1500	4075.71	II	110	6043.39	II	15000	920.35	III	680 c	4001.70	III
1500	4075.85	II	55	6047.40	I	40000	926.66	II	3100	4006.55	III
910	4083.23	II	10000	6060.91	III	25000 c	1054.79	III	420	4006.78	III
770	4118.14	II	45	6098.34	II	17 c	1673.99	III	520	4043.42	III
980	4123.87	II	45	6123.67	I	12	1705.25	III	14000	4264.70	II
980	4127.37	II	35	6143.36	II	10	1801.83	III	18000 w	4277.13	II
2700	4133.80	II	35	6186.17	I	20 c	1822.40	III	370	4403.86	III
2000	4137.65	II	35	6208.98	I	11	1823.93	III	1200	4410.22	III
770	4142.40	II	35	6228.94	I	12	1824.70	III	930	4425.68	III
980	4149.94	II	23	6232.45	II	12	1841.80	III	540	4471.48	III
1400	4151.97	II	28	6237.45	I	25	1915.50	III	12000	4501.55	II
1300	4165.61	II	45	6272.05	II	25 c	1923.29	III	1200	4506.72	III
3500	4186.60	II	35	6295.58	I	12	1961.33	III	590	4522.86	III
840	4198.72	II	28	6299.51	II	17	1996.56	III	20000	4526.74	II
910	4202.94	II	23	6300.21	I	710	2035.11	III	1000 c	4555.28	I
1500	4222.60	II	35	6310.01	I	120	2056.43	III	460 c	4593.17	I

Line Spectra of the Elements (continued): Cesium—Chlorine

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
99900	4603.79	II	18000	9172.32	I	1000	659.811	II	25000	1389.693	I			
420 h	4620.61	III	5200	9208.53	I	1300	661.841	II	20000	1389.957	I			
210	4665.52	III	19000	10024.36	I	2000	663.074	II	12000	1396.527	I			
25000	4830.19	II	4800	10123.41	I	1500	682.053	II	500	1441.470	II			
140	4851.59	III	26000	10123.60	I	1500	687.656	II	500	1528.569	II			
19000	4870.04	II	2900	13424.31	I	1500	693.594	II	500	1542.942	II			
37000	4952.85	II	38000 c	13588.29	I	2000	725.271	II	500	1558.144	II			
370	5035.72	III	8400	13602.56	I	2500	728.951	II	500	1565.050	II			
27000	5043.80	II	5700	13758.81	I	2000	777.562	II	600	1822.50	III			
75000	5227.04	II	55000 c	14694.91	I	5000	787.580	II	500	1828.40	III			
29000	5249.38	II	820	16535.63	I	5000	788.740	II	500	1857.488	II			
11000	5274.05	II	1500	17012.32	I	5000	793.342	II	500	1901.61	III			
10000 c	5349.13	II	760	20138.47	I	500	834.84	IV	500	1983.61	III			
22000	5370.99	II	880	22811.86	I	500	834.97	IV	450 h	1997.370	II			
230	5380.79	III	1100	23037.98	I	6000	839.297	II	450	2032.116	II			
60 c	5465.94	I	3900	23344.47	I	8000	839.599	II	350 h	2088.583	II			
37	5502.88	I	4400	24251.21	I	600	840.93	IV	350 h	2091.458	II			
39000	5563.02	II	850	24374.96	I	5000	851.691	II	700	2253.07	III			
100	5635.21	I	890 d	25763.51	I	2000	888.026	II	500	2268.95	III			
210 c	5664.02	I	500	25764.73	I	2000	893.549	II	500	2278.34	III			
27	5745.72	I	680 c	29310.06	I	2000	961.499	II	700	2283.93	III			
24000	5831.14	II	2800	30103.27	I	500	973.21	IV	600	2323.50	III			
59 c	5838.83	I	610 c	30953.06	I	600	977.56	IV	500	2336.45	III			
300	5845.14	I	1100	34900.13	I	40	978.284	I	600	2340.64	III			
51000	5925.63	II	190	36131.00	I	700	984.95	IV	600	2359.67	III			
140	5950.14	III	2 c	39177.28	I	25	998.372	I	600	2370.37	III			
110	5979.97	III	2 d	39421.25	I	25	998.432	I	700	2416.42	III			
640 c	6010.49	I	1	39424.11	I	75	1002.346	I	600	2447.14	III			
86	6034.09	I				500	1005.28	III	600	2448.58	III			
150	6043.99	III				600	1008.78	III	500	2486.91	III			
870	6079.86	III				150	1013.664	I	500	2532.48	III			
9800	6128.61	II	500	392.43	V	700	1015.02	III	600	2580.67	III			
330	6150.42	III	800	486.17	IV	90	1025.553	I	500	2603.59	III			
1000	6213.10	I	800	534.73	IV	6000	1063.831	II	500	2632.67	III			
170	6217.60	I	700	535.67	IV	3000	1067.945	II	500	2633.18	III			
450	6242.96	III	600	536.15	IV	9000	1071.036	II	600	2665.54	III			
320 c	6354.55	I	900	537.61	IV	6000	1071.767	II	700	2710.37	III			
510	6456.33	III	500	538.03	V	5000	1075.230	II	500	2724.03	IV			
8300	6495.53	II	600	538.12	IV	5000	1079.080	II	500	2751.23	IV			
10000 w	6536.44	II	800	542.23	V	200	1084.667	I	700	2782.47	IV			
490	6586.51	I	600	542.30	V	200	1085.171	I	600	2965.56	III			
97	6628.66	I	1000	545.11	V	250	1085.304	I	500	3063.13	IV			
8800	6646.57	II	600	546.33	V	400	1088.06	I	600	3076.68	IV			
3300 c	6723.28	I	1000	547.63	V	350	1090.271	I	600	3104.46	III			
9600	6724.47	II	500	549.22	IV	250	1090.982	I	800	3139.34	III			
400	6753.12	III	700	552.02	IV	250	1092.437	I	900	3191.45	III			
200	6824.65	I	600	553.30	IV	400	1094.769	I	700	3289.80	III			
300	6870.45	I	700	554.62	IV	350	1095.148	I	700	3320.57	III			
37000	6955.50	II	600	556.23	III	350	1095.662	I	800	3329.06	III			
4800	6973.30	I	700	556.61	III	400	1095.797	I	900	3340.42	III			
16000	6979.67	II	700	557.12	III	250	1096.810	I	800	3392.89	III			
980	6983.49	I	350	559.305	II	300	1097.369	I	800	3393.45	III			
13000 w	7149.54	I	700	561.53	III	200	1098.068	I	900	3530.03	III			
1900 c	7219.60	III	700	561.68	III	200	1099.523	I	800	3560.68	III			
790	7228.53	I	700	561.74	III	500	1107.528	I	900	3602.10	III			
130	7279.90	I	400	571.904	II	800	1139.214	II	800	3612.85	III			
1100	7279.96	I	800	574.406	II	800	1167.148	I	700	3622.69	III			
2600 c	7608.90	I	500	601.50	IV	3000	1179.293	I	700	3656.95	III			
3300	7943.88	I	500	604.59	IV	1200	1188.774	I	700	3670.28	III			
22000	7997.44	II	500	606.35	III	900	1201.353	I	700	3682.05	III			
3500	8015.73	I	700	618.057	II	3000	1335.726	I	600	3705.45	III			
510	8078.94	I	600	619.982	I	10000	1347.240	I	600	3707.34	III			
4500	8079.04	I	800	620.298	II	5000	1351.657	I	800	3720.45	III			
59000 c	8521.13	I	700	626.735	II	12000	1363.447	I	800	3748.81	III			
15000 c	8761.41	I	800	635.881	II	2500	1373.116	I	500	3779.35	III			
61000 c	8943.47	I	1000	636.626	II	20000	1379.528	I	10000	3850.99	II			
			1000	650.894	II									

Line Spectra of the Elements (continued): Chlorine—Chromium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
25000	3860.83	II	600	7980.60	I	259	16198.5	I	280	2668.71	II
500	3925.87	III	2900	7997.85	I	717	19755.3	I	350	2671.81	II
700	3991.50	III	2200	8015.61	I	100	24470.0	I	280	2672.83	II
600	4018.50	III	1100	8023.33	I		39716.0	I	1800	2677.16	II
600	4059.07	III	400	8051.07	I		40085.5	I	320	2678.79	II
500	4104.23	III	1700	8084.51	I		40089.5	I	230	2687.09	II
500	4106.83	III	2200	8085.56	I		40532.2	I	280	2691.04	II
10000 h	4132.50	II	3000	8086.67	I	Chromium			180	2698.41	II
500	4608.21	III	1300	8087.73	I	Cr Z = 24			180	2698.69	II
40	4623.938	I	2500	8194.42	I	100	438.62	V	110	2701.99	I
50	4654.040	I	2200	8199.13	I	100	464.02	V	140	2712.31	II
80	4661.208	I	2200	8200.21	I	100	620.66	IV	170	2722.75	II
45	4691.523	I	800	8203.78	I	100	629.26	IV	420 h	2726.51	I
40	4721.255	I	18000	8212.04	I	80	630.30	IV	280 h	2731.91	I
45	4740.729	I	3000	8220.45	I	100	666.55	IV	170 h	2736.47	I
13000	4781.32	II	20000	8221.74	I	100	693.92	IV	250	2743.64	II
99000	4794.55	II	18000	8333.31	I	60	1030.47	III	110 h	2748.29	I
29000	4810.06	II	99900	8375.94	I	100	1033.69	III	330	2748.98	II
16000	4819.47	II	400	8406.199	I	100	1036.03	III	390	2750.73	II
81000	4896.77	II	15000	8428.25	I	80	1055.89	IV	280	2751.87	II
47000	4904.78	II	2200	8467.34	I	80	1068.41	III	110 h	2752.88	I
26000	4917.73	II	2200	8550.44	I	100	1116.48	V	150	2757.10	I
10000	4995.48	II	20000	8575.24	I	150	1121.07	V	350	2757.72	II
26000	5078.26	II	750	8578.02	I	150	1127.63	V	750	2762.59	II
30	5099.789	I	75000	8585.97	I	100	1263.50	V	750	2766.54	II
56000	5217.94	II	450	8628.54	I	100	1417.42	IV	250 h	2769.92	I
23000	5221.36	II	300	8641.71	I	150	1465.86	V	610	2780.70	I
15000	5392.12	II	3500	8686.26	I	150	1497.97	V	180	2822.37	II
99000	5423.23	II	2200	8912.92	I	170	1519.03	V	180	2830.47	II
10000	5423.51	II	3000	8948.06	I	220	1579.70	V	2500	2835.63	II
19000	5443.37	II	2000	9038.982	I	170	1591.72	V	110	2840.02	II
10000	5444.21	II	2500	9045.43	I	150	1603.19	V	1700	2843.25	II
40	5532.162	I	1000	9069.656	I	120	1672.66	IV	1200	2849.84	II
50 d	5796.305	I	2000	9073.17	I	120	1758.51	IV	120	2851.36	II
45	5799.914	I	7500	9121.15	I	140	1802.72	IV	880	2855.68	II
30	5856.742	I	3000	9191.731	I	130	1812.41	IV	610	2858.91	II
50	6019.812	I	500	9197.596	I	200	1837.44	V	440	2860.93	II
200	6140.245	I	4000	9288.86	I	140	1873.89	IV	790	2862.57	II
160	6194.757	I	1500	9393.862	I	140	1967.18	IV	750	2865.11	II
150	6434.833	I	3500	9452.10	I	120	1972.07	IV	610	2866.74	II
300	6932.903	I	500	9486.964	I	19000	2055.52	II	480	2867.65	II
300	6981.886	I	1000	9584.801	I	14000	2061.49	II	210	2870.44	II
600	7086.814	I	3500	9592.22	I	8900	2065.42	II	110	2871.63	I
7500	7256.62	I	250	9632.509	I	200	2226.72	III	160	2873.48	II
5000	7414.11	I	1000	9702.439	I	200	2235.91	III	320	2875.99	II
550	7462.370	I	250	9744.426	I	150	2237.59	III	230	2876.24	II
550	7489.47	I	200	9807.057	I	150	2244.10	III	180	2877.98	II
700	7492.118	I	400	9875.970	I	150	2284.44	III	120	2879.27	I
11000	7547.072	I	331	10392.549	I	150	2324.88	III	170	2887.00	I
2300	7672.42	I	300	11123.05	I	130	2383.33	I	700	2889.29	I
450	7702.828	I	269	11409.69	I	140	2408.62	I	370	2893.25	I
7000	7717.581	I	1000	11436.33	I	170	2496.31	I	190	2894.17	I
10000	7744.97	I	350	13243.8	I	110	2502.53	I	210	2896.75	I
2200	7769.16	I	310	13296.0	I	190	2504.31	I	180	2905.49	I
650	7771.09	I	550	13346.8	I	110	2516.92	I	260	2909.05	I
2200	7821.36	I	525	13821.7	I	390	2519.52	I	260	2910.90	I
1700	7830.75	I	294	14931.7	I	190	2527.12	I	250	2911.14	I
3000	7878.22	I	269	15108.0	I	160	2549.54	I	480	2967.64	I
2300	7899.31	I	381	15465.1	I	130	2560.69	I	480	2971.11	I
1800	7915.08	I	1094	15520.3	I	150	2571.74	I	210	2971.91	II
3000	7924.645	I	1487	15730.1	I	100	2577.65	I	480	2975.48	I
2100	7933.89	I	2780	15869.7	I	380	2591.85	I	190	2979.74	II
1700	7935.012	I	277	15883.3	I	250	2653.59	II	350	2980.79	I
650	7952.52	I	342	15928.9	I	250	2658.59	II	110	2985.32	II
1500	7974.72	I	735	15960.0	I	320	2663.42	II	480	2985.85	I
1300	7976.97	I	283	15970.5	I	440	2666.02	II	1500	2986.00	I

Line Spectra of the Elements (continued): Chromium—Cobalt

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
2100	2986.47	I	130	3573.64	I	190	3984.34	I	60	5013.32	I
660	2988.65	I	330 h	3574.80	I	160	3989.99	I	70	5166.23	I
160	2989.19	II	19000	3578.69	I	960	3991.12	I	70	5184.59	I
480	2991.89	I	160 h	3584.33	I	160	3991.67	I	70	5192.00	I
230	2994.07	I	130	3585.30	II	190	3992.84	I	85	5196.44	I
300	2995.10	I	17000	3593.49	I	160	4001.44	I	5300	5204.52	I
700	2996.58	I	350	3601.67	I	120	4012.47	II	8400	5206.04	I
210	2998.79	I	13000	3605.33	I	120	4026.17	I	11000	5208.44	I
1100	3000.89	I	130	3632.84	I	190	4039.10	I	85	5224.94	I
750	3005.06	I	350	3636.59	I	160	4048.78	I	290	5247.56	I
140	3013.03	I	630	3639.80	I	120	4058.77	I	530	5264.15	I
710	3013.71	I	220	3641.83	I	140	4126.52	I	180	5265.72	I
710	3014.76	I	220	3649.00	I	120	4153.82	I	95 h	5275.17	I
1400	3014.92	I	170	3653.91	I	140	4163.62	I	70 h	5276.03	I
710	3015.19	I	220	3656.26	I	170	4174.80	I	340	5296.69	I
2800	3017.57	I	130	3663.21	I	170	4179.26	I	70 h	5297.36	I
430	3018.50	I	120	3685.55	I	110	4209.37	I	660	5298.27	I
240	3018.82	I	130	3686.80	I	20000	4254.35	I	85	5300.75	I
430	3020.67	I	130	3687.25	I	110	4263.14	I	340 h	5328.34	I
2800	3021.56	I	130	3730.81	I	16000	4274.80	I	70 h	5329.17	I
1100	3024.35	I	150	3732.03	I	10000	4289.72	I	780	5345.81	I
170	3029.16	I	480	3743.58	I	780	4337.57	I	380	5348.32	I
710	3030.24	I	570	3743.88	I	1100	4339.45	I	40	5400.61	I
140	3031.35	I	340	3749.00	I	380	4339.72	I	1400	5409.79	I
390	3034.19	I	230	3757.66	I	1900	4344.51	I	24	5628.64	I
550	3037.04	I	260	3768.24	I	380	4351.05	I	7	5642.36	I
550	3040.85	I	130	3791.38	I	2300	4351.77	I	24	5664.04	I
110	3050.14	II	130	3792.14	I	570	4359.63	I	24	5694.73	I
710	3053.88	I	120	3793.29	I	530	4371.28	I	40	5698.33	I
240	3118.65	II	130	3793.88	I	110	4374.16	I	24	5702.31	I
430	3120.37	II	140	3797.13	I	530	4384.98	I	24	5712.78	I
470	3124.94	II	200	3797.72	I	110	4458.54	I	24 h	5783.11	I
120	3128.70	II	530	3804.80	I	660	4496.86	I	30 h	5783.93	I
590	3132.06	II	110	3806.83	I	380	4526.47	I	24 h	5785.00	I
140	3136.68	II	110	3807.93	I	380	4530.74	I	19 h	5785.82	I
140	3147.23	II	180	3815.43	I	240	4535.72	I	60 h	5787.99	I
100	3155.15	I	180	3819.56	I	240	4540.50	I	180 h	5791.00	I
100	3163.76	I	130	3826.42	I	240	4540.72	I	35	6330.10	I
240	3180.70	II	130	3830.03	I	140	4544.62	I	22	6362.87	I
220	3197.08	II	380	3841.28	I	600	4545.96	I	19	6661.08	I
170	3209.18	II	190	3848.98	I	120	4565.51	I	21 h	6883.03	I
140	3217.40	II	140	3849.36	I	120	4571.68	I	27 h	6924.13	I
120	3245.54	I	290	3850.04	I	360	4580.06	I	30 h	6978.48	I
130	3251.84	I	140	3852.22	I	360	4591.39	I	85	7355.90	I
130	3257.82	I	190	3854.22	I	480	4600.75	I	130	7400.21	I
130	3339.80	II	110	3855.29	I	240	4613.37	I	150	7462.31	I
110	3342.59	II	140	3855.57	I	600	4616.14	I	40	8947.15	I
170	3358.50	II	260	3857.63	I	550	4626.19	I	19	8976.83	I
160	3360.30	II	660	3883.29	I	1600	4646.17	I	Cobalt Co Z = 27		
430	3368.05	II	570	3885.22	I	570	4651.28	I			
140	3382.68	II	380	3886.79	I	840	4652.16	I	20	355.52	V
170	3403.32	II	260	3894.04	I	240 d	4698.46	I	18	355.88	V
360	3408.76	II	360	3902.92	I	190	4708.04	I	12	356.06	V
210	3421.21	II	960	3908.76	I	240	4718.43	I	66	609.16	IV
270	3422.74	II	120 hd	3911.82	I	120	4730.71	I	70	609.21	IV
140	3433.31	II	120	3915.84	I	140	4737.35	I	64	609.28	IV
270	3433.60	I	190	3916.24	I	340	4756.11	I	10	1018.36	V
160	3436.19	I	1900	3919.16	I	190	4789.32	I	10	1021.14	V
140	3441.44	I	600	3921.02	I	120	4801.03	I	15	1231.73	V
170	3445.62	I	600	3928.64	I	110	4829.38	I	50	1277.01	V
170	3447.43	I	410	3941.49	I	140	4870.80	I	80	1299.58	II
190	3453.33	I	1900	3963.69	I	130	4887.01	I	80	1306.95	II
130	3455.60	I	120	3969.06	I	260	4922.27	I	50	1345.67	V
100	3460.43	I	1600	3969.75	I	110	4936.33	I	1000	1696.01	III
120	3550.64	I	1600	3976.66	I	70	4942.50	I	800	1697.99	III
130	3566.16	I	960	3983.91	I	110	4954.81	I	1000	1707.35	III

Line Spectra of the Elements (continued): Cobalt

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
5000	1760.35	III	200	2291.98	II	200	2546.74	II	8800	3443.64	I
5000	1773.57	III	300 d	2293.38	II	340	2548.34	I	50	3446.39	II
2000	1780.05	III	300	2301.40	II	310	2553.37	I	4100	3449.17	I
3000	1782.97	III	800 d	2307.85	II	310	2555.07	I	2100	3449.44	I
1000	1787.08	III	2600	2309.02	I	300	2559.41	II	21000	3453.50	I
1000	1789.07	III	500	2311.60	II	200	2560.03	II	1000	3455.23	I
1000	1823.08	III	500	2314.05	II	960	2562.15	I	5100	3462.80	I
2000	1830.09	III	300	2314.96	II	500	2564.04	II	5100	3465.80	I
2000	1831.44	III	200 p	2317.06	II	1100	2567.35	I	8000	3474.02	I
5000	1835.00	III	2400	2323.14	I	960	2574.35	I	1900	3483.41	I
1500	1842.34	I	300 p	2324.31	II	800	2580.32	II	4800	3489.40	I
1800	1847.89	I	200 d	2326.11	II	300 d	2582.22	II	2400	3495.69	I
1800	1852.71	I	500	2326.47	II	500	2587.22	II	50	3501.72	II
2400	1855.05	I	1400	2335.99	I	500	2587.52	II	9600	3502.28	I
2000	1863.83	III	1600	2338.67	I	200	2588.91	II	7000	3506.32	I
1500	1878.28	I	200	2347.39	II	100 p	2605.71	II	50	3507.77	II
1800	1936.58	I	1600	2352.85	I	100	2612.50	II	2900	3509.84	I
1500	1946.79	I	200 d	2353.41	II	100	2614.36	II	1400	3510.43	I
1500	1951.90	I	2000	2353.42	I	100 p	2628.77	II	4800	3512.64	I
1800	1954.22	I	500	2363.80	II	100	2632.26	II	3800	3513.48	I
1800	1955.17	I	400	2378.62	II	100	2636.07	II	4800	3518.35	I
1500	1958.55	I	1400	2380.48	I	310	2646.42	I	1300	3520.08	I
1500	1961.59	I	200	2381.76	II	770	2648.64	I	2700	3521.57	I
1500 h	1968.69	I	300 p	2383.45	II	100	2653.72	II	3800	3523.43	I
1500 h	1968.93	I	1400	2384.86	I	100	2663.53	II	60	3523.51	II
3000	1970.71	I	200	2386.36	II	200	2666.73	II	6400	3526.85	I
1800 h	1971.16	I	500	2388.92	II	100	2675.85	II	2700	3529.03	I
1800 h	1972.52	I	200	2397.38	II	100	2684.42	II	7300	3529.81	I
1500	1973.85	I	1100 d	2402.06	I	100	2702.02	II	1900	3533.36	I
1800	1976.97	I	200 p	2404.16	II	200	2706.62	II	50	3545.03	II
2400 h	1980.89	I	5300	2407.25	I	200	2707.35	II	1100	3560.89	I
1500	1989.80	I	5300	2411.62	I	190	2715.99	I	80	3561.07	II
1800	1990.34	I	1600	2412.76	I	100	2727.78	II	8800	3569.38	I
1500 l	1998.49	I	4800	2414.46	I	80	2734.54	II	50	3574.95	II
1500	2002.32	I	4800	2415.30	I	190	2745.10	I	1600	3574.96	I
900	2008.04	I	300	2417.65	II	100	2753.22	II	60	3575.32	II
50	2011.51	II	4100	2424.93	I	190	2764.19	I	2500	3575.36	I
1200 h	2014.58	I	3300	2432.21	I	100	2766.70	II	60	3577.96	II
900	2016.17	I	2900	2436.66	I	100	2774.97	II	1000	3585.16	I
50	2022.35	II	2400	2439.05	I	100	2791.00	II	6700	3587.19	I
50	2027.04	II	200	2442.63	II	100	2793.73	II	1900	3594.87	I
900	2031.96	I	200 d	2446.03	II	150	2815.56	I	1600	3602.08	I
1500	2039.95	I	200 p	2447.69	II	80	2835.63	II	100	3621.21	II
1200	2041.11	I	200	2450.00	II	80	2847.35	II	1000	3627.81	I
50	2065.54	II	200	2464.20	II	80	2871.22	II	80	3643.61	II
1500 h	2077.76	I	200	2486.44	II	190	2886.44	I	60	3681.35	II
900	2085.67	I	200	2498.82	II	100	2918.38	II	1100	3745.50	I
900	2087.55	I	570	2504.52	I	100	2930.24	II	1400	3842.05	I
900	2089.35	I	500	2506.46	II	100	2954.73	II	6900	3845.47	I
900	2093.40	I	360	2506.88	I	690	2987.16	I	5500	3873.12	I
900	2094.86	I	200	2511.16	II	690	2989.59	I	2800	3873.96	I
900	2095.77	I	860	2517.87	I	60	3022.59	II	7900	3894.08	I
1200	2097.51	I	500	2519.82	II	3100	3044.00	I	1500	3935.97	I
1500	2104.73	I	4300	2521.36	I	1700	3061.82	I	80 h	3963.10	II
1500	2106.80	I	200 h	2524.65	II	80	3387.70	II	6000	3995.31	I
900	2108.98	I	300	2524.97	II	1100	3388.17	I	970	3997.91	I
900 s	2117.68	I	500	2528.62	II	2200	3395.38	I	350	4020.90	I
900	2137.78	I	2900	2528.97	I	11000	3405.12	I	370	4045.39	I
900	2138.97	I	200 p	2530.09	II	4500	3409.18	I	350	4066.37	I
900	2163.03	I	720	2530.13	I	6700	3412.34	I	830	4092.39	I
1100	2174.60	I	860	2532.18	I	2200	3412.63	I	550	4110.54	I
200	2193.60	II	200 d	2533.82	II	2700	3417.16	I	2800	4118.77	I
200	2256.73	II	2900	2535.96	I	50	3423.84	II	4400	4121.32	I
150	2260.00	II	860	2536.49	I	2500	3431.58	I	90	4190.71	I
200	2283.52	II	300	2541.94	II	4500	3433.04	I	90	4469.56	I
1000	2286.15	II	1700	2544.25	I	1600	3442.93	I	690	4530.96	I

Line Spectra of the Elements (continued): Cobalt—Copper

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
90	4549.66	I	300	1004.055	II	250	1450.304	II	400	1606.834	II
140	4565.59	I	300	1008.569	II	200	1452.294	II	250	1608.639	II
190	4581.60	I	300	1008.728	II	300	1458.002	II	150	1610.296	II
120	4629.38	I	300	1010.269	II	250	1459.412	II	200	1617.915	II
85	4663.41	I	250	1012.597	II	200	1463.752	II	600	1621.426	II
110	4792.86	I	500	1018.707	II	400	1463.838	II	400	1622.428	II
100	4840.27	I	500	1027.831	II	200	1466.070	II	250	1630.268	II
150	4867.88	I	250	1028.328	II	400	1470.697	II	100	1636.605	II
80 h	4964.18	II	200	1030.263	II	200	1472.395	II	1000 r	1642.21	III
50	5212.71	I	600	1036.470	II	250	1473.978	II	250	1649.458	II
50	5230.22	I	600	1039.348	II	200	1474.935	II	30 r	1655.32	I
50	5247.93	I	600	1039.582	II	150	1476.059	II	200	1656.322	II
50	5342.71	I	800	1044.519	II	300 r	1481.23	III	200	1660.001	II
50	5352.05	I	800	1044.744	II	200	1481.544	II	300	1663.002	II
Copper			500	1049.755	II	200	1485.328	II	100	1672.776	II
Cu Z = 29			600	1054.690	II	750	1488.831	II	30	1688.09	I
80	685.141	II	400	1055.797	II	300	1492.834	II	30	1691.08	I
100	709.313	II	600	1056.955	II	250	1493.366	II	30 r	1703.84	I
100	718.179	II	400	1058.799	II	250	1495.430	II	50 r	1713.36	I
150	724.489	II	600	1059.096	II	350	1496.687	II	150	1717.721	II
200	735.520	II	600	1060.634	II	150	1503.368	II	50 r	1725.66	I
250	736.032	II	600	1063.005	II	250	1504.757	II	100	1736.551	II
80	779.295	II	200	1065.782	II	200	1505.388	II	50 r	1741.57	I
100	797.455	II	200	1066.134	II	300	1508.632	II	150	1753.281	II
150	810.998	II	500	1069.195	II	350	1510.506	II	200 r	1774.82	I
200	813.883	II	300	1073.745	II	200	1512.465	II	100 r	1825.35	I
300	826.996	II	200	1088.395	II	200	1513.366	II	250	1929.751	II
150	848.808	II	300	1094.402	II	500	1514.492	II	250	1944.597	II
250	851.303	II	250	1097.053	II	200	1517.631	II	100	1946.493	II
250	858.487	II	150	1119.947	II	500	1519.492	II	200	1957.518	II
400	861.994	II	200	1142.640	II	600	1519.837	II	150	1970.495	II
400	865.390	II	300	1144.856	II	200	1520.540	II	150	1977.027	II
250	869.336	II	100	1250.048	II	200	1524.860	II	500	1979.956	II
150	873.263	II	150	1265.506	II	150	1525.764	II	300	1989.855	II
200	876.723	II	300	1275.572	II	500	1531.856	II	250	1999.698	II
250	877.012	II	150	1282.455	II	300	1532.131	II	270	2035.854	II
200	877.555	II	150	1287.468	II	250	1533.986	II	250	2037.127	II
500	878.699	II	150	1298.395	II	250	1535.002	II	350	2043.802	II
100	884.133	II	300	1308.297	II	500	1537.559	II	300	2054.980	II
250	885.847	II	300	1314.337	II	200	1540.239	II	100	2078.663	II
600	886.943	II	100	1320.686	II	300	1540.389	II	110	2098.398	II
600	890.567	II	100	1326.395	II	300	1540.588	II	320	2104.797	II
500	892.414	II	150	1350.594	II	750	1541.703	II	300	2112.100	II
800	893.678	II	250	1351.837	II	400	1544.677	II	320	2117.310	II
400	894.227	II	150	1355.305	II	100	1547.958	II	350	2122.980	II
600	896.759	II	300	1358.773	II	300	1550.653	II	350	2126.044	II
400	896.976	II	200	1359.009	II	300	1551.389	II	420	2134.341	II
600	901.073	II	200	1362.600	II	500	1552.646	II	900	2135.981	II
400	906.113	II	250	1367.951	II	250	1553.896	II	400	2148.984	II
800	914.213	II	200	1371.840	II	400	1555.134	II	150	2161.320	II
600	922.019	II	300 r	1376.79	III	500	1555.703	II	1300 r	2165.09	I
500	924.239	II	200 r	1377.49	III	300	1558.345	II	250	2174.982	II
400	935.232	II	100	1393.128	II	400	1565.924	II	1600 r	2178.94	I
600	935.898	II	100	1398.642	II	400	1566.415	II	700	2179.410	II
600	943.335	II	150	1402.777	II	100	1569.416	II	1700 r	2181.72	I
600	945.525	II	150	1407.169	II	300	1579.492	II	700	2189.630	II
500	945.965	II	100	1414.898	II	300	1580.626	II	900	2192.268	II
200	954.383	II	250	1418.426	II	400	1581.995	II	400	2195.683	II
250	956.290	II	250	1421.759	II	500	1583.682	II	1700 r	2199.58	I
400	958.154	II	200	1427.829	II	400	1590.165	II	1300 r	2199.75	I
200	960.414	II	400	1430.243	II	600	1593.556	II	100	2200.509	II
250	968.042	II	250	1434.904	II	500 r	1593.75	III	200	2209.806	II
200	974.759	II	150	1436.236	II	400	1598.402	II	750	2210.268	II
250	977.567	II	150	1442.139	II	400	1602.388	II	1600 r	2214.58	I
100	987.657	II	200	1445.984	II	200	1604.848	II	250	2215.106	II
250	992.953	II	200	1449.058	II	300	1605.281	II	1000 r	2215.65	I

Line Spectra of the Elements (continued): Copper

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
750	2218.108	II	10000 r	3273.96	I	100	4758.433	II	550	6305.972	II
2100 r	2225.70	I	1400 h	3282.72	I	400	4812.948	II	400	6312.492	II
150	2226.780	II	400	3290.418	II	120	4851.262	II	120	6326.466	II
1600 r	2227.78	I	1500 h	3290.54	I	300	4854.988	II	400	6373.268	II
350	2228.868	II	110	3300.881	II	100	4873.304	II	750	6377.840	II
2500 r	2230.08	I	250	3301.229	II	150	4901.427	II	400	6403.384	II
1100 r	2238.45	I	2500 h	3307.95	I	1000	4909.734	II	850	6423.884	II
900	2242.618	II	200	3316.276	II	500	4918.376	II	200	6442.965	II
2300 r	2244.26	I	1500	3337.84	I	200	4926.424	II	750	6448.559	II
1000	2247.002	II	150	3338.648	II	900	4931.698	II	170	6466.246	II
1300 r	2260.53	I	200	3365.648	II	120	4943.026	II	950	6470.168	II
2200 r	2263.08	I	450	3370.454	II	700	4953.724	II	750	6481.437	II
150	2263.786	II	300	3374.952	II	500	4985.506	II	400	6484.421	II
200	2276.258	II	200	3380.712	II	400	5006.801	II	220	6517.317	II
100	2286.645	II	100	3384.945	II	350	5009.851	II	400	6530.083	II
2500 r	2293.84	I	1250 h	3483.76	I	400	5012.620	II	120	6551.286	II
170	2294.368	II	1250	3524.23	I	350	5021.279	II	200	6577.080	II
1000	2303.12	I	2000	3530.38	I	200	5039.016	II	750	6624.292	II
150	2369.890	II	1400	3599.13	I	300	5047.348	II	800	6641.396	II
2500 r	2392.63	I	1400	3602.03	I	900	5051.793	II	450	6660.962	II
120	2403.337	II	1000	3686.555	II	400	5058.910	II	100	6770.362	II
1500	2406.66	I	150	3786.270	II	500	5065.459	II	300	6806.216	II
1000 r	2441.64	I	170	3797.849	II	450	5067.094	II	400	6809.647	II
100	2485.792	II	100	3818.879	II	350	5072.302	II	320	6823.202	II
2000 r	2492.15	I	140	3826.921	II	450	5088.277	II	250	6844.157	II
150	2506.273	II	160	3864.137	II	420	5093.816	II	320	6868.791	II
120	2526.593	II	280	3884.131	II	350	5100.067	II	270	6872.231	II
300	2544.805	II	150	3892.924	II	1500	5105.54	I	270	6879.404	II
100	2571.756	II	170	3903.177	II	250	5124.476	II	220	6937.553	II
150	2590.529	II	140	3920.654	II	2000	5153.24	I	150	6952.871	II
200	2600.270	II	120	3933.268	II	100	5158.093	II	150	6977.572	II
2500 r	2618.37	I	120	3987.024	II	100	5183.367	II	200	7022.860	II
200	2666.291	II	150	3993.302	II	2500	5218.20	I	300	7194.896	II
750	2689.300	II	140	4003.476	II	100	5269.991	II	400	7326.008	II
700	2700.962	II	1250	4022.63	I	100	5276.525	II	300	7331.694	II
650	2703.184	II	100	4032.647	II	1650	5292.52	I	250	7382.277	II
700	2713.508	II	600	4043.484	II	100	5368.383	II	1000	7404.354	II
650	2718.778	II	500	4043.751	II	1500	5700.24	I	270	7434.156	II
300	2721.677	II	2000	4062.64	I	1500	5782.13	I	500	7562.015	II
120	2737.342	II	120	4068.106	II	150	5805.989	II	700	7652.333	II
270	2745.271	II	500	4131.363	II	100	5833.515	II	1000	7664.648	II
2500 r	2766.37	I	200	4143.017	II	200	5897.971	II	150	7681.788	II
800	2769.669	II	300	4153.623	II	120	5937.577	II	450	7744.097	II
200	2791.795	II	500	4161.140	II	400	5941.196	II	800	7778.738	II
170	2799.528	II	370	4164.284	II	100	5993.260	II	750	7805.184	II
100	2810.804	II	400	4171.851	II	650	6000.120	II	1500	7807.659	II
1250 r	2824.37	I	500	4179.512	II	100	6023.264	II	1000	7825.654	II
350	2837.368	II	500	4211.866	II	250	6072.218	II	350	7860.577	II
100	2857.748	II	320	4230.449	II	150	6080.343	II	300	7890.567	II
600	2877.100	II	200	4255.635	II	150	6099.990	II	700	7902.553	II
270	2884.196	II	950	4275.11	I	160	6107.412	II	1500	7933.13	I
2500 r	2961.16	I	300	4279.962	II	300	6114.493	II	400	7944.438	II
100	2986.335	II	500	4292.470	II	600	6150.384	II	400	7972.033	II
2000	2997.36	I	400	4365.370	II	750	6154.222	II	1200	7988.163	II
2000	3010.84	I	100	4444.831	II	500	6172.037	II	2000	8092.63	I
2500	3036.10	I	400	4506.002	II	550	6186.884	II	500	8277.560	II
2500	3063.41	I	150	4516.049	II	400	6188.676	II	800	8283.160	II
1400	3073.80	I	150	4541.032	II	300	6198.092	II	250	8503.396	II
1500	3093.99	I	500	4555.920	II	470	6204.261	II	750	8511.061	II
1250	3099.93	I	100	4596.906	II	450	6208.457	II	200	8609.134	II
2000	3108.60	I	120	4649.271	II	750	6216.939	II	500	9813.213	II
1400 h	3126.11	I	2000	4651.12	I	700	6219.844	II	250	9827.978	II
1500	3194.10	I	120	4661.363	II	500	6261.848	II	200	9830.798	II
1400	3208.23	I	320	4671.702	II	1000	6273.349	II	600	9861.280	II
1500 h	3243.16	I	300	4673.577	II	350	6288.696	II	600	9864.137	II
10000 r	3247.54	I	450	4681.994	II	900	6301.009	II	200	9883.969	II

Line Spectra of the Elements (continued): Copper—Erbium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
550	9916.419	II	560	3517.26	II	580	3806.27	II	4400	4218.09	I
500	9917.954	II	4400	3523.98	II	470	3812.27	I	4400	4221.11	I
550	9925.594	II	22000	3531.70	II	470	3813.67	II	2700	4225.16	I
450	9938.998	II	4400	3534.96	II	1400	3816.76	II	1000	4308.63	II
500	9960.354	II	5500	3536.02	II	700	3825.68	II	540	4409.38	II
450	10006.588	II	4400	3538.52	II	2300	3836.50	II	740	4449.70	II
550	10022.969	II	1700	3542.33	II	1400	3841.31	II	420	4577.78	I
550	10038.093	II	1400	3546.83	II	420	3846.34	II	2100	4589.36	I
650	10054.938	II	4400	3550.22	II	420	3847.02	I	990	4612.26	I
450	10080.354	II	2200	3551.62	II	1200	3853.03	II	170	4731.84	II
Dysprosium			440 h	3558.23	II	420	3858.40	I	120 h	4775.79	I
Dy Z = 66			440	3559.30	II	560	3868.45	II	480	4957.34	II
260	2356.91	II	2200	3563.15	II	1600	3868.81	I	70	5022.12	I
240	2410.01	II	560	3563.69	II	820	3869.86	II	160	5042.63	I
260	2439.84	II	780	3573.83	II	7000	3872.11	II	95	5070.68	I
220	2585.30	I	1400	3574.15	II	1200	3873.99	II	120	5077.67	I
440	2634.80	II	4400	3576.24	II	470	3879.11	II	80	5090.38	II
220	2755.75	II	1700	3576.87	II	5800	3898.53	II	80	5110.32	I
300	2816.39	II	830	3577.98	II	540	3914.87	II	130 h	5120.04	I
390	2913.95	II	440	3580.04	II	540	3915.59	II	190	5139.60	II
610	3038.28	II	3300	3585.06	II	540 d	3917.29	I	110	5169.69	II
830	3135.38	II	1400	3585.78	II	420	3927.86	I	80	5185.30	I
500	3141.14	II	560	3586.11	II	540	3930.14	I	290	5192.86	II
1200	3156.52	II	1100	3591.41	II	2100	3931.52	II	95	5197.66	II
670	3162.83	II	560	3591.81	II	10000	3944.68	II	70	5259.88	I
1000	3169.99	II	560	3592.11	II	800	3957.79	II	130	5260.56	I
470	3215.19	II	1800	3595.04	II	14000	3968.39	II	65	5267.11	I
830	3216.63	II	560	3600.38	II	2700	3978.57	II	55	5282.07	I
490	3235.89	II	1800	3606.12	II	1400	3981.92	II	160	5301.58	I
490	3245.12	II	440	3618.51	II	1600	3983.65	II	65	5340.30	I
1200	3251.27	II	560	3620.16	II	800	3984.21	II	85	5389.58	II
890	3280.09	II	470	3624.27	II	540	3991.32	II	80	5419.13	I
490	3282.77	II	1100	3629.42	II	1600	3996.69	II	70	5423.32	I
1100	3308.88	II	4000	3630.24	II	8000	4000.45	II	95	5451.11	I
780	3316.32	II	440	3632.78	II	420	4005.84	I	65	5547.27	I
1000	3319.88	II	1100	3640.25	II	540	4011.29	II	100	5639.50	I
780	3341.00	II	11000	3645.40	II	540	4013.82	I	55 h	5645.99	I
510	3353.58	II	1000	3648.78	II	540	4014.70	II	80	5652.01	I
510	3368.11	II	700	3664.62	II	420	4027.78	II	70 h	5718.46	I
5300	3385.02	II	990	3672.30	II	520 d	4028.32	II	55	5745.53	I
610	3388.85	II	420	3672.70	II	520	4032.47	II	55 h	5868.11	II
3800	3393.57	II	1400	3674.08	II	420	4033.65	II	70	5945.80	I
1300	3396.16	II	2200	3676.59	II	420	4036.32	II	120	5974.49	I
5300	3407.80	II	640	3678.51	I	12000	4045.97	I	140	5988.56	I
1300	3413.78	II	820	3684.85	I	1600	4050.56	II	140	6088.26	I
530	3414.82	II	1300	3685.78	I	520	4055.14	II	100	6168.43	I
780	3419.63	II	4700	3694.81	II	2500	4073.12	II	270	6259.09	I
530	3425.06	II	990	3698.21	II	7400	4077.96	II	160	6579.37	I
1900	3434.37	II	540	3701.63	II	3900	4103.30	II	75	6667.86	I
560	3440.93	II	440	3707.57	II	860	4103.87	I	180	6835.42	I
1300	3441.45	II	440	3708.22	II	1500	4111.34	II	80	6852.96	I
3800	3445.57	II	420	3710.07	II	490	4124.63	II	65	6899.32	II
830	3446.99	II	1600	3724.45	II	990	4129.42	II	55	7426.86	II
2700	3454.32	II	930	3739.34	I	1200	4143.10	II	55	7543.73	I
1300	3456.56	II	1200	3747.82	II	990	4146.06	I	80	7662.36	I
4400	3460.97	II	1400	3753.51	II	5700	4167.97	I	100	8201.57	II
720	3468.43	II	1400	3753.75	II	930	4183.72	I	45	8791.39	II
560	3471.14	II	1200	3757.05	I	12000	4186.82	I	Erbium		
560 d	3471.53	II	4700	3757.37	II	2200	4191.64	I	Er Z = 68		
1300	3477.07	II	640	3767.63	I	6800	4194.84	I	600	2277.65	III
4400	3494.49	II	640	3773.05	I	800	4198.02	I	290	2586.73	II
560	3496.34	II	420	3781.47	I	680	4201.30	I	490	2670.26	II
830	3498.71	II	3300	3786.18	II	680	4202.24	I	500	2739.27	III
830	3504.53	II	1600	3788.44	II	16000	4211.72	I	610	2755.63	II
830	3505.45	II	700	3791.87	II	1800	4213.18	I	1000	2904.47	II
1300	3506.81	II	510	3804.14	II	3700	4215.16	I	1500	2910.36	II

Line Spectra of the Elements (continued): Erbium—Europium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
1500	2964.52	II	3200	3973.58	I	55	6326.13	I	120	3058.98	I
1200	3002.41	II	1400	3974.72	II	55	6492.35	I	220	3077.36	II
1000	3055.10	III	810	3977.02	I	60	6583.48	I	120	3097.45	II
1000	3070.40	III	1100	3982.33	I	70	6601.11	I	320	3106.18	I
610	3073.34	II	810	3987.66	I	70	6759.87	I	950	3111.43	I
720	3082.08	II	14000	4007.96	I	35	6790.92	I	120	3130.73	II
610	3084.02	II	1100	4012.58	I	70	6848.10	I	50 c	3171.00	III
770	3122.72	II	3000	4020.51	I	55	6865.13	I	50 c	3183.78	III
1500	3166.25	III	1000	4046.96	I	55	7459.55	I	420	3210.57	I
870	3181.92	II	940	4055.47	II	120	7469.51	I	1000	3212.81	I
870	3220.73	II	690	4059.78	II	35	7680.01	I	420	3213.75	I
610	3223.31	II	3500	4087.63	I	35	7797.47	I	150	3272.77	II
2300	3230.58	II	1100	4098.10	I	35	7921.85	I	210	3277.78	II
2700	3264.78	II	6900	4151.11	I	30	7937.84	I	150	3301.95	II
720	3279.33	II	1000	4190.70	I	35	8312.82	I	140	3308.02	II
720	3280.22	II	1400	4218.43	I	55	8409.90	I	140	3313.33	II
2000	3301.23	III	690	4286.56	I	9	8866.84	II	950	3334.33	I
2300	3312.42	II	40000	4290.06	III	Europium			110	3350.40	I
770	3323.19	II	20000	4386.86	III	Eu Z = 63			140	3369.06	II
770	3332.70	II	810	4409.34	I	30	2124.69	III	190	3391.99	II
1300	3346.04	II	1000	4606.61	I	200	2350.51	III	280	3396.58	II
1400	3364.08	II	570	4675.62	II	4000	2375.46	III	150	3425.02	II
1400 d	3368.02	II	15000	4735.56	III	100 d	2435.14	III	150	3441.00	II
7700	3372.71	II	2000	4783.12	III	1000	2444.38	III	130	3461.38	II
970	3374.17	II	250	5007.25	I	4000	2445.99	III	470 cw	3521.09	II
1700	3385.08	II	200	5035.94	I	2000	2513.76	III	150	3542.15	II
2300	3392.00	II	210	5042.05	II	200	2522.14	III	180	3552.52	II
770	3441.13	II	120	5124.56	I	160	2564.17	II	150	3603.20	II
970	3471.71	II	130	5127.41	II	110	2568.17	II	6400	3688.42	II
610	3479.41	II	120	5131.53	I	230	2577.14	II	20000 cw	3724.94	II
970	3485.85	II	130	5133.83	II	1000	2638.77	II	350	3741.31	II
6700	3499.10	II	170	5164.77	II	380	2641.27	II	260	3761.12	II
610	3502.78	I	130	5172.78	I	640	2668.34	II	39000 cw	3819.67	II
610	3524.91	II	160	5188.90	II	110	2673.42	II	140	3844.23	II
820	3549.84	II	150	5206.52	I	250	2678.29	II	190	3865.57	I
1500	3558.02	I	140	5255.93	II	250	2685.66	II	150	3884.75	I
1000	3559.90	II	80	5272.91	I	550	2692.03	II	28000 cw	3907.10	II
920	3570.75	II	90	5348.06	I	700	2701.14	II	32000 cw	3930.48	II
1000	3580.52	II	60	5414.63	II	800	2701.90	II	30000 cw	3971.96	II
610	3590.76	I	180	5456.62	I	240	2705.28	II	180	4011.69	II
610	3599.50	II	90	5468.32	I	180	2709.99	I	150	4017.58	II
1000	3599.83	II	80	5485.97	II	700	2716.98	II	120	4039.19	I
3100	3616.56	II	80	5593.46	I	4200	2727.78	II	120	4085.38	II
720	3628.04	I	60	5611.82	I	160	2740.62	II	33000 cw	4129.70	II
1000	3633.54	II	70	5622.01	I	120	2744.26	II	60000 cw	4205.05	II
1600	3638.68	I	80	5626.53	II	480	2781.89	II	150	4298.73	I
900	3645.94	II	90	5640.36	I	1900	2802.84	II	240	4355.09	II
7900	3692.65	II	70	5664.95	I	220	2811.75	II	14000 cw	4435.56	II
1300	3729.52	II	70	5719.55	I	3400	2813.94	II	3000	4522.57	II
900	3742.64	II	100	5739.19	I	550	2816.18	II	11000	4594.03	I
900	3747.43	I	290	5762.80	I	2000	2820.78	II	9800	4627.22	I
1800	3786.84	II	70	5784.66	I	400 cw	2828.72	II	8300	4661.88	I
1600	3810.33	I	70	5800.79	I	260	2859.67	II	110	4867.62	I
4000	3816.78	III	430	5826.79	I	280	2862.57	II	150	4907.18	I
3600	3830.48	II	100	5850.07	I	200	2892.54	I	180	4911.40	I
680	3855.90	I	120	5855.31	I	140	2893.03	I	180	5013.17	I
7500	3862.85	I	140	5872.35	I	360	2893.83	I	170	5022.91	I
1500	3880.61	II	120	5881.14	I	3200	2906.68	II	110	5029.54	I
1200	3882.89	II	8000	5903.30	III	160	2908.99	I	170	5114.37	I
4200	3892.68	I	70	6022.56	I	850	2925.04	II	170	5129.10	I
5200	3896.23	II	70	6061.25	I	200 cw	2952.68	II	210	5133.52	I
11000	3906.31	II	60	6076.45	II	260	2960.21	II	270	5160.07	I
3200	3937.01	I	360	6221.02	I	300	2991.33	II	210	5166.70	I
2100	3938.63	II	55	6262.56	I	100 c	3023.93	III	200	5199.85	I
3200	3944.42	I	60	6268.87	I	200 c	3026.79	III	110	5200.96	I
2700	3973.04	I	130	6308.77	I	320 cw	3054.94	II	120	5206.44	I

Line Spectra of the Elements (continued): Europium—Fluorine

Intensity			Wavelength/Å			Intensity			Wavelength/Å			Intensity			Wavelength/Å		
750	5215.10	I	35	7887.99	I	750	955.55	I	150	2835.63	III						
300	5223.49	I	24 cw	8209.80	I	500	958.52	I	150	2860.33	III						
120	5239.24	I	21 cw	8642.67	I	20	972.40	I	120	2862.86	III						
200	5266.40	I	18	8870.30	I	350	973.90	I	140	2887.58	III						
390	5271.96	I	Fluorine F Z = 9			100	976.22	I	150	2889.45	III						
110	5272.48	I				40	976.51	I	120	2905.30	III						
150	5282.82	I	50	148.00	V	100	977.75	I	140	2913.29	III						
120	5291.26	I	50	163.56	V	60	1082.31	V	160	2916.34	III						
120	5294.64	I	90	165.98	V	70	1088.39	V	140	2932.49	III						
540	5357.61	I	100	166.18	V	80	1219.03	III	140	2994.28	III						
120	5361.61	I	50	186.84	V	80	1266.87	III	120 h	2997.21	III						
110	5376.94	I	60	190.57	V	90	1267.71	III	130	2997.53	III						
120	5392.94	I	70	190.84	V	70	1297.54	III	120	2999.47	III						
450	5402.77	I	50	196.39	IV	70	1359.92	III	130	3039.25	III						
380	5451.51	I	60	196.45	IV	110	1498.93	III	120	3039.75	III						
260	5452.94	I	70	200.09	IV	120	1502.01	III	160	3042.80	III						
120	5488.65	I	80	201.16	IV	110	1504.18	III	150	3049.14	III						
120	5510.52	I	90	208.25	IV	140	1504.79	III	140	3113.62	III						
200	5547.44	I	90	240.08	IV	130	1506.30	III	160	3115.70	III						
150	5570.33	I	100	251.03	IV	110	1506.77	III	180	3121.54	III						
200	5577.14	I	140	419.65	IV	100	1553.02	III	140	3124.79	III						
120	5580.03	I	150	420.05	IV	110	1557.59	III	140	3134.23	III						
210	5645.80	I	160	420.73	IV	100	1563.73	III	140	3146.99	III						
330	5765.20	I	100	429.51	III	100	1565.54	III	180	3174.17	III						
180	5783.69	I	110	430.15	III	100	1623.40	III	170	3174.76	III						
170	5818.74	II	150	430.76	IV	100	1650.76	III	120	3214.00	III						
600 cw	5830.98	I	90	464.29	III	130	1670.39	III	200	3501.45	II						
330	5966.07	II	120	465.98	V	140	1677.40	III	200	3501.57	II						
480 cw	5967.10	I	130	490.57	IV	100	1716.99	III	200	3502.96	II						
170	5972.75	I	160	491.00	IV	120	1770.09	III	6	3594.10	I						
240	5992.83	I	50	497.38	IV	150	1770.67	III	12	3668.17	I						
110	6012.56	I	60	497.83	IV	110	1772.93	III	270	3847.09	II						
420	6018.15	I	70	498.80	IV	140	1773.36	III	260	3849.99	II						
170	6029.00	I	90	506.16	V	160	1791.65	III	250	3851.67	II						
420	6049.51	II	100	508.08	V	110	1803.03	III	5	3898.48	I						
140	6057.36	I	120	508.39	III	170	1805.90	III	8	3930.69	I						
240	6083.84	I	60	514.08	V	110	1839.30	III	5	3934.26	I						
240	6099.35	I	90	525.29	V	120	1839.97	III	5	3948.56	I						
120	6118.78	I	100	526.30	V	110	1840.14	III	240	4024.73	II						
330	6173.05	II	120	567.69	III	100	2027.44	III	220	4025.01	II						
110	6178.76	I	110	567.75	III	120	2030.32	III	230	4025.49	II						
260 cw	6188.13	I	140	570.64	IV	120	2217.17	III	200	4103.51	II						
140	6195.07	I	140	571.30	IV	50	2298.29	IV	200	4246.23	II						
240	6262.25	I	150	571.39	IV	40	2451.58	IV	200	4299.17	II						
170	6299.77	I	160	572.66	IV	120	2452.07	III	140 h	4420.30	III						
230	6303.41	II	90	605.67	II	50	2456.92	IV	120 h	4427.35	III						
120 cw	6350.04	I	100	606.80	II	130	2464.85	III	120 h	4432.32	III						
120 cw	6400.93	I	90	630.20	III	130	2470.29	III	140 h	4479.99	III						
180	6410.04	I	100	647.77	V	120	2478.73	III	6	4960.65	I						
140	6411.32	I	110	647.87	V	150	2484.37	III	150	5012.54	III						
830	6437.64	II	130	654.03	V	120	2542.77	III	160	5110.99	III						
120	6457.96	I	120	656.12	III	120	2580.04	III	15	5230.41	I						
1400	6645.11	II	130	656.87	III	130	2583.81	III	12	5279.01	I						
50	6666.35	III	110	657.23	V	120	2593.23	III	18	5540.52	I						
140	6802.72	I	140	657.33	V	130	2595.53	III	12	5552.43	I						
360	6864.54	I	140	658.33	III	140	2599.28	III	10	5577.33	I						
120	7040.20	I	140	676.12	IV	130	2625.01	III	20	5624.06	I						
330	7077.10	II	130	677.15	IV	140	2629.70	III	12	5626.93	I						
570	7194.81	II	150	677.22	IV	120	2656.44	III	15	5659.15	I						
570	7217.55	II	130	678.99	IV	130	2755.55	III	40	5667.53	I						
540	7301.17	II	160	679.21	IV	160	2759.63	III	90	5671.67	I						
720	7370.22	II	60	757.04	V	120	2788.15	III	18	5689.14	I						
300	7426.57	II	150	806.96	I	160	2811.45	III	25	5700.82	I						
160	7583.91	I	125	809.60	I	40	2820.74	IV	25	5707.31	I						
60 cw	7742.57	I	500	951.87	I	50	2826.13	IV	140	5753.17	III						
70	7746.19	I	1000	954.83	I	140	2833.99	III	120	5761.20	III						

Line Spectra of the Elements (continued): Fluorine—Gadolinium

Intensity			Wavelength/Å			Intensity			Wavelength/Å			Intensity			Wavelength/Å		
12	5950.15	I	1500	8274.62	I	2200	3481.28	II	1100	4306.34	I						
25	5959.19	I	2000	8298.58	I	1700	3481.80	II	1800	4313.84	I						
70	5965.28	I	600	8302.40	I	1700	3494.40	II	2600 d	4325.57	II						
50	5994.43	I	900	8807.58	I	1400	3505.51	II	1900	4327.12	I						
150	6015.83	I	1000	8900.92	I	1100	3512.50	II	1000	4344.30	II						
80	6038.04	I	300	8912.78	I	4300	3545.80	II	2200	4346.46	I						
900	6047.54	I	350	9025.49	I	3900	3549.36	II	1400	4401.86	I						
100	6080.11	I	400	9042.10	I	1400	3557.05	II	1400	4422.41	I						
150	6091.82	III	350	9178.68	I	5400	3584.96	II	1100	4430.63	I						
140	6125.50	III	200	9433.67	I	1100	3592.71	II	1100	4519.66	I						
800	6149.76	I	25	9505.30	I	1100	3604.87	I	910	4537.81	I						
400	6210.87	I	12	9662.04	I	6100	3646.19	II	520	4614.50	I						
130	6233.57	III	25	9734.34	I	3900	3654.62	II	700	4694.33	I						
13000	6239.65	I	15	9822.11	I	3100	3656.15	II	410	4743.65	I						
10000	6348.51	I	12	9902.65	I	1400	3662.26	II	470	4767.24	I						
140	6363.05	III	80 h	10047.98	II	2700	3664.60	II	300	4784.62	I						
8000	6413.65	I	15	10285.45	I	2000	3671.20	II	320	4821.69	I						
450	6569.69	I	20	10862.31	I	2000	3684.13	I	280	4934.12	I						
300	6580.39	I	Francium			3100	3687.74	II	750	5015.04	I						
400	6650.41	I	Fr Z = 87			2000	3697.73	II	75	5039.09	I						
1800	6690.48	I	7177. I			1300	3699.73	II	5000	5091.70	III						
400	6708.28	I	Gadolinium			2700	3712.70	II	130	5098.38	II						
7000	6773.98	I	Gd Z = 64			2000	3713.57	I	910	5103.45	I						
1500	6795.53	I	1200	1007.24	IV	1400	3716.36	II	180	5108.91	II						
9000	6834.26	I	1200	1063.84	IV	2000	3717.48	I	120	5125.56	II						
50000	6856.03	I	1600	1476.98	IV	1800 d	3719.45	II	860	5155.84	I						
8000	6870.22	I	1500	1705.03	IV	1500	3730.84	II	190	5176.28	II						
15000	6902.48	I	1600	1706.01	IV	4500	3743.47	II	410	5197.77	I						
6000	6909.82	I	2000	1736.24	IV	1400	3758.31	II	280	5219.40	I						
4000	6966.35	I	1500	1815.32	IV	8700	3768.39	II	130	5233.93	I						
45000	7037.47	I	2200	1975.24	III	1400	3770.69	II	320	5251.18	I						
30000	7127.89	I	3400	2018.07	III	2900	3783.05	I	120	5252.14	II						
15000	7202.36	I	2800	2359.31	III	5100	3796.37	II	140	5255.80	I						
1000	7309.03	I	1400	2397.87	IV	3700	3813.97	II	280	5283.08	I						
15000	7311.02	I	2800	2697.39	III	3300	3850.69	II	280	5301.67	I						
700	7314.30	I	2800	2703.28	III	5100	3850.97	II	220	5302.76	I						
5000	7331.96	I	2700	2727.89	III	4300	3852.45	II	280	5307.30	I						
120	7336.77	III	9000	2904.73	III	1600	3866.99	I	130	5321.50	I						
130	7354.94	III	9500	2955.53	III	1500	3894.70	II	280	5321.78	I						
10000	7398.69	I	1200	2999.04	II	2200	3916.51	II	110	5327.32	I						
4000	7425.65	I	2100	3010.13	II	1200	3934.79	I	170	5333.30	I						
2200	7482.72	I	1900	3027.60	II	1400	3945.54	I	300	5343.00	I						
2500	7489.16	I	2100	3032.84	II	1200	3957.67	II	200	5348.67	I						
900	7514.92	I	1600	3034.05	II	1100	4023.14	I	300	5350.38	I						
5000	7552.24	I	2100	3081.99	II	1100	4028.15	I	240	5353.26	I						
5000	7573.38	I	3500	3100.50	II	1400	4037.33	II	3000	5365.96	III						
7000	7607.17	I	930	3145.00	II	1600	4045.01	I	150	5370.63	I						
18000	7754.70	I	980	3156.53	II	1300	4049.43	II	4000	5553.30	III						
15000	7800.21	I	980	3161.37	II	2200	4049.86	II	3000	5587.88	III						
300	7879.18	I	4000	3176.66	III	2600	4053.64	I	190	5617.91	I						
500	7898.59	I	1400	3331.38	II	2600	4058.22	I	110	5632.25	I						
350	7936.31	I	1100	3336.18	II	1900	4063.39	II	260	5643.24	I						
300	7956.32	I	5400	3350.47	II	1300	4078.44	II	3000	5658.98	III						
80	8016.01	II	4300	3358.62	II	2800	4078.70	I	390	5696.22	I						
1000	8040.93	I	5400	3362.23	II	1500	4085.56	II	120	5733.86	II						
900	8075.52	I	1100	3392.53	II	1100	4092.71	I	240	5791.38	I						
350	8077.52	I	1100 d	3407.56	II	2600	4098.61	II	220	5851.63	I						
350	8126.56	I	6900	3422.47	II	2200	4130.37	II	280	5856.22	I						
600	8129.26	I	1700	3439.21	II	1100	4132.28	II	110	5904.56	I						
300	8159.51	I	2700	3439.99	II	2400	4175.54	I	170	5911.45	II						
600	8179.34	I	1400	3450.38	II	2400	4184.25	II	85	5930.29	I						
300	8191.24	I	1100	3451.23	II	2200	4190.78	I	85	5936.84	I						
350	8208.63	I	2700	3463.98	II	1300	4212.00	II	65	5937.71	I						
2500	8214.73	I	1700	3467.27	II	4800	4225.85	I	110 h	5988.02	I						
3000	8230.77	I	1700	3468.99	II	1700	4251.73	II	430	6114.07	I						
500	8232.19	I	1400	3473.22	II	1600	4262.09	I	75	6305.15	II						

Line Spectra of the Elements (continued): Gadolinium—Germanium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
40	6331.35	I	80	1054.56	V	76	1351.06	IV	60	746.88	V
40	6380.95	II	90	1058.12	V	70	1353.92	III	60	760.05	V
40 h	6538.15	I	80	1066.69	V	74	1364.63	IV	10	862.234	II
55	6564.78	I	60	1069.60	V	60	1395.54	IV	15	875.493	II
50	6634.36	II	80	1073.77	V	77	1402.55	IV	15	905.977	II
35	6681.23	II	90	1078.83	V	70	1405.32	IV	20	920.554	II
85	6730.73	I	110	1079.60	V	73	1465.87	IV	300	971.35	V
50	6752.67	II	60	1080.99	V	90	1495.07	III	300	990.66	V
26	6786.33	II	80	1085.00	III	50	1534.46	III	50	999.101	II
100	6828.25	I	250	1085.01	V	10	1813.98	II	300	1004.38	V
100	6916.57	I	80	1087.37	V	15	1845.30	II	100	1016.638	II
50	6985.89	II	90	1091.71	V	20	2091.34	II	900	1045.71	V
75	6991.92	I	100	1094.36	V	90	2417.70	III	700	1072.66	V
60	6996.76	II	80	1095.10	V	90	2423.98	III	100	1075.072	II
45	7006.16	II	160	1102.83	V	15	2424.36	III	300	1085.51	II
35	7122.57	I	140	1103.03	V	10	2632.66	I	40	1088.45	III
170	7168.37	I	60	1105.61	III	10	2665.05	I	800	1089.49	V
28	7189.57	II	75	1105.62	V	20	2700.47	II	200	1098.71	II
28	7262.66	I	70	1106.17	V	15	2780.15	II	500	1106.74	II
35	7441.85	I	80	1118.34	V	50	3521.77	III	1000	1116.94	V
40	7464.36	I	120	1126.40	V	80	3581.19	III	500	1120.46	II
55	7562.97	I	130	1128.10	V	100	3589.34	III	700	1163.39	V
80	7733.50	I	120	1128.53	V	10	3731.10	III	200	1164.27	II
35	7846.35	II	100	1129.94	V	10	3806.60	III	500	1181.19	II
35	7856.93	I	130	1136.07	V	10	4032.99	I	500	1181.65	II
25	7930.25	II	67	1137.06	IV	10	4172.04	I	200	1188.73	II
18	8146.15	I	130	1150.23	V	15	4251.16	II	20	1188.99	IV
21	8668.63	I	90	1150.27	III	10 h	4254.04	II	300	1191.26	II
21 h	8832.06	II	70	1156.10	IV	10	4255.77	II	700	1222.30	V
14 h	8849.14	I	120	1156.51	V	40	4262.00	II	20	1229.81	IV
18 h	8867.31	I	35	1157.74	V	100	4380.69	III	500	1237.059	II
5000	14332.88	III	70	1163.60	IV	150	4381.76	III	500	1261.905	II
Gallium			25	1169.40	V	100	4863.00	III	100	1264.710	II
Ga Z = 31			75	1170.58	IV	150	4993.78	III	200	1401.24	II
14	294.53	IV	48	1171.71	IV	10	5808.28	III	200	1538.091	II
61	295.67	IV	40	1178.95	V	20	5848.25	III	500	1576.855	II
30	298.44	V	68	1185.23	IV	15	5993.51	III	75	1581.070	II
30	300.01	V	40	1186.06	IV	10	6334.2	II	100	1602.486	II
30	302.86	V	73	1190.89	IV	2000	6396.56	I	3 r	1615.57	I
41	304.99	IV	73	1193.02	IV	1000	6413.44	I	2 r	1624.130	I
30	307.03	V	75	1195.02	IV	10 h	7251.4	I	2 r	1630.173	I
30	308.26	V	69	1201.54	IV	20 h	7403.0	I	3 r	1636.31	I
30	311.79	V	72	1206.89	IV	30 h	7464.0	I	4 r	1639.730	I
30	313.68	V	80	1213.17	V	10 h	7620.5	I	2	1647.531	I
40	319.41	V	63	1216.15	IV	50 h	7734.77	I	200	1649.194	II
40	322.31	V	50	1228.03	IV	100 h	7800.01	I	2	1651.528	I
50	322.99	V	60	1236.38	IV	15 h	8002.55	I	4 r	1651.955	I
30	323.10	V	60	1238.59	IV	20 h	8074.25	I	3	1661.345	I
40	324.25	V	75	1245.53	IV	100 h	8311.86	I	4 r	1663.539	I
40	324.95	V	83	1258.77	IV	200 h	8386.49	I	10 h	1665.275	I
40	326.14	V	81	1264.66	IV	200 h	9492.92	I	4	1667.802	I
30	326.77	V	82	1267.15	IV	200 h	9493.12	I	3 r	1670.608	I
30	328.65	V	90	1267.16	III	300 h	9589.36	I	100 r	1691.090	I
25	423.18	IV	81	1279.24	IV	100 h	10905.95	I	200 r	1716.784	I
16	439.92	IV	15	1283.64	V	400	11949.12	I	100 h	1739.102	I
50	620.00	III	80	1285.33	IV	200	12109.78	I	100	1742.195	I
40	622.01	III	80	1293.46	III	60	14996.64	I	50	1746.065	I
90	806.51	III	60	1295.36	III	60	22016.81	I	200	1750.043	I
90	817.30	III	82	1295.86	IV	70	22568.71	I	100	1758.279	I
50	828.70	III	83	1299.46	IV	Germanium			100 h	1764.185	I
20	878.17	V	82	1303.53	IV	Ge Z = 32			100 h	1765.284	I
40	973.21	V	80	1309.68	IV	700	294.51	V	50 h	1766.433	I
40	989.75	V	80	1314.82	IV	1000	295.64	V	200	1774.176	I
90	1014.47	V	60	1323.15	III	200	304.98	V	200	1785.046	I
90	1019.71	V	85	1338.09	IV	20	621.52	V	100 h	1793.071	I
120	1050.48	V	77	1347.03	IV	50	724.21	V	75 h	1801.432	I

Line Spectra of the Elements (continued): Germanium—Gold

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
200 h	1841.328	I	1200	2651.172	I	4	9492.559	I	300	1428.93	III
200 h	1842.410	I	500	2651.568	I	7	9625.664	I	80	1429.19	I
100 h	1844.410	I	500	2691.341	I	5	10039.436	I	250	1430.06	III
100 h	1845.872	I	850	2709.624	I	4	10200.952	I	275	1433.37	III
100 h	1846.958	I	400	2729.78	II	10	10382.427	I	50	1435.79	I
200	1853.134	I	40	2740.426	I	10	10404.913	I	250	1435.81	III
500 r	1860.086	I	650	2754.588	I	8	10734.068	I	300	1439.12	III
100	1865.052	I	70	2793.925	I	8	10947.416	I	200	1441.21	III
300 r	1874.256	I	80	2829.008	I	10	11125.130	I	150	1446.37	III
100	1895.197	I	1000	2831.843	II	230	11252.83	I	250	1448.42	III
500 r	1904.702	I	1000	2845.527	II	600	11714.76	I	250	1454.95	III
50 h	1908.434	I	750	3039.067	I	1300	12069.20	I	100	1464.72	III
30	1912.409	I	600	3067.021	I	1050	12391.58	I	150	1471.28	III
300 r	1917.592	I	20	3124.816	I	235	13107.61	I	100	1474.73	III
100 h	1923.467	I	35	3211.86	III	470	14822.38	I	150	1481.10	III
500 r	1929.826	I	40	3255.05	III	150	16759.79	I	100	1481.76	I
10 h	1934.048	I	110	3269.489	I	135	17214.34	I	300	1487.15	III
100 r	1937.483	I	40	3434.03	III	70	18811.86	I	250	1487.91	III
500	1938.008	II	300	3499.21	II	62	19279.24	I	200	1489.47	III
100 r	1938.300	I	60	3554.19	IV	28	20673.64	I	250	1500.37	III
500	1938.891	II	50	3676.65	IV	Gold			200	1502.47	III
30 s	1944.116	I	200	4178.96	III	Au Z = 79			200	1503.74	III
200	1944.731	I	70	4226.562	I	100	843.44	III	100	1542.00	III
200	1955.115	I	200	4260.85	III	100	845.14	III	100	1548.50	III
500	1962.013	I	150	4291.71	III	200	945.10	III	200	1567.54	III
30 h	1963.373	I	10	4685.829	I	100	1040.63	III	200	1574.85	III
30	1965.383	I	1000	4741.806	II	80	1044.49	III	200	1579.44	III
200	1970.880	I	1000	4814.608	II	80	1046.81	III	150	1584.10	III
200	1979.274	II	50	4824.097	II	100 h	1239.96	III	200	1587.16	I
300 h	1987.849	I	100	5131.752	II	100	1278.51	III	200	1589.56	III
300	1988.267	I	200	5178.648	II	100	1314.84	III	150	1593.41	III
500 r	1998.887	I	3	5194.583	I	100 h	1328.37	I	70	1598.24	I
200	2011.29	I	6	5265.892	I	200	1336.72	III	200	1600.51	III
1700	2019.068	I	6	5513.263	I	180	1341.68	III	250	1617.16	III
2400 r	2041.712	I	8	5564.741	I	100	1348.89	III	100	1617.78	III
1600 r	2043.770	I	8	5607.010	I	150	1350.32	III	500	1621.93	III
420	2054.461	I	6	5616.135	I	150	1355.61	III	100	1624.34	I
220 h	2057.238	I	7	5621.426	I	150	1356.13	III	300 d	1629.13	III
750 r	2065.215	I	6	5664.226	I	50	1363.98	I	250	1638.88	III
2600 r	2068.656	I	5	5664.842	I	500	1365.40	III	50	1639.90	I
420	2086.021	I	9	5691.954	I	200	1367.17	III	100	1644.17	III
2000 r	2094.258	I	6	5701.776	I	60	1368.62	I	150	1646.67	I
25	2104.45	III	5	5717.877	I	70	1374.82	I	250	1652.74	III
240	2105.824	I	6	5801.029	I	50	1375.76	I	250	1664.77	III
95 h	2124.744	I	9	5802.093	I	180	1377.73	III	100	1665.76	I
50 h	2186.451	I	1000	5893.389	II	150	1378.69	III	100	1668.11	III
340 r	2198.714	I	500	6021.041	II	150	1379.98	III	125	1673.93	III
15	2220.375	I	75	6283.452	II	125	1380.53	III	1000	1693.94	III
18	2256.001	I	100	6336.377	II	200	1381.36	III	150	1697.09	III
18	2314.201	I	100	6484.181	II	80	1382.75	I	200	1698.98	III
24	2327.918	I	6	6557.488	I	50	1385.33	I	200	1699.34	I
15	2359.233	I	50	7049.369	II	300	1385.79	III	200	1700.00	III
20	2379.144	I	30	7145.390	II	100	1389.41	III	200	1702.25	III
10	2389.472	I	5	7353.334	I	180	1391.46	III	100	1707.53	III
15	2397.885	I	7	7384.208	I	60	1392.27	I	250	1710.16	III
130	2417.367	I	10	7833.575	I	180	1396.00	III	200	1715.69	III
30	2436.412	I	10	8031.039	I	50	1402.12	I	100	1716.71	III
30	2488.25	IV	6	8044.165	I	100	1402.91	III	300	1717.83	III
90	2497.962	I	10	8256.013	I	70	1407.38	I	500	1727.31	III
500	2500.54	II	10	8482.21	I	100	1408.45	I	100 d	1733.17	III
70	2533.230	I	9	8700.60	I	225	1409.50	III	300	1738.48	III
20	2542.44	IV	5	9068.785	I	250	1413.80	III	150	1744.39	III
3	2556.298	I	5	9095.957	I	100	1414.27	III	500	1746.10	III
28	2589.188	I	6	9398.868	I	100	1417.09	III	500	1756.92	III
500	2592.534	I	20	9474.993	II	125	1417.39	III	500	1761.95	III
8	2644.184	I	20	9475.645	II	150	1427.42	III	300	1767.42	III

Line Spectra of the Elements (continued): Gold—Hafnium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
100	1774.42	III	100	3122.50	II	270	921.67	V	450	2393.36	II
800	1775.17	III	1600	3122.78	I	245	951.62	V	670	2393.83	II
200	1776.40	III	100	3194.72	I	180	960.12	V	540	2405.42	II
100	1780.57	III	100	3227.99	III	180	964.74	V	370	2410.14	II
60	1783.22	II	300	3230.63	I	160	971.51	V	320	2417.69	II
300	1786.11	III	300	3308.30	I	160	1092.76	V	390	2447.25	II
150	1792.65	III	300	3309.64	I	160	1201.76	V	450	2460.49	II
500	1793.76	III	100	3309.86	III	270	1232.03	V	400	2461.74	III
200	1801.98	III	100	3320.12	I	200	1233.59	V	430	2464.19	II
400	1805.24	III	100	3355.15	I	160	1237.42	V	210	2469.18	II
100	1809.81	III	100 h	3391.31	I	160	1239.53	V	2000	2495.16	III
400	1821.17	III	100	3395.40	I	160	1244.46	V	290	2496.99	II
400	1844.89	III	100	3467.21	I	440	1396.66	V	580	2512.69	II
150	1848.83	III	300	3557.36	I	270	1400.09	V	580	2513.03	II
500	1861.80	III	300	3586.73	I	160	1401.70	V	1000	2515.16	III
150	1871.92	III	100	3611.57	I	370	1407.17	V	890	2516.88	II
100	1879.83	I	100 h	3631.31	I	370	1408.38	V	340	2531.19	II
150	1918.28	III	300	3637.90	I	270	1412.28	V	200	2537.33	II
100	1932.04	III	100 h	3645.02	I	270	1413.51	V	320	2551.40	II
100	1935.42	III	100	3650.74	I	160	1421.96	V	400 h	2560.74	III
200	1948.79	III	100	3709.62	I	220	1422.53	V	250	2563.61	II
100	1958.47	III	100	3796.01	I	370	1433.43	V	300 h	2567.46	III
400	1989.63	III	100	3874.73	I	370	1437.27	V	890	2571.67	II
150	1996.85	III	100 h	3892.26	I	500	1437.73	V	320	2573.90	II
11000	2012.00	I	400	3897.86	I	370	1445.40	V	320	2576.82	II
2600	2021.38	I	300	3909.38	I	270	1457.91	V	300	2578.14	II
150	2082.09	II	100	3927.69	I	100	1717.21	IV	320	2582.54	II
300	2083.09	III	400	4040.93	I	270	1719.32	V	390	2606.37	II
60	2110.68	II	700	4065.07	I	550	1729.08	V	450	2607.03	II
100	2159.08	III	100	4084.10	I	750	1731.83	V	230	2613.60	II
80	2167.33	III	100	4241.80	I	750	1733.96	V	450	2622.74	II
200	2172.20	III	200	4315.11	I	440	1741.74	V	160	2637.00	I
100	2184.11	III	120 h	4437.27	I	1000	1749.11	V	1100	2638.71	II
500	2188.97	III	250	4488.25	I	1000	1750.19	V	1100	2641.41	II
70	2248.56	II	900 h	4607.51	I	500	1760.89	V	160	2642.75	I
80	2263.62	II	100 h	4620.56	I	370	1765.62	V	670	2647.29	II
300	2322.27	III	500	4792.58	I	270	1774.02	V	160	2657.84	II
180	2352.65	I	100	4811.60	I	6200	2012.78	II	210	2661.88	II
100	2382.40	III	100	5147.44	I	8500	2028.18	II	290	2683.35	II
120	2387.75	I	300	5230.26	I	300	2070.94	III	200	2687.22	III
150	2402.71	III	100 h	5261.76	I	1200	2096.18	II	670	2705.61	I
150	2405.12	III	100	5655.77	I	200 h	2099.30	III	210	2712.42	II
2600	2427.95	I	100 h	5721.36	I	200 h	2110.31	III	250	2718.59	I
60	2533.52	II	300	5837.37	I	200	2155.66	III	710	2738.76	II
250	2641.48	I	100 h	5862.93	I	200	2183.50	III	200	2743.64	I
3400	2675.95	I	300 h	5956.96	I	200	2195.44	III	360	2751.81	II
1100	2748.25	I	600	6278.17	I	540	2210.82	II	500	2753.60	III
100	2780.82	I	100	6562.68	I	200	2234.59	III	450	2761.63	I
1000	2802.04	II	600	7510.73	I	320	2254.01	II	160	2766.96	I
300	2819.79	II	10	8145.06	I	160	2255.15	II	170	2773.02	I
100	2822.55	II	10	9254.28	I	250	2266.83	II	980	2773.36	II
100 h	2825.44	II	Hafnium			620	2277.16	II	180	2774.02	II
300	2837.85	II	Hf Z = 72			200 h	2313.44	III	390	2779.37	I
100	2846.92	II	220	545.41	V	230	2321.14	II	230	2808.00	II
100	2856.74	II	180	600.00	V	580	2322.47	II	230	2813.86	II
300	2883.45	I	200	618.27	IV	300	2323.25	II	170	2814.48	II
300	2891.96	I	200	644.54	IV	300	2324.89	II	230	2817.68	I
100	2893.25	II	400	647.39	IV	200	2332.97	II	200	2819.74	I
100	2907.04	II	600	665.65	IV	300	2336.47	III	1200	2820.22	II
300	2913.52	II	200	673.49	IV	200	2337.33	II	490	2822.68	II
300	2918.24	II	270	867.25	V	230	2343.32	II	180	2833.28	I
100	2954.22	II	180	875.88	V	320	2347.44	II	410	2845.83	I
100 h	2990.27	II	180	885.58	V	540	2351.22	II	270	2849.21	II
300	2994.80	II	180	896.14	V	250	2380.30	II	270	2850.96	I
320	3029.20	I	180	901.54	V	250	2383.540	III	180	2851.21	II
300	3065.42	I	180	919.10	V	170	2393.18	II	180	2860.56	I

Line Spectra of the Elements (continued): Hafnium—Helium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
760	2861.01	II	270	3255.28	II	1400	3777.64	I	85	6789.27	I
760	2861.70	II	180	3273.66	II	1400	3785.46	I	160	6818.94	I
2100	2866.37	I	200 h	3279.67	III	650	3793.37	II	160	7063.83	I
210	2887.14	I	270	3279.98	II	850 d	3800.38	I	570	7131.81	I
800	2889.62	I	160	3291.05	I	320	3811.78	I	650	7237.10	I
1800	2898.26	I	210	3306.12	I	1300	3820.73	I	410	7240.87	I
1200	2904.41	I	340	3310.27	I	280	3830.02	I	360	7624.40	I
890	2904.75	I	670	3312.86	I	800	3849.18	I	110	7740.17	I
2000	2916.48	I	180	3317.99	II	600	3858.31	I	310	7845.35	I
580	2918.58	I	890	3332.73	I	230	3860.91	I	130	7920.71	I
320	2919.59	II	370	3352.06	II	200	3872.55	II	250	7994.73	I
180	2924.62	I	230	3358.91	I	160	3877.10	II	130	8204.58	I
490	2929.63	II	180	3360.06	I	380	3880.82	II	150	8546.48	I
450	2929.90	I	180	3378.93	I	200	3882.52	I	160	8640.06	I
710	2937.80	II	230	3384.70	II	200	3889.23	I	40	8711.24	I
2000	2940.77	I	170	3386.21	I	200	3889.33	I	65	9004.73	I
160	2944.71	I	800	3389.83	II	620	3899.94	I	Helium		
1200	2950.68	I	230	3392.81	I	620	3918.09	II	He Z = 2		
1100	2954.20	I	230	3394.59	II	200	3923.90	II	15	231.454	II
540	2958.02	I	230	3397.26	I	320	3931.38	I	20	232.584	II
1400	2964.88	I	230	3397.60	I	410	3951.83	I	30	234.347	II
620	2966.93	I	2300	3399.80	II	160	3968.01	I	50	237.331	II
710	2968.81	II	170	3400.21	I	200	3973.48	I	100	243.027	II
890	2975.88	II	180	3402.51	I	180	4032.27	I	300	256.317	II
1100	2980.81	I	230	3410.17	II	230	4062.84	I	1000	303.780	II
210	2982.72	I	230	3417.34	I	180	4083.35	I	500	303.786	II
170	3000.10	II	410	3419.18	I	540	4093.16	II	10	320.293	I
800	3005.56	I	200	3428.37	II	1100	4174.34	I	2	505.500	I
1100	3012.90	II	250	3438.24	II	160	4206.58	II	3	505.684	I
540	3016.78	I	710	3472.40	I	190	4209.70	I	4	505.912	I
1100	3016.94	II	200	3478.99	II	170	4228.08	I	5	506.200	I
980	3018.31	I	480	3479.28	II	170	4232.44	II	7	506.570	I
1200	3020.53	I	250	3495.75	II	170	4260.98	I	10	507.058	I
410	3031.16	II	250	3497.16	I	200	4263.39	I	15	507.718	I
710	3050.76	I	980	3497.49	I	170	4272.85	II	20	508.643	I
1100	3057.02	I	1200	3505.23	II	320	4294.79	I	25	509.998	I
850	3067.41	I	980	3523.02	I	160	4330.27	I	35	512.098	I
2100	3072.88	I	980	3535.54	II	180	4336.66	II	50	515.616	I
170	3074.10	I	760	3536.62	I	250	4356.33	I	100	522.213	I
250	3074.79	I	180	3548.81	I	180	4370.97	II	400	537.030	I
430	3080.84	I	540	3552.70	II	160	4417.91	I	1000	584.334	I
200	3096.76	I	1300	3561.66	II	200	4438.04	I	50	591.412	I
340	3101.40	II	270	3567.36	I	250	4565.94	I	5	958.70	II
710	3109.12	II	1100	3569.04	II	500 d	4598.80	I	6	972.11	II
710	3131.81	I	210	3597.42	II	230	4620.86	I	8	992.36	II
850	3134.72	II	540	3599.87	I	210	4655.19	I	15	1025.27	II
170	3139.65	II	800	3616.89	I	120	4699.01	I	30	1084.94	II
220	3145.32	II	320	3630.87	II	160	4782.74	I	35	1215.09	II
220	3148.41	I	800	3644.36	II	310	4800.50	I	50	1215.17	II
450	3156.63	I	320	3649.10	I	130	4859.24	I	120	1640.34	II
270	3159.82	I	200	3651.84	I	120	4975.25	I	180	1640.47	II
710	3162.61	II	220	3665.35	II	95	5018.20	I	7	2385.40	II
450	3168.39	I	200	3672.27	I	95	5047.45	I	9	2511.20	II
890	3172.94	I	480	3675.74	I	75	5170.18	I	50	2577.6	I
450	3176.86	II	2200	3682.24	I	230	5181.86	I	1	2723.19	I
220	3181.01	I	280	3696.51	I	110	5243.99	I	12	2733.30	II
360	3193.53	II	240	3699.72	II	120	5294.87	I	2	2763.80	I
670	3194.19	II	340	3701.15	II	110	5354.73	I	10	2818.2	I
200	3196.93	I	1000	3717.80	I	110	5373.86	I	4	2829.08	I
310	3206.11	I	650	3719.28	II	75	5452.92	I	10	2945.11	I
180	3210.98	I	160	3729.10	I	230	5550.60	I	40	3013.7	I
180	3217.30	II	460	3733.79	I	230	5552.12	I	20	3187.74	I
180	3220.61	II	160	3737.88	II	95	5613.27	I	3	3202.96	II
360	3247.66	I	400	3746.80	I	160	5719.18	I	15	3203.10	II
220	3249.53	I	170	3766.92	II	95	6098.67	I	1	3354.55	I
890	3253.70	II	200	3768.25	I	95	6185.13	I	2	3447.59	I

Line Spectra of the Elements (continued): Helium—Hydrogen

Intensity			Wavelength/Å			Intensity			Wavelength/Å			Intensity			Wavelength/Å		
1	3587.27	I	200	17002.47	I	410	3580.75	II	220	4979.97	I						
3	3613.64	I	1	18555.55	I	410	3581.83	II	90	4995.05	I						
2	3634.23	I	6	18636.8	II	630 c	3592.23	II	130	5042.37	I						
3	3705.00	I	500	18685.34	I	1100 cw	3598.77	II	80	5093.07	I						
1	3732.86	I	200	18697.23	I	540 c	3600.95	II	140	5127.81	I						
10	3819.607	I	100	19089.38	I	410	3618.43	I	130	5142.59	II						
1	3819.76	I	20	19543.08	I	430 c	3626.69	II	110	5143.22	II						
500	3888.65	I	1000	20581.30	I	490	3627.25	II	160	5149.59	II						
20	3964.729	I	80	21120.07	I	430 c	3631.76	II	90 c	5167.88	I						
1	4009.27	I	10	21121.43	I	430 c	3638.30	II	130 c	5182.11	I						
50	4026.191	I	20	21132.03	I	1600 c	3662.29	I	90	5190.11	II						
5	4026.36	I	3	30908.5	II	1400	3667.97	I	65	5251.82	I						
12	4120.82	I	4	40478.90	I	720	3679.19	I	90	5301.25	I						
2	4120.99	I	Holmium			670	3679.70	I	80	5330.11	I						
3	4143.76	I	Ho Z = 67			720	3682.65	I	90	5359.99	I						
10	4387.929	I	170	2502.91	II	580	3690.65	I	100	5407.08	I						
3	4437.55	I	170	2533.80	I	410	3700.04	I	70	5566.52	I						
200	4471.479	I	190	2605.86	II	490 c	3702.35	II	65	5627.60	I						
25	4471.68	I	270	2750.35	II	430	3712.88	I	140	5659.58	I						
6	4685.4	II	270	2769.89	II	450	3720.72	I	140 c	5691.47	I						
30	4685.7	II	300	2824.20	II	1100	3731.40	I	140 c	5696.57	I						
30	4713.146	I	270 c	2831.69	II	810	3736.35	I	140 c	5860.28	I						
4	4713.38	I	270	2849.10	II	3200 cw	3748.17	II	70 c	5882.99	I						
20	4921.931	I	360	2880.26	II	8900 c	3796.75	II	70	5921.76	I						
100	5015.678	I	460	2880.98	II	8900 c	3810.73	II	70 cw	5948.03	I						
10	5047.74	I	570 c	2909.41	II	410 c	3835.35	II	70	5972.76	I						
5	5411.52	II	410 c	2979.63	II	1300 cw	3837.51	II	90	5973.52	I						
500	5875.62	I	410	2987.64	II	410 c	3842.05	II	230 c	5982.90	I						
100	5875.97	I	480 c	3049.38	II	1100	3843.86	II	120	6081.79	I						
8	6560.10	II	410 c	3054.00	II	490 c	3846.73	II	70	6208.65	I						
100	6678.15	I	500 c	3057.45	II	1800 c	3854.07	II	70 c	6305.36	I						
3	6867.48	I	500 c	3082.34	II	2700 c	3861.68	II	70	6550.97	I						
200	7065.19	I	910	3084.36	II	3000 c	3888.96	II	260	6604.94	I						
30	7065.71	I	430 c	3086.54	II	13000 c	3891.02	II	120	6628.99	I						
50	7281.35	I	760	3118.50	II	1300 cw	3905.68	II	55 cw	6694.32	I						
1	7816.15	I	580 c	3166.62	II	580	3955.73	I	55 c	6785.43	I						
2	8361.69	I	810	3173.78	II	490	3959.68	I	40 cw	6939.49	I						
2	9063.27	I	810 c	3181.50	II	2700	4040.81	I	45 cw	6950.39	I						
2	9210.34	I	980 c	3281.97	II	5400 c	4045.44	II	140	7555.09	I						
10	9463.61	I	630 c	3337.23	II	8100	4053.93	I	40 c	7628.42	I						
4	9516.60	I	980 c	3343.58	II	1700	4065.09	II	50 c	7693.15	I						
3	9526.17	I	8100 c	3398.98	II	720	4068.05	I	60 cw	7815.48	I						
1	9529.27	I	810 c	3410.26	II	8900	4103.84	I	60	7894.64	I						
1	9603.42	I	1400 c	3414.90	II	2900	4108.62	I	50	8512.94	I						
3	9702.60	I	5400	3416.46	II	1500	4120.20	I	40	8670.19	I						
6	10027.73	I	1200	3421.63	II	1300	4125.65	I	90	8915.98	II						
2	10031.16	I	2000 c	3425.34	II	4300	4127.16	I	Hydrogen								
15	10123.6	II	2000 c	3428.13	II	1500	4136.22	I	H Z = 1								
1	10138.50	I	3200	3453.14	II	980 cw	4152.61	II	15	926.226	I						
10	10311.23	I	16000 c	3456.00	II	8100	4163.03	I	20	930.748	I						
2	10311.54	I	1600	3461.97	II	2500	4173.23	I	30	937.803	I						
3	10667.65	I	810 c	3473.91	II	540	4194.35	I	50	949.743	I						
300	10829.09	I	5400 c	3474.26	II	2000	4227.04	I	100	972.537	I						
1000	10830.25	I	6300	3484.84	II	1300 cw	4254.43	I	300	1025.722	I						
2000	10830.34	I	2500 c	3494.76	II	490	4264.05	I	1000	1215.668	I						
9	10913.05	I	810 c	3498.88	II	1300	4350.73	I	500	1215.674	I						
3	10917.10	I	810	3510.73	I	300	4477.64	II	5	3835.384	I						
4	11626.4	II	4100 c	3515.59	II	290	4629.10	II	6	3889.049	I						
30	11969.12	I	410 c	3519.94	II	80	4701.69	II	8	3970.072	I						
20	12527.52	I	630	3540.76	II	130	4709.84	II	15	4101.74	I						
50	12784.99	I	1600	3546.05	II	130 c	4717.52	I	30	4340.47	I						
20	12790.57	I	1100 c	3556.78	II	290	4742.04	II	80	4861.33	I						
7	12845.96	I	410	3560.15	II	100 c	4757.01	I	120	6562.72	I						
10	12968.45	I	410 c	3573.24	II	65	4782.92	I	180	6562.852	I						
2	12984.89	I	630 c	3574.80	II	290	4939.01	I	5	9545.97	I						
12	15083.64	I	810	3579.12	I	250 c	4967.21	II	7	10049.4	I						

Line Spectra of the Elements (continued): Hydrogen—Iodine

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
12	10938.1	I	40	2281.64	II	250 w	3962.35	II	180 w	6115.9	II
20	12818.1	I	100 c	2306.05	II	120 c	4004.66	II	230 w	6128.7	II
40	18751.0	I	90 d	2313.21	II	140 d	4013.92	II	240 w	6129.4	II
5	21655.3	I	70 d	2327.95	II	100	4023.77	III	320 w	6132.1	II
8	26251.5	I	80 h	2334.57	II	150	4032.32	III	150 c	6140.0	II
15	40511.6	I	110 d	2382.63	II	410 w	4056.94	II	90	6143.23	II
4	46525.1	I	70 h	2427.20	II	100	4071.57	III	140 c	6148.10	II
6	74578.	I	100	2447.90	II	100	4072.93	III	190 w	6149.5	II
Indium			110 d	2488.62	II	17000	4101.76	I	80	6161.15	II
In Z = 49			90	2488.95	II	140 c	4205.14	II	180 w	6162.45	II
17	378.61	V	80	2498.59	II	100 d	4213.04	II	200	6197.72	III
17	386.21	V	100	2499.60	II	110 d	4219.66	II	100 c	6224.28	II
14	388.91	V	90 d	2500.99	II	100	4252.68	III	280 w	6228.3	II
25	393.89	V	110 d	2512.31	II	150 d	4372.87	II	140 w	6231.1	II
25	400.57	V	100	2521.37	I	150 c	4500.78	II	270 w	6304.8	II
25	402.39	V	100	2527.41	III	18000	4511.31	I	290 w	6362.3	II
622	472.71	IV	160 d	2554.44	II	110 c	4549.01	II	300 w	6469.0	II
689	479.39	IV	1100	2560.15	I	140 c	4570.85	II	210 c	6541.20	II
709	498.62	IV	200	2601.76	I	180 w	4578.02	II	190 c	6751.88	II
10	882.24	III	90 d	2654.70	II	180 w	4578.40	II	180 c	6765.9	II
10	890.84	III	100 d	2662.63	II	140 c	4616.08	II	100 c	6783.72	II
10	915.87	III	140 d	2668.65	II	170 c	4617.17	II	320 w	6891.5	II
85	954.67	IV	140 d	2674.56	II	250 c	4620.14	II	380 w	7182.9	II
87	973.50	IV	80	2683.12	II	150 w	4620.70	II	180 c	7255.0	II
86	991.60	IV	1600	2710.26	I	170 c	4627.30	II	210 c	7276.5	II
89	1024.68	IV	300	2713.94	I	140 c	4637.04	II	180 c	7303.4	II
85	1024.79	IV	80	2726.15	III	380 c	4638.16	II	320 c	7350.6	II
88	1031.45	IV	130 d	2749.75	II	220 c	4644.58	II	100 c	7632.7	II
82	1031.98	IV	700	2753.88	I	360 c	4655.62	II	100 c	7682.9	II
80	1054.43	IV	90 d	2818.97	II	320 w	4656.74	II	210 c	7740.7	II
84	1063.03	IV	180 c	2836.92	I	190 c	4681.11	II	100 c	7776.96	II
83	1068.25	IV	80	2865.68	II	450 w	4684.8	II	180 c	7789.0	II
82	1069.82	IV	120 d	2890.18	II	90 d	4907.06	II	90 c	7840.9	II
86	1077.64	IV	1100	2932.63	I	150 c	4973.77	II	240 c	8227.0	II
90	1082.10	IV	100	2941.05	II	80 h	5109.36	II	100 w	8813.5	II
83	1086.33	IV	100	2982.80	III	100 w	5115.14	II	80 c	8832.6	II
82	1096.81	IV	110 c	2999.40	II	140 c	5117.40	II	120 c	9197.7	II
84	1097.18	IV	100	3008.08	III	270 c	5120.80	II	120 c	9202.0	II
85	1116.10	IV	8000	3039.36	I	200 w	5121.75	II	220 w	9213.0	II
80	1124.06	IV	110 d	3099.80	II	80 d	5129.85	II	160 d	9241.1	II
90	1131.46	IV	180 c	3101.8	II	240 c	5175.42	II	100	9977.86	I
85	1144.43	IV	130 c	3138.60	II	140 c	5184.44	II	200	10257.03	I
80	1145.41	IV	80 c	3142.75	II	200	5248.77	III	100 h	10744.31	I
89	1146.62	IV	130 d	3146.70	II	150 c	5309.45	II	20	11334.72	I
83	1154.11	IV	150	3155.77	II	80	5411.41	II	20	11731.48	I
84	1154.60	IV	100 c	3158.40	II	140 c	5418.45	II	10	12912.59	I
90	1157.71	IV	90 c	3176.30	II	220 w	5436.70	II	9	13429.96	I
90	1157.82	IV	90 d	3198.11	II	130 c	5497.50	II	7	14719.08	I
85	1159.78	IV	13000	3256.09	I	140 c	5507.08	II	6	22291.06	I
88	1176.50	IV	3000	3258.56	I	320 c	5513.00	II	7	23879.13	I
85	1191.58	IV	90 c	3338.50	II	250 w	5523.28	II	Iodine		
83	1204.87	IV	100 c	3404.28	II	130 c	5536.50	II	I Z = 53		
90	1206.55	IV	110 d	3438.40	II	190 w	5555.45	II	30	363.78	V
88	1221.50	IV	180 c	3693.91	II	240 c	5576.90	II	36	380.74	V
85	1221.90	IV	95 c	3708.13	II	200 w	5636.70	II	45	565.53	V
85	1233.58	IV	380 w	3716.14	II	100	5645.15	III	50	607.57	V
87	1235.84	IV	120 c	3718.30	II	160 c	5708.50	II	6	612.46	IV
90	1373.20	IV	160 c	3718.72	II	100 c	5721.80	II	6	666.81	III
88	1398.77	IV	160 c	3723.40	II	100	5819.50	III	8	705.11	III
81	1412.09	IV	170 w	3795.21	II	210 c	5853.15	II	7	784.64	III
100	1625.42	III	230 c	3799.21	II	490 w	5903.4	II	7	784.80	III
100	1748.83	III	250 c	3834.65	II	260 w	5915.4	II	8	795.52	III
30	1842.41	III	200 c	3842.18	II	120 c	5918.78	II	7	919.28	IV
40	1850.30	III	100	3852.82	III	130 c	6062.9	II	10000	1034.66	II
30	2154.08	III	100	3889.78	II	250 c	6095.95	II	8	1094.20	III
50	2205.28	II	100 c	3902.07	II	210 c	6108.66	II	10000	1139.80	II

Line Spectra of the Elements (continued): Iodine—Iridium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
10000	1160.56	II	8	2519.74	IV	2000 c	7700.20	I	10	30361.93	I
20000	1166.48	II	8	2545.67	IV	600	7897.98	I	8	30383.88	I
10000	1178.65	II	7	2545.71	III	500	7969.48	I	10	34295.73	I
15000	1187.34	II	8	2652.23	IV	1000	8003.63	I	9	34513.11	I
10000	1190.85	II	5000	3078.75	II	99000	8043.74	I	3	40228.54	I
200	1218.41	I	200	4102.23	I	300 d	8065.70	I	2	41633.80	I
20000	1220.89	II	200	4129.21	I	1000	8090.76	I	Iridium		
600	1224.05	I	100 d	4134.15	I	800 c	8169.38	I	Ir Z = 77		
600	1224.08	I	500 d	4321.84	I	500 d	8222.57	I	9900	2010.65	I
500	1228.89	I	250	4763.31	I	4000	8240.05	I	8700	2022.35	I
20000	1234.06	II	1000	4862.32	I	10000 c	8393.30	I	15000	2033.57	I
600	1251.34	I	200	4916.94	I	1000	8486.11	I	6200	2052.22	I
8	1252.35	III	10000	5119.29	I	1500 c	8664.95	I	5000	2060.64	I
2500	1259.15	I	3000 c	5161.20	II	500 c	8700.80	I	3700	2083.22	I
3000	1259.51	I	1000	5234.57	I	250 d	8748.22	I	3100	2085.74	I
800	1261.27	I	3000 c	5245.71	II	1000	8853.24	I	17000	2088.82	I
600	1267.57	I	10000	5338.22	II	2000	8853.80	I	14000	2092.63	I
600	1267.60	I	5000 c	5345.15	II	3000	8857.50	I	2700	2112.68	I
1500	1275.26	I	600 c	5427.06	I	1000 d	8898.50	I	1800	2119.54	I
3000	1289.40	I	3000	5435.83	II	400	8964.69	I	2000	2125.44	I
10000	1300.34	I	2000 c	5464.62	II	400	8993.13	I	4500	2126.81	II
3000	1302.98	I	10000	5625.69	II	5000	9022.40	I	2000	2127.52	I
3000	1313.95	I	2000 c	5690.91	II	15000	9058.33	I	4500	2127.94	I
3000	1317.54	I	4000 c	5710.53	II	1000	9098.86	I	3700	2148.22	I
2000	1330.19	I	1000 d	5764.33	I	12000	9113.91	I	2500	2150.54	I
20000	1336.52	II	2000	5894.03	I	600	9128.03	I	3500	2152.68	II
5000	1355.10	I	5000	5950.25	II	600	9227.74	I	2900	2155.81	I
3000	1357.97	I	300	5984.86	I	1000	9335.05	I	7900	2158.05	I
5000	1360.97	I	2000 d	6024.08	I	4000	9426.71	I	2100	2162.88	I
3000	1361.11	I	2000 c	6074.98	II	3000	9427.15	I	5800	2169.42	II
2500	1367.71	I	1000	6082.43	I	2000	9598.22	I	4500	2175.24	I
2500	1368.22	I	2000 c	6127.49	II	2000	9649.61	I	2700	2178.17	I
4000	1383.23	I	800	6191.88	I	3000 d	9653.06	I	1600	2187.43	II
3000	1390.75	I	500	6213.10	I	5000	9731.73	I	1100	2190.38	II
2000	1392.90	I	800	6244.48	I	500	10003.05	I	740	2191.64	I
2000	1400.01	I	1000	6293.98	I	750	10131.16	I	910	2208.09	II
8000	1425.49	I	500	6313.13	I	1000	10238.82	I	1300	2220.37	I
5000	1446.26	I	800	6330.37	I	400	10375.20	I	790	2221.07	II
5000	1453.18	I	400	6333.50	I	400	10391.74	I	2500	2242.68	II
5000	1457.39	I	2000	6337.85	I	5000	10466.54	I	620	2245.76	II
5000	1457.47	I	1000	6339.44	I	400	11236.56	I	2100	2253.38	I
10000	1457.98	I	500	6359.16	I	350	11558.46	I	2100	2255.10	I
2500	1458.79	I	1000	6566.49	I	320	11778.34	I	1400	2255.81	I
4000	1459.15	I	2000	6583.75	I	450	11996.86	I	350	2258.51	I
2500	1465.83	I	1000	6585.27	I	300	12033.69	I	1400	2258.86	I
1000	1485.92	I	5000	6619.66	I	150	12304.58	I	830	2264.61	I
5000	1492.89	I	500	6661.11	I	60	13149.16	I	1100	2266.33	I
5000	1507.04	I	500 c	6697.29	I	140	13958.27	I	1000	2268.90	I
5000	1514.68	I	400	6732.03	I	200	14287.02	I	660	2280.00	I
15000	1518.05	I	4000	6812.57	II	100	14460.00	I	950	2281.02	II
2500	1526.45	I	500	6989.78	I	225	15032.57	I	660	2281.91	I
5000	1593.58	I	500	7120.05	I	105	15528.65	I	330	2284.60	I
5000	1617.60	I	1200	7122.05	I	150	16037.33	I	330	2295.08	I
2500	1640.78	I	2000	7142.06	I	15	18275.71	I	790	2298.05	I
15000	1702.07	I	1000	7164.79	I	20	18348.52	I	460	2299.53	I
12000	1782.76	I	400 d	7191.66	I	15	18982.41	I	910	2300.50	I
5000	1799.09	I	700	7227.30	I	35	19070.17	I	2700	2304.22	I
75000	1830.38	I	1000	7236.78	I	110	19105.12	I	410	2305.47	I
15000	1844.45	I	500	7237.84	I	50	19370.02	I	210	2307.27	I
2000	2061.63	I	5000	7402.06	I	10	20648.69	I	910	2308.93	I
7	2361.13	IV	1000	7410.50	I	220	22183.03	I	460	2315.38	I
6	2372.45	IV	500	7416.48	I	150	22226.53	I	410	2321.45	I
7	2376.46	IV	5000	7468.99	I	30	22309.21	I	410	2321.58	I
8	2387.11	IV	500 c	7490.52	I	32	24420.82	I	210	2327.98	I
9	2426.10	IV	2000	7554.18	I	12	27365.42	I	540	2333.30	I
8	2475.35	IV	500 d	7556.65	I	9	27573.05	I	740	2333.84	I

Line Spectra of the Elements (continued): Iridium—Iron

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
580	2334.50	I	330	2617.78	I	3400	3133.32	I	45	5625.55	I
1600	2343.18	I	210	2619.88	I	490	3168.88	I	35	5894.06	I
740	2343.61	I	250	2625.32	I	370	3177.58	I	20	6110.67	I
580	2355.00	I	700	2634.17	I	370	3198.92	I	12	6288.28	I
230	2357.53	II	250	2639.42	I	610	3212.12	I	10	6686.08	I
410	2358.16	I	3500	2639.71	I	370	3219.51	I	6	7834.32	I
500	2360.73	I	210	2644.19	I	5100	3220.78	I			
2500	2363.04	I	1800	2661.98	I	300	3229.28	I		Iron	
370	2368.04	II	350	2662.63	I	470	3241.52	I		Fe Z = 26	
3500	2372.77	I	2700	2664.79	I	200	3262.01	I	350	386.16	V
290	2375.09	II	520	2669.91	I	390	3266.44	I	350	386.88	V
250	2377.28	I	520	2671.84	I	200	3322.60	I	400	387.20	V
250	2377.98	I	330	2673.61	I	560	3368.48	I	400	387.50	V
500	2379.38	I	270	2692.34	I	660	3437.02	I	400	387.76	V
540	2381.62	I	3000	2694.23	I	410	3448.97	I	400	387.78	V
210	2383.17	I	330	2772.46	I	3200	3513.64	I	400	387.87	V
1300	2386.89	I	250	2775.55	I	220	3515.95	I	400	395.90	V
2500	2390.62	I	520	2781.29	I	410	3522.03	I	400	404.62	V
2700	2391.18	I	330	2785.22	I	320	3558.99	I	400	405.50	V
230	2407.59	I	540	2797.35	I	1200	3573.72	I	800	407.42	V
290	2409.37	I	1600	2797.70	I	320	3594.39	I	600	407.44	V
290	2410.17	I	380	2798.18	I	220	3609.77	I	400	407.49	V
290	2410.73	I	410	2800.82	I	660	3628.67	I	500	407.75	V
540	2413.31	I	680	2823.18	I	220	3636.20	I	400	409.71	V
370	2415.86	I	1200	2824.45	I	300	3661.71	I	400	410.20	V
620	2418.11	I	820	2836.40	I	300	3664.62	I	600	411.55	V
210	2424.89	I	1100	2839.16	I	320	3674.98	I	700	417.39	V
370	2424.99	I	820	2840.22	I	200	3687.08	I	700	418.04	V
290	2425.66	I	3800	2849.72	I	200	3731.36	II	500	418.47	V
540	2427.61	I	380	2875.60	I	530	3747.20	I	500	421.06	V
540	2431.24	I	380	2875.98	I	3100	3800.12	I	500	421.78	V
1300	2431.94	I	270	2877.68	I	230	3817.24	I	500	422.31	V
270	2435.14	I	820	2882.64	I	480	3902.51	I	500	426.06	V
250	2445.34	I	650	2897.15	I	480	3915.38	I	500	426.11	V
250	2447.76	I	260	2901.95	I	400	3934.84	I	350	426.97	V
910	2452.81	I	260	2904.80	I	590	3976.31	I	17	525.69	IV
1300	2455.61	I	200	2907.24	I	460	3992.12	I	15	526.29	IV
230	2455.87	I	440	2916.36	I	350	4033.76	I	13	526.63	IV
210	2457.03	I	230	2918.57	I	370	4069.92	I	14	536.61	IV
210	2457.23	I	4400	2924.79	I	150	4070.68	I	15	537.10	IV
870	2467.30	I	1200	2934.64	I	100	4092.61	I	13	537.26	IV
3300	2475.12	I	880	2936.68	I	140	4115.78	I	14	537.79	IV
210	2478.11	I	250	2938.47	I	90	4172.56	I	13	537.94	IV
2100	2481.18	I	2700	2943.15	I	260	4172.56	I	13	552.14	IV
620	2493.08	I	230	2946.97	I	220	4268.10	I	14	607.53	IV
210	2496.27	I	200	2949.76	I	160	4311.50	I	13	608.80	IV
250	2502.63	I	1200	2951.22	I	65	4399.47	I	10	813.38	III
4100	2502.98	I	200	2974.95	I	110	4403.78	I	10	844.28	III
210	2513.71	I	440	2980.65	I	55	4426.27	I	10 p	861.83	III
990	2533.13	I	300	2996.08	I	55	4478.48	I	10	891.17	III
1100	2534.46	I	220	3002.25	I	30	4545.68	I	10	950.33	III
580	2537.22	I	600	3003.63	I	35	4548.48	I	10	981.37	III
580	2542.02	I	270	3017.31	I	75	4568.09	I	10 w	983.88	III
7900	2543.97	I	380	3029.36	I	26	4616.39	I	12	1055.27	II
790	2546.03	I	330	3039.26	I	50	4656.18	I	15	1068.36	II
210	2551.40	I	300	3047.16	I	26	4728.86	I	15	1071.60	II
210	2555.35	I	300	3049.44	I	26	4756.46	I	15	1096.89	II
910	2564.18	I	300	3057.28	I	65	4778.16	I	12	1099.12	II
210	2569.88	I	1600	3068.89	I	30	4795.67	I	18	1112.09	II
230	2572.70	I	320	3083.22	I	50	4938.09	I	12	1121.99	II
740	2577.26	I	240	3086.44	I	26	4970.48	I	12	1122.86	II
740	2592.06	I	390	3088.04	I	25	4999.74	I	12	1128.07	II
740	2599.04	I	510	3100.29	I	25	5002.74	I	12	1130.43	II
700	2608.25	I	510	3100.45	I	30	5014.98	I	15	1133.41	II
1800	2611.30	I	340	3120.76	I	30	5123.66	I	12	1133.68	II
210	2614.98	I	200	3121.78	I	35	5364.32	I	12	1138.64	II
						75	5449.50	I	12	1142.33	II
									12	1143.23	II

Line Spectra of the Elements (continued): Iron

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
18	1144.95	II	13	1606.98	IV	18	1788.07	II	300	2178.118	I
12	1147.41	II	17	1609.10	IV	13	1792.10	IV	12	2180.41	III
15	1148.29	II	14	1609.83	IV	13	1796.93	IV	250	2186.486	I
12	1151.16	II	13	1610.47	IV	13	1827.98	IV	60	2186.892	I
12	1267.44	II	13	1611.20	IV	10	1869.83	III	120	2187.195	I
12	1272.00	II	13	1613.64	IV	12	1877.99	III	250	2191.839	I
400	1317.86	V	15	1614.02	IV	10	1882.05	III	150	2196.043	I
400	1323.27	V	13	1614.64	IV	12	1886.76	III	80	2200.390	I
400	1330.40	V	13	1615.00	IV	13	1890.67	III	80	2200.724	I
400	1359.01	V	16	1616.68	IV	11	1893.98	III	15	2208.41	II
600	1361.82	V	14	1617.68	IV	20	1895.46	III	10 p	2208.85	III
700	1373.59	V	12	1618.47	II	10 s	1907.58	III	20	2213.65	II
600	1373.67	V	14	1619.02	IV	19	1914.06	III	12	2218.26	II
500	1376.34	V	13	1621.16	IV	15	1915.08	III	20	2220.38	II
500	1378.56	V	14	1621.57	IV	15	1922.79	III	10	2221.83	III
800	1387.94	V	13	1623.38	IV	10 p	1926.01	III	10	2229.27	III
400	1397.97	V	13	1623.53	IV	18	1926.30	III	10	2232.43	III
600	1400.24	V	15	1626.47	IV	15	1930.39	III	10	2232.69	III
800	1402.39	V	14	1626.90	IV	14	1931.51	III	10	2235.91	III
400	1406.67	V	13	1628.54	IV	30	1934.538	I	10	2238.16	III
500	1406.82	V	13	1630.18	IV	25	1937.269	I	12 p	2241.54	III
400	1407.25	V	17	1631.08	IV	14	1937.34	III	50	2250.790	I
600	1409.45	V	15	1631.12	II	10 l	1938.90	III	60	2251.874	I
400	1415.20	V	14	1632.40	IV	14 s	1943.48	III	300	2259.511	I
600	1420.46	V	13	1634.01	IV	12	1945.34	III	12	2261.59	III
800	1430.57	V	18	1635.40	II	50	1946.988	I	60	2264.389	I
13	1431.43	IV	15	1636.32	II	10	1950.33	III	80	2267.085	I
800	1440.53	V	15	1639.40	II	12	1951.01	III	10	2267.42	III
400	1442.22	V	14	1639.40	IV	25	1951.571	I	80	2267.469	I
800	1446.62	V	16	1640.04	IV	30	1952.59	I	50	2270.862	I
700	1448.85	V	14	1640.16	IV	11	1952.65	III	150	2272.070	I
400	1449.93	V	12	1641.76	II	30	1953.005	I	150	2276.026	I
700	1456.16	V	15	1641.87	IV	13	1953.32	III	80	2279.937	I
500	1459.83	V	15	1647.09	IV	10	1953.49	III	150	2284.086	I
400	1460.73	V	12	1647.16	II	10 w	1954.22	III	150	2287.250	I
500	1462.63	V	15	1651.58	IV	60	1957.823	I	300	2292.524	I
700	1464.68	V	15	1652.90	IV	11	1958.58	III	10	2293.06	III
500	1465.38	V	13	1653.41	IV	60	1960.144	I	15	2295.86	III
400	1466.65	V	13	1656.11	IV	13	1960.32	III	200	2297.787	I
500	1469.00	V	15	1656.65	IV	30	1961.25	I	600	2298.169	I
500	1479.47	V	14	1660.10	IV	50	1962.111	I	80	2299.220	I
10 h	1505.17	III	13	1662.32	IV	12	1963.11	II	300	2300.142	I
13	1526.60	IV	13	1662.52	IV	15	1987.50	III	50	2301.684	I
13	1530.26	IV	13	1663.54	IV	14	1991.61	III	100	2303.424	I
14	1532.63	IV	13	1668.09	IV	13	1994.07	III	150	2303.581	I
13	1532.91	IV	12	1670.74	II	12	1995.56	III	120	2308.999	I
15	1533.86	IV	14	1671.04	IV	12	1996.42	III	150	2313.104	I
13	1533.95	IV	13	1673.68	IV	10	2061.55	III	10 p	2317.70	III
14	1536.58	IV	14	1675.66	IV	12	2068.24	III	10	2319.22	III
10 h	1538.63	III	13	1681.36	IV	14	2078.99	III	200	2320.358	I
13	1542.16	IV	15	1687.69	IV	100	2084.122	I	10 p	2321.71	III
14	1542.70	IV	15	1698.88	IV	10	2084.35	III	10	2326.95	III
12 h	1550.20	III	12	1702.04	II	12	2090.14	III	100	2327.40	II
13	1566.26	IV	13	1709.81	IV	15	2097.48	III	100	2331.31	II
14	1568.27	IV	15	1711.41	IV	12	2097.69	III	300	2332.80	II
13	1591.51	IV	14	1712.76	IV	12	2103.80	III	10 p	2336.77	III
13	1592.05	IV	14	1717.90	IV	10	2107.32	III	200	2338.01	II
13	1598.01	IV	14	1718.16	IV	15	2151.78	III	10	2338.96	III
13	1600.58	IV	14	1719.46	IV	12	2157.71	III	600	2343.49	II
10 h	1601.21	III	14	1722.71	IV	50	2157.794	I	80	2343.96	II
13	1601.67	IV	14	1724.06	IV	12	2158.47	III	150	2344.28	II
13	1603.18	IV	16	1725.63	IV	10	2161.27	III	200	2348.11	II
13	1603.73	IV	13	1761.08	IV	40	2166.773	I	250	2348.30	II
13	1604.88	IV	12	1761.38	II	12	2166.95	III	200	2359.12	II
13	1605.68	IV	20	1785.26	II	12	2171.04	III	150	2360.00	II
15	1605.97	IV	20	1786.74	II	15	2174.66	III	120	2360.29	II

Line Spectra of the Elements (continued): Iron

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
200	2364.83	II	50	2485.990	I	80	2549.39	II	250	2742.254	I
80	2365.76	II	800	2486.373	I	600	2549.613	I	800	2742.405	I
80	2368.59	II	100	2486.691	I	400	2562.53	II	200	2743.20	II
80	2369.456	I	100	2487.066	I	200	2563.48	II	150	2743.565	I
80	2369.95	II	120	2487.370	I	150	2574.36	II	200	2744.068	I
120	2371.430	I	4000	2488.143	I	300	2576.691	I	80	2744.527	I
300	2373.624	I	100	2488.945	I	100	2582.58	II	300	2746.48	II
150	2373.74	II	80	2489.48	II	1500	2584.54	I	100	2749.32	II
120	2374.518	I	1000	2489.750	I	650	2585.88	II	500	2749.48	II
120	2376.43	II	50	2489.913	I	90	2591.54	II	1200	2750.140	I
80	2379.27	II	3000	2490.644	I	90	2593.73	II	80	2753.29	II
120	2380.76	II	100	2490.71	II	650	2598.37	II	150	2754.032	I
150	2381.835	I	2000	2491.155	I	2000	2599.40	II	100	2754.426	I
1000	2382.04	II	100	2491.40	II	300	2599.57	I	800	2755.73	II
300	2388.63	II	100	2493.18	II	60	2605.657	I	250	2756.328	I
200	2389.973	I	500	2493.26	II	300	2606.51	II	100	2757.316	I
1000	2395.62	II	60	2494.000	I	800	2606.827	I	120	2761.780	I
300	2399.24	II	50	2494.251	I	650	2607.09	II	150	2761.81	II
800	2404.88	II	100	2495.87	I	600	2611.87	II	150	2762.026	I
250	2406.66	II	600	2496.533	I	320	2613.82	II	120	2762.772	I
80	2406.97	II	150	2498.90	I	320	2617.62	II	120	2763.109	I
300	2410.52	II	1000	2501.132	I	250	2618.018	I	80	2766.910	I
200	2411.07	II	50	2501.693	I	90	2620.41	II	250	2767.522	I
150	2413.31	II	80	2506.09	II	400	2623.53	I	300	2772.07	I
80	2417.87	II	500	2507.900	I	200	2625.67	II	600	2778.220	I
60	2420.396	I	50	2508.753	I	150	2628.29	II	3000	2788.10	I
60	2423.089	I	1000	2510.835	I	250	2631.05	II	200	2797.78	I
150	2424.14	II	120	2511.76	II	250	2631.32	II	400	2804.521	I
120	2428.36	II	80	2512.275	I	100	2632.237	I	1500	2806.98	I
120	2430.08	II	400	2512.365	I	300	2635.809	I	10 p	2813.24	III
80	2432.26	II	80	2516.570	I	50	2641.646	I	2500	2813.287	I
60	2438.182	I	300	2517.661	I	200	2643.998	I	300	2823.276	I
150	2439.30	II	800	2518.102	I	300	2666.812	I	600	2825.56	I
150	2439.74	I	150	2519.629	I	60	2666.965	I	50	2825.687	I
100	2442.57	I	50	2522.480	I	600	2679.062	I	120	2828.808	I
250	2443.872	I	4000	2522.849	I	500	2684.75	II	1500	2832.436	I
100	2444.51	II	200	2523.66	I	400	2689.212	I	120	2835.950	I
50	2445.212	I	500	2524.293	I	10 h	2695.13	III	200	2838.119	I
100	2445.57	II	100	2525.02	I	200	2699.106	I	200	2843.631	I
60	2447.709	I	200	2525.39	II	80	2706.012	I	1000	2843.977	I
100	2453.476	I	300	2526.29	II	400	2706.582	I	100	2845.594	I
1500	2457.598	I	2000	2527.435	I	60	2708.571	I	800	2851.797	I
150	2458.78	II	800	2529.135	I	200	2711.655	I	50	2869.307	I
80	2461.28	II	250	2529.55	II	80	2714.41	II	50	2872.334	I
100	2461.86	II	150	2529.836	I	50	2716.257	I	80	2874.172	I
100	2462.181	I	200	2530.687	I	50	2717.786	I	50	2894.504	I
1500	2462.647	I	120	2533.63	II	250	2718.436	I	12	2904.43	III
50	2463.730	I	100	2534.42	II	4000	2719.027	I	10	2907.50	III
800	2465.149	I	120	2535.49	II	100	2719.420	I	12	2907.70	III
60	2467.732	I	400	2535.607	I	50	2720.197	I	120	2912.157	I
600	2468.879	I	200	2536.792	I	1500	2720.903	I	120	2929.007	I
80	2470.67	II	200	2536.80	II	400	2723.578	I	1200	2936.903	I
80	2470.965	I	100	2538.80	II	150	2724.953	I	60	2941.343	I
800	2472.336	I	100	2538.91	II	50	2726.235	I	1000	2947.876	I
1000	2472.895	I	150	2538.99	II	80	2727.54	II	600	2953.940	I
200	2473.16	I	50	2539.357	I	200	2728.020	I	250	2957.364	I
600	2474.814	I	200	2540.66	II	50	2728.820	I	150	2965.254	I
60	2476.657	I	600	2540.972	I	80	2728.90	II	1500	2966.898	I
120	2479.480	I	80	2541.10	II	1000	2733.581	I	120	2969.36	I
1200	2479.776	I	300	2542.10	I	60	2734.005	I	800	2970.099	I
100	2480.16	II	250	2543.92	I	50	2734.268	I	1200	2973.132	I
80	2482.12	II	150	2544.70	I	500	2735.475	I	500	2973.235	I
100	2482.66	II	800	2545.978	I	50	2735.612	I	600	2981.445	I
10000	2483.271	I	80	2546.67	II	500	2737.310	I	1000	2983.570	I
300	2483.533	I	100	2548.74	II	120	2737.83	I	1000	2994.427	I
1000	2484.185	I	80	2549.08	II	400	2739.55	II	250	2994.502	I

Line Spectra of the Elements (continued): Iron

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
500	2999.512	I	11	3276.08	III	200	3605.454	I	100	3786.68	I			
120	3000.451	I	150	3286.75	I	500	3606.680	I	250	3787.880	I			
800	3000.948	I	10	3288.81	III	1500	3608.859	I	250	3790.092	I			
12	3001.62	III	120	3305.97	I	250	3610.16	I	150	3794.34	I			
60	3001.655	I	200	3306.343	I	60	3612.068	I	400	3795.002	I			
12 h	3007.28	III	400	3355.227	I	150	3617.788	I	120	3797.518	I			
200	3007.282	I	80	3355.517	I	1500	3618.768	I	250	3798.511	I			
500	3008.14	I	60	3369.546	I	200	3621.462	I	400	3799.547	I			
120	3009.569	I	120	3370.783	I	150	3622.004	I	200	3805.345	I			
15	3013.17	III	50	3378.678	I	150	3623.19	I	80	3806.696	I			
60	3017.627	I	50	3380.110	I	100	3631.096	I	600	3812.964	I			
60	3018.983	I	60	3383.978	I	1200	3631.463	I	60	3813.059	I			
500	3020.491	I	50	3392.304	I	60	3632.041	I	1500	3815.840	I			
1500	3020.639	I	150	3392.651	I	100	3638.298	I	2500	3820.425	I			
600	3021.073	I	150	3399.333	I	200	3640.389	I	150	3821.179	I			
500	3024.032	I	80	3404.353	I	80	3643.717	I	80	3824.306	I			
150	3025.638	I	500	3407.458	I	1500	3647.842	I	2500	3824.444	I			
500	3025.842	I	250	3413.131	I	250	3649.506	I	1500	3825.880	I			
80	3030.148	I	60	3424.284	I	80	3650.279	I	1200	3827.823	I			
60	3031.214	I	500	3427.119	I	200	3651.467	I	1000	3834.222	I			
60	3034.484	I	60	3428.748	I	120	3670.024	I	120	3839.257	I			
800	3037.389	I	6000	3440.606	I	150	3670.089	I	500	3840.437	I			
80	3041.637	I	2500	3440.989	I	100	3676.311	I	800	3841.047	I			
800	3047.604	I	1000	3443.876	I	150	3677.629	I	120	3843.256	I			
600	3057.446	I	200	3445.149	I	1500	3679.913	I	80	3846.800	I			
1000	3059.086	I	1200	3465.860	I	200	3682.242	I	200	3849.96	I			
250	3067.244	I	2000	3475.450	I	120	3683.054	I	120	3850.817	I			
120	3075.719	I	500	3476.702	I	150	3684.107	I	2500	3856.372	I			
120	3091.577	I	2500	3490.574	I	120	3685.998	I	150	3859.212	I			
80	3098.189	I	500	3497.840	I	500	3687.456	I	10000	3859.911	I			
100	3099.895	I	10	3501.76	III	120	3689.477	I	150	3865.523	I			
100	3099.968	I	250	3513.817	I	150	3694.008	I	60	3867.215	I			
60	3100.303	I	300	3521.261	I	120	3695.051	I	250	3872.501	I			
100	3100.665	I	400	3526.040	I	150	3701.086	I	150	3873.761	I			
10 p	3136.43	III	100	3526.166	I	80	3704.462	I	250	3878.018	I			
10	3174.09	III	60	3526.237	I	1200	3705.566	I	2000	3878.573	I			
80	3175.445	I	60	3526.381	I	60	3707.041	I	4000	3886.282	I			
10	3175.99	III	60	3526.467	I	150	3707.821	I	200	3887.048	I			
10	3178.01	III	100	3533.199	I	300	3707.919	I	300	3888.513	I			
150	3184.895	I	200	3536.556	I	600	3709.246	I	800	3895.656	I			
250	3191.659	I	300	3541.083	I	120	3716.442	I	1200	3899.707	I			
500	3193.226	I	250	3542.075	I	8000	3719.935	I	400	3902.945	I			
800	3193.299	I	80	3553.739	I	1500	3722.563	I	250	3906.479	I			
200	3196.928	I	400	3554.925	I	120	3724.377	I	80	3916.731	I			
80	3199.500	I	200	3556.878	I	60	3725.491	I	600	3920.258	I			
50	3205.398	I	400	3558.515	I	60	3727.093	I	1200	3922.911	I			
100	3211.88	I	1000	3565.379	I	500	3727.619	I	1200	3927.920	I			
200	3214.011	I	1200	3570.097	I	150	3732.396	I	2000	3930.296	I			
200	3214.396	I	800	3570.25	I	1200	3733.317	I	60	3948.774	I			
60	3215.938	I	120	3571.996	I	5000	3734.864	I	60	3949.953	I			
50	3217.377	I	100	3573.393	I	120	3735.324	I	50	3951.164	I			
80	3219.583	I	60	3573.829	I	6000	3737.131	I	50	3952.601	I			
60	3219.766	I	60	3573.888	I	100	3738.306	I	16	3954.33	III			
300	3222.045	I	4000	3581.19	I	400	3743.362	I	60	3956.454	I			
600	3225.78	I	150	3582.199	I	6000	3745.561	I	250	3956.68	I			
80	3227.796	I	150	3584.660	I	1200	3745.899	I	60	3966.614	I			
50	3233.967	I	120	3584.929	I	3000	3748.262	I	11	3968.72	III			
120	3234.613	I	300	3585.319	I	80	3748.964	I	100	3969.257	I			
300	3236.222	I	150	3585.705	I	3000	3749.485	I	80	3977.741	I			
100	3239.433	I	10	3586.04	III	1500	3758.232	I	10 w	3979.42	III			
80	3244.187	I	200	3586.103	I	400	3760.05	I	40	3981.771	I			
80	3246.005	I	400	3586.984	I	1500	3763.788	I	50	3983.956	I			
80	3265.046	I	100	3594.633	I	400	3765.54	I	60	3994.114	I			
50	3265.617	I	11	3600.94	III	600	3767.191	I	200	3997.392	I			
13	3266.88	III	150	3603.204	I	60	3776.452	I	40	3998.053	I			
50	3271.000	I	11	3603.88	III	250	3785.95	I	400	4005.241	I			

Line Spectra of the Elements (continued): Iron—Krypton

Intensity			Wavelength/Å			Intensity			Wavelength/Å			Intensity			Wavelength/Å		
60	4009.713	I	12 h	4273.40	III	150	5216.274	I	16	6032.59	III						
100	4021.867	I	12	4279.72	III	60	5226.862	I	13	6036.56	III						
10	4035.42	III	1200	4282.402	I	1000	5227.150	I	11	6048.72	III						
50	4040.638	I	14 h	4286.16	III	250	5232.939	I	11	6054.18	III						
4000	4045.813	I	80	4291.462	I	10	5235.66	III	40	6065.482	I						
11	4053.11	III	16 h	4296.85	III	18	5243.31	III	30	6102.159	I						
1500	4063.594	I	250	4299.234	I	13 l	5260.34	III	40	6136.614	I						
50	4066.975	I	18 h	4304.78	III	100	5266.555	I	40	6137.694	I						
50	4067.977	I	1200	4307.901	I	1200	5269.537	I	40	6191.558	I						
1200	4071.737	I	20 h	4310.36	III	800	5270.357	I	30	6213.429	I						
40	4076.629	I	150	4315.084	I	14	5272.98	III	30	6219.279	I						
12	4081.00	III	1500	4325.761	I	15	5276.48	III	40	6230.726	I						
40	4100.737	I	80	4352.734	I	30	5281.789	I	20	6246.317	I						
40	4107.489	I	80	4369.771	I	16	5282.30	III	80	6247.56	II						
150	4118.544	I	11 h	4372.31	III	60	5283.621	I	30	6252.554	I						
10	4120.90	III	14 h	4372.53	III	12	5284.83	III	20	6393.602	I						
11	4122.02	III	18 h	4372.81	III	11	5298.12	III	30	6399.999	I						
11	4122.78	III	800	4375.929	I	12	5299.93	III	20	6411.647	I						
40	4127.608	I	3000	4383.544	I	25	5302.299	I	20	6421.349	I						
400	4132.058	I	1200	4404.750	I	14 w	5302.60	III	30	6430.844	I						
80	4134.676	I	300	4415.122	I	10	5306.76	III	200	6456.38	II						
40	4136.997	I	12	4419.60	III	10	5322.74	III	60	6494.981	I						
15	4137.76	III	600	4427.299	I	150	5324.178	I	20	6546.239	I						
13	4139.35	III	400	4461.652	I	800	5328.038	I	20	6592.913	I						
200	4143.415	I	120	4466.551	I	300	5328.531	I	40	6677.989	I						
800	4143.869	I	80	4476.017	I	100	5332.899	I	25	7164.443	I						
40	4153.898	I	80	4482.169	I	80	5339.928	I	80	7187.313	I						
50	4154.500	I	200	4482.252	I	500	5341.023	I	30	7207.381	I						
60	4156.799	I	50	4489.739	I	11	5346.88	III	30	7445.746	I						
18	4164.73	III	50	4528.613	I	12	5353.77	III	40	7495.059	I						
13	4166.84	III	30	4647.433	I	12	5363.76	III	60	7511.045	I						
50	4172.744	I	30	4736.771	I	10	5368.06	III	80	7937.131	I						
13	4174.26	III	50	4859.741	I	400	5371.489	I	60	7945.984	I						
60	4174.912	I	120	4871.317	I	11 l	5375.47	III	80	7998.939	I						
50	4175.635	I	60	4872.136	I	40	5393.167	I	60	8046.047	I						
50	4177.593	I	30	4878.208	I	300	5397.127	I	50	8085.176	I						
120	4181.754	I	100	4890.754	I	250	5405.774	I	150	8220.41	I						
50	4184.891	I	250	4891.492	I	250	5429.695	I	120	8327.053	I						
120	4187.038	I	30	4903.309	I	100	5434.523	I	20	8331.908	I						
120	4187.795	I	150	4918.992	I	200	5446.871	I	120	8387.770	I						
80	4191.430	I	500	4920.502	I	120	5455.609	I	30	8468.404	I						
40	4195.329	I	1500	4957.597	I	25	5497.516	I	15	8514.069	I						
150	4198.304	I	80	5001.862	I	20	5501.464	I	60	8661.898	I						
40	4199.095	I	30	5005.711	I	30	5506.778	I	150	8688.621	I						
300	4202.029	I	100	5006.117	I	30	5569.618	I	52	11422.32	I						
40	4203.984	I	60	5012.067	I	60	5572.841	I	87	11439.12	I						
80	4206.696	I	30	5014.941	I	120	5586.755	I	91	11593.59	I						
80	4210.343	I	150	5041.755	I	200	5615.644	I	255	11607.57	I						
400	4216.183	I	30	5049.819	I	20	5624.541	I	160	11638.26	I						
100	4219.360	I	30	5051.634	I	50	5662.515	I	230	11689.98	I						
50	4222.212	I	25	5074.748	I	11	5719.88	III	160	11783.26	I						
11	4222.27	III	150	5110.357	I	10	5756.38	III	580	11882.84	I						
50	4225.956	I	40	5139.251	I	20	5762.990	I	225	11884.08	I						
200	4227.423	I	100	5139.462	I	18	5833.93	III	1030	11973.05	I						
100	4233.602	I	25	5151.910	I	10	5854.62	III	96	14400.56	I						
13	4235.56	III	12	5156.12	III	30	5862.353	I	72	14512.23	I						
250	4235.936	I	80	5166.281	I	15	5891.91	III	50	14555.06	I						
50	4238.809	I	2500	5167.487	I	30	5914.114	I	40	14826.43	I						
12	4243.75	III	80	5168.897	I	10 p	5920.13	III	94	15294.58	I						
50	4247.425	I	500	5171.595	I	18 p	5929.69	III	41	15769.42	I						
200	4250.118	I	50	5191.454	I	10	5952.31	III	105	18856.65	I						
300	4250.787	I	80	5192.343	I	14	5953.62	III									
40	4258.315	I	200	5194.941	I	12	5979.32	III									
800	4260.473	I	10	5199.08	III	30	5986.956	I	30	467.35	III						
250	4271.153	I	30	5204.582	I	12 h	5989.08	III	150	472.16	V						
1200	4271.759	I	25	5215.179	I	18	5999.54	III	100	484.39	V						

Line Spectra of the Elements (continued): Krypton

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
250	496.25	V	50	837.66	III	6	2774.70	IV	40 h	3868.70	III
120	500.77	V	22	842.04	IV	3	2829.60	IV	150 h	3875.44	II
200	507.20	V	100	844.06	II	100	2833.00	II	150	3906.177	II
30	540.86	III	50	854.73	III	3	2836.08	IV	200	3920.081	II
60	548.04	V	60	862.58	III	30	2841.00	III	5	3934.29	IV
30	565.64	III	60	864.82	II	30	2851.16	III	100	3994.840	II
30	569.16	III	60	868.87	II	5	2853.0	IV	100 h	3997.793	II
30	571.98	III	40	870.84	III	3	2859.3	IV	300	4057.037	II
30	579.83	III	50	876.08	III	50	2870.61	III	300	4065.128	II
30	585.14	III	200	884.14	II	100	2892.18	III	50	4067.37	III
30	585.96	III	1000	886.30	II	30	2909.17	III	500	4088.337	II
30	593.70	III	400	891.01	II	50	2952.56	III	250	4098.729	II
30	594.10	III	75	897.81	III	60	2992.22	III	100	4109.248	II
30	596.41	III	200	911.39	II	50	3022.30	III	40	4131.33	III
40	600.17	III	2000	917.43	II	80	3024.45	III	250	4145.122	II
30	603.67	III	50	945.44	I	50	3046.93	III	40	4154.46	III
50	605.86	III	50	946.54	I	30	3056.72	III	150	4250.580	II
35	606.47	III	20	951.06	I	60	3063.13	III	1000	4273.969	I
50	611.12	III	50	953.40	I	40	3097.16	III	100	4282.967	I
35	616.72	III	50	963.37	I	60	3112.25	III	600	4292.923	II
40	621.45	III	2000	964.97	II	30	3120.61	III	200	4300.49	II
45	622.80	III	50	987.29	III	100	3124.39	III	500 h	4317.81	II
50	625.02	III	100	1001.06	I	60	3141.35	III	400	4318.551	I
30	625.76	III	100	1003.55	I	3	3142.01	IV	1000	4319.579	I
45	628.59	III	100	1030.02	I	100	3189.11	III	150 h	4322.98	II
50	630.04	III	30	1158.74	III	80	3191.21	III	100	4351.359	I
35	633.09	III	200	1164.87	I	6	3224.99	IV	3000	4355.477	II
120	637.87	V	650	1235.84	I	40	3239.52	III	500	4362.641	I
50	639.98	III	6	1638.82	III	40	3240.44	III	200	4369.69	II
60	646.41	III	6	1914.09	III	300	3245.69	III	800	4376.121	I
50	651.20	III	3	2237.34	IV	3	3261.70	IV	300 h	4386.54	II
50	659.72	III	6	2291.26	IV	150	3264.81	III	200	4399.965	I
30	664.86	III	3	2329.3	IV	100	3268.48	III	100	4425.189	I
40	672.34	III	4	2336.75	IV	30	3271.65	III	500	4431.685	II
35	672.85	III	4	2348.27	IV	30	3285.89	III	600	4436.812	II
35	676.57	III	3	2358.5	IV	30	3304.75	III	600	4453.917	I
35	680.13	III	3	2388.05	IV	50	3311.47	III	800	4463.689	I
35	683.68	III	40	2393.94	III	200	3325.75	III	800	4475.014	II
45	686.25	III	4	2416.9	IV	60	3330.76	III	400 h	4489.88	II
45	687.98	III	3	2428.04	IV	50	3342.48	III	600	4502.353	I
	690.86	V	5	2442.68	IV	100	3351.93	III	400 h	4523.14	II
	691.75	V	4	2451.7	IV	40	3374.96	III	200 h	4556.61	II
45	691.93	III	6	2459.74	IV	100	3439.46	III	800	4577.209	II
50	695.61	III	100 h	2464.77	II	70	3474.65	III	300	4582.978	II
30	698.05	III	5	2474.06	IV	100	3488.59	III	150 h	4592.80	II
50	708.36	III	60	2492.48	II	200	3507.42	III	500	4615.292	II
600	708.85	V	40	2494.01	III	100	3564.23	III	1000	4619.166	II
50	714.00	III	4	2517.0	IV	100 h	3607.88	II	800	4633.885	II
100 p	722.04	III	5	2518.02	IV	200	3631.889	IV	2000	4658.876	II
60	729.40	II	6	2519.38	IV	30	3641.34	III	500	4680.406	II
30	746.70	III	5	2524.5	IV	250	3653.928	II	100	4691.301	II
200	761.18	II	5	2546.0	IV	80	3665.324	I	200	4694.360	II
100	763.98	II	6	2547.0	IV	150	3669.01	IV	3000	4739.002	II
60	766.20	II	4	2558.08	IV	100	3679.559	I	300	4762.435	II
200	771.03	II	30	2563.25	III	80	3686.182	II	1000	4765.744	II
60 p	773.69	II	3	2586.9	IV	30	3690.65	III	300	4811.76	II
200	782.10	II	5	2606.17	IV	300 h	3718.02	II	300	4825.18	II
100	783.72	II	10	2609.5	IV	200	3718.595	II	800	4832.077	II
60	785.97	III	8	2615.3	IV	150	3721.350	II	700	4846.612	II
	793.44	IV	7	2621.11	IV	200	3741.638	II	150	4857.20	II
	794.11	IV	60	2639.76	III	150	3744.80	II	300	4945.59	II
7	805.76	IV	30	2680.32	III	80	3754.245	II	20 h	5016.45	III
	810.70	V	40	2681.19	III	500	3778.089	II	200	5022.40	II
18	816.82	IV	80 h	2712.40	II	500	3783.095	II	250	5086.52	II
60	818.15	II	3	2730.55	IV	3	3809.30	IV	400 h	5125.73	II
60	830.38	II	8	2748.18	IV	5	3860.58	IV	500	5208.32	II

Line Spectra of the Elements (continued): Krypton—Lanthanum

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
200	5308.66	II	100	9362.082	I	140	20446.971	I	30000 c	2962.58	IV
500	5333.41	II	200 h	9402.82	II	600	21165.471	I	70000 w	3009.51	IV
200	5468.17	II	200 h	9470.93	II	1800	21902.513	I	90000 c	3056.68	IV
10	5501.43	III	500	9577.52	II	120	22485.775	I	1000	3171.63	III
500	5562.224	I	500 h	9605.80	II	180	23340.416	I	1500	3171.74	III
2000	5570.288	I	400 h	9619.61	II	120	24260.506	I	510	3245.13	II
80	5580.386	I	200	9663.34	II	180	24292.221	I	550	3265.67	II
100	5649.561	I	200 h	9711.60	II	600	25233.820	I	800	3303.11	II
400	5681.89	II	2000	9751.758	I	180	28610.55	I	1500	3337.49	II
200 h	5690.35	II	500	9803.14	II	1000	28655.72	I	870	3344.56	II
100	5832.855	I	500	9856.314	I	150	28769.71	I	1500	3380.91	II
3000	5870.914	I	1000	10221.46	II	140	28822.49	I	320	3628.83	II
200	5992.22	II	100	11187.108	I	300	29236.69	I	1000	3645.42	II
60	5993.849	I	200	11257.711	I	300	30663.54	I	550	3713.54	II
10 h	6037.17	III	150	11259.126	I	300	30979.16	I	2400	3759.08	II
60	6056.125	I	500	11457.481	I	500	39300.6	I	3700	3790.83	II
10 h	6078.38	III	150	11792.425	I	1100	39486.52	I	3900	3794.78	II
10	6310.22	III	1500	11819.377	I	220	39557.25	I	600	3840.72	II
300	6420.18	II	600	11997.105	I	100	39572.60	I	1600	3849.02	II
100	6421.026	I	160	12077.224	I	1400	39588.4	I	3400	3871.64	II
200	6456.288	I	100	12861.892	I	1100	39589.6	I	1700	3886.37	II
150	6570.07	II	1100	13177.412	I	500	39954.8	I	1300	3916.05	II
60	6699.228	I	1000	13622.415	I	300	39966.6	I	1100	3921.54	II
100	6904.678	I	2400	13634.220	I	1300	40306.1	I	2200	3929.22	II
250	7213.13	II	800	13658.394	I	250	40685.16	I	9000	3949.10	II
100	7224.104	I	200	13711.036	I	Lanthanum La Z = 57		4400	3988.52	II	
80	7287.258	I	600	13738.851	I			3600	3995.75	II	
400	7289.78	II	150	13974.027	I	100	344.12	IV	2800	4031.69	II
400	7407.02	II	550	14045.657	I	400	390.72	V	3000	4042.91	II
60	7425.541	I	140	14104.298	I	1000	432.11	V	850	4067.39	II
200	7435.78	II	180	14402.22	I	2500	435.28	V	2800	4077.35	II
100	7486.862	I	2000	14426.793	I	10000	463.14	IV	5500	4086.72	II
300	7524.46	II	100	14517.84	I	5000	482.16	V	4400	4123.23	II
1000	7587.411	I	1600	14734.436	I	7000	498.08	V	550	4141.74	II
2000	7601.544	I	550	14762.672	I	15000	499.54	IV	1100	4151.97	II
150	7641.16	II	450	14765.472	I	10000	503.58	V	1500	4196.55	II
1000	7685.244	I	400	14961.894	I	12000	526.76	V	1600	4238.38	II
1200	7694.538	I	120	15005.307	I	10000	531.07	V	480	4269.50	II
250	7735.69	II	140	15209.526	I	15000	533.23	V	600	4286.97	II
150	7746.827	I	1700	15239.615	I	8000	547.44	V	600	4296.05	II
800	7854.821	I	130	15326.480	I	40000	552.02	IV	440	4322.51	II
200	7913.423	I	1500	15334.958	I	5000	600.24	V	4600	4333.74	II
180	7928.597	I	700	15372.037	I	30000	631.26	IV	550	4354.40	II
200	7933.22	II	200	15474.026	I	400	796.99	III	2000	4429.90	II
120	7973.62	II	180	15681.02	I	2000	870.40	III	850	4522.37	II
100	7982.401	I	120	15820.09	I	1000	882.34	III	420	4526.12	II
1500	8059.503	I	200	16726.513	I	400	942.86	III	400	4558.46	II
4000	8104.364	I	2000	16785.128	I	50000	1081.61	III	400	4574.88	II
6000	8112.899	I	1000	16853.488	I	95000	1099.73	III	410	4613.39	II
60	8132.967	I	2400	16890.441	I	2000	1255.63	III	410	4619.88	II
3000	8190.054	I	1600	16896.753	I	10000	1349.18	III	540	4655.50	II
200	8202.72	II	1800	16935.806	I	25000	1368.04	IV	360	4662.51	II
80	8218.365	I	600	17098.771	I	20000	1463.47	IV	230	4692.50	II
3000	8263.240	I	700	17367.606	I	15000	1507.87	IV	230	4728.42	II
100	8272.353	I	120	17404.443	I	10000	1523.79	III	500	4740.28	II
1500	8281.050	I	150	17616.854	I	4000	1808.66	IV	390	4743.09	II
5000	8298.107	I	650	17842.737	I	5000	1902.97	IV	320	4748.73	II
100	8412.430	I	700	18002.229	I	4000 c	2197.45	IV	320	4860.91	II
3000	8508.870	I	2600	18167.315	I	770	2256.76	II	850	4899.92	II
150	8764.110	I	100	18399.786	I	25000 w	2417.58	IV	1000	4920.98	II
6000	8776.748	I	150	18580.896	I	50000	2532.75	IV	1000	4921.79	II
2000	8928.692	I	300	18696.294	I	45000	2582.05	IV	370	4949.77	I
500	9238.48	II	170	18785.460	I	95000 w	2597.50	IV	340	4970.39	II
500 hl	9293.82	II	200	18797.703	I	70000 w	2662.75	IV	370	4986.83	II
200 h	9320.99	II	140	20209.878	I	420	2808.39	II	720	4999.47	II
300	9361.95	II	300	20423.964	I	50000 w	2848.30	IV	210	5050.57	I

Line Spectra of the Elements (continued): Lanthanum—Lead

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
470	5114.56	II	10	827.41	IV	10	1348.37	II	4	2986.876	II
470	5122.99	II	12	832.60	IV	16	1388.94	IV	10	3043.85	III
450	5145.42	I	12	845.94	IV	18	1400.26	IV	150	3118.894	I
290	5158.69	I	18	857.64	IV	10	1404.34	IV	10	3137.81	III
580	5177.31	I	16	862.33	IV	10	1433.96	II	10	3176.50	III
850	5183.42	II	20	863.97	V	10	1512.42	II	600	3220.528	I
260	5188.22	II	14	870.44	IV	14	1535.71	IV	100	3229.613	I
720	5211.86	I	6	873.71	II	20	1553.1	III	400	3240.186	I
520	5234.27	I	12	879.96	IV	10	1671.53	II	200	3262.355	I
340	5253.46	I	18	883.90	V	10	1682.15	II	35000	3572.729	I
370	5271.19	I	14	884.96	IV	20	1726.75	II	50000 r	3639.568	I
370	5301.98	II	14	884.99	IV	10	1796.670	II	20000	3671.491	I
180	5303.55	II	14	888.37	V	10	1822.050	II	70000 r	3683.462	I
500	5455.15	I	8	889.68	II	10	1904.77	I	10	3713.982	II
470	5501.34	I	16	890.72	IV	7	1921.471	II	25000	3739.935	I
240	5648.25	I	14	894.40	V	12	1959.34	IV	12	3854.08	III
180	5740.66	I	12	896.08	V	16	1973.16	IV	15000	4019.632	I
370	5769.34	I	12	908.51	IV	10	1998.83	V	95000	4057.807	I
320	5789.24	I	14	915.71	V	5 r	2022.02	I	14000	4062.136	I
450	5791.34	I	12	917.90	IV	10	2042.58	IV	10	4157.814	I
140	5821.99	I	12	918.09	V	12	2049.34	IV	10000	4168.033	I
320	5930.62	I	12	920.28	V	8 r	2053.28	I	8	4272.66	III
720	6249.93	I	12	920.66	V	12	2079.22	IV	200	4340.413	I
260 d	6262.30	II	10	922.12	IV	6	2111.758	I	10	4496.15	IV
450	6394.23	I	12	922.49	IV	10	2115.066	I	6	4499.34	III
250	6455.99	I	10	927.64	IV	15	2154.01	IV	16	4534.60	IV
180	6709.50	I	14	932.20	IV	500 r	2170.00	I	7	4571.21	III
110	7045.96	I	12	954.35	V	7	2175.580	I	10	4579.051	II
160	7066.23	II	10	967.23	II	12	2177.46	IV	6	4761.12	III
50	7161.25	I	10	986.71	II	7	2187.888	I	1000	5005.416	I
110 w	7282.34	II	10	995.89	II	8	2189.603	I	100	5006.572	I
110 w	7334.18	I	10	1016.61	II	10	2203.534	II	50	5089.484	I
75 cw	7483.50	II	14	1028.61	IV	20	2237.425	I	10	5107.242	I
50	7498.83	I	20	1032.05	IV	20	2246.86	I	2000	5201.437	I
85	7539.23	I	16	1041.24	IV	25	2246.89	I	10	5372.099	II
40	7964.83	I	18	1044.14	IV	20	2259.01	V	40	5692.346	I
75	8086.05	I	12	1048.9	III	150	2332.418	I	200	5895.624	I
85	8324.69	I	10	1049.82	II	16	2359.53	IV	2000	6001.862	I
95	8346.53	I	10	1050.77	II	180	2388.797	I	500	6011.667	I
65	8545.44	I	10	1051.26	V	550 r	2393.792	I	500	6059.356	I
300	8583.45	III	15	1056.53	IV	140	2399.597	I	40	6081.409	II
40	8674.43	I	10	1060.66	II	320 r	2401.940	I	50	6110.520	I
35	8825.82	I	12	1072.09	IV	320 r	2411.734	I	100	6235.266	I
120	9184.38	III	18	1080.81	IV	16	2417.61	IV	50 c	6660.20	II
100	9212.63	III	20	1084.17	IV	15	2424.81	V	20000	7228.965	I
140	10284.79	III	10	1088.86	V	150 r	2443.829	I	10	7346.676	I
	Lead		10	1103.94	II	160 r	2446.181	I	20	7809.259	I
	Pb Z = 82		10	1108.43	II	130 r	2476.378	I	5	7896.737	I
10	496.38	IV	10	1109.84	II	80 r	2577.260	I	10	8168.001	I
12	499.94	IV	20	1116.08	IV	500 r	2613.655	I	6	8191.886	I
14	529.78	IV	10	1119.57	II	900 r	2614.175	I	5	8217.711	I
20	570.16	IV	10	1121.36	II	160	2628.262	I	40	8272.690	I
10	648.50	IV	10	1133.14	II	4	2634.256	II	20	8409.384	I
20	703.73	V	18	1137.84	IV	10	2657.094	I	10	8478.492	I
12	749.46	V	14	1144.93	IV	700	2663.154	I	5	8722.810	I
10	752.52	V	12	1157.88	V	10	2697.541	I	10	8857.457	I
10	761.09	IV	14	1185.43	V	25000 r	2801.995	I	8	9293.476	I
18	767.45	V	20	1189.95	IV	100	2822.58	I	15	9438.05	I
18	769.49	V	10	1203.63	II	14000 r	2823.189	I	15	9604.297	I
14	771.42	V	10	1231.20	II	35000 r	2833.053	I	15	9674.351	I
14	782.79	V	11	1233.50	V	6	2840.557	II	200	10290.458	I
15	797.02	V	10	1291.10	IV	14000 r	2873.311	I	100	10498.965	I
18	802.07	IV	20	1313.05	IV	3	2914.442	II	50	10649.249	I
12	802.82	IV	10	1331.65	II	15	2966.460	I	15	10886.688	I
18	809.63	V	10	1335.20	II	15	2972.991	I	40	10969.53	I
10	812.59	IV	12	1343.06	IV	15	2980.157	I		13512.6	I

Line Spectra of the Elements (continued): Lead—Lutetium

Intensity	Wavelength/Å	Intensity	Wavelength/Å	Intensity	Wavelength/Å	Intensity	Wavelength/Å
	14743.0 I		2164. II		2846. I		5037.92 II
	15349.6 I		2173.4 I		2868. I		5271. I
	39039.4 I		2183. II		2895. I		5315. I
Lithium			2214. II	2	2934.02 II		5395. I
Li Z = 3			2222. II	2	2934.07 II		5440. I
	102.9 III		2237. II	5	2934.12 II	600 c	5483.55 II
	103.4 III	h	2249.21 II	1	2934.25 II	600 c	5485.65 II
	104.1 III		2286.82 II		2968. I	320	6103.54 I
	105.5 III		2302.57 II	3	3029.12 II	320	6103.65 I
	108.0 III		2303.33 II	3	3029.14 II	3600	6707.76 I
	113.9 III		2304.59 I		3144. I	3600	6707.91 I
	125.5 II		2304.92 I	3	3155.31 II	48	8126.23 I
	135.0 III		2305.36 I	4	3155.33 II	48	8126.45 I
	136.5 II		2305.83 I	1	3196.26 II		8517.37 II
	140.5 II		2306.29 I	9	3196.33 II		9581.42 II
	167.21 II		2306.82 I	4	3196.36 II		10120. II
	168.74 II		2307.44 I	5	3199.33 II		12232. I
	171.58 II		2308.97 I	2	3199.43 II		12782. I
	178.02 II		2309.88 I	17	3232.66 I		13566. I
	199.28 II		2310.94 I		3249.87 II		17552. I
	207.5 II		2312.11 I		3306.28 II		18697. I
	456. II		2313.49 I		3488. I		19290. I
	483. II		2315.08 I		3579.8 I		24467. I
	540. II		2316.95 I		3618. I		40475. I
	540.0 III		2319.18 I		3662. I	Lutetium	
	729. II		2321.88 I		3684.32 II	Lu Z = 71	
	729.1 III		2325.11 I	1	3714.00 II	100	563.72 V
	800. II		2329.02 I	5	3714.16 II	500	810.73 III
	820. II		2329.84 II	6 d	3714.27 II	2000	832.28 III
	861. II		2333.94 I	8	3714.29 II	100	861.92 V
	905.5 II	3	2336.88 II	7 d	3714.40 II	400	876.80 IV
	917.5 II	5	2336.91 II	10	3714.41 II	100	880.32 V
	936. II	2	2337.00 II	1	3714.51 II	100	891.81 V
	945. II		2340.15 I		3714.58 II	100	914.72 V
	965. II		2348.22 I	3	3718.7 I	400	1001.18 III
	972. II		2358.93 I	6	3794.72 I	100	1272.42 IV
	988. II		2373.54 I	20	3915.30 I	800	1333.79 IV
	1018. II		2381.54 II	20	3915.35 I	400	1429.38 IV
	1032. II		2383.20 II	10	3985.48 I	200	1441.76 V
	1036. II	1	2394.39 I	10	3985.54 I	200	1453.35 V
	1093. II		2402.33 II	40	4132.56 I	200	1468.99 V
	1103. II		2410.84 II	40	4132.62 I	400	1472.12 V
	1109. II	3	2425.43 I		4196. I	200	1473.71 V
	1116. II		2429.81 II	20	4273.07 I	200	1485.58 V
	1132.1 II		2460.2 I	20	4273.13 I	400	1511.26 IV
	1141. II	10	2475.06 I	5	4325.42 II	600	1772.57 IV
	1166.4 II		2506.94 II	5	4325.47 II	100 c	1786.25 V
	1198.09 II		2508.78 II	1	4325.54 II	1000	1854.57 III
	1215. II		2518. I		4516.45 II	1500	2065.35 III
	1238. II		2539.49 II	13	4602.83 I	1500 c	2070.56 III
	1253.8 II	24	2551.7 II	13	4602.89 I	600 c	2086.47 IV
	1420.89 II		2559. II		4607.34 II	1000 c	2104.41 IV
	1424. II	15	2562.31 I		4671.51 II	1000 c	2108.31 IV
3	1492.93 II		2605.08 II	6	4671.65 II	1700 h	2195.54 II
5	1492.97 II	2	2657.29 II	2	4671.70 II	1000	2236.14 III
1	1493.04 II	3	2657.30 II	3	4678.06 II	2000	2236.22 III
	1555. II		2674.46 II	1	4678.29 II	95	2276.94 II
3	1653.08 II		2728.24 II		4760. I	190	2297.41 II
5	1653.13 II	5	2728.29 II		4763. II	1300	2392.19 II
1	1653.21 II	2	2728.32 II		4788.36 II	120	2399.14 II
	1681.66 II	3	2730.47 II		4843.0 II	80	2419.21 II
	1755.33 II	1	2730.55 II	4	4881.32 II	130	2459.64 II
	2009. II	5	2741.20 I	4	4881.39 II	370	2536.95 II
	2039. I		2766.99 II	1	4881.49 II	930	2571.23 II
	2068. II		2790.31 II	8	4971.66 I	1700	2578.79 II
	2131. II		2801. I	8	4971.75 I	4500 c	2603.35 III

Line Spectra of the Elements (continued): Lutetium—Magnesium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
1800	2613.40	II	1600	4184.25	II	150	857.29	IV	3	2646.21	I
18000	2615.42	II	150	4277.50	I	50	919.03	IV	4	2649.06	I
1800	2619.26	II	250	4281.03	I	250	1037.41	IV	8	2660.76	II
2700	2657.80	II	330 d	4295.97	I	300	1210.99	IV	8	2660.82	II
570 h	2685.08	I	150	4309.57	I	300	1342.19	IV	6	2668.12	I
4200	2701.71	II	190 c	4430.48	I	800	1346.57	IV	8	2669.55	I
180 d	2719.09	I	190	4450.81	I	300	1346.68	IV	10	2672.46	I
480 h	2728.95	I	3300	4518.57	I	600	1352.05	IV	3	2693.72	I
3600	2754.17	II	100 h	4648.21	I	900	1384.46	IV	5	2695.18	I
750 h	2765.74	I	1000	4658.02	I	500	1385.77	IV	6	2698.14	I
2000	2772.55	III	85 h	4659.03	I	800	1387.53	IV	8	2731.99	I
2700	2796.63	II	150	4785.42	II	300	1404.68	IV	10	2733.49	I
270 c	2834.35	II	85	4815.05	I	1000	1409.36	IV	12	2736.53	I
330 h	2845.13	I	460	4904.88	I	500	1437.53	IV	5	2765.22	I
3000	2847.51	II	180	4942.34	I	1000	1437.64	IV	7	2768.34	I
570 h	2885.14	I	800	4994.13	II	300	1447.42	IV	38	2776.69	I
6300	2894.84	II	800	5001.14	I	300	1459.54	IV	32	2778.27	I
4500	2900.30	II	140	5134.05	I	400	1459.62	IV	90	2779.83	I
300	2903.05	I	2700	5135.09	I	400	1481.51	IV	8	2781.29	I
9000	2911.39	II	170	5196.61	I	350	1490.45	IV	32	2781.42	I
270 h	2949.73	I	500	5402.57	I	300	1495.50	IV	36	2782.97	I
1200	2951.69	II	140 c	5421.90	I	300	1607.11	IV	1000	2795.53	II
4200	2963.32	II	100	5437.88	I	5	1668.43	I	600	2802.70	II
2400	2969.82	II	2100	5476.69	II	500	1683.02	IV	3	2809.76	I
1800	2989.27	I	550	5736.55	I	10	1683.41	I	2	2811.11	I
3000	3020.54	II	80	5800.59	I	400	1698.81	IV	1	2811.78	I
2100	3056.72	II	690 cw	5983.9	II	15	1707.06	I	12	2846.72	I
1000	3057.86	III	140	5997.13	I	40	1734.84	II	12	2846.75	I
7500	3077.60	II	1400	6004.52	I	50	1737.62	II	14	2848.34	I
390	3080.11	I	440	6055.03	I	20	1747.80	I	14	2848.42	I
5100 h	3081.47	I	150	6159.94	II	40	1750.65	II	16	2851.65	I
3000	3118.43	I	600	6198.13	III	50	1753.46	II	16	2851.66	I
2400	3171.36	I	160	6199.66	II	30	1827.93	I	6000	2852.13	I
260	3191.80	II	2100	6221.87	II	300	1844.17	IV	2	2902.92	I
1400	3198.12	II	80	6235.36	II	9	2025.82	I	4	2906.36	I
4800	3254.31	II	160	6242.34	II	25	2064.90	III	3	2915.45	I
3800	3278.97	I	70 h	6345.35	I	20	2091.96	III	10	2936.74	I
7600	3281.74	I	1100	6463.12	II	20	2177.70	III	12	2938.47	I
6200	3312.11	I	29	6477.67	I	3	2329.58	II	2	2942.00	I
7600	3359.56	I	55 c	6523.18	I	20	2395.15	III	13	2942.00	I
6200	3376.50	I	35 cw	6611.28	II	6	2449.57	II	20	3091.08	I
950	3385.50	I	23 c	6677.14	I	1	2557.23	I	22	3092.99	I
160 h	3391.55	I	30 c	6793.77	I	1	2560.94	I	14	3096.90	I
1400	3396.82	I	45	6917.31	I	1	2562.26	I	9	3104.71	II
4100	3397.07	II	23	7031.24	I	1	2564.94	I	8	3104.81	II
4800	3472.48	II	45	7125.84	II	1	2570.91	I	6	3168.98	II
8300 c	3507.39	II	14 ch	7237.98	I	1	2572.25	I	6	3172.71	II
1600	3508.42	I	11 c	7441.52	I	2	2574.94	I	7	3175.78	II
4800	3554.43	II	9 c	8178.16	I	1	2577.89	I	2	3197.62	I
4800	3567.84	I	17	8382.08	I	1	2580.59	I	17	3329.93	I
340	3596.34	I	35	8459.19	II	1	2584.22	I	6	3332.15	I
800	3623.99	II	10 d	8478.50	I	2	2585.56	I	9	3336.68	I
680	3636.25	I	29 c	8508.08	I	3	2588.28	I	7	3535.04	II
2600	3647.77	I	35 c	8610.98	I	1	2591.89	I	8	3538.86	II
110	3756.70	I	Magnesium Mg Z = 12		1	2593.23	I	7	3549.52	II	
110	3756.79	I			2	2595.97	I	8	3553.37	II	
150	3800.67	I	400	146.95	IV	2	2602.50	I	140	3829.30	I
2700	3841.18	I	20	186.51	III	4	2603.85	I	300	3832.30	I
530	3876.65	II	20	187.20	III	5	2606.62	I	500	3838.29	I
50	3918.86	I	10	188.53	III	1	2613.36	I	8	3848.24	II
480	3968.46	I	100	231.73	III	2	2614.73	I	7	3850.40	II
670	4054.45	I	80	234.26	III	3	2617.51	I	3	3878.31	I
310	4122.49	I	35	276.58	V	3	2628.66	I	3	3895.57	I
3100	4124.73	I	4000	320.99	IV	6	2630.05	I	4	3903.86	I
150 c	4131.79	I	3000	323.31	IV	8	2632.87	I	6	3938.40	I
460	4154.08	I	30	353.09	V	2	2644.80	I	8	3986.75	I

Line Spectra of the Elements (continued): Magnesium—Manganese

Intensity			Wavelength/Å			Intensity			Wavelength/Å			Intensity			Wavelength/Å		
10	4057.50	I	17	9429.81	I	80	1795.65	IV	50	2427.72	II						
15	4167.27	I	19	9432.76	I	80	1795.79	IV	30	2427.94	II						
20	4351.91	I	20	9438.78	I	30	1853.27	II	30	2437.37	II						
9	4384.64	II	12	9631.89	II	20	1857.92	II	20	2437.84	II						
10	4390.59	II	11	9632.43	II	50	1902.95	II	30	2452.49	II						
8	4428.00	II	15	9953.20	I	20	1907.84	II	50	2499.00	II						
9	4433.99	II	15	9983.20	I	75	1910.25	IV	30	2507.60	II						
14	4481.16	II	17	9986.47	I	30	1911.41	II	20	2516.60	II						
13	4481.33	II	18	9993.21	I	20 d	1914.68	II	30	2516.74	II						
28	4571.10	I	14	10092.16	II	100	1915.10	II	20	2521.66	II						
10	4730.03	I	35	10811.08	I	20	1918.64	II	20	2530.72	II						
7	4851.10	II	11	10914.23	II	30	1919.64	II	20	2531.80	II						
75	5167.33	I	10	10951.78	II	80	1921.25	II	50	2532.78	II						
220	5172.68	I	25	10953.32	I	20	1923.07	II	50	2533.33	II						
400	5183.61	I	27	10957.30	I	20	1923.34	II	30	2534.10	II						
8	5264.21	II	28	10965.45	I	30	1925.52	II	80	2534.22	II						
7	5264.37	II	15	11032.10	I	50	1926.59	II	100	2535.66	II						
9	5401.54	II	14	11033.66	I	30	1931.40	II	30	2535.98	II						
6	5528.41	I	45	11828.18	I	500	1941.28	III	100	2537.92	II						
30	5711.09	I	30	12083.66	I	800	1943.21	III	50	2541.11	II						
10	6318.72	I	28	14877.62	I	20	1945.15	II	80	2542.92	II						
9	6319.24	I	35	15024.99	I	20	1947.93	II	50	2543.45	II						
7	6319.49	I	30	15040.24	I	20	1950.14	II	100	2548.75	II						
10	6346.74	II	25	15047.70	I	500	1952.36	III	50	2551.85	II						
9	6346.96	II	10	15765.84	I	1000	1952.52	III	30	2553.27	II						
11	6545.97	II	30	17108.66	I	30	1953.23	II	75	2556.57	II						
7	6781.45	II	5	26392.90	I	20 d	1954.81	II	30	2556.89	II						
8	6787.85	II	Manganese Mn Z = 25			30	1959.25	II	95	2558.59	II						
7	6812.86	II				20	1969.24	II	30	2559.41	II						
8	6819.27	II	600	410.30	V	500	1978.95	III	150	2563.65	II						
10	7193.17	I	600	410.60	V	30	1994.23	II	30	2565.22	II						
10	7291.06	I	600	415.62	V	9700	1996.06	I	580	2572.76	I						
12	7387.69	I	650	415.98	V	14000	1999.51	I	480	2575.51	I						
20	7657.60	I	600	428.59	V	18000	2003.85	I	12000	2576.10	II						
19	7659.15	I	600	435.67	V	1000 w	2027.83	III	550	2584.31	I						
17	7659.90	I	1000	441.72	V	500 w	2028.14	III	30	2588.97	II						
15	7691.55	I	850	442.49	V	50	2037.31	II	45	2589.71	II						
12	7877.05	II	60	579.79	IV	40	2037.64	II	250	2592.94	I						
13	7896.37	II	60	581.44	IV	40	2039.97	II	6200	2593.73	II						
10	8098.72	I	60	581.65	IV	500	2049.68	III	250	2595.76	I						
9	8115.22	II	60	585.21	IV	500	2066.38	III	95	2598.90	II						
8	8120.43	II	90	1242.25	IV	1000	2069.02	III	30	2602.72	II						
10	8209.84	I	90	1244.50	IV	30	2076.21	II	45	2603.72	II						
20	8213.03	I	95	1251.93	IV	900	2077.38	III	4300	2605.69	II						
10	8213.99	II	95	1257.28	IV	800	2084.23	III	190	2610.20	II						
11	8234.64	II	90	1264.41	IV	600	2090.05	III	500	2618.14	II						
10	8310.26	I	500	1283.58	III	1500	2092.16	I	140	2622.90	I						
15	8346.12	I	400	1287.59	III	500	2094.78	III	150	2624.04	I						
10	8710.18	I	300	1291.62	III	20	2097.46	II	40	2624.80	II						
12	8712.69	I	1000	1360.72	III	500	2097.93	III	200	2625.58	II						
13	8717.83	I	800	1365.20	III	500	2099.97	III	190	2632.35	II						
10	8734.99	II	500 h	1609.17	III	20	2102.50	II	130	2638.17	II						
17	8736.02	I	1000	1614.14	III	1700	2109.58	I	80	2639.84	II						
11	8745.66	II	2000	1620.60	III	30	2113.96	II	27	2650.99	II						
14	8806.76	I	500	1633.80	III	1000	2169.78	III	60	2655.91	II						
10	8824.32	II	80	1667.00	IV	700	2174.15	III	30	2666.77	II						
11	8835.08	II	80	1698.30	IV	900	2176.87	III	30	2667.03	II						
20	8923.57	I	20	1726.47	II	800	2181.86	III	110	2672.59	II						
10	8997.16	I	30	1732.70	II	800	2184.87	III	55	2673.37	II						
14	9218.25	II	50	1733.55	II	290	2208.81	I	55	2674.43	II						
13	9244.27	II	40	1734.49	II	540	2213.85	I	45	2680.34	II						
12	9246.50	I	30	1737.93	II	900	2220.55	III	30	2680.68	II						
30	9255.78	I	20	1740.16	II	770	2221.84	I	30	2681.25	II						
10	9327.54	II	20	1742.00	II	1000	2227.42	III	55	2684.55	II						
10	9340.54	II	85	1742.10	IV	20	2373.36	II	55	2685.94	II						
25	9414.96	I	85	1766.27	IV	20	2427.38	II	110	2688.25	II						

Line Spectra of the Elements (continued): Manganese—Mercury 198

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
27	2693.19	II	200	3330.78	II	730	4063.53	I	40	5481.40	I
55	2695.36	II	720	3441.99	II	290	4070.28	I	30	5505.87	I
27	2698.97	II	50	3460.03	II	730	4079.24	I	50	5516.77	I
85	2701.00	II	360	3460.33	II	730	4079.42	I	40	5537.76	I
50	2701.17	II	360 h	3474.04	II	1100	4082.94	I	21	5551.98	I
160	2701.70	II		3474.13	II	1100	4083.63	I	200	5946.65	III
100	2703.98	II	290	3482.91	II	200	4110.90	I	140	6013.50	I
130	2705.74	II	180	3488.68	II	150	4131.12	I	200	6016.64	I
80	2707.53	II	140	3495.84	II	120	4135.04	I	290	6021.80	I
110	2708.45	II	50	3496.81	II	150	4176.60	I	200	6231.21	III
45	2709.96	II	100	3497.54	II	120	4189.99	I	17	6440.97	I
80	2710.33	II	360	3531.85	I	370	4235.14	I	24	6491.71	I
110	2711.58	II	1100	3532.12	I	510	4235.29	I	14 h	6942.52	I
30	2716.80	II	1300	3547.80	I	190	4239.72	I	12	6989.96	I
30	2717.53	II	1100	3548.03	I	290	4257.66	I	14	7069.84	I
30	2719.01	II	390	3548.20	I	290	4265.92	I	12	7184.25	I
50	2719.74	II	2200	3569.49	I	270	4281.10	I	24 h	7283.82	I
30	2722.10	II	720	3569.80	I	50	4323.63	II	35 h	7302.89	I
30	2724.46	II	1400	3577.88	I	350	4414.88	I	50	7326.51	I
55	2728.61	II	720	3586.54	I	210	4436.35	I	12	7680.20	I
6200	2794.82	I	290	3595.12	I	800	4451.59	I	12 h	8672.06	I
5100	2798.27	I	150	3601.72	III	160	4453.00	I	12 h	8701.05	I
220	2799.84	I	420	3607.54	I	130	4455.01	I	17 h	8703.76	I
3700	2801.06	I	420	3608.49	I	160	4455.32	I	30 h	8740.93	I
110	2809.11	I	360	3610.30	I	110	4455.82	I	Mercury 198		
60	2815.02	II	290	3619.28	I	210	4457.55	I	Hg Z = 80		
30	2816.33	II	220	3623.79	I	270	4458.26	I	80	1250.564	I
60	2870.08	II	140	3629.74	I	150	4461.08	I	8	1259.242	I
30	2872.94	II	100	3660.40	I	510	4462.02	I	100	1268.825	I
80	2879.49	II	280	3693.67	I	290	4464.68	I	5	1307.751	I
70	2886.68	II	180	3696.57	I	200	4470.14	I	20	1402.619	I
160	2889.58	II	210	3706.08	I	130	4472.79	I	10	1435.503	I
55	2892.39	II	130	3718.93	I	170	4490.08	I	1000	1849.492	I
50	2898.70	II	130	3731.93	I	240	4498.90	I	60	2262.210	II
80	2900.16	II	260	3790.22	I	240	4502.22	I	20	2302.065	I
140 h	2914.60	I	110	3800.55	I	160	4709.72	I	20	2345.440	I
190 h	2925.57	I	3200	3806.72	I	180	4727.48	I	100	2378.325	I
1100	2933.06	II	700	3809.59	I	130	4739.11	I	20	2380.004	I
1500	2939.30	II	2100	3823.51	I	1000	4754.04	I	40	2399.349	I
250 h	2940.39	I	390	3823.89	I	180	4761.53	I	20	2399.729	I
1900	2949.20	II	200	3829.68	I	750	4762.38	I	20	2446.900	I
30	3019.92	II	480	3833.86	I	300	4765.86	I	15	2464.064	I
55	3031.06	II	1300	3834.36	I	500	4766.43	I	40	2481.999	I
30	3035.35	II	350	3839.78	I	940	4783.42	I	30	2482.713	I
330	3044.57	I	670	3841.08	I	1000	4823.52	I	40	2483.821	I
120	3045.59	I	350	3843.98	I	19	5004.91	I	90	2534.769	I
200	3047.04	I	120	3926.47	I	30	5074.79	I	15000	2536.506	I
30	3050.65	II	130	3982.58	I	200	5079.20	III	25	2563.861	I
250	3054.36	I	150	3985.24	I	150	5100.03	III	25	2576.290	I
140	3062.12	I	190	3986.83	I	60	5117.94	I	250	2652.043	I
170	3066.02	I	150	3987.10	I	50	5150.89	I	400	2653.683	I
170	3070.27	I	1500	4018.10	I	50	5196.59	I	100	2655.130	I
160	3073.13	I	150	4026.44	I	85	5255.32	I	50	2698.831	I
140 h	3178.50	I	27000	4030.76	I	160	5341.06	I	80	2752.783	I
220	3212.88	I	19000	4033.07	I	19	5349.88	I	20	2759.710	I
1000	3228.09	I	11000	4034.49	I	95	5377.63	I	40	2803.471	I
300	3230.72	I	1500	4035.73	I	95	5394.67	I	30	2804.438	I
850	3236.78	I	5600	4041.36	I	50	5399.49	I	750	2847.675	II
330	3243.78	I	210 d	4045.13	I	95	5407.42	I	50	2856.939	I
650	3248.52	I	1100	4048.76	I	35	5413.69	I	150	2893.598	I
100	3251.14	I	150	4055.21	I	85	5420.36	I	150	2916.227	II
310	3252.95	I	1900	4055.54	I	35	5432.55	I	60	2925.413	I
310	3256.14	I	210	4057.95	I	150	5454.07	III	1200	2967.283	I
220	3258.41	I	1100	4058.93	I	12	5457.47	I	300	3021.500	I
180	3260.23	I	150	4059.39	I	60	5470.64	I	120	3023.476	I
180	3264.71	I	730	4061.74	I	200	5474.68	III	30	3025.608	I

Line Spectra of the Elements (continued): Mercury 198—Mercury

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
50	3027.490	I	9	1681.40	III	3	2670.49	III	100	4398.62	II
400	3125.670	I	100	1702.73	II	5	2674.91	I	15	4470.58	III
320	3131.551	I	100	1707.40	II	50	2698.83	I	12	4552.84	III
320	3131.842	I	120	1727.18	II	50	2699.38	I	90	4660.28	II
80	3341.481	I	250	1732.14	II	80	2705.36	II	50	4797.01	III
2800	3650.157	I	15	1759.75	III	70	2724.43	III	80	4855.72	II
300	3654.839	I	20	1775.68	I	80	2752.78	I	10	4869.85	III
80	3662.883	I	40	1783.70	II	20	2759.71	I	5	4883.00	I
240	3663.281	I	30	1796.22	II	6	2769.22	III	5	4889.91	I
30	3701.432	I	200	1796.90	II	40	2803.46	I	80	4916.07	I
35	3704.170	I	60	1798.74	II	30	2804.43	I	5	4970.37	I
30	3801.660	I	30	1803.89	II	2	2805.34	I	80	4973.57	III
20	3901.867	I	40	1808.29	II	2	2806.77	I	5	4980.64	I
60	3906.372	I	400	1820.34	II	150	2814.93	II	20	5102.70	I
200	3983.839	II	5	1832.74	I	3	2844.76	III	40	5120.64	I
1800	4046.572	I	1000	1849.50	I	750	2847.68	II	100	5128.45	II
150	4077.838	I	160	1869.23	II	50	2856.94	I	20	5137.94	I
40	4108.057	I	300	1870.55	II	150	2893.60	I	30	5210.82	III
250	4339.224	I	200	1875.54	II	150	2916.27	II	20	5290.74	I
400	4347.496	I	1	1894.77	III	60	2925.41	I	5	5316.78	I
4000	4358.337	I	20	1900.28	II	150	2935.94	II	60	5354.05	I
80	4916.068	I	30	1927.60	II	400	2947.08	II	30	5384.63	I
1100	5460.753	I	300	1942.27	II	1200	2967.28	I	1100	5460.74	I
160	5675.922	I	100	1972.94	II	300	3021.50	I	30	5549.63	I
240	5769.598	I	200	1973.89	II	120	3023.47	I	160	5675.86	I
280	5790.663	I	150	1987.98	II	30	3025.61	I	6	5695.71	III
20	6072.713	I	90	2026.97	II	50	3027.49	I	240	5769.60	I
30	6234.402	I	90	2052.93	II	15	3090.05	III	100	5789.66	I
160	6716.429	I	70	2148.00	II	400	3125.67	I	280	5790.66	I
250	6907.461	I	5	2247.55	I	320	3131.55	I	140	5803.78	I
240	11287.407	I	60	2262.23	II	320	3131.84	I	60	5859.25	I
Mercury			20	2302.06	I	400	3208.20	II	60	5871.73	II
Hg Z = 80			7	2314.15	III	400	3264.06	II	20	5871.98	I
3	621.44	III	15	2323.20	I	5	3283.02	III	20	6072.72	I
2	679.68	III	5	2340.57	I	12	3312.28	III	1000	6149.50	II
2	878.59	III	20	2345.43	I	80	3341.48	I	25	6220.35	III
1	886.48	III	20	2352.48	I	100	3385.25	II	30	6234.40	I
400	893.08	II	100	2378.32	I	8	3389.01	III	35	6418.98	III
300	915.83	II	20	2380.00	I	5	3450.77	III	40	6501.38	III
150	923.39	II	4	2380.55	III	400	3451.69	II	80	6521.13	II
200	940.80	II	40	2399.38	I	3	3500.35	III	10	6584.26	III
100	962.74	II	20	2399.73	I	4	3538.88	III	6	6610.12	III
50	969.13	II	10	2400.49	I	200	3549.42	II	30	6709.29	III
1	988.89	III	60	2407.35	II	5	3557.24	III	160	6716.43	I
2	1009.29	III	50	2414.13	II	2800	3650.15	I	250	6907.52	I
5	1068.03	III	8	2431.65	III	300	3654.84	I	250	7081.90	I
800	1099.26	II	5	2441.06	I	80	3662.88	I	200	7091.86	I
2	1161.95	III	20	2446.90	I	240	3663.28	I	40	7346.37	II
80	1250.58	I	15	2464.06	I	30	3701.44	I	100	7485.87	II
8	1259.24	I	5	2480.56	III	35	3704.17	I	12	7517.46	III
100	1268.82	I	40	2482.00	I	30	3801.66	I	20	7728.82	I
5	1307.75	I	30	2482.72	I	15	3803.51	III	7	7808.10	III
300	1307.93	II	40	2483.82	I	100	3806.38	II	100	7944.66	II
400	1321.71	II	7	2484.50	III	20	3901.87	I	25	7946.75	III
400	1331.74	II	90	2534.77	I	60	3906.37	I	50	7984.51	III
80	1350.07	II	15000	2536.52	I	100	3918.92	II	5	8151.64	III
200	1361.27	II	25	2563.86	I	200	3983.96	II	2000	10139.75	I
20	1402.62	I	25	2576.29	I	1800	4046.56	I	240	11287.40	I
200	1414.43	I	5	2578.91	I	150	4077.83	I	120	13209.95	I
10	1435.51	I	2	2612.92	III	40	4108.05	I	140	13426.57	I
15	1619.46	II	4	2617.97	III	70	4122.07	III	60	13468.38	I
120	1623.95	II	15	2625.19	I	10	4140.34	III	80	13505.58	I
20	1628.25	II	5	2639.78	I	100	4216.74	III	500	13570.21	I
150	1649.94	II	250	2652.04	I	250	4339.22	I	450	13673.51	I
50	1653.64	II	400	2653.69	I	400	4347.49	I	200	13950.55	I
200	1672.41	II	100	2655.13	I	4000	4358.33	I	500	15295.82	I

Line Spectra of the Elements (continued): Mercury—Molybdenum

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
100	16881.48	I	200	2506.19	III	290	2903.07	II	1300	3344.75	I
400	16920.16	I	440	2538.46	II	80	2907.12	II	95	3346.40	II
300	16942.00	I	330	2542.67	II	600	2909.12	II	1600	3358.12	I
500	17072.79	I	80	2558.88	II	1100	2911.92	II	950	3363.78	I
400	17109.93	I	85	2564.34	II	120	2918.83	II	950	3379.97	I
20	17116.75	I	250	2593.70	II	1300	2923.39	II	1900	3384.62	I
20	17198.67	I	250	2602.80	II	140	2924.32	II	130	3395.36	II
20	17213.20	I	400	2616.78	I	1100	2930.50	II	640	3404.34	I
70	17329.41	I	440	2629.85	I	800	2934.30	II	1300	3405.94	I
30	17436.18	I	330	2636.67	II	95	2940.10	II	640	3437.22	I
50	18130.38	I	720	2638.76	II	110	2941.22	II	130	3446.08	II
40	19700.17	I	410	2640.99	I	150	2944.82	II	3200	3447.12	I
	22493.28	I	600	2644.35	II	140	2946.69	II	640	3449.07	I
250	23253.07	I	370	2646.49	II	95	2947.28	II	950	3456.39	I
	32148.06	I	640	2649.46	I	125	2947.32	III	640	3460.78	I
	36303.03	I	480	2653.35	II	95	2955.84	II	800	3504.41	I
Molybdenum			560 h	2655.03	I	240	2956.06	II	560	3508.12	I
Mo Z = 42			640	2660.58	II	70	2956.90	II	480	3521.41	I
50	867.92	IV	720	2672.84	II	95	2960.24	II	640	3537.28	I
100	884.19	IV	250	2673.27	II	250	2963.79	II	520	3558.10	I
60	886.05	IV	1000	2679.85	I	210	2965.27	II	400	3563.14	I
50	891.74	IV	95	2681.36	II	70	2971.91	II	1400	3581.89	I
100	1169.33	III	640	2683.23	II	250	2972.61	II	1400	3624.46	I
100	1254.93	III	880	2684.14	II	80	2975.40	II	1000	3635.43	I
100	1258.52	III	560	2687.99	II	95	2992.84	II	400	3657.35	I
100	1262.21	III	480	2701.42	II	95	3027.77	II	540	3664.81	I
100	1263.74	III	190	2713.51	II	100	3060.78	II	590	3672.82	I
100	1274.37	III	290	2717.35	II	800	3064.28	I	1300	3680.60	I
100	1276.40	III	85	2726.97	II	250	3065.04	II	65	3688.31	II
200	1277.40	III	140	2729.68	II	800	3074.37	I	180	3692.64	II
200	1277.58	III	80	2730.20	II	85	3077.66	II	1400	3694.94	I
200	1278.40	III	330	2732.88	II	800	3085.62	I	500	3727.69	I
150	1281.90	III	160	2736.96	II	270	3087.62	II	80	3744.37	II
150	1283.60	III	80 h	2737.88	II	190	3092.07	II	29000	3798.25	I
100	1854.73	III	290	2746.30	II	560	3094.66	I	520	3826.70	I
80	1926.26	IV	110	2756.07	II	560	3101.34	I	940	3828.87	I
100	1929.24	IV	220	2763.62	II	1400	3112.12	I	1700	3833.75	I
80	1971.06	IV	240	2769.76	II	290	3122.00	II	29000	3864.11	I
70	2010.92	IV	160	2773.78	II	14000	3132.59	I	580	3869.08	I
19000	2015.11	II	190	2774.39	II	110	3138.72	II	580	3886.82	I
40000	2020.30	II	1700	2775.40	II	220	3152.82	II	19000	3902.96	I
21000	2038.44	II	65	2777.86	II	55	3155.64	II	65	3941.48	II
17000	2045.98	II	880	2780.04	II	6000	3158.16	I	1400	4062.08	I
50	2060.38	IV	400	2784.99	II	8700	3170.35	I	2300	4069.88	I
4800	2081.68	II	100	2807.74	III	95	3172.03	II	1300	4081.44	I
2400	2089.52	II	400	2807.76	II	160	3172.74	II	940	4084.38	I
2200	2092.50	II	1700	2816.15	II	120 d	3187.59	II	730	4107.47	I
4000	2093.11	II	220	2817.44	II	7600	3193.97	I	630	4120.10	I
2700	2100.84	II	80	2827.74	II	880	3205.88	I	2900	4143.55	I
1500	2104.29	II	80	2834.39	II	3000	3208.83	I	480	4185.82	I
1400	2108.02	II	80	2835.33	II	560	3215.07	I	2500	4188.32	I
100	2184.37	III	160	2842.15	II	880	3228.22	I	1500	4232.59	I
100	2211.02	III	1700	2848.23	II	600	3229.79	I	890	4276.91	I
400	2269.69	II	370	2853.23	II	1100	3233.14	I	1200	4277.24	I
150	2269.71	III	370	2863.81	II	950	3237.08	I	1400	4288.64	I
200	2294.97	III	220	2866.69	II	65	3240.71	II	680	4292.13	I
160	2304.25	II	1700	2871.51	II	950	3256.21	I	890	4293.21	I
160	2306.97	II	85	2872.88	II	480	3264.40	I	840	4326.14	I
150	2330.93	III	220	2879.05	II	800	3270.90	I	1900	4381.64	I
110	2332.12	II	65	2888.15	II	200	3271.69	III	2500	4411.57	I
190	2341.59	II	1300	2890.99	II	1100	3289.02	I	990	4434.95	I
100	2359.76	III	95	2891.28	II	950	3290.82	I	480	4457.36	I
110	2389.20	II	190	2892.81	II	190	3292.31	II	630	4474.56	I
140	2403.61	II	950	2894.45	II	100	3313.62	II	400	4536.80	I
120	2413.01	II	140	2897.63	II	190	3320.90	II	460	4626.47	I
85	2498.28	II	70	2900.80	II	640	3323.95	I	640	4707.26	I

Line Spectra of the Elements (continued): Molybdenum—Neodymium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
700	4731.44	I	50	5869.33	I	780	3723.50	II	2000	3951.16	II
770	4760.19	I	820	5888.33	I	410	3724.87	II	810	3952.20	II
410	4819.25	I	50 h	5893.38	I	710	3728.13	II	590	3958.00	II
410	4830.51	I	160 h	5928.88	I	470	3730.58	II	510	3962.21	II
180	5014.60	I	35	6025.49	I	1000 d	3735.54	II	1400	3963.12	II
80	5029.00	I	1300	6030.66	I	440	3737.10	II	1100	3973.30	II
65	5030.78	I	40	6101.87	I	1000	3738.06	II	740	3973.69	II
100	5047.71	I	40	6357.22	I	580	3752.49	II	740	3976.85	II
50	5055.00	I	35	6401.07	I	510	3757.82	II	740	3979.49	II
200	5059.88	I	100	6424.37	I	930	3758.95	II	470	3986.25	II
100	5080.02	I	230	6619.13	I	930	3763.47	II	1400	3990.10	II
100	5096.65	I	50	6650.38	I	510	3769.65	II	1000	3991.74	II
130	5097.52	I	110	6733.98	I	1400	3775.50	II	1100	3994.68	II
130	5109.71	I	50	6746.27	I	710	3779.47	II	410	4000.50	II
80	5114.97	I	35	6753.97	I	580	3780.40	II	540	4004.02	II
150	5145.38	I	40	6838.88	I	510	3781.32	II	410	4007.43	II
110	5147.39	I	35	6914.01	I	2400	3784.25	II	3700	4012.25	II
80	5163.19	I	110	7109.87	I	370	3801.12	II	540	4012.70	II
100	5167.76	I	150	7242.50	I	1200	3803.47	II	1000	4020.87	II
160 d	5171.08	I	40	7245.85	I	2500	3805.36	II	1000	4021.34	II
230 h	5172.94	I	40	7391.36	I	470	3807.23	II	1000	4021.78	II
160 h	5174.18	I	140	7485.74	I	540	3808.77	II	1200	4023.00	II
110	5200.17	I	27	7720.77	I	440	3809.06	II	410	4030.47	II
50	5200.74	I	40 h	8328.44	I	580	3810.49	II	1200	4031.82	II
50	5211.86	I	45 h	8389.32	I	710	3814.73	II	3000	4040.80	II
80	5219.40	I	45 h	8483.39	I	410	3822.47	II	410	4043.59	II
65	5231.06	I	Neodymium			1200	3826.42	II	410	4048.81	II
100	5234.26	I	Nd Z = 60			540	3828.85	II	850	4051.15	II
460 h	5238.20	I	75	2764.98	I	440	3829.16	II	850	4059.96	II
230 h	5240.88	I	80	2993.20	II	510	3830.47	II	4700	4061.09	II
110 h	5242.81	I	95	3007.97	II	740	3836.54	II	1100	4069.28	II
100	5245.51	I	95	3014.19	II	1700	3838.98	II	710	4075.12	II
150	5259.04	I	95	3018.35	II	410 d	3841.82	II	470	4075.28	II
65	5261.14	I	140	3056.71	II	1700 d	3848.24	II	470	4080.23	II
65	5279.65	I	130	3069.73	II	1500	3848.52	II	1400	4109.08	II
210	5280.86	I	160	3075.38	II	470	3850.22	II	2500	4109.46	II
55	5292.08	I	240	3092.92	II	2400 d	3851.66	II	510	4110.48	II
55	5295.47	I	260	3115.18	II	3700 d	3863.33	II	410	4123.88	II
55	5313.89	I	290	3133.60	II	850	3869.07	II	470	4133.36	II
80	5354.88	I	220	3134.90	II	470	3875.87	II	510	4135.33	II
65	5356.48	I	170	3141.46	II	1100	3878.58	II	3000	4156.08	II
560 hl	5360.56	I	170	3142.44	II	1000	3879.55	II	510	4156.26	II
110 hl	5364.28	I	150	3203.47	II	780	3880.38	II	410	4168.00	II
65	5394.52	I	220	3259.24	II	1200	3880.78	II	810	4175.61	II
50	5400.47	I	220	3265.12	II	540	3887.87	II	2400	4177.32	II
55	5435.68	I	320	3275.22	II	1300	3889.93	II	640	4179.59	II
65	5437.75	I	290	3285.10	II	1300	3890.58	II	470	4205.60	II
50	5501.54	I	410	3328.28	II	1300	3890.94	II	470	4211.29	II
7800	5506.49	I	320	3353.59	II	580	3891.51	II	440	4227.73	II
5200	5533.05	I	410	3560.75	II	470	3892.06	II	1300	4232.38	II
50	5543.12	I	470	3587.51	II	810	3894.63	II	2000	4247.38	II
55	5556.28	I	370	3615.82	II	440	3897.63	II	850	4252.44	II
2500	5570.45	I	410	3653.15	II	2000	3900.21	II	410	4261.84	II
100	5610.93	I	470	3662.26	II	1300	3901.84	II	470	4282.44	II
330	5632.47	I	540	3665.18	II	1700	3905.89	II	710	4284.52	II
50	5634.86	I	540	3672.36	II	510	3907.84	II	5400	4303.58	II
230	5650.13	I	580	3673.54	II	2000	3911.16	II	470	4314.52	II
55	5674.47	I	1200	3685.80	II	850	3912.23	II	1100	4325.76	II
460	5689.14	I	440	3687.30	II	440	3915.13	II	510	4327.93	II
80	5705.72	I	410	3689.69	II	610	3915.95	II	540	4338.70	II
210	5722.74	I	410	3697.56	II	1100	3920.96	II	680	4351.29	II
620	5751.40	I	470	3713.70	II	510	3927.10	II	850	4358.17	II
520	5791.85	I	640 d	3714.73	II	610	3934.82	II	470 d	4374.93	II
55 h	5849.73	I	470	3715.68	II	410	3936.11	II	710	4385.66	II
50 h	5851.52	I	410	3718.54	II	510	3938.86	II	540	4400.83	II
520	5858.27	I	410	3721.35	II	2000	3941.51	II	510	4411.06	II

Line Spectra of the Elements (continued): Neodymium—Neon

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
580	4446.39	II	55	6310.49	I	100	208.48	IV	80	541.13	IV
1400	4451.57	II	65	6385.20	II	100	208.73	IV	100	542.07	IV
740	4462.99	II	45	6630.14	I	80	208.90	IV	150	543.89	IV
410	4501.82	II	45	6650.57	II	150	212.56	IV	400	568.42	V
250	4516.36	II	40	6740.11	II	140	223.24	IV	250	569.76	V
340	4541.27	II	40	6900.43	II	120	223.60	IV	500	569.83	V
340	4542.61	II	35	7037.30	II	140	234.32	IV	250	572.11	V
340	4563.22	II	40	7066.89	II	120	234.70	IV	800	572.34	V
300	4621.94	I	29	7129.35	II	20	251.14	III	35	587.213	I
510	4634.24	I	24	7189.42	II	20	251.56	III	35	589.179	I
340	4641.10	I	20	7192.01	II	20	251.73	III	35	589.911	I
250	4645.77	II	15	7236.54	II	40	267.06	III	70	591.830	I
300	4649.67	I	12	7316.81	II	40	267.52	III	100	595.920	I
310	4683.45	I	10	7406.62	II	20	267.71	III	75	598.706	I
470	4706.54	II	10	7418.18	II	40	283.18	III	35	598.891	I
240	4719.02	I	12	7511.16	II	160	283.21	III	70	600.036	I
240	4811.34	II	17	7513.73	II	110	283.69	III	170	602.726	I
350	4825.48	II	12	7528.99	II	40	283.89	III	170	615.628	I
280	4859.02	II	10	7538.26	II	220	301.12	III	170	618.672	I
350	4883.81	I	12	7696.56	II	220	313.05	III	120	619.102	I
220	4890.70	II	10	7750.95	II	220	313.68	III	200	626.823	I
240	4891.07	I	10	7808.47	II	40	313.95	III	200	629.739	I
280	4896.93	I	12	7863.04	II	90	352.956	I	1000	735.896	I
210	4901.84	I	12	7917.01	II	60	354.962	I	400	743.720	I
330	4920.68	II	12	7958.95	I	50	357.83	IV	60	993.88	I
470	4924.53	I	12	7965.73	II	400	357.96	V	70	1068.65	I
260	4944.83	I	15	7982.09	II	500	358.47	V	90	1131.72	I
290	4954.78	I	12	7982.68	II	200	358.72	IV	100	1131.85	II
290	4959.13	II	12	8000.76	II	500	359.38	V	90	1229.83	I
250	4989.94	II	10	8120.93	II	90	361.433	II	20	1255.03	III
360	5076.59	II	12	8122.07	II	60	362.455	II	110	1255.68	III
360	5092.80	II	12	8141.75	II	1000	365.59	V	160	1257.19	III
360	5107.59	II	12	8143.27	II	220	379.31	III	90	1418.38	I
340	5123.79	II	10	8231.52	II	125	387.14	IV	90	1428.58	I
680	5130.60	II	10	8307.72	II	100	388.22	IV	90	1436.09	I
500	5191.45	II	12	8346.36	II	150	405.854	II	120	1681.68	II
630	5192.62	II	17	8839.10	II	120	407.138	II	180	1688.36	II
330	5200.12	II	Neon			800	416.20	V	100	1888.11	II
310	5212.37	II	Ne Z = 10			150	421.61	IV	100	1889.71	II
450	5234.20	II	66	119.01	V	200	445.040	II	200	1907.49	II
250	5239.79	II	200	122.52	V	300	446.256	II	500	1916.08	II
720	5249.59	II	66	125.12	V	250	446.590	II	300	1930.03	II
360	5255.51	II	45	131.99	V	180	447.815	II	200	1938.83	II
590	5273.43	II	50	132.04	V	150	454.654	II	100 c	1945.46	II
680	5293.17	II	150	140.76	V	200	455.274	II	80	2007.01	II
220	5311.46	II	150	140.79	V	10	456.275	II	65	2018.44	IV
500	5319.82	II	100	142.44	V	120	456.348	II	110	2022.19	IV
290	5361.47	II	100	142.50	V	90	456.896	II	80	2025.56	II
160	5431.53	II	150	142.72	V	1000	460.728	II	150	2085.47	II
240	5594.43	II	100	143.27	V	500	462.391	II	200	2086.96	III
220	5620.54	I	150	143.34	V	140	469.77	IV	300	2089.43	III
140 d	5675.97	I	150	147.13	V	200	469.82	IV	240	2092.44	III
220	5688.53	II	66	151.23	V	180	469.87	IV	400	2095.54	III
130	5702.24	II	120	151.42	V	140	469.92	IV	180	2096.11	II
160	5708.28	II	15	151.82	IV	250	480.41	V	120	2096.25	II
100	5729.29	I	15	152.23	IV	150	481.28	V	200	2161.22	III
160	5804.02	II	45	154.50	V	250	481.36	V	300	2163.77	III
80	5811.57	II	15	158.65	IV	500	482.99	V	200	2180.89	III
70	5825.87	II	15	158.82	IV	285	488.10	III	30	2203.88	IV
80	5842.39	II	100	164.02	V	220	488.87	III	200	2209.35	III
55	5858.91	I	100	164.14	V	450	489.50	III	200	2211.85	III
45	6007.67	I	80	172.62	IV	70	489.64	III	240	2213.76	III
45	6034.24	II	500	173.93	V	220	490.31	III	300	2216.07	III
55	6066.03	I	80	177.16	IV	360	491.05	III	10	2220.81	IV
45	6178.59	I	150	186.58	IV	120	521.74	IV	75	2227.42	V
45	6223.39	I	100	194.28	IV	140	521.82	IV	110	2232.41	V

Line Spectra of the Elements (continued): Neon

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
65	2245.48	V	300	3028.86	II	40	3369.908	I	150 p	4430.90	II
250	2258.02	IV	100	3030.79	II	100	3371.80	II	150 p	4430.94	II
65	2259.57	V	120	3034.46	II	500	3378.22	II	120	4457.05	II
175	2262.08	IV	100	3035.92	II	150	3388.42	II	100	4522.72	II
240	2263.21	III	100	3037.72	II	120	3388.94	II	10	4537.754	I
65	2263.39	V	100	3039.59	II	300	3392.80	II	10	4540.380	I
110	2264.54	IV	100	3044.09	II	100	3404.82	II	100	4569.06	II
200	2264.91	III	100	3045.56	II	120	3406.95	II	15	4704.395	I
250	2265.71	V	120	3047.56	II	100	3413.15	II	12	4708.862	I
550	2285.79	IV	100	3054.34	II	120	3416.91	II	10	4710.067	I
30	2293.14	IV	100	3054.68	II	120	3417.69	II	10	4712.066	I
250	2293.49	IV	100	3059.11	II	50	3417.904	I	15	4715.347	I
250	2350.84	IV	100	3062.49	II	15	3418.006	I	10	4752.732	I
450	2352.52	IV	100	3063.30	II	120	3428.69	II	12	4788.927	I
700	2357.96	IV	100	3070.89	II	60	3447.703	I	10	4790.22	I
250	2362.68	IV	100	3071.53	II	50	3454.195	I	10	4827.344	I
250	2363.28	IV	100	3075.73	II	100	3456.61	II	10	4884.917	I
110	2365.49	IV	120	3088.17	II	100	3459.32	II	4	5005.159	I
350	2372.16	IV	100	3092.09	II	25	3460.524	I	10	5037.751	I
65	2384.20	IV	120	3092.90	II	30	3464.339	I	10	5144.938	I
350	2384.95	IV	100	3094.01	II	30	3466.579	I	25	5330.778	I
300	2412.73	III	100	3095.10	II	60	3472.571	I	20	5341.094	I
240	2412.94	III	100	3097.13	II	150	3479.52	II	8	5343.283	I
200	2413.78	III	100	3117.98	II	200	3480.72	II	60	5400.562	I
200	2473.40	III	120	3118.16	II	200	3481.93	II	5	5562.766	I
80 p	2562.12	II	10	3126.199	I	25	3498.064	I	10	5656.659	I
90 w	2567.12	II	300	3141.33	II	30	3501.216	I	5	5719.225	I
800	2590.04	III	100	3143.72	II	25	3515.191	I	12	5748.298	I
600	2593.60	III	100 p	3148.68	II	150	3520.472	I	80	5764.419	I
400	2595.68	III	100	3164.43	II	120	3542.85	II	12	5804.450	I
300	2610.03	III	100	3165.65	II	120	3557.80	II	40	5820.156	I
240	2613.41	III	100	3188.74	II	100	3561.20	II	500	5852.488	I
200	2615.87	III	120	3194.58	II	250	3568.50	II	100	5872.828	I
80	2623.11	II	500	3198.59	II	100	3574.18	II	100	5881.895	I
80	2629.89	II	60	3208.96	II	200	3574.61	II	60	5902.462	I
90 w	2636.07	II	120	3209.36	II	50	3593.526	I	60	5906.429	I
80	2638.29	II	120	3213.74	II	30	3593.640	I	100	5944.834	I
200	2638.70	III	150	3214.33	II	15	3600.169	I	100	5965.471	I
200	2641.07	III	150	3218.19	II	20	3633.665	I	100	5974.627	I
80	2644.10	II	120	3224.82	II	150	3643.93	II	120	5975.534	I
600	2677.90	III	120	3229.57	II	200	3664.07	II	80	5987.907	I
500	2678.64	III	200	3230.07	II	20	3682.243	I	100	6029.997	I
80	2762.92	II	120	3230.42	II	12	3685.736	I	100	6074.338	I
90	2792.02	II	120	3232.02	II	200	3694.21	II	80	6096.163	I
80	2794.22	II	150	3232.37	II	10	3701.225	I	60	6128.450	I
100	2809.48	II	100	3243.40	II	150	3709.62	II	100	6143.063	I
80	2906.59	II	100	3244.10	II	250	3713.08	II	120	6163.594	I
80	2906.82	II	100	3248.34	II	250	3727.11	II	250	6182.146	I
90	2910.06	II	100	3250.36	II	800	3766.26	II	150	6217.281	I
90	2910.41	II	150	3297.73	II	1000	3777.13	II	150	6266.495	I
80	2911.14	II	150	3309.74	II	100	3818.43	II	60	6304.789	I
80	2915.12	II	300	3319.72	II	120	3829.75	II	100	6334.428	I
80	2925.62	II	1000	3323.74	II	150	4219.74	II	120	6382.992	I
80 w	2932.10	II	150	3327.15	II	100	4233.85	II	200	6402.246	I
80	2940.65	II	100	3329.16	II	120	4250.65	II	150	6506.528	I
90	2946.04	II	200	3334.84	II	120	4369.86	II	60	6532.882	I
150	2955.72	II	150	3344.40	II	70	4379.40	II	150	6598.953	I
150	2963.24	II	300	3345.45	II	150	4379.55	II	70	6652.093	I
150	2967.18	II	150	3345.83	II	100	4385.06	II	90	6678.276	I
100	2973.10	II	200	3355.02	II	200	4391.99	II	20	6717.043	I
15	2974.72	I	120	3357.82	II	150	4397.99	II	100	6929.467	I
100	2979.46	II	200	3360.60	II	150	4409.30	II	90	7024.050	I
12	2982.67	I	120	3362.16	II	100	4413.22	II	100	7032.413	I
150	3001.67	II	100	3362.71	II	100	4421.39	II	50	7051.292	I
120 p	3017.31	II	120	3367.22	II	100 p	4428.52	II	80	7059.107	I
300	3027.02	II	12	3369.808	I	100 p	4428.63	II	100	7173.938	I

Line Spectra of the Elements (continued): Neon—Nickel

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
150	7213.20	II	3000	9313.97	I	1100	23709.2	I	300 s	7370.60	I
150	7235.19	II	6000	9326.51	I	1800	23951.42	I	300 l	7381.03	I
100	7245.167	I	2000	9373.31	I	600	23956.46	I	300 l	7381.65	I
150	7343.94	II	5000	9425.38	I	1000	23978.12	I	300 l	7402.70	I
40	7472.439	I	3000	9459.21	I	200	24098.54	I	300 s	7512.22	I
90	7488.871	I	5000	9486.68	I	500	24161.42	I	300 l	7515.15	I
100	7492.10	II	5000	9534.16	I	600	24249.64	I	300 l	7546.05	I
150	7522.82	II	3000	9547.40	I	1500	24365.05	I	300 l	7624.83	I
80	7535.774	I	120	9577.01	II	800	24371.60	I	300	7626.85	I
60	7544.044	I	1000	9665.42	I	400	24447.85	I	300 s	7681.01	I
100	7724.628	I	100	9808.86	II	700	24459.4	I	300 s	7685.25	I
120	7740.74	II	800	10295.42	I	300	24776.46	I	1000 l	7735.14	I
300	7839.055	I	2000	10562.41	I	550	24928.88	I	300 l	7761.61	I
120	7926.20	II	1500	10798.07	I	250	25161.69	I	1000 l	7765.75	I
400	7927.118	I	2000	10844.48	I	650	25524.37	I	300 s	7776.07	I
700	7936.996	I	3000	11143.020	I	125	28386.21	I	300	7787.46	I
2000	7943.181	I	3500	11177.528	I	150	30200.	I	1000 l	7791.38	I
2000	8082.458	I	1600	11390.434	I	250	33173.09	I	300 l	7851.44	I
100	8084.34	II	1100	11409.134	I	450	33352.35	I	300 l	7887.88	I
1000	8118.549	I	3000	11522.746	I	1300	33901.	I	300 l	7901.71	I
600	8128.911	I	1500	11525.020	I	2200	33912.10	I	300 l	7975.98	I
3000	8136.406	I	950	11536.344	I	600	34131.31	I	300 h	8080.32	I
2500	8259.379	I	500	11601.537	I	100	34471.44	I	300 s	8124.59	I
100	8264.81	II	1200	11614.081	I	120	35834.78	I	300	8155.11	I
2500	8266.077	I	300	11688.002	I	Neptunium			300 l	8167.42	I
800	8267.117	I	2000	11766.792	I	Np Z = 93			300 l	8183.06	I
6000	8300.326	I	1500	11789.044	I	300	3481.93	I	300 l	8188.61	I
100	8315.00	II	500	11789.889	I	300 h	3501.50	I	300 l	8247.82	I
1500	8365.749	I	1000	11984.912	I	300 l	3986.89	I	300 l	8287.11	I
100	8372.11	II	3000	12066.334	I	300 s	5044.66	I	300 s	8287.75	I
8000	8377.606	I	800	12459.389	I	300 l	5601.70	I	300 l	8306.22	I
1000	8417.159	I	1000	12689.201	I	300 l	5652.75	I	300 s	8313.66	I
4000	8418.427	I	1100	12912.014	I	300 l	5784.39	I	1000 l	8339.12	I
1500	8463.358	I	700	13219.241	I	300 l	5878.04	I	300	8356.79	I
800	8484.444	I	800	15230.714	I	300 s	6011.22	I	300 l	8367.11	I
5000	8495.360	I	400	17161.930	I	300	6056.09	I	3000	8372.88	I
600	8544.696	I	400	18035.80	I	300 s	6073.90	I	3000	8529.96	I
1000	8571.352	I	1000	18083.21	I	300 s	6080.05	I	1000 s	8696.23	I
4000	8591.259	I	350	18221.11	I	300 l	6120.49	I	1000 s	8906.02	I
6000	8634.647	I	250	18227.02	I	300	6188.59	I	1000	8942.70	I
3000	8647.041	I	2500	18276.68	I	300 l	6200.00	I	1000 s	9004.75	I
15000	8654.383	I	2000	18282.62	I	300 s	6215.90	I	1000 l	9006.31	I
4000	8655.522	I	1200	18303.97	I	300 s	6317.84	I	10000 l	9016.18	I
100	8668.26	II	250	18359.12	I	300 l	6341.38	I	3000 l	9141.30	I
5000	8679.492	I	1200	18384.85	I	300 l	6566.11	I	3000 s	9379.33	I
5000	8681.921	I	2000	18389.95	I	300 l	6720.68	I	3000 l	9468.66	I
2000	8704.112	I	1000	18402.84	I	300 s	6751.32	I	3000 s	9679.13	I
4000	8771.656	I	1200	18422.39	I	300 s	6795.21	I	3000 l	9930.55	I
12000	8780.621	I	300	18458.65	I	300 l	6802.62	I	10000 l	10091.99	I
10000	8783.753	I	400	18475.79	I	300 l	6805.81	I	10000 s	10817.45	I
500	8830.907	I	900	18591.55	I	300 s	6816.44	I	10000 l	11695.15	I
7000	8853.867	I	1600	18597.70	I	300 l	6865.45	I	10000 l	11776.64	I
1000	8865.306	I	350	18618.96	I	300 s	6907.13	I	10000 s	12148.18	I
1000	8865.755	I	550	18625.16	I	300 h	6912.91	I	10000 s	12377.42	I
3000	8919.501	I	1200	21041.295	I	1000 s	6930.31	I	10000 l	12407.99	I
2000	8988.57	I	750	21708.145	I	300 l	6963.63	I	10000 l	13834.33	I
100	9079.46	II	300	22247.35	I	3000 s	6972.09	I	Nickel		
6000	9148.67	I	350	22428.13	I	300	7014.02	I	Ni Z = 28		
6000	9201.76	I	2250	22530.40	I	300 l	7018.91	I	55	315.24	V
4000	9220.06	I	400	22661.81	I	300 s	7039.14	I	56	315.71	V
2000	9221.58	I	600	23100.51	I	300 s	7080.01	I	72	354.18	V
2000	9226.69	I	1000	23260.30	I	300 l	7174.83	I	76	354.42	V
1000	9275.52	I	1050	23373.00	I	300 l	7184.93	I	68	354.49	V
200	9287.56	II	850	23565.36	I	300 l	7284.28	I	500	630.71	III
6000	9300.85	I	3500	23636.52	I	300 l	7292.29	I	500	676.94	III
1500	9310.58	I	300	23701.64	I	300 l	7332.52	I	300	713.33	III

Line Spectra of the Elements (continued): Nickel—Niobium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
300	713.38	III	2000	2174.67	II	660	3500.85	I	13	7797.59	I
500	718.48	III	1500	2175.15	II	2600	3510.34	I	1000	8096.75	II
300	722.09	III	2500	2185.50	II	6600	3515.05	I	700	8121.48	II
500	729.82	III	3000	2192.09	II	660	3519.77	I	9	8862.55	I
400	731.70	III	5000	2205.55	II	8200	3524.54	I	500 w	9900.92	II
300	732.16	III	4000	2206.72	II	5000	3566.37	I	Niobium		
300	747.99	III	6000	2216.48	II	990	3571.87	I	Nb Z = 41		
300	750.05	III	1000	2264.46	II	1300	3597.70	I	80	464.55	V
300	757.80	III	2000	2270.21	II	1300	3610.46	I	80	468.32	V
400	770.22	III	1600	2289.98	I	530	3612.74	I	80	763.77	V
500	778.81	III	630	2300.78	I	6600	3619.39	I	80	774.02	V
300	788.04	III	1000	2303.00	II	200	3664.10	I	60	993.54	IV
500	811.57	III	2000	2310.96	I	130	3669.24	I	400	1005.72	IV
500	826.14	III	1700	2312.34	I	180	3670.43	I	500	1007.05	IV
500	842.14	III	1400	2313.66	I	260	3674.15	I	500	1010.19	IV
400	845.24	III	1400	2313.98	I	160	3688.42	I	100	1116.08	IV
300	847.43	III	1000	2316.04	II	80	3693.93	I	150	1120.02	IV
300	860.64	III	1400	2317.16	I	120	3722.48	I	100	1258.87	V
300	862.88	III	2600	2320.03	I	150	3736.81	I	60	1314.56	III
300	863.22	III	1900	2321.38	I	60	3739.23	I	80	1445.43	III
300	867.51	III	1400	2325.79	I	600	3775.57	I	80	1445.98	III
300	973.79	III	940	2329.96	I	700	3783.53	I	80	1447.09	III
400	979.59	III	1200	2345.54	I	700	3807.14	I	100	1456.68	III
500	1317.22	II	400	2347.52	I	110	3831.69	I	80	1484.73	III
76	1398.19	IV	1000	2375.42	II	1200	3858.30	I	100	1495.94	III
74	1411.45	IV	240	2386.58	I	110	3973.56	I	80	1498.02	III
70	1438.82	IV	1000	2394.52	II	110	4401.55	I	80	1499.45	III
73	1449.01	IV	2000	2416.13	II	85	4459.04	I	100	1501.99	III
76	1452.22	IV	240	2419.31	I	55	4470.48	I	60	1502.30	IV
73	1482.25	IV	160	2472.06	I	65	4605.00	I	80	1513.81	III
72	1489.83	IV	150	2798.65	I	75	4648.66	I	60	1524.36	IV
75	1525.31	IV	250	2821.29	I	110	4714.42	I	100	1524.91	III
74	1527.68	IV	500	2943.91	I	45	4786.54	I	100	1590.21	III
74	1527.80	IV	570	2981.65	I	45	4855.41	I	80	1598.86	III
76	1534.71	IV	500	2992.60	I	40	4904.41	I	80	1604.72	III
73	1537.25	IV	1000	2994.46	I	45	4980.16	I	80	1639.51	III
75	1543.41	IV	4000	3002.49	I	45	4984.13	I	100	1682.77	III
74	1546.23	IV	2200	3003.63	I	50	5017.59	I	100	1705.44	III
300	1604.54	III	3700	3012.00	I	100	5035.37	I	100	1707.14	III
300	1652.87	III	1700	3037.94	I	100	5080.52	I	100	1758.33	V
400	1687.90	III	3500	3050.82	I	65	5081.11	I	100	1877.34	V
1000	1692.51	III	1500	3054.32	I	40 h	5146.48	I	100	1892.92	III
800	1709.90	III	1900	3057.64	I	40 h	5155.76	I	60	1922.41	IV
650	1715.30	III	500	3064.62	I	180	5476.91	I	100	1938.84	III
500	1719.46	III	2600	3101.55	I	23	5709.56	I	60	1978.22	IV
400	1722.28	III	1300	3101.88	I	16	5754.68	I	3300	2029.32	II
500	1738.25	III	2900	3134.11	I	10	5857.76	I	65	2032.53	IV
300	1739.78	III	1100	3232.96	I	10	5892.88	I	3000	2032.99	II
1000	1741.55	II	600	3243.06	I	10	6108.12	I	2000	2109.42	II
300	1741.96	III	660	3315.66	I	10	6176.81	I	1700	2125.21	II
550	1747.01	III	2000	3331.88	II	10	6191.18	I	1100	2126.54	II
300	1752.43	III	2900	3369.57	I	13	6256.36	I	80 h	2130.24	III
400	1753.01	III	3300	3380.57	I	16	6643.64	I	1500	2131.18	II
800	1764.69	III	1300	3391.05	I	22	6767.77	I	80	2273.92	III
500	1767.94	III	3300	3392.99	I	10	6914.56	I	100	2275.23	III
2000	1769.64	III	8200	3414.76	I	26	7122.20	I	80	2279.36	III
400	1776.07	III	1600	3423.71	I	16	7393.60	I	100	2281.51	III
300	1807.24	III	2600	3433.56	I	16	7409.35	I	80	2284.40	III
300	1819.28	III	990	3437.28	I	23	7422.28	I	100	2290.36	III
800	1823.06	III	4800	3446.26	I	13	7522.76	I	370	2295.68	II
400	1830.01	III	1300	3452.89	I	19	7555.60	I	280	2302.08	II
650	1847.28	III	5000	3458.47	I	23	7617.00	I	100	2313.30	III
800	1854.15	III	5000	3461.65	I	16	7714.32	I	100	2338.09	III
300	1858.75	III	1600	3472.54	I	19	7727.61	I	80	2344.12	III
1000	2165.55	II	550	3483.77	I	19	7748.89	I	90	2349.21	III
2000	2169.10	II	5500	3492.96	I	10	7788.94	I	80	2355.54	III

Line Spectra of the Elements (continued): Niobium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
100	2362.06	III	470	2716.62	II	390	3215.60	II	2700	3726.24	I
80	2362.50	III	470	2721.98	II	800	3225.48	II	2700	3739.80	I
80	2365.70	III	310	2733.26	II	140	3229.56	II	670	3740.73	II
100	2372.73	III	110	2737.09	II	400	3236.40	II	1700	3742.39	I
170	2376.40	II	240	2768.13	II	200	3247.47	II	530	3763.49	I
110	2387.09	II	310	2773.20	I	120	3248.94	II	350	3765.08	I
100	2387.41	III	270	2780.24	II	320	3254.07	II	530	3771.85	I
140	2387.52	II	110	2793.05	II	230	3260.56	II	870	3781.01	I
80	2388.23	III	190	2827.08	II	160	3263.37	II	1700	3787.06	I
45	2388.27	II	250	2841.15	II	200	3283.46	II	1300	3790.15	I
160	2398.48	II	280	2842.65	II	160	3292.02	II	3500	3791.21	I
80	2404.89	III	160	2846.28	II	320	3296.01	I	2700	3798.12	I
55	2405.34	II	240	2861.09	II	400	3312.60	I	2700	3802.92	I
55	2405.85	II	100	2865.61	II	120	3319.58	II	670	3803.88	I
140	2412.46	II	500	2868.52	II	130	3341.60	II	530	3804.74	I
100	2413.94	III	800	2875.39	II	1300	3341.97	I	670	3810.49	I
160	2416.99	II	270	2876.95	II	1300	3343.71	I	530	3811.03	I
140	2418.69	II	530	2877.03	II	1700	3349.06	I	530	3815.51	I
100	2421.91	III	100	2880.72	II	420	3349.52	I	210	3818.86	II
75	2433.80	II	570	2883.18	II	340	3354.74	I	670	3824.88	I
40	2435.95	II	280	2888.83	II	1700	3358.42	I	350	3835.18	I
45	2437.42	II	470	2897.81	II	130	3365.58	II	350	3863.38	I
40	2442.14	II	400	2899.24	II	340	3366.96	I	530	3877.56	I
28	2442.68	II	470	2908.24	II	130	3369.16	II	870	3878.82	I
65	2451.87	II	670	2910.59	II	350	3374.92	I	670	3883.14	I
65	2453.95	II	470	2911.74	II	170	3386.24	II	1100	3885.44	I
100	2456.99	III	1100	2927.81	II	350	3392.34	I	670	3885.68	I
55	2458.09	II	110	2931.47	II	230	3408.68	II	580	3891.30	I
65	2462.89	I	870	2941.54	II	180	3409.19	II	670	3914.70	I
80	2468.72	III	110 h	2945.88	II	230	3412.94	II	530	3920.20	I
80	2475.87	III	110	2946.12	II	230	3425.42	II	670	3937.44	I
110	2477.38	II	110	2946.90	II	230	3426.57	II	520	3943.67	I
65	2478.29	II	1100	2950.88	II	180	3432.70	II	910 d	3966.09	I
65	2479.94	II	400	2972.57	II	180	3440.59	II	1100	4032.52	I
35	2483.88	II	320	2974.10	II	200	3479.56	II	16000 c	4058.94	I
100	2499.73	III	210	2977.68	II	100	3484.05	II	350	4060.79	I
110	2511.00	II	200	2982.11	II	500	3498.63	I	12000	4079.73	I
110	2521.40	II	330	2990.26	II	460	3507.96	I	440	4100.40	I
390	2544.80	II	470	2994.73	II	200	3510.26	II	6700	4100.92	I
100	2545.64	III	80	3001.84	III	200	3515.42	II	310	4116.90	I
110	2551.38	II	140	3024.74	II	200	3517.67	II	5300	4123.81	I
130	2556.94	II	350	3028.44	II	2000	3535.30	I	670	4129.43	I
80	2557.94	III	300	3032.77	II	1300	3537.48	I	770	4129.93	I
130	2562.41	II	100	3044.76	II	250	3540.96	II	2300	4137.10	I
110	2571.33	II	100	3055.52	II	500	3544.02	I	440	4139.44	I
390	2583.99	II	220	3064.53	II	300	3550.45	I	2700	4139.71	I
390	2590.94	II	110	3069.68	II	1000	3554.66	I	350	4143.21	I
80	2598.86	III	100	3070.90	II	630	3563.50	I	870	4150.12	I
80	2633.17	III	110	3071.56	II	630	3563.62	I	4400	4152.58	I
200	2642.24	II	100	3073.24	II	1500	3575.85	I	870	4163.47	I
320	2646.26	II	400	3076.87	II	5000	3580.27	I	4400	4163.66	I
330	2647.50	I	110	3080.35	II	500	3584.97	I	4000	4164.66	I
330	2654.45	I	1800	3094.18	II	750	3589.11	I	3500	4168.13	I
310	2656.08	II	140	3099.19	II	500	3589.36	I	310	4184.44	I
80	2657.99	III	270	3127.53	II	500	3593.97	I	1200	4190.88	I
110	2665.25	II	1500	3130.79	II	500	3602.56	I	870	4192.07	I
110	2666.59	II	80	3142.26	III	300	3619.51	II	870	4195.09	I
110	2667.30	II	390	3145.40	II	420	3649.85	I	1300	4195.66	I
400	2671.93	II	1200	3163.40	II	400	3651.19	II	310	4198.51	I
200	2673.57	II	150	3175.78	II	200	3659.61	II	350	4201.52	I
200	2675.94	II	390	3180.29	II	630	3660.37	I	870	4205.31	I
160	2691.77	II	300	3191.10	II	900	3664.70	I	350	4214.73	I
1000	2697.06	II	150	3191.43	II	1500	3697.85	I	420	4217.94	I
320	2698.86	II	1000	3194.98	II	330	3711.34	I	420	4229.15	I
320	2702.20	II	120	3203.35	II	3300	3713.01	I	770	4262.05	I
150	2702.52	II	300	3206.34	II	480	3716.99	I	420	4266.02	I

Line Spectra of the Elements (continued): Niobium—Nitrogen

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
400	4286.99	I	210 cw	6660.84	I	600 w	297.7	IV	550	916.012	II
580	4299.60	I	150 cw	6677.33	I	700	297.82	IV	650	916.701	II
580	4300.99	I	130 c	6723.62	I	650	300.32	IV	520	921.992	IV
390	4311.27	I	85	6828.11	I	90	303.123	IV	500	922.519	IV
350	4326.33	I	85	6990.32	I	500	303.28	IV	480	923.057	IV
390	4331.37	I	190 c	7046.81	I	150	314.715	III	520	924.283	IV
330	4410.21	I	130	7159.43	I	200	314.850	III	90	953.415	I
150	4503.04	I	190 cw	7372.50	I	90	314.877	III	100	953.655	I
530	4523.41	I	65	7515.93	I	150	315.053	IV	130	953.970	I
480	4546.82	I	170 c	7574.58	I	120	322.503	IV	1000	955.335	IV
370	4564.53	I	75 c	7726.68	I	150	322.570	IV	130	963.990	I
720	4573.08	I	35	7885.31	I	200	322.724	IV	115	964.626	I
480	4581.62	I	40	8135.20	I	120	323.175	IV	70	965.041	I
1200	4606.77	I	29 cw	8320.93	I	600	323.26	III	650	979.842	III
170	4616.17	I	29	8346.08	I	300	335.050	IV	700	979.919	III
450	4630.11	I	35	8905.78	I	500	338.35	III	900	989.790	III
450	4648.95	I	Nitrogen			500	340.20	III	700	991.514	III
450	4663.83	I	N Z = 7			500 w	351.93	IV	1000	991.579	III
340	4666.24	I	400	181.75	IV	500	351.98	III	150 w	1036.16	IV
240	4667.22	I	52	186.069	V	700	353.06	IV	90	1067.614	I
580	4672.09	I	62	186.153	V	120	362.833	III	60	1068.612	I
530	4675.37	I	400	191.7	IV	150	362.881	III	90	1078.71	IV
320	4685.14	I	400	192.9	IV	150	362.946	III	450	1083.990	II
130 c	4706.14	I	500	196.87	IV	90	362.985	III	600	1084.580	II
260	4708.29	I	500	197.23	IV	300	374.204	III	430	1085.546	II
150	4713.50	I	500	202.60	IV	350	374.441	III	650	1085.701	II
220 c	4749.70	I	500	205.94	IV	500	387.48	III	175	1097.237	I
130 c	4967.78	I	500	205.97	IV	500	420.77	IV	115	1098.095	I
190	4988.97	I	500	206.03	IV	250	451.869	III	115	1098.260	I
230	5017.75	I	90	209.303	V	300	452.226	III	105	1100.360	I
150	5026.36	I	500	217.20	IV	650	463.74	IV	40	1100.465	I
210	5039.04	I	500 d	217.90	IV	285	644.634	II	90	1101.291	I
170	5058.01	I	500 d	223.4	IV	360	644.837	II	360	1134.165	I
130	5065.25	I	800 w	225.12	IV	450	645.178	II	385	1134.415	I
750	5078.96	I	800	225.21	IV	140	647.50	I	410	1134.980	I
420	5095.30	I	600 w	234.12	IV	360	660.286	II	105	1143.65	I
170	5100.16	I	600 w	234.20	IV	170	671.016	II	130	1163.884	I
170	5120.30	I	600 w	234.25	IV	285	671.386	II	60	1164.206	I
210	5134.75	I	550	236.07	IV	150	671.630	II	105	1164.325	I
250	5160.33	I	500	237.99	IV	160	671.773	II	270	1167.448	I
250	5164.38	I	500 w	238.7	IV	170	672.001	II	105	1168.334	I
230	5180.31	I	600	238.80	IV	500	684.996	III	60	1168.417	I
190	5189.20	I	500 w	239.62	IV	570	685.513	III	195	1168.536	I
170	5193.08	I	900	247.20	IV	650	685.816	III	230	1176.510	I
150	5195.84	I	90	247.561	V	500	686.335	III	105	1176.630	I
150	5232.81	I	120	247.706	V	350	692.70	I	195	1177.695	I
150 d	5251.62	I	500 w	248.43	IV	90	713.518	V	500	1183.031	III
270	5271.53	I	500 w	248.46	IV	150	713.860	V	570	1184.550	III
130 c	5276.20	I	500 w	248.48	IV	285	746.984	II	90	1188.01	IV
250	5318.60	I	500	257.95	III	150	748.195	V	410	1199.550	I
460	5344.17	I	650	258.50	III	200	748.291	V	385	1200.223	I
340	5350.74	I	700	259.19	III	500	763.336	III	360	1200.710	I
110	5437.27	I	800	260.09	III	570	764.359	III	175	1225.026	I
85	5551.35	I	600	260.45	IV	570	765.148	IV	160	1225.37	I
170	5642.11	I	800	261.28	III	250	771.544	III	130	1228.41	I
130	5664.71	I	500	262.91	III	300	771.901	III	160	1228.79	I
170	5665.63	I	500	265.23	III	350	772.385	III	1000	1238.821	V
130	5729.19	I	500	265.27	III	200	772.891	III	900	1242.804	V
110	5760.34	I	150	266.196	V	150	772.975	III	360	1243.179	I
110	5819.43	I	200	266.379	V	650	775.965	II	315	1243.306	I
130 d	5838.64	I	500	268.70	III	90	885.67	I	290	1310.540	I
190 cw	5900.62	I	650	270.99	IV	90	909.697	I	250	1310.95	I
150	5983.22	I	250	283.42	IV	80	910.278	I	230	1319.00	I
75	6221.96	I	300	283.48	IV	40	910.645	I	315	1319.68	I
85 c	6430.46	I	350	283.58	IV	450	915.612	II	115	1326.57	I
65	6544.61	I	600	285.56	IV	450	915.962	II	115	1327.92	I

Line Spectra of the Elements (continued): Nitrogen

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
150	1387.371	III	160	2885.27	II	160	4950.23	I	160	7406.12	I
360	1411.94	I	90 I	2974.52	V	350	4963.98	I	265	7406.24	I
700	1492.625	I	150 w	2980.78	V	285	4987.37	II	685	7423.64	I
490	1492.820	I	250 w	2981.31	V	450	4994.36	II	785	7442.29	I
640	1494.675	I	60 w	2998.43	V	650	5001.48	II	900	7468.31	I
90	1549.336	V	220	3006.83	II	360	5002.70	II	185	7608.80	I
200 I	1616.33	V	90	3078.25	IV	870	5005.15	II	60 w	7618.46	V
350 I	1619.69	V	120	3367.34	III	550	5007.32	II	450	7762.24	II
1000	1718.55	IV	360	3437.15	II	450	5010.62	II	400	8184.87	I
250	1729.945	III	90	3463.37	IV	360	5016.39	II	400	8188.02	I
775	1742.729	I	570	3478.71	IV	360	5025.66	II	250	8200.36	I
700	1745.252	I	500	3482.99	IV	550	5045.10	II	300	8210.72	I
570	1747.848	III	400	3484.96	IV	185	5281.20	I	570	8216.34	I
350	1751.218	III	90	3747.54	IV	140	5292.68	I	400	8223.14	I
650	1751.657	III	90	3754.67	III	90	5314.35	III	400	8242.39	I
150	1804.486	III	120	3771.05	III	200	5320.82	III	550	8438.74	II
200	1805.669	III	285	3838.37	II	150	5327.18	III	500	8567.74	I
150	1846.42	III	360	3919.00	II	450	5495.67	II	570	8594.00	I
90 w	1860.37	V	90	3938.52	III	285	5535.36	II	650	8629.24	I
350	1885.06	III	450	3955.85	II	650	5666.63	II	500	8655.89	I
400	1885.22	III	1000	3995.00	II	550	5676.02	II	220	8676.08	II
200	1907.99	III	150	3998.63	III	870	5679.56	II	700	8680.28	I
150	1919.55	III	200	4003.58	III	450	5686.21	II	650	8683.40	I
150	1919.77	III	360	4035.08	II	450	5710.77	II	500	8686.15	I
300	1920.65	III	550	4041.31	II	285	5747.30	II	110	8687.43	II
150	1920.84	III	360	4043.53	II	700	5752.50	I	110 h	8699.00	II
200	1921.30	III	150	4057.76	IV	240	5764.75	I	500	8703.25	I
200	2064.01	III	250	4097.33	III	265	5829.54	I	160 h	8710.54	II
250	2064.42	III	140	4099.94	I	235	5854.04	I	570	8711.70	I
120	2068.68	III	200	4103.43	III	360	5927.81	II	500	8718.83	I
90	2071.09	III	185	4109.95	I	550	5931.78	II	250	8728.89	I
90	2080.34	IV	285	4176.16	II	285	5940.24	II	200	8747.36	I
160	2095.53	II	120	4195.76	III	650	5941.65	II	500	9386.80	I
70	2096.20	II	150	4200.10	III	285	5952.39	II	570	9392.79	I
110	2096.86	II	285	4227.74	II	160	5999.43	I	250	9460.68	I
90	2117.59	III	285	4236.91	II	210	6008.47	I	200	9863.33	I
90	2121.50	III	220	4237.05	II	285	6167.76	II	160 h	9865.41	II
110	2130.18	II	450	4241.78	II	360	6379.62	II	110 h	9868.21	II
160	2142.78	II	90	4332.91	III	150	6380.77	IV	160 h	9887.39	II
90	2147.31	III	120	4345.68	III	185	6411.65	I	220 h	9891.09	II
200	2188.20	III	300	4379.11	III	210	6420.64	I	160 h	9961.86	II
150	2188.38	III	285	4432.74	II	210	6423.02	I	220 h	9969.34	II
160	2206.09	II	650	4447.03	II	210	6428.32	I	285 h	10023.27	II
160	2286.69	II	90	4510.91	III	185	6437.68	I	220 h	10035.45	II
110	2288.44	II	120	4514.86	III	235	6440.94	I	220 h	10065.15	II
220	2316.49	II	360	4530.41	II	90	6454.11	III	160 h	10070.12	II
160	2316.69	II	550	4601.48	II	185	6457.90	I	250	10105.13	I
285	2317.05	II	350	4603.73	V	120	6467.02	III	300	10108.89	I
90 w	2318.09	IV	90	4606.33	IV	300	6468.44	I	350	10112.48	I
160	2461.27	II	450	4607.16	II	265	6481.71	I	400	10114.64	I
150	2477.69	IV	360	4613.87	II	750	6482.05	II	110 h	10126.27	II
110	2496.83	II	250	4619.98	V	360	6482.70	I	250	10539.57	I
70	2496.97	II	450	4621.39	II	300	6483.75	I	200	12074.51	I
110	2520.22	II	870	4630.54	II	325	6484.80	I	380	12186.82	I
160	2520.79	II	90	4634.14	III	160	6491.22	I	225	12288.97	I
220	2522.23	II	120	4640.64	III	210	6499.54	I	290	12328.76	I
110	2590.94	II	550	4643.08	II	185	6506.31	I	310	12381.65	I
250	2645.65	IV	285	4788.13	II	750	6610.56	II	180	12438.40	I
300	2646.18	IV	450	4803.29	II	185	6622.54	I	510	12461.25	I
350	2646.96	IV	180	4847.38	I	185	6636.94	I	920	12469.62	I
250 w	2682.18	III	90	4858.82	III	235	6644.96	I	500	13429.61	I
90	2689.20	III	150	4867.15	III	185	6646.50	I	840	13581.33	I
160	2709.84	II	285	4895.11	II	235	6653.46	I	180	13587.73	I
110	2799.22	II	160	4914.94	I	210	6656.51	I	180	13602.27	I
110	2823.64	II	210	4935.12	I	185	6722.62	I	290	13624.18	I
60 I	2859.16	V	200 w	4944.56	V	210	7398.64	I	250	14757.07	I

Line Spectra of the Elements (continued): Nitrogen—Oxygen

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
100	14868.87	I	5100	2838.63	I	28	5417.51	I	250	215.245	V
160	14966.60	I	2300	2844.40	I	55	5443.31	I	250	216.018	V
180	15582.27	I	1500	2850.76	I	22	5446.93	I	520	220.352	V
120 s	17516.58	I	1500	2860.96	I	22	5457.30	I	80	227.372	V
100 l	17584.86	I	9600	2909.06	I	28	5470.00	I	80	227.469	V
100	17878.26	I	2100	2912.33	I	22	5509.33	I	150	227.511	V
Osmium			2100	2919.79	I	270	5523.53	I	80	227.549	V
Os Z = 76			1100 h	2948.23	I	22	5546.82	I	80	227.634	V
9600	2001.45	I	1400	2949.53	I	80	5584.44	I	80	227.689	V
13000	2003.73	I	4400	3018.04	I	35	5620.08	I	150	231.823	V
17000	2010.15	I	1100	3030.70	I	22	5642.56	I	140	233.46	IV
29000	2018.14	I	2900	3040.90	I	28	5645.25	I	150	233.50	IV
14000	2022.76	I	120	3042.74	II	28	5680.88	I	110	233.52	IV
14000	2028.23	I	8600	3058.66	I	170	5721.93	I	200	233.56	IV
18000	2034.44	I	1100	3077.72	I	22	5765.05	I	110	233.60	IV
26000	2045.36	I	3100	3156.25	I	170	5780.82	I	90	238.36	IV
8600	2058.69	I	180	3173.93	II	40	5800.60	I	180	238.57	IV
13000	2061.69	I	150	3213.31	II	110	5857.76	I	110	248.459	V
7800	2067.21	II	1900	3232.06	I	28	5860.64	I	110	252.56	IV
4200	2070.67	II	3100	3262.29	I	65	5996.00	I	110	252.95	IV
7200	2076.95	I	3100	3267.94	I	35	6227.70	I	150	253.08	IV
14000	2079.97	I	1200	3290.26	I	22	6269.41	I	300	260.39	IV
2900	2082.54	I	7600	3301.56	I	22	6403.15	I	250	260.56	IV
2900	2089.03	I	960	3336.15	I	27	6729.56	I	80 d	264.34	III
2900	2089.21	I	960	3370.59	I	22	7145.54	I	110	264.48	III
6000	2097.60	I	620	3387.84	I	26	7602.95	I	110	266.97	III
5300	2100.63	I	620	3401.86	I	7	8041.29	I	150	266.98	III
2100	2117.66	I	620	3504.66	I	Oxygen			150	267.03	III
4800	2117.96	I	1200	3528.60	I	O Z = 8			150	277.38	III
5300	2137.11	I	1200	3560.86	I	80	124.616	V	300	279.63	IV
2600	2154.59	I	620	3598.11	I	110	135.523	V	375	279.94	IV
1300	2157.84	I	95	3604.48	II	80	138.109	V	110	285.71	IV
1200	2158.53	I	480	3670.89	I	110	139.029	V	150	285.84	IV
3100	2166.90	I	3700	3752.52	I	80	151.447	V	110	286.448	V
1100	2167.75	I	2100	3782.20	I	110	151.477	V	80	295.62	III
2100	2171.65	I	730	3876.77	I	150	151.546	V	110	295.66	III
1100	2234.61	I	1000	3963.63	I	80	164.574	V	120	295.72	III
1300	2252.15	I	730	3977.23	I	110	164.657	V	150	303.41	III
2000	2255.85	II	960	4066.69	I	80	164.709	V	150	303.46	III
1400	2264.60	I	1200	4112.02	I	80	166.235	V	140	303.52	III
1400	2282.26	II	2500	4135.78	I	150	167.99	V	160	303.62	III
500	2367.35	II	1200	4173.23	I	110	170.219	V	160	303.69	III
2600	2377.03	I	1200	4211.86	I	450	172.169	V	250	303.80	III
1700	2387.29	I	4900	4260.85	I	250	185.745	V	200	305.60	III
1100	2395.88	I	560	4293.95	I	375	192.751	V	250	305.66	III
200	2423.07	II	560	4311.40	I	450	192.799	V	190	305.70	III
1400	2424.97	I	4900	4420.47	I	520	192.906	V	300	305.77	III
110	2454.91	II	540	4550.41	I	80	193.003	V	190	305.84	III
1800	2461.42	I	670	4793.99	I	200	194.593	V	200	306.62	IV
110	2468.90	II	55	5031.83	I	150	195.86	IV	150	306.88	IV
530	2486.24	II	45	5039.12	I	200	196.01	IV	450	320.979	III
4500	2488.55	I	35	5072.88	I	80	202.161	V	300	328.45	III
2600	2498.41	I	35	5074.77	I	80	202.224	V	250	328.74	III
2400	2513.25	I	35	5079.09	I	80	202.283	V	300	345.31	III
780	2538.00	II	90	5103.50	I	80	202.334	V	110	355.14	III
1000	2542.51	I	55	5110.81	I	150	202.393	V	90	355.33	III
1000	2590.76	I	140	5149.74	I	110	203.78	V	80	355.47	III
1800	2613.06	I	40	5193.52	I	150	203.82	V	200	359.02	III
3800	2637.13	I	270	5202.63	I	100	203.85	V	190	359.22	III
1900	2644.11	I	35	5203.23	I	200	203.89	V	150	359.38	III
1900	2658.60	I	45	5255.82	I	100	203.94	V	210	373.80	III
2100	2689.82	I	55	5265.15	I	110	207.18	IV	200	374.00	III
3000	2714.64	I	40	5298.78	I	150	207.24	IV	300	374.08	III
1300	2720.04	I	110	5376.79	I	300	207.794	V	190	374.16	III
960	2770.71	I	120	5416.34	I	150	215.040	V	200	374.33	III
2800	2806.91	I	45	5416.69	I	200	215.103	V	210	374.44	III

Line Spectra of the Elements (continued): Oxygen

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
450	395.558	III	80	805.810	I	30 d	2283.42	II	160	3305.15	II			
300	434.98	III	240	832.762	II	30 d	2284.89	II	160	3306.60	II			
800	507.391	III	600	832.927	III	110	2293.32	II	80	3312.30	III			
900	507.683	III	450	833.332	II	200	2300.35	II	110	3340.74	III			
1000	508.182	III	780	833.742	III	30 d	2313.05	II	230	3348.08	IV			
1000	525.795	III	600	834.467	II	30 d	2316.12	II	270	3349.11	IV			
250	537.83	II	600	835.096	III	30 d	2316.79	II	160	3354.27	IV			
300	538.26	II	800	835.292	III	50 d	2319.68	II	200	3375.40	IV			
220	539.09	II	40	877.879	I	30 d	2322.15	II	220	3377.20	II			
200	539.55	II	130	921.296	IV	30 d	2339.31	II	130	3378.06	IV			
150	539.85	II	160	921.366	IV	200 d	2390.44	III	360	3381.20	IV			
700	553.330	IV	80	922.008	I	80	2394.33	III	360	3385.52	IV			
775	554.075	IV	200	923.367	IV	110	2411.60	II	285	3390.25	II			
850	554.514	IV	130	923.433	IV	80	2422.84	III	270	3396.79	IV			
700	555.261	IV	90	935.193	I	80	2425.55	II	360	3403.52	IV			
700	597.818	III	40	948.686	I	250	2433.56	II	220	3407.38	II			
1000	599.598	III	90	971.738	I	80 d	2436.06	II	230	3409.66	IV			
580	608.398	IV	40	976.448	I	80 d	2438.83	III	160	3409.84	II			
110	609.70	III	160	988.773	I	80	2444.26	II	410	3411.69	IV			
640	609.829	IV	40	990.204	I	300	2445.55	II	230	3413.64	IV			
160	610.04	III	250	1025.762	I	200	2449.372	IV	80	3444.10	III			
200	610.75	III	90	1027.431	I	200	2450.040	IV	80	3455.12	III			
100	610.85	III	160	1039.230	I	200	2454.99	III	285	3470.81	II			
270	616.952	IV	60	1040.942	I	200	2493.44	IV	200	3489.83	IV			
150	617.005	IV	40	1152.152	I	200	2493.77	IV	160	3492.24	IV			
200	617.036	IV	900	1302.168	I	200	2507.73	IV	230	3560.39	IV			
520	624.617	IV	600	1304.858	I	230	2509.19	IV	270	3563.33	IV			
580	625.130	IV	300	1306.029	I	200	2517.2	IV	80	3698.70	III			
640	625.852	IV	200	1338.612	IV	200	2558.06	III	80	3702.75	III			
1000	629.730	V	130	1342.992	IV	80	2687.53	III	80	3703.37	III			
150	644.148	II	230	1343.512	IV	110	2695.49	III	110	3707.24	III			
200	672.95	II	640	1371.292	V	300	2733.34	II	220	3712.75	II			
150	673.77	II	160	1476.89	III	110	2747.46	II	110	3715.08	III			
230	681.272	V	160 w	1506.72	V	1000	2781.01	V	315 w	3725.93	IV			
70	685.544	I	285	1590.01	III	920	2786.99	V	285	3727.33	II			
800	702.332	III	160	1591.33	III	775	2789.85	V	360	3729.03	IV			
800	702.822	III	315 w	1643.68	V	160	2836.26	IV	410	3736.85	IV			
900	702.899	III	160	1707.996	V	160	2921.45	IV	160	3739.92	II			
1000	703.850	III	220	1760.12	III	200	2941.33	V	110	3744.00	III			
900	718.484	II	110	1760.42	III	210	2941.65	V	230	3744.89	IV			
600	718.562	II	220	1763.22	III	80	2959.68	III	360	3749.49	II			
70	744.794	I	220	1764.48	III	265	2972.29	I	150	3754.67	III			
700	758.678	V	750	1767.78	III	250	2983.78	III	80	3757.21	III			
640	759.441	V	550	1768.24	III	80	3017.63	III	250	3759.87	III			
580	760.228	V	360	1771.67	III	80	3023.45	III	110	3791.26	III			
775	760.445	V	110	1773.00	III	80	3043.02	III	160	3803.14	II			
640	761.128	V	110	1773.85	III	200	3047.13	III	120	3823.41	I			
700	762.003	V	220	1779.16	III	110	3059.30	III	450	3911.96	II			
70	770.793	I	160	1781.03	III	460	3063.42	IV	160	3919.29	II			
90	771.056	I	160	1784.85	III	410	3071.61	IV	185	3947.29	I			
520	774.518	V	220	1789.66	III	80	3121.71	III	160	3947.48	I			
70	775.321	I	110	1848.26	III	160	3122.62	II	140	3947.59	I			
200	779.734	IV	110	1856.62	III	220	3129.44	II	220	3954.37	II			
315	779.821	IV	285	1872.78	III	110	3132.86	III	100	3954.61	I			
360	779.912	IV	285	1872.87	III	450	3134.82	II	200	3961.59	III			
200	779.997	IV	285	1874.94	III	285	3138.44	II	450	3973.26	II			
640	787.711	IV	160	1920.04	III	160	3144.66	V	220	3982.20	II			
520	790.109	IV	110	1920.75	III	160	3209.66	IV	160	4069.90	II			
700	790.199	IV	110	1921.52	III	80	3238.57	III	285	4072.16	II			
70	791.973	I	220	1923.49	III	200	3260.98	III	450	4075.87	II			
300	796.66	II	110	1923.82	III	300	3265.46	III	80 d	4083.91	II			
200	802.200	IV	110	1926.94	III	80	3267.31	III	50 d	4087.14	II			
160	802.255	IV	360	2013.27	III	220	3270.98	II	150 d	4089.27	II			
90	804.267	I	160	2026.96	III	220	3273.52	II	110	4097.24	II			
70	804.848	I	220	2045.67	III	220	3277.69	II	220	4105.00	II			
70	805.295	I	160	2052.74	III	360	3287.59	II	285	4119.22	II			

Line Spectra of the Elements (continued): Oxygen—Palladium

Intensity			Wavelength/Å			Intensity			Wavelength/Å			Intensity			Wavelength/Å		
100	4123.99	V	130	6500.24	V	100	9622.13	I	4000	1914.62	III						
160	4132.81	II	80	6604.91	I	120	9625.29	I	1000	1930.33	III						
50	4146.06	II	100	6653.83	I	160	9677.38	I	2000	1941.64	III						
220	4153.30	II	360	7001.92	I	80	9694.66	I	800	2002.16	III						
285	4185.46	II	450	7002.23	I	65	9694.91	I	1000	2004.47	III						
450	4189.79	II	210	7156.70	I	235	9741.50	I	500	2055.11	III						
80	4233.27	I	400	7254.15	I	235	9760.65	I	500	2149.82	III						
50 d	4253.74	II	450	7254.45	I	120	9909.05	I	500	2177.55	III						
50 d	4253.98	II	320	7254.53	I	140	9936.98	I	500	2177.63	III						
50 d	4275.47	II	210	7476.44	I	120	9940.41	I	100 r	2231.59	II						
50 d	4303.78	II	100	7477.24	I	160	9995.31	I	200 r	2296.53	II						
285	4317.14	II	120	7479.08	I	120 d	10421.18	I	100	2426.87	II						
160	4336.86	II	120	7480.67	I	590	11286.34	I	100	2430.94	II						
220	4345.56	II	100	7706.75	I	640	11286.91	I	100	2433.11	II						
285	4349.43	II	870	7771.94	I	490	11287.02	I	100	2435.32	II						
220	4366.90	II	810	7774.17	I	490	11287.32	I	150	2446.17	II						
100	4368.25	I	750	7775.39	I	490	11295.10	I	1100	2447.91	I						
220	4395.95	II	80	7886.27	I	540	11297.68	I	100	2457.29	II						
450	4414.91	II	100	7943.15	I	590	11302.38	I	150	2469.29	II						
285	4416.98	II	100	7947.17	I	265	11358.69	I	100	2471.18	II						
160	4448.21	II	235	7947.55	I	490	12464.02	I	1700	2476.42	I						
160	4452.38	II	210	7950.80	I	450	12570.04	I	250	2486.52	II						
50	4465.45	II	185	7952.16	I	120	12990.77	I	300	2488.92	II						
50 d	4466.28	II	110	7981.94	I	160	13076.91	I	200	2498.81	II						
50	4467.83	II	135	7982.40	I	700	13163.89	I	150	2505.73	II						
50	4469.41	II	190	7986.98	I	750	13164.85	I	150	2551.84	II						
360	4590.97	II	135	7987.33	I	640	13165.11	I	150	2565.51	II						
285	4596.17	II	250	7995.07	I	160	16212.06	I	100	2569.56	II						
80 d	4609.39	II	400	8221.82	I	120	17966.70	I	150	2658.75	II						
160	4638.85	II	265	8227.65	I	590	18021.21	I	1900	2763.09	I						
360	4641.81	II	265	8230.02	I	120	18041.48	I	150 h	2776.85	II						
450	4649.14	II	325	8233.00	I	120	18042.19	I	100 h	2787.92	II						
160	4650.84	II	120	8235.35	I	120	18046.23	I	200	2854.59	II						
360	4661.64	II	120	8426.16	I	140	18229.23	I	100 h	2871.37	II						
285	4676.23	II	810	8446.25	I	540	18243.63	I	100 h	2878.01	II						
220	4699.21	II	1000	8446.36	I	140	26173.56	I	520	2922.49	I						
285	4705.36	II	935	8446.76	I	Palladium			650	3002.65	I						
160	4924.60	II	325	8820.43	I	Pd Z = 46			1500	3027.91	I						
230 w	4930.27	V	160 d	9057.01	I	200	705.49	III	1100	3065.31	I						
220	4943.06	II	120	9118.29	I	200	727.72	III	2600	3114.04	I						
135	5329.10	I	80	9134.71	I	500	763.06	III	11000	3242.70	I						
160	5329.68	I	80	9150.14	I	500	766.42	III	2700	3251.64	I						
190	5330.74	I	80	9151.48	I	2000	781.02	III	3500	3258.78	I						
90	5435.18	I	235	9156.01	I	500	794.08	III	3600	3302.13	I						
110	5435.78	I	450	9260.81	I	500	797.52	III	5000	3373.00	I						
135	5436.86	I	490	9260.84	I	500	800.03	III	24000	3404.58	I						
120	5577.34	I	450	9260.94	I	500	800.10	III	13000	3421.24	I						
110	5592.37	III	400	9262.58	I	500	803.67	III	5000	3433.45	I						
130	5597.91	V	540	9262.67	I	500	825.35	III	6400	3441.40	I						
160	5958.39	I	590	9262.77	I	500	840.58	III	7700	3460.77	I						
190	5958.58	I	490	9265.94	I	500	856.47	III	10000	3481.15	I						
80	5995.28	I	640	9266.01	I	500	864.04	III	2000	3489.77	I						
160	6046.23	I	185	9399.19	I	500	880.59	III	12000	3516.94	I						
190	6046.44	I	120	9481.16	I	500	888.84	III	12000	3553.08	I						
110	6046.49	I	120 d	9482.88	I	1000	889.29	III	4500	3571.16	I						
100	6106.27	I	235	9487.43	I	300	1596.89	III	20000	3609.55	I						
400	6155.98	I	140	9492.71	I	500	1741.62	III	20000	3634.70	I						
450	6156.77	I	265	9497.97	I	4000	1782.55	III	5500	3690.34	I						
490	6158.18	I	160	9499.30	I	400	1843.49	III	1400	3718.91	I						
80	6256.83	I	235	9505.59	I	1500	1851.59	III	1500	3799.19	I						
100	6261.55	I	210	9521.96	I	2000	1852.27	III	1500	3832.29	I						
100	6366.34	I	120	9523.36	I	1000	1859.21	III	2200	3894.20	I						
100	6374.32	I	120	9523.96	I	1500	1874.63	III	1500	3958.64	I						
320	6453.60	I	100	9528.28	I	2000	1885.83	III	290	4087.34	I						
360	6454.44	I				1000	1887.40	III	2500	4212.95	I						
400	6455.98	I				1500	1891.34	III	180	4473.59	I						

Line Spectra of the Elements (continued): Palladium—Phosphorus

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
160	5163.84	I	15	1373.500	I	520	3204.04	V	150	6992.690	III
120	5295.63	I	10	1374.732	I	300	3219.307	III	100	7102.200	I
55	5542.80	I	15	1377.080	I	400	3233.602	III	100	7158.367	I
75	5670.07	I	15	1377.937	I	650	3347.736	IV	180	7165.465	I
55 h	5695.09	I	25	1379.429	I	570	3364.467	IV	180	7175.102	I
65	6784.52	I	25	1381.469	I	400	3371.122	IV	180	7176.660	I
75	7368.12	I	15	1381.637	I	300	3957.641	III	200	7443.657	IV
120	7764.03	I	500	1484.507	IV	350	3978.307	III	250	7845.63	II
45	7915.80	I	400	1487.788	IV	400	4059.312	III	100	8046.801	I
55	8132.82	I	350	1502.228	III	300	4080.084	III	150	8113.528	III
45	8300.83	I	80	1532.51	II	500	4222.195	III	140	8278.058	I
65	8761.35	I	120	1535.90	II	350	4246.720	III	100	8367.856	I
Phosphorus			450	1610.50	V	400	4420.71	II	140	8531.475	I
P Z = 15			150	1618.632	III	250	4479.776	III	140	8613.835	I
250	328.78	V	200	1618.907	III	250	4540.288	IV	180	8637.578	I
150	359.899	IV	140	1671.070	I	250	4541.112	IV	400	8741.529	I
500	388.318	IV	100	1671.510	I	500	4588.04	II	100	8872.174	I
250	389.50	V	180	1671.680	I	500	4589.86	II	180	9175.819	I
300	390.70	V	140	1672.035	I	600	4602.08	II	950	9193.85	I
300	445.158	IV	140	1672.474	I	300	4626.70	II	600	9278.88	I
375	475.60	V	600	1674.591	I	300	4658.31	II	1250	9304.94	I
120	498.180	III	600	1679.695	I	500	4943.53	II	500	9323.50	I
520	542.57	V	140	1685.976	I	300	4954.39	II	950	9435.069	I
600	544.92	V	100	1694.028	I	300	4969.71	II	950	9441.86	I
200	569.853	III	100	1694.486	I	100	5079.381	I	600	9452.83	I
200	581.831	III	100	1706.376	I	100	5098.221	I	1250	9493.56	I
350	629.008	IV	100	1707.553	I	100	5100.974	I	1700	9525.73	I
400	629.914	IV	600	1774.951	I	140	5109.628	I	1500	9545.18	I
500	631.779	IV	500	1782.838	I	140	5154.844	I	280	9556.81	I
450	673.90	V	400	1787.656	I	180	5162.290	I	1700	9563.439	I
10	810.24	II	140	1834.801	I	300	5253.52	II	280	9593.50	I
650	823.179	IV	140	1847.165	I	140	5293.539	I	750	9609.04	I
700	824.730	IV	100	1849.820	I	400	5296.13	II	400	9638.939	I
800	827.932	IV	140	1851.194	I	250	5316.07	II	500	9676.24	I
300	847.669	III	100	1852.069	I	300	5344.75	II	180	9706.533	I
350	855.624	III	500	1858.886	I	180	5345.851	I	1500	9734.750	I
500	859.652	III	400	1859.393	I	100	5364.631	I	280	9736.680	I
10	865.44	II	140	1864.348	I	250	5378.20	II	1500	9750.77	I
450	865.45	V	650	1888.523	IV	300	5386.88	II	600	9790.21	I
600	871.39	V	180	1905.481	I	400	5425.91	II	1700	9796.85	I
700	877.476	IV	140	1906.403	I	100	5428.094	I	280	9834.80	I
300	913.971	III	280	1907.665	I	400	5450.74	II	400	9903.68	I
300	917.120	III	280	2023.489	I	140	5458.305	I	280	9976.67	I
350	918.665	III	180	2024.516	I	180	5477.672	I	229	10084.27	I
1000	950.655	IV	400	2032.432	I	140	5477.860	I	458	10511.58	I
250	1003.598	III	400	2033.477	I	140	5478.267	I	962	10529.52	I
570	1025.563	IV	400	2135.465	I	100	5514.774	I	1235	10581.57	I
500	1028.096	IV	400	2136.182	I	100	5516.997	I	415	10596.90	I
570	1030.517	IV	400	2149.145	I	250	5588.34	II	435	10681.40	I
500	1033.111	IV	280	2152.940	I	500	6024.18	II	265	10813.13	I
500	1035.517	IV	500	2154.080	I	400	6034.04	II	764	11183.23	I
900	1117.98	V	180	2235.732	I	500	6043.12	II	402	11186.75	I
570	1118.551	IV	450	2440.93	V	250	6055.50	II	479	14241.64	I
700	1128.01	V	250	2478.256	IV	150	6083.409	III	256	14307.83	I
20	1249.82	II	750	2533.976	I	350	6087.82	II	714	15711.52	I
20	1301.87	II	950	2535.603	I	180	6097.690	I	228	15962.53	I
20	1304.47	II	750	2553.262	I	350	6165.59	II	296	16254.77	I
15	1304.68	II	500	2554.915	I	500	6199.024	I	203	16292.97	I
35	1305.48	II	250	2605.506	IV	180	6210.499	I	1627	16482.92	I
60	1310.70	II	300	2632.713	III	140	6375.681	I	588	16590.07	I
500	1334.808	III	400	2644.295	IV	100	6388.579	I	225	16613.05	I
650	1344.327	III	400	2728.770	IV	250	6435.32	II	221	16738.68	I
300	1344.845	III	500	2739.309	IV	600	6459.99	II	419	16803.39	I
500	1366.695	IV	250	2739.872	IV	600	6503.46	II	471	17112.48	I
15	1372.033	I	450	2978.55	V	600	6507.97	II	289	17286.91	I
400	1372.674	IV	700	3175.09	V	100	6717.411	I	299	17423.67	I

Line Spectra of the Elements (continued): Phosphorus—Potassium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
287	23844.97	I	100	2418.06	I	40 h	2865.05	II	14	4445.55	I
311	29097.16	I	50	2424.87	II	40 h	2875.85	II	25	4498.76	I
Platinum			80	2428.04	I	100 h	2877.52	II	12	4520.90	I
Pt Z = 78			50	2428.20	I	25	2888.20	I	35	4552.42	I
30	1621.66	II	25	2429.10	I	25	2893.22	I	12	4879.53	I
30	1723.13	II	180	2436.69	I	600	2893.86	I	14	5044.04	I
30	1751.70	II	650	2440.06	I	300	2897.87	I	30	5059.48	I
50 r	1777.09	II	60	2450.97	I	60	2905.90	I	35	5227.66	I
30	1781.86	II	440	2467.44	I	120	2912.26	I	40	5301.02	I
30	1879.09	II	35	2471.01	I	120	2913.54	I	12	5368.99	I
40	1883.05	II	1000	2487.17	I	70	2919.34	I	12	5390.79	I
50	1889.52	II	25	2488.74	II	30	2921.38	I	14	5475.77	I
50	1911.70	II	200	2490.12	I	1700	2929.79	I	14	5478.50	I
30	1929.25	II	160	2495.82	I	30	2942.76	I	6	5763.57	I
30	1929.68	II	240	2498.50	I	30	2944.75	I	20	5840.12	I
30	1939.80	II	50	2505.93	I	25	2959.10	I	8	5844.84	I
30	1949.90	II	120	2508.50	I	60	2960.75	I	6	6026.04	I
30	1983.74	II	50	2514.07	I	1800	2997.97	I	7	6318.37	I
40	2014.93	II	60	2515.03	I	35	3001.17	II	8	6326.58	I
3200	2030.63	I	240	2515.58	I	220	3002.27	I	9	6523.45	I
4400	2032.41	I	140	2524.30	I	30	3017.88	I	10	6710.42	I
100	2036.46	II	40	2529.41	I	30 h	3031.22	II	20	6760.02	I
40	2041.57	II	50	2536.49	I	130	3036.45	I	60	6842.60	I
5500	2049.37	I	160	2539.20	I	800	3042.64	I	20	7113.73	I
1500	2067.50	I	18	2549.46	I	3200	3064.71	I	10	8224.74	I
3000	2084.59	I	50	2552.25	I	30	3071.94	I	Plutonium		
1000	2103.33	I	50	2596.00	I	130	3100.04	I	Pu Z = 94		
30	2115.57	II	70	2603.14	I	320	3139.39	I	10000	2806.11	II
950	2128.61	I	30	2616.76	II	140	3156.56	I	10000	2950.06	II
30	2130.69	II	50	2619.57	I	120	3200.71	I	10000	3000.31	II
1900	2144.23	I	30	2625.34	II	320	3204.04	I	10000	3200.23	II
100	2144.24	II	1100	2628.03	I	30	3230.29	I	10000	3418.88	II
600	2165.17	I	130	2639.35	I	20	3233.42	I	10000	3805.93	I
1500	2174.67	I	1000	2646.89	I	20	3250.36	I	10000	4097.12	I
30	2190.32	II	500	2650.86	I	40	3251.98	I	10000	4170.95	I
400	2202.22	I	20	2658.17	I	160	3255.92	I	10000	4367.41	I
50 h	2202.58	II	2800	2659.45	I	25	3268.42	I	10000	5590.54	I
320	2222.61	I	40	2674.57	I	25	3281.97	I	10000	7068.90	I
50 h	2233.11	II	440	2677.15	I	120	3290.22	I	10000	8691.94	I
30 h	2240.99	II	200	2698.43	I	500	3301.86	I	3000	9533.07	I
100	2245.52	II	2000	2702.40	I	60	3315.05	I	3000	12144.46	I
150	2249.30	I	1600	2705.89	I	35	3323.80	I	3000	16897.38	I
30	2251.52	II	60	2713.13	I	340	3408.13	I	Polonium		
30 h	2251.92	II	1300	2719.04	I	35	3427.93	I	Po Z = 84		
190	2268.84	I	130	2729.92	I	60	3483.43	I	1500 w	2450.08	I
30 h	2271.72	II	1800	2733.96	I	160	3485.27	I	1500 w	2558.01	I
280	2274.38	I	70	2738.48	I	120	3628.11	I	2500 w	3003.21	I
50 h	2287.50	II	70	2747.61	I	70	3638.79	I	1200	4170.52	I
30	2288.20	II	80	2753.86	I	70	3643.17	I	800	4493.21	I
150	2289.27	I	200	2754.92	I	50	3663.10	I	500	8618.26	I
150	2292.40	I	30	2769.84	I	80	3671.99	I	Potassium		
240	2308.04	I	500	2771.67	I	80	3674.04	I	K Z = 19		
50	2310.96	II	40	2773.24	I	35	3699.91	I	100	214.35	V
90	2315.50	I	20	2774.00	I	18	3706.53	I	150	271.82	IV
220	2318.29	I	50	2774.77	II	80	3818.69	I	100	273.06	IV
100	2326.10	I	50	2793.27	I	40	3900.73	I	150	282.35	V
170	2340.18	I	100	2794.21	II	110	3922.96	I	150	293.33	V
280	2357.10	I	40 h	2799.98	II	35	3948.40	I	300	294.84	V
180	2368.28	I	140	2803.24	I	100	3966.36	I	200	296.17	V
50	2377.28	II	10	2808.51	I	20	3996.57	I	200	297.06	V
130	2383.64	I	50	2818.25	I	110	4118.69	I	200	300.25	V
40	2386.81	I	30 h	2822.27	II	80	4164.56	I	200	300.50	V
120	2389.53	I	1400	2830.30	I	40	4192.43	I	200	311.24	V
35	2396.17	I	70	2834.71	I	18	4327.06	I	250	312.77	V
70	2401.87	I	16	2853.11	I	18	4391.83	I	200	315.18	V
200	2403.09	I	80 h	2860.68	II	80	4442.55	I	250	327.38	V

Line Spectra of the Elements (continued): Potassium—Praseodymium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
25	330.68	III	75	434.72	III	15	874.04	III	11	8503.45	I
300	340.46	IV	50	435.68	III	6	2550.02	III	10	8505.11	I
150	340.74	IV	250	438.02	V	5	2635.11	III	4	8763.96	I
30	341.92	III	25	441.81	II	5	2689.90	III	3	8767.05	I
15	348.00	III	200	442.30	IV	5	2938.45	III	13	8902.19	I
200	349.50	V	300	443.57	IV	5	2986.20	III	12	8904.02	I
300	354.93	IV	75	444.34	III	6	2992.42	III	5	8923.31	I
150	356.26	IV	200	445.61	IV	6	3052.07	III	4	8925.44	I
300	359.73	IV	250	446.83	IV	5	3056.84	III	7	9347.24	I
200	359.91	IV	75	448.60	III	5	3062.18	II	3	9349.25	I
250	362.08	IV	750	448.60	IV	4	3101.79	I	6	9351.59	I
150	362.15	IV	200	449.71	V	3	3102.04	I	15	9595.70	I
150	363.02	IV	200	452.90	V	7	3217.16	I	14	9597.83	I
500	372.15	V	250	455.67	V	6	3217.62	I	6	9949.67	I
200	372.46	V	400	456.33	IV	11	3446.37	I	5	9954.14	I
200	372.77	V	400	456.33	V	10	3447.38	I	9	10479.63	I
300	375.96	IV	75	466.79	III	3	3648.84	I	5	10482.15	I
300	375.96	V	100	470.09	III	4	3648.98	I	8	10487.11	I
250	377.76	V	75	471.57	III	18	4044.14	I	17	11019.87	I
30	379.12	III	45	474.92	III	17	4047.21	I	16	11022.67	I
300	379.12	V	10	476.03	II	10	4641.88	I	17	11690.21	I
300	379.88	IV	40	479.18	III	11	4642.37	I	16	11769.62	I
25	380.48	III	10	482.11	III	4	4740.91	I	17	11772.83	I
250	380.48	IV	10	482.41	III	6	4744.35	I		12522.11	I
200	381.70	IV	200	482.71	V	5	4753.93	I		13377.86	I
30	382.23	III	200	483.75	V	7	4757.39	I		13397.09	I
300	382.23	IV	30	495.14	II	5	4786.49	I		15163.08	I
150	382.49	IV	75	497.10	III	7	4791.05	I		15168.40	I
200	382.65	IV	10	514.94	III	6	4799.75	I		40158.37	I
300	382.91	IV	50	520.61	III	8	4804.35	I	Praseodymium		
250	384.10	IV	250	523.00	IV	7	4849.86	I	Pr Z = 59		
200	386.61	IV	25	523.79	III	8	4856.09	I	7000	865.90	V
300	387.80	V	200	526.45	IV	8	4863.48	I	5000	869.17	V
250	388.92	IV	150	527.62	IV	9	4869.76	I	2000	1228.59	IV
250	389.07	IV	40	529.80	III	8	4942.02	I	5000	1293.22	IV
250	389.07	V	15	539.71	III	9	4950.82	I	5000	1295.28	IV
250	390.11	V	15	546.12	III	9	4956.15	I	5000	1321.36	IV
250	390.42	IV	750	580.32	V	10	4965.03	I	5000	1333.57	IV
300	390.57	IV	250	585.51	V	10	5084.23	I	5000	1354.66	IV
200	391.46	IV	500	586.32	V	11	5097.17	I	2000	1360.64	IV
200	392.47	IV	30	600.77	II	11	5099.20	I	2000	1365.77	IV
500	393.14	IV	250	602.27	V	12	5112.25	I	5000	1374.41	IV
250	395.40	V	400	603.43	V	12	5323.28	I	5000	1435.56	IV
200	398.36	V	25	607.93	II	13	5339.69	I	2000	1520.98	IV
15	398.63	III	30	612.62	II	12	5342.97	I	5000	1574.55	IV
200	398.88	V	250	638.67	V	14	5359.57	I	5000	1575.10	IV
200	399.75	V	750	646.19	IV	16	5782.38	I	3000	1578.38	IV
400	400.21	IV	300	687.50	V	17	5801.75	I	2000	1622.30	IV
20	402.10	III	20	708.84	III	15	5812.15	I	10000	1884.87	IV
300	402.91	IV	300	720.43	V	17	5831.89	I	2000	2083.23	IV
250	403.97	IV	400	724.42	V	8	6120.27	II	3300	2246.20	V
150	404.41	IV	600	731.86	V	7	6307.29	II	2000 c	2378.98	IV
30	406.48	III	500	737.14	IV	19	6911.08	I	40 h	2598.04	II
250	408.08	IV	500	741.95	IV	12	6936.28	I	100 h	2707.37	II
40	408.96	III	500	745.26	IV	20	6938.77	I	60	2760.35	II
50	413.79	III	400	746.35	IV	7	6964.18	I	270	3168.24	II
30	414.87	III	300	749.99	IV	12	6964.67	I	200 d	3195.99	II
250	415.05	V	150	754.19	IV	25	7664.90	I	190	3219.48	II
200	415.79	V	400	754.67	IV	24	7698.96	I	200	3584.21	II
30	416.00	III	20	765.31	III	5	7955.37	I	250	3645.66	II
150	417.28	IV	30	765.64	III	4	7956.83	I	250	3646.30	II
30	417.54	III	150	770.29	V	7	8078.11	I	370	3668.83	II
30	418.62	III	150	771.46	V	6	8079.62	I	290	3714.05	II
400	422.18	V	35	778.53	III	9	8250.18	I	410	3739.18	II
300	425.16	V	20	872.31	III	8	8251.74	I	680	3761.87	II
500	425.59	V	10	873.86	III	3	8390.22	I	680	3800.30	II

Line Spectra of the Elements (continued): Praseodymium—Protactinium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
390	3811.84	II	560	4096.82	II	680	5259.73	II	1000 r	3998.96	II
1300 h	3816.02	II	380	4098.40	II	340 c	5292.02	II	1000	4417.96	II
680	3818.28	II	2900 c	4100.72	II	340	5292.62	II	900 r	4728.36	I
310	3821.80	II	1700 c	4118.46	II	430	5322.76	II	900	6100.21	I
960	3830.72	II	340	4130.77	II	65	5509.15	II	1000 d	6520.45	I
480	3840.99	II	1500 c	4141.22	II	150	5535.17	II	Protactinium		
580	3846.59	II	2700	4143.11	II	110	5623.05	II	Pa Z = 91		
1200	3850.79	II	1700 c	4164.16	II	90	5624.45	II	3000	2599.16	II
720 c	3851.55	II	620	4171.82	II	90	5756.17	II	3000	2699.22	II
960	3852.80	II	730	4172.25	II	90	5779.28	I	3000	2822.79	II
480 c	3865.45	II	5200	4179.39	II	160 d	5815.17	II	3000 h	2871.42	II
480	3876.19	II	2500	4189.48	II	90	5823.72	II	3000 h	2891.14	II
1700 c	3877.18	II	560 c	4191.60	II	90	5859.68	II	3000 l	3011.10	II
680	3880.47	II	2500 c	4206.72	II	160	5939.90	II	3000 s	3033.59	II
440 c	3885.19	II	500	4208.32	II	7000 w	5956.05	III	3000 l	3071.24	II
440 c	3889.34	II	320	4211.86	II	90	5956.60	II	3000 l	3093.23	II
770 c	3908.05	II	320	4217.81	II	110	5967.82	II	3000 l	3126.23	II
630	3912.90	II	3800	4222.93	II	90	6006.33	II	3000 l	3146.28	II
310	3913.55	II	3800	4225.35	II	150	6017.80	II	3000 l	3170.89	II
1300 c	3918.85	II	320	4233.11	II	150	6025.72	II	3000 l	3171.54	II
420	3919.63	II	320 c	4236.15	II	140	6055.13	I	3000 l	3240.58	II
960	3925.47	II	960	4241.01	II	65	6087.52	II	3000	3274.46	II
480	3927.46	II	340	4243.51	II	9000 w	6090.02	III	3000 l	3332.69	II
370	3929.29	II	840 c	4247.63	II	65	6114.38	II	3000 s	3346.66	II
370	3935.82	II	500	4254.40	II	65	6148.23	I	3000 l	3452.82	II
730 c	3947.63	II	320	4269.09	II	5000	6160.24	III	3000	3504.97	I
900 c	3949.43	II	790 c	4272.27	II	190	6161.18	II	3000 s	3530.65	II
900 c	3953.51	II	470 c	4280.07	II	270	6165.94	II	3000	3570.56	I
380	3956.75	II	790 c	4282.42	II	45	6244.35	II	3000	3571.82	I
470	3962.45	II	450 c	4298.98	II	110	6281.28	II	3000	3618.07	I
560	3964.26	II	1500	4305.76	II	55 c	6359.03	I	10000	3636.52	I
1600 c	3964.81	II	1300	4333.97	II	55	6411.23	I	3000	3702.74	I
560 c	3966.57	II	360	4338.70	II	45	6429.63	II	3000	3752.67	I
500	3971.16	II	620 cw	4344.30	II	45	6431.84	II	3000	3873.35	I
320	3971.67	II	470 c	4347.49	II	45	6486.55	I	3000	3931.83	I
620 c	3972.14	II	340	4350.40	II	45	6566.77	II	3000 s	3952.62	II
320	3974.85	II	450	4354.91	II	55	6616.67	I	10000 l	3957.85	II
1300 c	3989.68	II	410 c	4359.79	II	75	6656.83	II	3000 s	3970.07	II
340	3992.16	II	1200	4368.33	II	55	6673.41	II	3000	3981.82	I
1600	3994.79	II	320	4371.62	II	75	6673.78	II	10000	3982.23	I
560 c	3997.04	II	430	4405.83	II	35 c	6747.09	I	3000 l	4012.96	II
320	3999.12	II	1700	4408.82	II	55 cw	6798.60	I	3000 s	4018.21	II
620 c	4000.17	II	410	4413.77	II	35 cw	6827.60	II	3000	4030.16	II
730	4004.70	II	1200 c	4429.13	II	7000	6910.14	III	3000 s	4046.93	II
1900	4008.69	II	730	4449.83	II	40	7021.51	II	10000 s	4056.20	II
620	4010.60	II	960	4468.66	II	5000	7030.39	III	10000 s	4070.40	II
730	4015.39	II	1100	4496.46	II	4500	7076.62	III	3000 l	4176.18	II
620	4020.96	II	790	4510.15	II	20	7114.55	I	10000 l	4217.23	II
470	4022.71	II	340 c	4534.15	II	24	7227.70	II	10000 s	4248.08	II
360	4025.54	II	340	4535.92	II	16	7407.56	II	3000 s	4291.34	II
360 c	4029.72	II	270 c	4628.74	II	20 c	7451.74	II	3000 s	4601.43	II
730 c	4031.75	II	270 c	4672.09	II	14	7541.02	II	3000 l	6035.78	I
960	4033.83	II	290	4695.77	I	20	7645.66	II	3000	6162.56	I
730	4038.45	II	250	4736.69	I	16	7721.84	I	3000 l	6358.61	I
470	4039.34	II	200	4924.60	I	14	7871.67	I	3000	6379.25	I
1300	4044.81	II	320	4939.74	I	14	8067.44	I	3000 l	6438.97	I
340	4047.08	II	380	4951.37	I	10 cw	8122.78	II	3000 h	6792.75	I
450	4051.13	II	270	5034.41	II	11	8141.10	I	10000	6945.72	I
2200	4054.88	II	320	5045.52	I	5000 w	8602.74	III	3000	6960.09	I
2200	4056.54	II	360	5110.38	II	10	8714.59	II	3000 h	6961.78	I
450	4058.80	II	560	5110.76	II	Promethium			3000 s	6992.73	I
3400	4062.81	II	410	5129.52	II	Pm Z = 61			3000	7076.27	I
500 c	4079.77	II	620	5173.90	II	1000	3892.15	II	3000 h	7100.94	I
500 c	4080.98	II	360	5206.55	II	1000	3910.26	II	10000 s	7114.89	I
790	4081.85	II	360	5219.05	II	1000	3919.10	II	3000 h	7171.55	I
500	4083.34	II	560	5220.11	II	1000	3957.74	II	3000	7227.13	I

Line Spectra of the Elements (continued): Protactinium—Rhenium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
3000	7318.79	I	680	2306.54	I	270	2649.05	I	440	3177.71	I
10000 I	7368.25	I	800	2322.49	I	660	2651.90	I	260	3178.61	I
3000 h	7471.89	I	300	2328.66	I	400	2654.12	I	600	3182.87	I
10000 h	7493.15	I	860	2344.78	I	220	2663.63	I	1100	3184.76	I
3000 h	7558.26	I	230	2349.39	I	940	2674.34	I	1100	3185.57	I
10000 h	7608.20	I	680	2352.07	I	220	2688.53	I	260	3190.78	I
10000	7626.79	I	250	2356.50	I	1300	2715.47	I	260	3192.36	I
10000 s	7635.18	I	1200	2365.90	I	220	2732.21	I	220	3198.58	I
10000	7669.34	I	570	2367.68	I	610	2733.04	II	1100 c	3204.25	I
3000	7679.20	I	520	2369.27	I	220	2758.00	I	380	3235.94	I
10000 h	7749.19	I	220	2370.76	II	210	2763.79	I	600	3258.85	I
3000	7872.95	I	320	2375.07	I	310	2767.74	I	600	3259.55	I
3000 I	7945.56	I	370	2379.77	I	220	2768.85	I	300	3268.89	I
10000	8039.34	I	340	2388.57	I	220	2769.32	I	280	3296.70	I
10000 h	8099.84	I	230	2393.65	I	350	2770.42	I	280	3296.99	I
10000	8199.04	I	320	2394.37	I	550	2783.57	I	280	3301.60	I
10000	8271.87	I	320	2396.79	I	220	2791.29	I	240	3302.23	I
3000 s	8358.98	I	210 d	2400.72	I	220	2814.68	I	320	3303.21	II
3000 s	8369.60	I	210	2401.68	I	880	2819.95	I	280	3303.75	I
3000 h	8441.04	I	1500	2405.06	I	310	2834.08	I	240	3313.95	I
10000 h	8532.66	I	740	2405.60	I	220	2843.00	I	600	3322.48	I
10000 s	8572.96	I	320	2406.70	I	270	2850.98	I	2000	3338.18	I
3000 h	8639.91	I	270	2410.37	I	240	2867.19	I	1600	3342.24	I
3000 h	8653.51	I	1200	2419.81	I	2900	2887.68	I	810	3344.32	I
10000	8735.27	I	300	2421.73	I	490	2896.01	I	320	3346.20	I
3000	10923.32	I	300	2421.88	I	830 c	2902.48	I	240 d	3356.33	I
10000	11791.73	I	2500	2428.58	I	210	2905.58	I	240	3377.74	I
10000	14344.76	I	490	2431.54	I	550	2909.82	I	320	3379.06	II
3000	18478.61	I	420	2432.18	I	830 c	2927.42	I	320	3379.70	I
	Radium		340 c	2441.47	I	270	2930.61	I	240	3389.43	I
	Ra Z = 88		230	2442.51	I	440	2943.14	I	4000	3399.30	I
100	3649.55	II	250	2444.94	I	270	2962.27	I	650	3404.72	I
200	3814.42	II	610	2446.98	I	720	2965.11	I	650	3405.89	I
100	4340.64	II	610	2449.71	I	1500	2965.76	I	240	3408.67	I
100	4682.28	II	390	2461.20	I	310	2976.29	I	320	3409.83	I
100	4825.91	I	800 c	2461.84	II	210	2978.15	I	320	3417.77	I
50	5660.81	I	1200	2483.92	I	220	2980.82	I	810	3419.41	I
50	7141.21	I	390	2485.81	I	220	2982.19	I	8000	3424.62	I
50	8019.70	II	980	2487.33	I	220	2988.47	I	400	3426.19	I
	Radon		370	2496.04	I	1800	2992.36	I	300	3427.61	I
	Rn Z = 86		370	2501.72	I	5500	2999.60	I	320	3437.71	I
100	4349.60	I	570	2502.35	II	350	3001.14	I	400	3449.37	I
200	7055.42	I	230	2504.60	II	220	3004.14	I	16000 c	3451.88	I
100	7268.11	I	270	2505.94	I	500	3016.02	I	240	3453.50	I
300	7450.00	I	1800 c	2508.99	I	300	3016.49	I	55000 c	3460.46	I
100	7809.82	I	570	2520.01	I	380	3030.45	I	40000 c	3464.73	I
100	8099.51	I	540	2521.50	I	240	3047.25	I	400	3467.96	I
100	8270.96	I	370	2534.80	I	1600	3067.40	I	240	3476.44	I
100	8600.07	I	570	2540.51	I	320	3069.94	I	400	3480.38	I
	Rhenium		740 d	2544.74	I	260	3071.16	I	320	3480.85	I
	Re Z = 75		370	2545.48	I	550	3082.43	I	240	3482.23	I
25000	2003.53	I	300	2552.02	I	340	3088.76	I	560	3503.06	I
16000	2017.87	I	370	2554.63	II	700	3100.67	I	320	3516.65	I
27000	2049.08	I	1000	2556.51	I	700	3108.81	I	320	3517.33	I
10000	2085.59	I	250	2559.08	I	340	3110.86	I	320	3537.46	I
9800	2097.12	I	340	2564.19	I	340 c	3118.19	I	240	3549.89	I
3400	2139.04	II	540	2568.64	II	340	3121.36	I	240	3570.26	I
3700	2156.67	I	370	2571.81	II	420	3128.94	I	360	3579.12	I
4900	2167.94	I	380	2586.79	I	260	3134.02	I	810 c	3580.15	II
3400	2176.21	I	290	2599.86	I	250	3141.38	I	650	3580.97	I
4200 c	2214.26	II	290	2603.89	I	440	3151.64	I	810	3583.02	I
5200 c	2275.25	II	660	2608.50	II	330	3153.79	I	320	3617.08	I
2900	2287.51	I	610 d	2611.54	I	360 c	3158.31	I	810	3637.84	I
2700	2294.49	I	310	2635.83	II	220	3164.52	I	440	3651.97	I
390	2298.09	II	550	2636.64	I	700	3168.37	I	320	3670.53	I
610	2302.99	I	270	2642.75	I	220	3174.61	I	860 c	3689.50	I

Line Spectra of the Elements (continued): Rhenium—Rhodium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
1500 c	3691.48	I	800	1880.66	III	160	2728.94	I	880 d	3538.14	I
520	3703.24	I	500	1884.91	III	100	2771.51	I	280	3541.91	I
240	3709.93	I	500	1887.36	III	130	2783.03	I	1200	3543.95	I
360 c	3717.28	I	700	1888.62	III	150	2826.43	I	1800	3549.54	I
4000	3725.76	I	800	1901.32	III	180	2826.68	I	1200	3570.18	I
240 c	3735.01	I	500	1910.16	III	280	2862.94	I	4700	3583.10	I
810	3735.31	I	600	1919.37	III	110	2878.66	I	4700	3596.19	I
910	3740.10	I	500	1927.07	III	140	2882.37	I	5900	3597.15	I
300 cw	3745.44	I	700	1931.79	III	160	2907.21	I	3100	3612.47	I
700	3787.52	I	500	1954.25	III	65	2910.17	II	1800	3626.59	I
240	3869.94	I	500	1994.26	III	180	2924.02	I	8200	3657.99	I
240	3875.26	I	800	2013.71	III	130	2929.11	I	1300	3666.22	I
240	3876.86	I	500	2017.47	III	130	2931.94	I	560	3681.04	I
380 c	3917.27	I	500	2028.53	III	230	2968.66	I	1900	3690.70	I
550	3929.85	I	800	2036.72	III	160	2977.68	I	9400	3692.36	I
280	3961.04	I	600	2037.61	III	450	2986.20	I	940	3695.52	I
350 c	3962.48	I	1000	2040.18	III	110	3004.46	I	280	3698.26	I
220	4033.31	I	3000	2048.67	III	50	3006.43	III	380	3698.60	I
240	4081.43	I	2000	2064.11	III	130	3023.91	I	7600	3700.91	I
240 c	4110.89	I	800	2076.84	III	50	3052.44	III	940	3713.02	I
240 cw	4133.42	I	1000	2118.53	III	180	3083.96	I	650	3735.28	I
1800	4136.45	I	1000	2118.63	III	140	3121.76	I	420	3737.27	I
700	4144.36	I	1000	2139.44	III	240	3123.70	I	420	3744.17	I
220	4182.90	I	1000	2152.23	III	130	3155.78	I	1200	3748.22	I
220	4183.06	I	3000	2158.17	III	140	3189.05	I	240	3754.12	I
650	4221.08	I	3000	2163.19	III	470	3191.19	I	380	3754.27	I
3600 c	4227.46	I	3000	2167.33	III	190	3197.13	I	490	3755.58	I
260 c	4257.60	I	150	2276.21	II	520	3263.14	I	1000	3760.40	I
380	4358.69	I	140	2288.57	I	520	3271.61	I	2300	3765.08	I
360 cw	4394.38	I	110	2309.82	I	2300	3280.55	I	490	3769.97	I
2600	4513.31	I	350	2322.58	I	2300	3283.57	I	380	3778.13	I
260	4516.64	I	140	2326.47	I	280	3289.14	I	1000	3788.47	I
500	4522.73	I	190	2334.77	II	210	3294.28	I	1300	3792.18	I
2200 cw	4889.14	I	300	2361.92	I	260	3300.46	I	3800	3793.22	I
220	4923.90	I	110	2368.34	I	50	3310.69	III	4900	3799.31	I
1300	5270.95	I	270	2382.89	I	4200	3323.09	I	760	3805.92	I
1600 cw	5275.56	I	230	2383.40	I	330	3338.54	I	1300	3806.76	I
100	5667.88	I	270	2386.14	II	280	3360.80	I	470	3815.01	I
110 c	5752.93	I	80	2415.84	II	420	3368.38	I	760	3816.47	I
110 cw	5776.83	I	130	2427.68	I	1100	3372.25	I	1300	3818.19	I
550	5834.31	I	230	2429.52	I	110	3377.14	I	3800	3822.26	I
200	6307.70	I	110	2437.90	I	110	3385.78	I	2300	3828.48	I
200	6321.90	I	330	2440.34	I	5600	3396.82	I	2000	3833.89	I
100 cw	6605.19	I	90	2461.04	II	820	3399.70	I	5900	3856.52	I
180 c	6813.41	I	130	2473.09	I	160	3406.55	I	490	3870.01	I
260	6829.90	I	150	2487.47	I	820	3412.27	I	380	3877.34	I
50 cw	7640.94	I	100	2490.77	II	330	3421.22	I	120	3913.51	I
65 cw	7912.94	I	130	2502.46	I	120 d	3424.38	I	240	3922.19	I
Rhodium			300	2504.29	II	8200	3434.89	I	2000	3934.23	I
Rh Z = 45			150	2505.67	I	1400	3440.53	I	590	3942.72	I
50	813.44	III	350	2509.70	I	120	3447.74	I	3800	3958.86	I
80	882.51	III	300	2511.03	II	120	3450.29	I	45	3964.54	II
100	925.75	III	200	2515.75	I	400	3455.22	I	380	3975.31	I
150	937.28	III	130	2520.53	II	180	3457.07	I	240	3984.40	I
500	991.62	III	110	2537.04	II	220	3457.93	I	240	3995.61	I
400	992.48	III	350	2545.70	I	5900	3462.04	I	380	3996.15	I
500 d	1009.60	III	550	2555.36	I	180	3469.62	I	120	4023.14	I
200	1012.22	III	150	2622.58	I	4700	3470.66	I	560	4082.78	I
200	1015.17	III	230	2625.88	I	120	3472.25	I	140	4097.52	I
200	1073.87	III	100	2630.42	I	4700	3474.78	I	120	4119.68	I
150	1784.24	III	110	2647.28	I	2100	3478.91	I	1100	4121.68	I
200	1784.94	III	400	2652.66	I	110	3494.44	I	1500	4128.87	I
150	1796.50	III	100	2680.63	I	1200	3498.73	I	2100	4135.27	I
200	1816.03	III	400	2703.73	I	5900	3502.52	I	240	4154.37	I
1000	1832.05	III	100	2715.31	II	2800	3507.32	I	330	4196.50	I
500	1859.85	III	180	2718.54	I	8800	3528.02	I	3300	4211.14	I

Line Spectra of the Elements (continued): Rhodium—Ruthenium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
820	4288.71	I	1200	598.49	III	5	6299.224	I	370	2456.57	II
4200	4374.80	I	1500	643.878	II	10000	6458.33	II	280	2478.93	II
130	4569.00	I	25	663.76	IV	5000	6560.81	II	140	2498.42	II
150	4675.03	I	3000	697.049	II	100 I	7279.997	I	140	2498.57	II
70	4745.11	I	6000	711.187	II	150	7408.173	I	260	2507.01	II
70	5090.63	I	25	716.24	IV	200 I	7618.933	I	110	2513.32	II
60	5155.54	I	50	740.85	IV	300	7757.651	I	110	2517.32	II
60	5175.97	I	10000	741.456	II	60	7759.436	I	150	2535.59	II
95	5193.14	I	5000	769.04	III	90000 c	7800.27	I	550	2549.58	I
130	5354.40	I	25	776.89	IV	45000 c	7947.60	I	370	2609.06	I
95	5390.44	I	2500	815.28	III	40 I	8271.41	I	830	2612.07	I
160	5599.42	I	15	850.18	IV	30	8271.71	I	460	2642.96	I
40	5686.38	I	1000	1604.12	II	40 I	8868.512	I	330	2651.84	I
29	5792.66	I	5000	1760.50	II	30	8868.852	I	400	2659.62	I
40	5806.91	I	2000	2068.92	II	30 I	9522.65	I	330	2661.61	II
35	5831.58	I	10000	2075.95	II	20 I	9540.18	I	690	2678.76	II
130	5983.60	I	30000	2143.83	II	2000 c	9689.05	II	330	2692.06	II
35	6102.72	I	10000	2217.08	II	35 I	10075.282	I	200	2712.41	II
14	6199.99	I	5000	2291.71	II	30 I	10075.708	I	690	2719.52	I
16	6253.72	I	50000	2472.20	II	100	13235.17	I	140	2725.47	II
29	6319.53	I	1000	2631.75	III	20	13442.81	I	310	2734.35	II
40	6752.35	I	2000	2956.07	III	30	13443.57	I	1800	2735.72	I
13	6827.33	I	500	3086.84	III	75	13665.01	I	100	2778.38	II
11	6857.68	I	500	3111.36	III	1000	14752.41	I	110	2787.83	II
20	6879.94	I	5000 c	3148.90	II	800	15288.43	I	350	2810.03	I
65	6965.67	I	25	3157.54	I	150	15289.48	I	1700	2810.55	I
16	6979.15	I	50	3227.98	I	20	22529.65	I	350	2818.36	I
16	7001.58	I	500	3286.41	III	4	27314.31	I	400	2829.16	I
18	7101.64	I	60	3348.72	I	Ruthenium			640	2854.07	I
15	7104.45	I	75	3350.82	I	Ru Z = 44			420	2861.41	I
18	7268.18	I	100	3587.05	I	250	850.09	III	550	2866.64	I
35	7270.82	I	40	3591.57	I	200	850.30	III	1800	2874.98	I
18 h	7442.39	I	5000	3600.60	II	250	919.74	III	740	2886.54	I
12	7475.74	I	10000	3600.64	II	500	940.09	III	370	2908.88	I
12	7495.24	I	25000	3940.51	II	500	966.54	III	1100	2916.26	I
11	7557.67	I	1000	4201.80	I	750	974.14	III	180	2945.67	II
29	7791.61	I	500	4215.53	I	900	979.43	III	370	2949.50	I
55	7824.91	I	90000	4244.40	II	500	981.35	III	550	2965.16	I
21	8029.91	I	15000	4273.14	II	900	986.84	III	170	2965.55	II
29	8045.36	I	20000	4571.77	II	900	994.56	III	140	2976.59	II
15	8136.20	I	10000	4648.57	II	300	1001.65	III	550	2976.92	I
8	8425.59	I	30000	4775.95	II	500	1009.13	III	1400	2988.95	I
Rubidium			2	5087.987	I	900	1009.87	III	460	2994.96	I
Rb Z = 37			2	5132.471	I	500	1014.68	III	440	3006.59	I
30	465.85	III	10	5150.134	I	800	1190.51	III	330	3017.24	I
40	481.118	II	10000	5152.08	II	500	1200.07	III	310	3020.88	I
500	482.83	III	1	5165.023	I	500	1207.17	III	390	3064.84	I
500	489.66	III	2	5165.142	I	500	1209.77	III	330	3096.57	I
600	493.48	III	15	5195.278	I	300	1211.31	III	830	3099.28	I
90	497.430	II	2	5233.968	I	500	1941.35	III	740	3100.84	I
20	508.434	II	20	5260.034	I	500	2009.28	III	490	3294.11	I
150	513.266	II	1	5260.228	I	2400	2076.43	I	370	3301.59	I
300	530.173	II	3	5322.380	I	2600	2083.77	I	930	3339.55	I
75	533.801	II	40	5362.601	I	2400	2090.89	I	3100	3417.35	I
1200	535.86	III	4	5390.568	I	690	2255.52	I	4900	3428.31	I
40	542.887	II	75	5431.532	I	780	2272.09	I	6400	3436.74	I
200	555.036	II	3	5431.830	I	780	2279.57	I	8300	3498.94	I
1200	556.19	III	6	5578.788	I	480	2317.80	I	640	3514.49	I
1500	566.71	III	40	5647.774	I	120	2334.96	II	790	3539.37	I
1000	572.82	III	20	5653.750	I	190 h	2342.85	II	690	3570.59	I
1500	576.65	III	60	5724.121	I	310	2351.33	I	6400	3589.22	I
2500	579.63	III	3	5724.614	I	170	2357.91	II	6900	3593.02	I
1500	581.26	III	75	6070.755	I	780	2402.72	II	6400	3596.18	I
2500	589.419	II	30 c	6159.626	I	150	2407.92	II	1300	3599.76	I
1000	594.94	III	75 c	6206.309	I	180	2455.53	II	3100	3634.93	I
1300	595.88	III	120 c	6298.325	I	150	2456.44	II	6200	3661.35	I

Line Spectra of the Elements (continued): Ruthenium—Samarium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
830	3663.37	I	930	4307.60	I	18	7722.87	I	1500	3990.00	II
650	3669.49	I	550	4319.87	I	22	7791.86	I	1400	4064.58	II
550	3726.10	I	550	4342.07	I	30	7847.80	I	1000	4092.27	II
8700	3726.93	I	710	4354.13	I	80	7881.49	I	1900	4118.55	II
11000	3728.03	I	870	4361.21	I	18	8264.96	I	1200	4152.21	II
7100	3730.43	I	2400	4372.21	I	22	8710.84	I	1000	4188.13	II
3500	3742.28	I	870	4385.39	I				1100	4203.05	II
870	3742.78	I	1300	4385.65	I				1000	4225.33	II
2800	3745.59	I	1700	4390.44	I				1200	4236.74	II
760	3753.54	I	1600	4410.03	I	150	2789.38	II	2100	4256.39	II
870	3755.93	I	1100	4460.04	I	410	3152.52	II	1300	4262.68	II
1200	3759.84	I	5400	4554.51	I	720	3183.92	II	1200	4279.68	II
600	3761.51	I	1700	4584.44	I	600	3211.73	II	2200	4280.79	II
600	3767.35	I	720	4647.61	I	600	3216.85	II	710	4282.21	I
1500	3777.59	I	1400	4709.48	I	720	3218.61	II	470	4282.83	I
600	3782.74	I	500	4757.84	I	720	3230.56	II	1600	4296.74	I
3900	3786.06	I	550	4869.15	I	720	3236.64	II	1900	4318.94	II
6000	3790.51	I	160	5011.23	I	720	3239.66	II	470	4319.53	I
760	3798.05	I	450	5057.33	I	850	3250.37	II	1800	4329.02	II
7600	3798.90	I	120	5076.32	I	1700	3254.38	II	440	4330.02	I
7600	3799.35	I	200	5093.83	I	1200	3306.39	II	1300	4334.15	II
600	3812.72	I	530	5136.55	I	1200	3321.18	II	880	4336.14	I
760	3817.27	I	170	5142.76	I	1200	3365.86	II	1100	4336.14	I
760	3819.03	I	250	5147.24	I	1200	3382.40	II	440	4347.80	II
650	3822.09	I	110	5151.07	I	4200	3568.27	II	530	4362.91	I
550	3824.93	I	500	5155.14	I	4200	3592.60	II	1600	4380.42	I
760	3831.80	I	920	5171.03	I	1700	3604.28	II	410	4390.86	II
930	3839.70	I	180	5195.02	I	3400	3609.49	II	470	4401.17	I
760	3850.43	I	130	5284.08	I	1700	3621.23	II	1500	4419.33	I
1300	3857.55	I	260	5309.27	I	3400	3634.29	II	2900	4420.53	II
650	3862.69	I	110	5335.93	I	2200	3661.36	II	470	4424.34	II
1300	3867.84	I	130	5361.77	I	2200	3670.84	II	470	4429.66	I
650	3892.21	I	110 h	5401.04	I	1100	3693.99	II	1600	4433.88	II
760	3909.08	I	80	5484.32	I	1600	3728.47	II	1800	4434.32	II
1500	3923.47	I	130	5510.71	I	2100	3731.26	II	530	4441.81	I
3300	3925.92	I	90	5559.75	I	1600	3735.98	II	440	4442.28	I
600	3931.76	I	290	5636.24	I	2900	3739.12	II	710	4445.15	I
760	3945.57	I	180	5699.05	I	1200	3743.87	II	1300	4452.73	II
600	3978.44	I	65	5814.98	I	930	3745.46	I	1200	4454.63	II
600	3979.42	I	55	5919.34	I	800	3756.41	I	1000	4458.52	II
870	3984.86	I	80	5921.45	I	1200	3757.53	II	2200	4467.34	II
1500	4022.16	I	21 h	5973.38	I	1900	3760.69	II	810	4470.89	I
600	4023.83	I	16	5988.67	I	1100	3764.37	II	370	4499.11	I
1400	4051.40	I	35	5993.65	I	370 d	3773.33	I	440	4581.73	I
710	4054.05	I	18	6116.77	I	1100	3778.14	II	380	4649.49	I
760	4068.37	I	26	6199.42	I	1500	3788.12	II	470 d	4670.75	I
980	4076.73	I	26	6225.20	I	1600	3793.97	II	1100	4674.60	II
6000	4080.60	I	18	6295.22	I	1600	3797.73	II	370	4688.73	I
930	4097.79	I	16	6390.23	I	1600	3826.20	II	530	4704.40	II
1900	4112.74	I	26 h	6444.84	I	1100	3831.50	II	730	4716.10	I
2000	4144.16	I	21	6663.14	I	560	3834.48	I	770	4728.42	I
650	4145.74	I	55	6690.00	I	1600	3843.50	II	470	4745.68	II
870	4167.51	I	21	6766.95	I	530	3853.30	I	730	4760.27	I
550	4197.58	I	30	6775.02	I	2700	3854.21	II	580	4783.10	I
550	4198.88	I	21	6824.17	I	480	3854.56	I	350	4785.86	I
7600	4199.90	I	26	6911.48	I	400	3858.74	I	970	4841.70	I
1500	4206.02	I	110	6923.23	I	3700	3885.29	II	730	4883.97	I
5400	4212.06	I	26	6982.01	I	1600	3896.98	II	630	4910.40	I
760	4214.44	I	26	7027.98	I	1300	3903.42	II	350	4913.25	II
930	4217.27	I	35	7238.92	I	2500	3922.40	II	430	4918.99	I
550	4230.31	I	16	7393.93	I	1900	3928.28	II	400	5044.28	I
760	4241.05	I	18	7468.91	I	1300	3941.87	II	540	5071.20	I
760	4243.06	I	26	7485.79	I	470	3951.89	I	510	5117.16	I
760	4284.33	I	70	7499.75	I	1500	3963.00	II	350	5122.14	I
550	4295.93	I	26	7559.61	I	1500	3971.40	II	360	5155.03	II
3700	4297.71	I	18	7621.50	I	620	3974.66	I	470	5175.42	I
						1000	3976.43	II	250	5200.59	I

Line Spectra of the Elements (continued): Samarium—Scandium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
260	5251.92	I	500	252.85	V	130 d	3469.65	I	160 h	4573.99	I
400	5271.40	I	500	253.73	V	110	3471.13	I	350	4670.40	II
250	5282.91	I	900	283.91	V	200	3498.91	I	120	4706.97	I
220	5453.00	I	800	284.45	V	2700	3535.73	II	120	4709.34	I
230	5493.72	I	600	288.29	V	6600	3558.55	II	200	4728.77	I
230	5516.09	I	900	289.59	V	6100	3567.70	II	490	4729.23	I
140	5550.40	I	15	289.85	IV	13000	3572.53	II	590	4734.10	I
140	5659.86	I	1000 d	291.93	V	9900	3576.35	II	690	4737.65	I
120	5696.73	I	800	293.25	V	7700	3580.94	II	790	4741.02	I
85	5706.20	I	15	296.31	IV	4000	3589.64	II	1200	4743.81	I
70	5773.77	I	15	299.04	IV	4000	3590.48	II	200	4753.16	I
60	5778.33	I	700	300.00	V	28000	3613.84	I	220	4779.35	I
70 d	5786.98	II	1000	573.36	V	110	3617.43	I	170	4839.44	I
60	5788.38	I	600	587.94	V	20000	3630.75	II	90	4909.76	I
60	5800.52	I	10	785.12	IV	13000	3642.79	II	90	4922.84	I
65	5802.84	I	25	1168.61	III	6600	3645.31	II	90	4934.25	I
65	5867.79	I	15	1550.80	IV	110	3646.90	I	170	4954.06	I
50	5874.21	I	180	1603.06	III	5300	3651.80	II	120	4973.66	I
50	5898.96	I	150	1610.19	III	110	3664.25	II	150	4980.37	I
65	5965.71	II	160	2010.42	III	290	3666.54	II	140	4991.92	I
50	6045.00	I	12	2118.97	IV	75 h	3717.10	I	530	5031.02	II
50	6070.06	I	11	2185.43	IV	270	3833.07	II	250	5064.32	I
45	6084.12	I	11	2205.46	IV	610	3843.03	II	530	5070.23	I
45 h	6159.56	I	14	2222.22	IV	20000	3907.49	I	250	5075.81	I
45	6256.54	I	11	2271.33	IV	23000	3911.81	I	2100	5081.56	I
100	6267.28	II	110	2438.62	I	4400	3933.38	I	1200	5083.72	I
140	6569.31	II	560	2545.22	II	5500	3996.61	I	1100	5085.55	I
110	6589.72	II	2900	2552.37	II	530	4014.49	II	750	5086.95	I
50	6671.51	I	560	2555.82	II	20000	4020.40	I	390	5087.14	I
120 d	6731.84	II	2300	2560.25	II	20000	4023.69	I	270	5089.89	I
95	6794.20	II	1100	2563.21	II	220	4030.67	I	390	5096.73	I
120	6860.93	I	11	2586.93	IV	140	4031.39	I	620	5099.23	I
120	6955.29	II	120	2692.78	I	220	4043.80	I	370	5101.12	I
90	7020.44	II	350	2699.07	III	200	4046.48	I	180	5109.06	I
90	7039.22	II	360	2706.77	I	2700	4047.79	I	150	5112.86	I
90	7042.24	II	210	2707.95	I	120	4049.95	I	320	5116.69	I
90	7051.52	II	580	2711.35	I	5500	4054.55	I	390	5210.52	I
90	7082.37	II	230	2734.05	III	220	4056.59	I	280	5219.67	I
26	7088.30	I	340	2965.86	I	100	4068.66	III	350	5239.82	II
30	7095.50	I	1200	2974.01	I	160 h	4074.97	I	280	5258.33	I
30	7104.54	I	1400	2980.75	I	160	4078.57	I	210	5285.76	I
26	7115.96	I	340	2988.95	I	6100	4082.40	I	120	5341.05	I
85 d	7149.60	II	2200	3015.36	I	200	4086.67	I	350	5349.30	I
23	7213.82	I	2700	3019.34	I	400	4087.16	I	120	5349.71	I
60	7240.90	II	360	3030.76	I	440 h	4133.00	I	210	5355.75	I
26	7347.30	I	120 h	3056.31	I	530 h	4140.30	I	530	5356.10	I
30	7444.56	I	130	3065.11	II	720	4152.36	I	270	5375.35	I
26	7445.41	I	990	3251.32	II	1100 h	4165.19	I	370	5392.08	I
13	7470.76	I	1500	3255.69	I	110 h	4218.26	I	270	5446.20	I
45	7645.09	II	4400	3269.91	I	110 h	4219.73	I	120	5451.34	I
12	7645.82	I	5500	3273.63	I	180	4231.93	I	750	5481.99	I
40 w	7835.08	II	110 d	3343.28	II	200	4233.61	I	530	5484.62	I
16	7895.96	I	270	3352.05	II	400	4238.05	I	570	5514.22	I
90	7928.14	II	9900	3353.73	II	15000	4246.83	II	660	5520.50	I
40	8048.70	II	2000	3359.68	II	290	4294.77	II	660	5526.82	II
16	8065.16	I	1700	3361.27	II	350	4305.71	II	70	5564.86	I
45	8068.46	II	1700	3361.94	II	4200	4314.09	II	110	5591.33	I
40 w	8305.79	II	4000	3368.95	II	3300	4320.74	II	80	5640.98	II
19	8383.71	I	6600	3372.15	II	2400	4325.01	II	250	5657.88	II
45 w	8485.99	II	130	3418.51	I	180	4354.61	II	1500	5671.81	I
45 w	8708.43	II	200	3429.21	I	110	4358.64	I	1200	5686.84	I
95	8913.66	II	200	3429.48	I	2000	4374.46	II	1100	5700.21	I
Scandium Sc Z = 21			270	3431.36	I	130	4384.81	II	10	5706.82	IV
			530	3435.56	I	1100	4400.37	II	190	5708.61	I
			270	3457.45	I	880	4415.56	II	880	5711.75	I
			180	3462.19	I	120 h	4557.24	I	230	5717.28	I
350	180.14	V									
500	243.87	V									

Line Spectra of the Elements (continued): Scandium—Silicon

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
180	5724.08	I	200	1580.0	I	150	7013.875	I	10	993.52	III
14	5771.63	IV	150	1587.5	I	300	7062.065	I	13	994.79	III
620	6210.68	I	150	1593.2	I	200	7575.1	I	16	997.39	III
320	6239.78	I	250	1606.5	I	250	7583.4	I	50	1023.69	II
120	6245.63	II	200	1617.4	I	150	7592.2	I	8	1066.63	IV
110	6249.96	I	150	1621.2	I	300	8001.0	I	14	1108.37	III
80	6256.01	III	150	1643.4	I	200	8036.4	I	16	1109.97	III
250	6258.96	I	250	1671.2	I	150	8093.2	I	18	1113.23	III
750	6305.67	I	250	1675.3	I	150	8094.7	I	8	1122.49	IV
60	6378.82	I	250	1690.7	I	180	8149.3	I	10	1128.34	IV
90	6413.35	I	250	1793.3	I	150	8152.0	I	100	1190.42	II
60	6604.60	II	300	1795.3	I	200	8157.7	I	200	1193.28	II
65	6737.87	I	300	1855.2	I	180	8163.1	I	250	1194.50	II
50	6819.52	I	250	1858.8	I	150	8182.9	I	100	1197.39	II
50	6835.03	I	400	1898.6	I	150	8440.47	I	30	1206.51	III
90	7449.16	III	350	1913.8	I	150	8450.38	I	30	1206.53	III
55 h	7741.17	I	300	1919.2	I	150	8742.33	I	9	1207.52	III
30	7800.44	I	500	1960.9	I	300	8918.86	I	10	1210.46	III
19 h	8761.40	I	500	2039.8	I	200	9001.97	I	50	1226.81	II
50	8829.78	III	285	2057.5	III	200	9038.61	I	100	1227.60	II
30 h	8834.35	I	500	2074.8	I	100	9432.50	I	150	1228.75	II
400	22051.86	I	285	2136.6	IV	200	10217.25	I	200	1229.39	II
150	22065.05	I	500	2164.2	I	377	10307.45	I	100	1246.74	II
Selenium			600	2413.5	I	900	10327.26	I	150	1248.43	II
Se Z = 34			300	2548.0	I	640	10386.36	I	100	1250.09	II
360	613.0	V	360	2665.5	IV	275	11946.87	I	150	1250.43	II
360	652.7	IV	285	2724.3	IV	170	11952.64	I	200	1251.16	II
450	670.1	IV	285	2767.2	III	205	11972.93	I	40	1256.49	I
360	724.3	III	220	2773.8	III	315	14817.93	I	50	1258.80	I
450	746.4	IV	160	2951.6	IV	410	14917.47	I	1000	1260.42	II
450	759.1	V	450	3387.2	III	500	15151.44	I	2000	1264.73	II
360	808.7	V	450	3413.9	III	320	15471.00	I	200	1265.02	II
360	830.3	V	450	3457.8	III	265	15520.97	I	17	1294.54	III
360	832.7	II	450	3637.6	III	395	15618.40	I	14	1296.73	III
450	839.5	V	450	3738.7	III	360	16659.44	I	15	1298.89	III
360	843.0	III	450	3800.9	III	505	16813.78	I	18	1298.96	III
360	845.8	V	450	4169.1	III	205	16866.54	I	14	1301.15	III
360	912.9	II	360	4175.3	II	235	21374.24	I	16	1303.32	III
360	959.6	IV	450	4180.9	II	680	21442.56	I	100	1304.37	II
360	974.8	III	285	4382.9	II	415	21473.48	I	50 h	1305.59	II
450	996.7	IV	285	4446.0	II	270	21716.36	I	200	1309.27	II
360	1013.4	II	220	4449.2	II	240	21730.60	I	13	1312.59	III
360	1014.0	II	285	4467.6	II	150	23388.85	I	100	1346.87	II
450	1033.6	II	500	4730.8	I	265	24148.18	I	100	1348.54	II
450	1049.6	II	400	4739.0	I	375	24385.99	I	150	1350.06	II
360	1057.4	II	300	4742.2	I	255	25017.51	I	100	1352.64	II
360	1094.7	V	285	4840.6	II	510	25127.43	I	100	1353.72	II
360	1099.1	III	360	4845.0	II	Silicon			15	1393.76	IV
450	1119.2	III	450	5227.5	II	Si Z = 14			12	1402.77	IV
360	1141.9	II	360	5305.4	II	10	85.18	V	13	1417.24	III
450	1192.3	II	100	5365.5	I	15	96.44	V	90 h	1485.02	II
450	1227.6	V	120	5369.9	I	10	97.14	V	100 h	1485.51	II
285	1291.0	II	110	5374.1	I	20	117.86	V	12	1500.24	III
285	1308.9	II	285	5522.4	II	20	118.97	V	10	1501.19	III
285	1314.4	IV	285	5566.9	II	4	457.82	IV	9	1501.87	III
120	1435.3	I	285	5866.3	II	8	566.61	III	100 h	1509.10	II
120	1435.8	I	450	6056.0	II	8	653.33	III	50 h	1512.07	II
150	1449.2	I	285	6303.8	III	7	815.05	IV	60 p	1516.91	II
150	1500.9	I	200	6325.6	I	8	818.13	IV	500	1526.72	II
250	1530.4	I	360	6444.2	II	9	823.41	III	1000	1533.45	II
150	1531.3	I	285	6490.5	II	40 h	845.77	II	150	1594.55	I
200	1531.8	I	285	6535.0	II	100	889.72	II	100	1622.87	I
150	1575.3	I	150	6831.3	I	200	892.00	II	300	1629.43	I
150	1577.6	I	120	6990.690	I	9	967.95	III	200	1629.92	I
150	1577.9	I	100	6991.792	I	100	989.87	II	100	1667.62	I
150	1579.5	I	200	7010.809	I	200	992.68	II	100	1668.52	I

Line Spectra of the Elements (continued): Silicon

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
100	1672.59	I	300	2904.28	II	16	4819.72	III	1000	6347.10	II
200	1675.20	I	500	2905.69	II	18	4828.97	III	1000	6371.36	II
200	1696.20	I	55	2970.355	I	30	4947.607	I	45	6526.609	I
200	1697.94	I	150	2987.645	I	40	5006.061	I	45	6527.199	I
100 h	1770.92	I	50	3006.739	I	1000	5041.03	II	45	6555.462	I
100 h	1776.83	I	75	3020.004	I	1000	5055.98	II	50 h	6660.52	II
100 h	1799.12	I	100 h	3030.00	II	10 h	5091.42	III	100	6671.88	II
150	1808.00	II	9	3040.93	III	100	5181.90	II	7	6701.21	IV
500 h	1814.07	I	100 h	3043.69	II	100 h	5185.25	II	50 h	6717.04	II
200	1816.92	II	50 h	3048.30	II	200 h	5192.86	II	100	6721.853	I
200	1836.51	I	150 h	3053.18	II	500 h	5202.41	II	50	6829.82	II
200	1841.44	I	25	3086.24	III	100 h	5405.34	II	30	6848.568	I
9	1842.55	III	20	3093.42	III	100 h	5438.62	II	80	6976.523	I
200	1843.77	I	16	3096.83	III	100 h	5456.45	II	180	7003.567	I
300	1845.51	I	9	3165.71	IV	500 h	5466.43	II	180	7005.883	I
400	1847.47	I	16	3185.13	III	500 h	5466.87	II	90	7017.646	I
200	1848.14	I	13	3186.02	III	100 h	5469.21	II	250	7034.903	I
500	1850.67	I	150	3188.97	II	200 h	5496.45	II	6 h	7047.94	IV
200	1852.46	I	150	3193.09	II	35	5517.535	I	200	7165.545	I
500 h	1874.84	I	100	3195.41	II	100 h	5540.74	II	100	7226.206	I
200	1881.85	I	14	3196.50	III	150 h	5576.66	II	100	7235.326	I
200	1887.70	I	200	3199.51	II	30	5622.221	I	180	7250.625	I
200 h	1893.25	I	100 h	3203.87	II	100 h	5632.97	II	160	7275.294	I
1000 h	1901.33	I	200 h	3210.03	II	200 h	5639.48	II	400	7289.173	I
100 h	1902.46	II	15	3210.55	III	90	5645.611	I	375	7405.774	I
50 h	1910.62	II	75	3214.66	II	150 h	5660.66	II	200	7409.082	I
50	1941.67	II	12	3230.50	III	80	5665.554	I	275	7415.946	I
100	1949.56	II	14	3233.95	III	1000 h	5669.56	II	425	7423.497	I
100	1954.97	I	15	3241.62	III	120	5684.484	I	9 h	7466.32	III
50	2058.65	II	12	3258.66	III	300 h	5688.81	II	12 h	7612.36	III
50	2059.01	II	10	3276.26	III	100	5690.425	I	100	7680.267	I
200	2072.02	II	300	3333.14	II	90	5701.105	I	6 h	7723.82	IV
200	2072.70	II	500	3339.82	II	200 h	5701.37	I	30	7800.008	I
100	2124.12	I	15	3486.91	III	100 h	5706.37	II	400	7848.80	II
50 h	2136.56	II	9	3525.94	III	160	5708.397	I	500	7849.72	II
110	2207.98	I	20	3590.47	III	20	5739.73	III	30	7849.967	I
115	2210.89	I	8	3762.44	IV	45	5747.667	I	90	7918.386	I
110	2211.74	I	20 c	3791.41	III	45	5753.625	I	120	7932.349	I
120	2216.67	I	25	3796.11	III	45	5754.220	I	140	7944.001	I
120	2218.06	I	30	3806.54	III	45	5762.977	I	35	7970.306	I
10	2296.87	III	100 h	3853.66	II	70	5772.145	I	35	8035.619	I
10	2308.19	III	500 h	3856.02	II	70	5780.384	I	70	8093.241	I
100 h	2356.30	II	200 h	3862.60	II	90	5793.071	I	9 h	8102.86	III
30 h	2357.18	II	300	3905.523	I	100	5797.859	I	11 h	8103.45	III
50 h	2357.97	II	20	3924.47	III	150 h	5800.47	I	35	8230.642	I
300	2435.15	I	10	4088.85	IV	200	5806.74	II	9 h	8262.57	III
11	2449.48	III	70	4102.936	I	50	5846.13	II	40	8443.982	I
425	2506.90	I	9	4116.10	IV	300 h	5868.40	II	40	8501.547	I
375	2514.32	I	300 h	4128.07	II	40	5873.764	I	60	8502.221	I
500	2516.113	I	500 h	4130.89	II	10 h	5898.79	III	40	8536.165	I
7	2517.51	IV	100 h	4190.72	II	150	5915.22	II	120	8556.780	I
350	2519.202	I	50	4198.13	II	200	5948.545	I	50	8648.462	I
425	2524.108	I	9	4338.50	III	500	5957.56	II	40	8728.011	I
450	2528.509	I	30	4552.62	III	500	5978.93	II	75	8742.451	I
110	2532.381	I	25	4567.82	III	90	6125.021	I	100	8752.009	I
25	2541.82	III	20	4574.76	III	85	6131.574	I	35	8790.389	I
10	2546.09	III	100	4621.42	II	90	6131.850	I	100	9412.72	II
14	2559.21	III	150	4621.72	II	100	6142.487	I	100	9413.506	I
30	2563.679	I	9 h	4631.24	IV	100	6145.015	I	30	10371.269	I
85	2568.641	I	10 h	4654.32	IV	160	6155.134	I	120	10585.141	I
45	2577.151	I	9	4683.02	III	160	6237.320	I	120	10603.431	I
190	2631.282	I	16	4716.65	III	40	6238.287	I	120	10660.975	I
11	2640.79	III	50	4782.991	I	125	6243.813	I	30	10694.251	I
14	2655.51	III	35	4792.212	I	125	6244.468	I	30	10727.408	I
9	2817.11	III	80	4792.324	I	180	6254.188	I	60	10749.384	I
1000	2881.579	I	15	4813.33	III	45	6331.954	I	30	10784.550	I

Line Spectra of the Elements (continued): Silicon—Sodium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
80	10786.856	I	600	1917.08	III	100	4212.82	I	15	410.372	IV
140	10827.091	I	700	1957.62	III	50	4311.07	I	10	411.334	IV
60	10843.854	I	100	1967.38	II	50 h	4476.04	I	13	412.242	IV
130	10869.541	I	600	1975.92	III	30 h	4615.69	I	11	1582.18	IV
30	10882.802	I	500	1977.03	III	80	4620.04	II	11 d	1583.98	IV
30	10885.336	I	600	2000.24	III	50	4620.46	II	12	1584.14	IV
80	10979.308	I	150	2015.96	II	60 h	4668.48	I	12 d	1587.05	IV
30	10982.061	I	150	2033.98	II	30 h	4677.60	I	11	1615.92	IV
80	11017.965	I	200	2061.17	I	100	4788.40	II	12	1618.57	IV
370	11984.19	I	100	2069.85	I	30 h	4847.82	I	11	1655.47	IV
220	11991.57	I	80 r	2113.82	II	100	4874.10	I	15 c	1701.97	IV
440	12031.51	I	60	2145.60	II	80	5027.35	II	20 d	1887.47	III
190	15888.39	I	600	2161.89	III	1000	5209.08	I	12	1960.76	IV
95	16060.03	I	50	2186.76	II	1000	5465.50	I	11	1965.08	IV
110	19722.50	I	60	2229.53	II	100	5471.55	I	12 d	2106.33	IV
	Silver		100 r	2246.43	II	100	5667.34	I	30	2230.33	III
	Ag Z = 47		500	2246.51	III	10 h	6268.50	I	16	2232.19	III
25	730.83	II	75 r	2248.74	II	320	7687.78	I	20 h	2246.70	III
30	752.80	II	75	2280.03	II	25	8005.4	II	300	2315.65	II
400	799.41	III	30 h	2309.56	I	500	8273.52	I	18	2386.99	III
15	1005.32	II	700	2310.04	III	25	8403.8	II	17	2394.03	III
10	1065.49	II	70 r	2317.05	II	30 h	8645.70	I	300	2420.99	II
12	1072.23	II	80 r	2320.29	II	10 h	8704.85	I	300	2424.73	II
250	1074.22	II	70 r	2324.68	II	12	8747.6	II	25	2459.31	III
150	1107.03	II	80 r	2331.40	II	15	9000.9	II	18	2468.85	III
150	1112.46	II	70	2357.92	II	10	12551.0	I	20	2474.73	III
60	1195.83	II	50 h	2375.02	I	60	16819.5	I	1000	2493.15	II
50	1223.33	II	75	2411.41	II	20	17416.7	I	25	2497.03	III
50	1240.80	II	90 r	2413.23	II	15	18307.9	I	17	2510.26	III
50	1246.87	II	100 r	2437.81	II	15	18382.3	I	20	2543.84	I
55	1256.81	II	80	2447.93	II		Sodium		10	2543.87	I
55	1257.55	II	80	2473.84	II		Na Z = 11		70	2593.87	I
50	1266.63	II	60	2506.63	II	7	142.232	IV	35	2593.92	I
70	1273.67	II	50 h	2575.63	I	8	146.064	IV	850	2611.81	II
65	1297.51	II	60	2660.49	II	9	150.298	IV	850	2661.00	II
85	1311.20	II	60	2721.77	I	8	150.687	IV	1000	2671.83	II
55	1313.81	II	75	2767.54	II	8	155.510	IV	200	2680.34	I
50	1314.61	II	100 h	2824.39	I	8	156.537	IV	100	2680.43	I
60	1323.84	II	30 h	3130.02	I	12	162.448	IV	1000	2841.72	II
60	1342.09	II	90	3180.70	II	10	163.190	IV	400	2852.81	I
50	1342.57	II	100	3267.35	II	12	168.411	IV	200	2853.01	I
70	1346.62	II	55000 r	3280.68	I	10	168.546	IV	2	2893.62	I
50	1353.54	II	28000 r	3382.89	I	5	183.95	III	1100	2904.92	II
150	1364.50	II	30	3469.16	I	10	190.445	IV	1100	2917.52	II
100	1396.00	II	70	3475.82	II	10	199.772	IV	1100	2919.05	II
100	1410.93	II	80	3495.28	II	8	202.49	III	1200	2919.85	II
90	1419.72	II	50	3542.61	I	8	202.76	III	1300	2920.95	II
95	1432.60	II	50 h	3624.68	I	8 p	203.06	III	1000	2923.49	II
100	1464.72	II	75	3682.46	II	8	203.28	III	1200	2951.24	II
50	1466.23	II	30	3682.50	I	8	203.33	III	1100	2952.40	II
50 r	1507.37	I	80	3683.34	II	15	229.87	III	1000	2977.13	II
100 r	1515.63	I	50 h	3709.20	I	50 c	250.52	III	1100	2979.66	II
50 r	1548.58	I	200	3810.94	I	30	251.37	III	1100	2980.63	II
100	1555.16	II	50	3811.78	I	25	266.90	III	1300	2984.19	II
100	1644.50	II	100 h	3840.74	I	70	267.65	III	1700	3124.42	II
60	1651.52	I	50 h	3907.41	I	50	267.87	III	2500	3135.48	II
50	1652.10	I	50	3909.31	II	50	268.63	III	1700	3137.86	II
700	1656.18	III	50 h	3914.40	I	20 p	272.08	III	2000	3149.28	II
120	1682.82	II	70	3920.10	II	20	272.45	III	2000	3163.74	II
500	1693.51	III	60	3949.43	II	10	319.644	IV	1000	3179.06	II
10	1708.11	I	100 h	3981.58	I	300	372.08	II	1700	3189.79	II
50	1709.27	I	70	3985.19	II	350	376.38	II	1600	3212.19	II
125	1736.44	II	100 h	4055.48	I	100	378.14	III	1500	3257.96	II
750	1751.03	III	80	4085.91	II	70	380.10	III	1700	3285.60	II
10 h	1766.14	I	100	4185.48	II	12	408.684	IV	1700	3301.35	II
75	1790.37	II	90 h	4210.96	I	10	409.614	IV	1200	3302.37	I

Line Spectra of the Elements (continued): Sodium—Sulfur

Intensity			Wavelength/Å			Intensity			Wavelength/Å			Intensity			Wavelength/Å		
600	3302.98	I	400	12679.17	I	340	4305.45	II	Sulfur								
1500	3304.96	II	60	14767.48	I	65000	4607.33	I	S Z = 16								
1000	3318.04	II	100	14779.73	I	9	4685.08	IV	5	437.4	V						
50	3426.86	I	60	16373.85	I	3200	4722.28	I	5	438.2	V						
1500	3533.05	II	100	16388.85	I	2200	4741.92	I	5	439.6	V						
1200	3631.27	II	400	18465.25	I	1400	4784.32	I	20	519.3	IV						
6	4238.99	I	50	22056.44	I	4800	4811.88	I	20	520.1	IV						
10	4242.08	I	25	22083.67	I	3600	4832.08	I	40	520.8	IV						
1	4249.41	I	60	23348.41	I	3000	4872.49	I	20	522.0	IV						
2	4252.52	I	100	23379.13	I	2000	4876.32	I	20	522.5	IV						
15	4273.64	I	Strontium			1000	4891.98	I	20	551.2	IV						
20	4276.79	I	Sr Z = 38			8000	4962.26	I	40	652.5	IV						
2	4287.84	I	15	298.12	IV	1300	4967.94	I	40	653.0	IV						
3	4291.01	I	15	300.12	IV	800 h	5156.07	I	70	653.6	IV						
30	4321.40	I	125	330.67	III	1400	5222.20	I	40	654.0	IV						
40	4324.62	I	500	351.62	III	2000	5225.11	I	70	655.6	IV						
3	4341.49	I	75	358.80	III	2000	5229.27	I	20	655.9	IV						
5	4344.74	I	250	363.49	III	2800	5238.55	I	110	657.3	IV						
40	4390.03	I	150	371.21	III	4800	5256.90	I	40	658.3	V						
60	4393.34	I	20	378.53	IV	40	5257.71	III	70	659.8	V						
5	4419.88	I	75	392.44	IV	40	5443.48	III	40	660.9	IV						
8	4423.25	I	50	393.00	IV	1500	5450.84	I	160	661.4	IV						
60	4494.18	I	50	396.22	IV	7000	5480.84	I	110	663.2	V						
100	4497.66	I	1000	437.24	III	3500	5504.17	I	40	663.7	IV						
10	4541.63	I	1875	491.79	III	2600	5521.83	I	40	664.8	IV						
15	4545.19	I	1250	507.04	III	2000	5534.81	I	70	666.1	IV						
120	4664.811	I	3750	514.38	III	2000	5540.05	I	20	678.1	V						
200	4668.560	I	10	517.28	V	1000	6380.75	I	40	680.3	V						
20	4747.941	I	2500	562.75	III	900 h	6386.50	I	110	680.9	V						
30	4751.822	I	25	578.01	V	600 h	6388.24	I	40	681.6	V						
200	4978.541	I	30	624.93	V	9000	6408.47	I	20	693.5	V						
400	4982.813	I	25	642.23	V	5500	6504.00	I	70	729.5	III						
40	5148.838	I	50	649.21	V	1000	6546.79	I	110	732.42	III						
80	5153.402	I	25	660.94	V	1700	6550.26	I	70	735.2	III						
280	5682.633	I	200	664.43	IV	3000	6617.26	I	70	738.5	III						
70	5688.193	I	35	686.23	V	1800	6791.05	I	110	744.9	IV						
560	5688.205	I	100	710.35	IV	4800	6878.38	I	110	748.4	IV						
80000	5889.950	I	12	747.82	V	1200	6892.59	I	110	750.2	IV						
40000	5895.924	I	50	1025.23	III	5500	7070.10	I	110	753.8	IV						
120	6154.225	I	35	1125.49	III	2500	7309.41	I	285	786.5	V						
240	6160.747	I	50	1236.23	III	500	7621.50	I	70	789.0	III						
130	6530.70	II	1400	2152.84	II	400 h	7673.06	I	70	796.7	III						
130	6544.04	II	1400	2165.96	II	200 h	8422.80	I	70	800.5	IV						
130	6545.75	II	100	2273.71	III	120	8505.69	II	70	804.0	IV						
20	7373.23	I	100	2340.13	III	200	8688.91	II	70	809.7	IV						
10	7373.49	I	50	2346.97	IV	100	9294.10	I	110	816.0	IV						
50	7809.78	I	160	2428.10	I	400 h	9448.95	I	70	824.9	III						
25	7810.24	I	100	2486.52	III	600	9596.00	I	70	836.3	III						
4400	8183.256	I	40	2555.60	IV	300	9624.70	I	160	849.2	V						
800	8194.790	I	40	2571.04	IV	100	9638.10	I	110	852.2	V						
8800	8194.824	I	100	3002.61	III	100 h	9647.70	II	220	854.8	V						
100	8649.92	I	200	3012.32	III	300	10036.66	II	110	857.9	V						
60	8650.89	I	10	3019.29	IV	1000	10327.31	II	110	860.5	V						
25	8942.96	I	100	3021.73	III	200	10914.88	II	40	906.9	II						
40	9153.88	I	50	3061.43	III	700	11241.25	I	40	910.5	II						
60	9465.94	I	50	3182.61	III	100	12014.76	II	40	912.7	II						
80	9961.28	I	100	3235.39	III	60	12445.90	II	40	937.4	II						
20	10566.00	I	400	3351.25	I	40	12495.00	I	40	937.7	II						
60	10572.28	I	650	3380.71	II	75	12974.70	II	160	1062.7	IV						
200	10746.44	I	50	3430.76	III	100	13123.80	II	160	1073.0	IV						
80	10749.29	I	950	3464.46	II	50	17447.40	I	70	1073.5	IV						
120	10834.87	I	600	3969.26	I	230	20261.40	I	285	1077.1	III						
35	11190.19	I	1300	4030.38	I	120	20700.70	I	40	1102.3	II						
50	11197.21	I	46000	4077.71	II	30	26023.60	I	70	1194.0	III						
400	11381.45	I	32000	4215.52	II				70	1201.0	III						
1000	11403.78	I	9	4298.57	IV				40	1234.1	II						

Line Spectra of the Elements (continued): Sulfur—Tantalum

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
40	1250.5	II	110	3097.5	IV	110	8882.5	I	1500	2199.67	II
110	1253.8	II	110	3497.3	III	220	8884.2	I	90	2207.64	IV
110	1259.5	II	160	3632.0	III	160	9035.9	I	1400 d	2210.03	II
275	1270.782	I	110	3709.4	III	450	9212.9	I	1400	2239.48	II
250	1277.216	I	160	3717.8	III	450	9228.1	I	1200	2250.76	II
280	1295.653	I	160	3838.3	III	450	9237.5	I	840	2261.42	II
275	1302.337	I	285	3867.6	I	285	9413.5	I	990	2262.30	II
235	1302.863	I	285	3902.0	I	285	9421.9	I	990	2272.59	II
235	1303.110	I	160	3928.6	III	285	9437.1	I	790	2285.25	II
245	1303.430	I	360	3933.3	II	650	9649.9	I	600	2286.59	II
260	1305.883	I	450	4120.8	I	450	9672.3	I	990	2289.16	II
265	1310.194	I	280	4142.3	II	450	9680.8	I	440	2302.24	II
355	1316.542	I	360	4145.1	II	450	9693.7	I	440	2302.93	II
290	1316.618	I	450	4153.1	II	285	9697.3	I	440	2312.60	II
375	1323.515	I	450	4162.7	II	285	9739.7	I	420	2315.46	II
355	1326.643	I	360	4253.6	III	285	9932.3	I	690	2331.98	II
775	1381.552	I	450	4694.1	I	285	9949.8	I	550	2332.19	II
710	1385.510	I	285	4695.4	I	285	9958.9	I	250	2357.30	I
960	1388.435	I	160	4696.2	I	285	10455.5	I	260	2361.09	I
640	1389.154	I	280	4716.2	II	285	10459.5	I	600	2364.24	II
775	1392.588	I	450	4815.5	II	Tantalum		320	2371.58	I	
1000	1396.112	I	360	4924.1	II	Ta Z = 73		1400	2387.06	II	
300	1409.337	I	450	4925.3	II	60	493.07	V	2400	2400.63	II
510	1425.030	I	285	4993.5	I	1000	890.87	V	320	2416.89	II
425	1433.280	I	360	5428.6	II	500	947.30	V	360	2427.64	I
300	1436.968	I	650	5432.8	II	67	999.34	IV	360	2429.71	II
300	1448.229	I	1000	5453.8	II	79	1116.10	IV	480	2432.70	II
425	1472.972	I	1000	5473.6	II	78	1136.17	IV	380	2470.90	II
550	1473.995	I	1000	5509.7	II	85	1175.51	IV	600	2474.62	I
300	1474.380	I	280	5564.9	II	80	1189.28	IV	500	2484.95	I
355	1481.665	I	1000	5606.1	II	80	1192.67	IV	600	2488.70	II
485	1483.039	I	450	5640.0	II	85	1213.09	IV	500	2490.46	I
300	1483.233	I	450	5640.3	II	500	1213.42	V	600	2504.45	I
330	1485.622	I	280	5647.0	II	85	1215.53	IV	600	2507.45	I
390	1487.150	I	650	5659.9	II	90	1223.73	IV	1200 d	2526.35	I
20	1624.0	IV	450	5664.7	II	88	1238.12	IV	600	2532.12	II
20	1629.2	IV	160	5706.1	I	95	1240.06	IV	1200	2559.43	I
680	1666.688	I	450	5819.2	II	87	1258.34	IV	460	2562.10	I
640	1687.530	I	450	6052.7	I	94	1264.91	IV	600	2577.37	II
710	1807.311	I	280	6286.4	II	98	1272.42	IV	600	2603.49	II
680	1820.343	I	450	6287.1	II	94	1275.48	IV	1400	2608.63	I
640	1826.245	I	450	6305.5	II	86	1275.94	IV	1200	2635.58	II
710	1900.286	I	450	6312.7	II	92	1308.51	IV	860	2636.90	I
550	1914.698	I	280	6384.9	II	87	1315.58	IV	2400	2647.47	I
20	2387.0	IV	280	6397.3	II	92	1332.38	IV	2600	2653.27	I
40	2398.9	IV	280	6398.0	II	86	1343.30	IV	1900	2656.61	I
110	2460.5	III	360	6413.7	II	92	1365.88	IV	1500	2661.34	I
110	2489.6	III	160	6743.6	I	5000	1392.56	V	770	2675.90	II
160	2496.2	III	285	6748.8	I	91	1398.78	IV	1500	2685.17	II
160	2499.1	III	450	6757.2	I	93	1413.40	IV	470	2694.52	II
220	2508.2	III	450	7579.0	I	91	1454.32	IV	1000	2698.30	I
70	2636.9	III	450	7629.8	I	92	1464.41	IV	1200	2710.13	I
220	2665.4	III	285	7686.1	I	93	1469.82	IV	2600	2714.67	I
110	2691.8	III	450	7696.7	I	90	1495.25	IV	470	2727.44	II
110	2702.8	III	1000	7924.0	I	95	1514.19	IV	1200	2748.78	I
220	2718.9	III	160	7928.8	I	85	1607.70	IV	860	2749.83	I
110	2721.4	III	285	7930.3	I	7000	1709.10	V	410	2752.49	II
220	2726.8	III	450	7931.7	I	85	1712.16	IV	1000	2758.31	I
220	2731.1	III	450	7967.4	I	85	1716.13	IV	430	2761.68	II
110	2741.0	III	450	7967.4	II	85	2055.75	IV	770	2775.88	I
285	2756.9	III	450	8314.7	I	1100	2140.13	II	680	2796.34	I
110	2775.2	III	450	8314.7	II	1500	2146.87	II	680	2797.76	II
160	2785.5	III	450	8585.6	I	1200	2182.71	II	510	2806.58	I
110	2863.5	III	285	8680.5	I	1100	2193.88	II	640	2844.25	I
160	2904.3	III	450	8694.7	I	1500	2196.03	II	560	2848.52	I
160	2986.0	III	360	8874.5	I	90	2199.58	IV	1500	2850.49	I

Line Spectra of the Elements (continued): Tantalum—Terbium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
1900	2850.98	I	150	5645.91	I	20000	4262.27	I	200	4686.91	II
360	2861.98	I	130	5664.90	I	30000	4297.06	I	100	4696.38	II
470	2871.42	I	130	5776.77	I	20000	4853.59	I	100	4706.53	II
380	2880.02	I	90	5780.71	I	Tellurium			100	4766.05	II
770	2891.84	I	130	5811.10	I	Te Z = 52			100	4784.87	II
560	2902.05	I	240	5877.36	I	8	802.28	II	100	4827.14	II
310	2915.49	I	130	5882.30	I	8	1059.51	II	150	4831.28	II
410	2925.19	I	90	5901.91	I	8	1077.66	II	150	4842.90	II
310	2932.70	I	90	5918.95	I	10	1161.42	II	130	4865.12	II
1700	2933.55	I	130	5939.76	I	10	1174.34	II	200	4866.24	II
470	2940.06	I	240	5944.02	I	12	1175.79	II	8	5083.0	I
1200	2940.22	I	190 c	5997.23	I	9	1208.54	II	50	5449.84	II
510	2951.92	I	100	6020.72	I	9	1220.98	II	50	5487.95	II
340	2953.56	I	250	6045.39	I	9	1253.62	II	150	5576.35	II
1500	2963.32	I	100	6047.25	I	9	1270.52	II	150	5649.26	II
770	2965.13	II	100	6101.58	I	10	1324.92	II	100	5666.20	II
770	2965.54	I	65	6144.56	I	9	1363.24	II	200	5708.12	II
340	2969.47	I	130	6154.50	I	8	1366.73	II	150	5755.85	II
430	2975.56	I	150	6256.68	I	10	1374.80	II	100	5974.68	II
1800	3012.54	II	150	6268.70	I	10	1608.41	II	50	6367.13	II
290 d	3027.48	I	150	6309.58	I	10	1613.15	II	10 h	6790.0	I
530	3049.56	I	75	6325.08	I	5	1655.4	I	20 h	6837.6	I
530	3069.24	I	65	6341.17	I	5	1688.5	I	20 h	6854.7	I
360	3077.24	I	75	6356.16	I	6	1700.0	I	15 h	7191.1	I
560	3103.25	I	65	6360.84	I	5	1708.0	I	20 h	7263.5	I
380	3124.97	I	90	6389.45	I	10	1822.4	I	12	7460.98	II
380	3130.58	I	65	6428.60	I	26000	2002.02	I	15	7468.75	II
270	3132.64	I	250	6430.79	I	6500	2081.16	I	15	7921.69	II
320	3170.29	I	200	6450.36	I	18000	2142.81	I	15	7943.14	II
270	3173.59	I	380	6485.37	I	3200	2147.25	I	10	7950.34	II
600	3180.95	I	65	6505.52	I	500	2259.02	I	30 h	8061.4	I
300	3223.83	I	100	6514.39	I	1200	2383.26	I	10	8122.44	II
1100	3311.16	I	100	6516.10	I	1500	2385.78	I	20	8186.44	II
680	3318.84	I	100	6574.84	I	50	2438.69	II	15	8273.53	II
330 d	3330.99	II	110	6611.95	I	120	2530.72	I	15	8672.95	II
640	3371.54	I	75	6621.30	I	100	2649.66	II	10	8733.81	II
360	3385.05	I	100	6673.73	I	80	2661.10	II	205	8758.18	I
450	3406.94	I	180	6675.53	I	110	2677.13	I	81	9004.37	I
490	3480.52	I	75 c	6740.73	I	100	2858.29	II	5660	9722.74	I
380	3497.85	I	75	6771.74	I	150	2895.41	II	532	9868.92	I
490	3511.04	I	160 c	6813.25	I	70	2967.29	II	689	9956.30	I
750	3607.41	I	210	6866.23	I	70	3047.00	II	325	9977.13	I
980	3626.62	I	180	6875.27	I	100	3175.14	I	5950	10051.41	I
500	3642.06	I	150	6902.10	I	60	3256.80	II	4097	10091.01	I
210	3918.51	I	140	6927.38	I	60	3329.22	II	381	10118.08	I
210	3970.10	I	140	6928.54	I	150	3406.79	II	397	10300.56	I
210	3996.17	I	65	6951.26	I	50	3442.25	II	745	10493.57	I
410	4061.40	I	180	6966.13	I	50	3521.11	II	1880	10918.34	I
310	4067.91	I	110 d	6995.22	I	50	3552.19	II	10200	11089.56	I
300	4205.88	I	75	7006.96	I	100	3611.78	II	508	11163.74	I
360 c	4510.98	I	150	7148.63	I	50	3617.57	II	6620	11487.23	I
340	4574.31	I	110	7172.90	I	50	4006.52	II	1580	13247.75	I
260	4619.51	I	140	7301.74	I	70	4127.32	II	1050	14513.51	I
450	4681.88	I	160	7346.41	I	100	4169.77	II	1480	15452.45	I
200	5037.37	I	140 c	7352.86	I	80	4225.73	II	2430	15546.23	I
100	5067.87	I	100	7356.96	I	100	4261.11	II	3760	16403.90	I
110	5115.84	I	90 cw	7369.09	I	60	4273.43	II	1960	17303.54	I
100	5141.62	I	160	7407.89	I	80	4285.85	II	2780	18291.59	I
100	5143.69	I	100	7882.37	I	150	4364.00	II	1020	21043.73	I
330	5156.56	I	75	8026.50	I	75	4385.10	II	464	21602.50	I
110	5212.74	I	75	8281.62	I	170	4478.63	II	74	22555.29	I
110 d	5218.45	I	Technetium			80	4537.07	II	38	26539.17	I
140	5341.05	I	Tc Z = 43			100	4557.78	II	Terbium		
200	5402.51	I	10000 c	3636.07	I	70	4630.62	II	Tb Z = 65		
130	5419.19	I	20000 c	4031.63	I	100	4641.12	II	1000	1259.40	IV
90	5518.91	I	15000	4095.67	I	180	4654.37	II	1000	1327.67	IV

Line Spectra of the Elements (continued): Terbium—Thallium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
1000	1373.86	IV	1700	3765.14	I	65	4632.07	I	30	7737.63	I
5000	1595.39	IV	2100	3776.49	II	65 h	4636.59	I	30	7855.79	II
2000	1633.19	IV	600	3783.53	I	85	4641.00	II	27	7927.90	II
2000	2027.79	IV	410	3789.92	I	210	4641.98	II	30	8025.42	II
1000	2089.98	IV	760 d	3806.85	II	260 cw	4645.31	II	30	8085.06	II
1000	2332.54	IV	1500	3830.26	I	80	4647.23	I	65	8194.82	II
110	2584.61	II	540	3833.42	I	80	4662.79	I	95	8212.57	I
110	2608.57	II	920 d	3842.50	II	80	4676.90	I	40	8450.06	II
130	2628.69	II	3700	3848.73	II	70 c	4681.87	I	30 h	8511.80	I
140	2669.29	II	3500 w	3874.17	II	80	4688.63	II	45	8583.45	II
190	2704.07	II	480	3888.22	I	80	4693.11	II	30	8603.40	I
270	2769.53	II	490	3894.64	I	200	4702.41	II	65	8765.74	II
320	2897.44	II	2400	3899.20	II	110	4707.94	II	Thallium Tl Z = 81		
250	2956.21	II	1600	3901.33	I	80	4739.93	I			
230	3010.59	II	480	3908.06	I	70	4747.80	I	10	570.49	IV
230	3016.18	II	650	3915.43	I	410 cw	4752.53	II	5 r	670.87	II
460	3053.55	II	760	3925.45	II	180	4786.78	I	15 r	696.30	II
460	3070.05	II	810 d	3939.52	II	100	4813.77	I	5 r	709.23	II
670	3078.86	II	2200 d	3976.84	II	80	4875.57	II	10 r	817.18	II
480	3082.36	II	1800	3981.87	II	80	4881.15	II	5 r	836.34	II
480	3089.58	II	970	4002.59	I	95	4915.90	I	8 r	1018.85	II
480	3102.96	II	1900	4005.47	II	65	4931.79	I	30	1028.69	IV
440	3139.64	II	760	4012.75	II	85	4993.82	II	20	1034.73	IV
480	3187.26	II	870	4032.28	I	110	5078.25	I	20	1036.61	IV
480	3199.56	II	2100	4033.03	II	75	5089.12	II	10 r	1049.73	II
1100	3218.93	II	430	4054.12	I	85	5186.13	I	8 r	1050.30	II
1200	3219.98	II	410	4060.37	I	120	5228.12	I	5 r	1074.97	II
480	3252.32	II	1300	4061.58	I	75	5248.71	I	30	1079.68	IV
760	3280.31	II	650	4105.37	I	75 w	5262.11	II	10 r	1130.17	II
760	3281.40	II	1100	4144.41	II	75	5281.05	I	15 r	1162.55	II
1000	3285.04	II	350	4158.53	I	65	5304.72	I	10 r	1167.43	II
1500	3293.07	II	390	4196.74	I	110	5319.23	I	10 r	1183.41	II
3800	3324.40	II	650	4203.74	I	65 w	5337.90	I	12 r	1194.84	II
760	3349.42	II	600	4206.49	I	160	5354.88	I	5 r	1246.00	II
760	3364.93	II	480	4215.09	I	75	5369.72	I	10	1266.33	III
810	3454.06	II	480	4232.82	I	75	5375.98	I	15 r	1307.50	II
810 d	3472.79	II	650	4266.34	I	50	5424.10	II	8 r	1310.20	II
810	3500.84	II	760 cw	4278.52	II	55	5459.81	I	25 r	1321.71	II
5700	3509.17	II	450	4310.42	I	55	5509.61	I	8 r	1330.40	II
1300	3523.66	II	2200	4318.83	I	50	5514.54	I	10 r	1373.52	II
1100	3540.24	II	600	4322.23	I	65	5524.12	I	10	1477.14	III
810	3543.89	II	600	4325.83	II	85 c	5747.58	I	8 r	1489.65	I
3200	3561.74	II	3000	4326.43	I	75	5795.64	I	10 r	1499.30	II
810	3567.35	II	600	4332.12	I	75	5803.13	II	10 r	1507.82	II
4200	3568.52	II	870	4336.43	I	65	5815.36	I	15 r	1561.58	II
1600	3568.98	II	600	4337.64	I	65	5851.07	I	10 r	1568.57	II
1100	3579.20	II	1700	4338.41	I	65	5870.62	I	7 r	1593.26	II
710	3585.03	II	700	4340.62	I	65 c	5920.78	I	5 h	1616.	I
810	3596.38	II	870	4356.81	I	75	5967.34	II	5	1685.40	I
1600	3600.44	II	330	4382.45	I	35	6331.68	II	10 r	1792.76	II
810	3625.54	II	300	4388.23	I	35 cw	6518.68	I	12 r	1814.85	II
2300	3650.40	II	260	4390.91	I	35	6581.82	I	25 r	1908.64	II
810	3654.88	II	350	4423.10	I	90	6677.94	II	100 r	2007.56	I
2000	3658.88	II	240	4436.12	I	40 cw	6702.61	I	100 r	2210.71	I
3800	3676.35	II	240	4448.04	I	130	6794.58	II	30	2298.04	II
810	3682.26	II	430	4493.07	I	55	6896.37	II	140	2315.98	I
450	3693.58	I	75	4514.31	II	45 h	6899.95	I	900 h	2379.69	I
450	3700.12	I	110	4549.07	I	40	6901.98	I	20	2530.86	II
4700	3702.86	II	110	4550.45	I	65	7204.28	I	700	2580.14	I
2400	3703.92	II	110	4556.46	I	40	7257.73	I	420	2709.23	I
1000 d	3711.76	II	110	4563.69	II	45	7348.88	II	4400 d	2767.87	I
650	3745.04	I	210	4578.69	II	45	7496.12	I	10	2849.80	II
870	3747.17	II	65	4584.84	II	27 h	7582.03	II	2800	2918.32	I
870	3747.34	II	65	4591.56	II	45	7590.24	I	20	3091.56	II
1100	3755.24	II	75 d	4626.32	II	65	7596.44	I	15	3185.51	II
650	3759.35	I	95	4626.94	II	30	7627.81	I	15	3186.56	II

Line Spectra of the Elements (continued): Thallium—Thulium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
15	3187.74	II	510	3119.526	II	310	3747.539	I	30	7045.795	II
1200	3229.75	I	510	3122.963	II	650	3752.569	II	30	7084.171	I
15	3291.01	II	480	3125.507	II	180	3770.056	I	30	7168.896	I
15	3369.15	II	100	3136.216	I	590	3803.075	I	40	7191.132	II
9	3456.34	III	420	3139.306	I	450	3828.384	I	35	7208.006	I
20000	3519.24	I	420	3142.835	II	840	3839.746	II	50	7525.508	II
5000	3529.43	I	420	3175.726	II	450	3863.405	II	30	7647.380	I
8	3540.08	II	1100	3180.193	II	210	3875.374	I	30	8330.451	I
9	3560.68	II	770	3188.233	II	340	3895.419	I	40	8967.641	I
12000 w	3775.72	I	560	3221.292	II	590	3929.669	II	20	9833.42	I
10	3832.30	II	560	3229.009	II	200	3932.911	I	20	10726.93	I
10	3887.15	II	480	3235.84	II	390	3967.392	I	20	10942.24	II
7	4109.85	III	590	3238.116	II	200	3972.155	I	30	11230.259	I
6	4269.81	III	910	3256.274	II	150	3980.089	I	20	11984.67	II
20	4274.98	II	180	3257.366	I	530	3994.549	II	20	17208.22	II
40	4306.80	II	910	3262.668	II	220	4008.210	I	15	18811.88	I
20	4737.05	II	620	3287.789	II	220	4009.056	I	10	22264.35	II
15	4981.35	II	910	3291.739	II	280	4012.495	I	Thulium		
25	5078.54	II	620	3292.520	II	4200	4019.129	II	Tm Z = 69		
25	5152.14	II	240	3301.650	I	250	4030.842	I	5000	2185.94	III
18000	5350.46	I	480	3304.238	I	250	4036.047	I	360	2284.79	II
15 d	5384.85	II	510	3321.450	II	250	4063.407	I	20000	2296.21	III
10	5410.97	II	840	3325.120	II	700	4086.520	II	5000	2305.03	III
25	5949.48	II	250	3330.476	I	700	4094.747	II	20000	2311.16	III
10	6179.98	II	620	3334.604	II	150	4100.341	I	5000	2312.72	III
10	6378.32	II	620	3337.870	II	840	4108.421	II	5000	2326.19	III
16 h	6549.84	I	310	3348.768	I	240	4112.754	I	6000	2328.50	III
10	6966.5	II	980	3351.228	II	280	4115.758	I	6000	2329.29	III
10	7815.80	I	620	3358.602	II	1100	4116.713	II	3000	2331.80	III
20	8373.6	I	250	3374.974	I	200	4127.411	I	3000	2357.05	III
10	8474.27	I	1300	3392.035	II	200	4134.067	I	4000	2406.63	III
10	8664.1	II	200	3396.727	I	450	4149.986	II	450	2409.02	II
20	9130.	II	250	3398.544	I	620	4178.060	II	450	2426.17	II
20	9130.5	I	200	3405.558	I	620	4208.890	II	770	2480.13	II
40	9509.4	I	250	3413.012	I	110	4253.538	I	30000	2489.44	III
20	9930.4	I	390	3421.210	I	110	4260.333	I	2000	2504.71	III
30	10011.9	I	270	3423.989	I	480	4277.313	II	1300	2509.08	II
40	10488.80	I	980	3433.998	II	700	4282.042	II	3000	2519.78	III
1000	11512.82	I	770	3435.976	II	130	4337.277	I	130	2527.02	I
150	12736.4	I	1300	3469.920	II	1300	4381.860	II	10000	2552.46	III
700	13013.2	I	170	3471.218	I	1100	4391.110	II	360	2552.76	I
Thorium			200	3486.552	I	110	4498.940	I	540	2561.65	II
Th Z = 90			670	3539.587	II	280	4510.527	II	430	2588.27	II
150	1707.37	IV	180	3544.018	I	90	4723.438	I	170 h	2596.49	I
200	1959.02	IV	170	3549.595	I	50	4840.843	I	810	2607.06	II
200	2002.34	IV	200	3555.013	I	280	4863.163	II	730	2624.33	II
200	2413.50	III	530	3559.451	II	260	5017.255	II	5000	2682.32	III
200	2427.94	III	200	3576.557	I	110	5067.974	I	2000	2707.03	III
200	2431.68	III	270	3592.780	I	120	5148.211	II	3000	2719.47	III
200	2441.24	III	270	3598.120	I	95	5216.596	II	540	2721.19	II
500	2565.593	II	980	3609.445	II	110	5231.160	I	3000	2724.44	III
480	2692.415	II	200	3612.427	I	95	5247.654	II	4000	2727.56	III
520	2747.156	II	480	3615.133	II	60	5343.581	I	680	2794.60	II
410	2752.166	II	270	3635.943	I	60	5587.026	I	730	2797.27	II
800	2832.315	II	210	3642.248	I	95	5707.103	II	2000	2806.77	III
1200	2837.295	II	170	3649.735	I	70	5760.551	I	580	2827.92	II
100	2848.084	I	220	3663.202	I	85	5989.044	II	200	2854.17	I
550	2870.406	II	280	3669.968	I	60	6169.822	I	1600	2869.23	II
100	2936.086	I	700	3675.567	II	50	6182.622	I	1000	2947.72	III
100	2943.729	I	150	3682.486	I	50	6274.116	II	490	2973.22	I
420	3049.092	II	170	3692.566	II	50	6274.117	II	1000	2998.28	III
450	3067.729	II	180	3698.105	I	50	6355.911	II	1500	3015.30	II
670	3078.828	II	340	3706.767	I	60	6457.283	I	360	3081.12	I
480	3080.217	II	590	3719.435	I	50	6462.614	I	7400	3131.26	II
510	3108.296	II	770	3721.825	II	50 h	6531.342	I	2300	3133.89	II
100	3116.263	I	1300	3741.183	II	55	6989.656	I	1900	3151.04	II

Line Spectra of the Elements (continued): Thulium—Tin

Intensity			Wavelength/Å			Intensity			Wavelength/Å			Intensity			Wavelength/Å		
1500	3157.34	II	1500	3958.10	II	40	7856.08	I	70	2058.31	I						
450	3172.65	I	1800	3996.52	II	55	7927.51	I	80	2068.58	I						
2300	3172.83	II	220	4024.23	I	110	7930.84	I	100	2072.89	I						
1200	3236.81	II	380	4044.47	I	95	8017.90	I	100	2073.08	I						
1600	3240.23	II	10000	4094.19	I	27	8472.01	II	200	2096.39	I						
2300	3241.54	II	9500	4105.84	I	Tin Sn Z = 50			100	2100.93	I						
320	3246.96	I	1100	4138.33	I				100 r	2113.93	I						
1900	3258.05	II	8800	4187.62	I	7	169.47	II	50	2121.26	I						
1600	3266.64	II	6000	4203.73	I	150	361.01	V	40 r	2148.73	I						
1200	3267.40	II	380	4222.67	I	100	753.01	III	20 r	2151.43	I						
1100	3276.81	II	3000	4242.15	II	200	910.92	III	30	2151.54	II						
1200	3283.40	II	270	4271.71	I	500	956.25	IV	80	2171.32	I						
1200	3285.61	II	150	4298.36	I	7	985.13	II	150 r	2194.49	I						
2300	3291.00	II	2700	4359.93	I	500	1019.72	IV	300 r	2199.34	I						
2000	3302.46	II	1400	4386.43	I	1000	1044.49	IV	400 r	2209.65	I						
1200	3309.80	II	200	4394.42	I	1000	1073.41	IV	80 r	2231.72	I						
230	3349.99	I	140	4396.50	I	200	1089.35	V	400 r	2246.05	I						
4000	3362.61	II	120	4454.03	I	8	1108.19	II	60	2251.17	I						
1700	3397.50	II	540	4481.26	II	1000	1119.34	IV	400 r	2268.91	I						
850	3410.05	I	150	4519.60	I	1000	1139.29	III	200 r	2286.68	I						
340	3412.59	I	260	4522.57	II	1000	1158.33	III	600 r	2317.23	I						
340	3416.59	I	110	4548.60	I	200	1160.74	V	300 r	2334.80	I						
6400	3425.08	II	270	4599.02	I	10	1161.43	II	1000 r	2354.84	I						
340	3429.33	I	300	4615.94	II	1000	1184.25	III	22	2368.33	II						
4900	3441.50	II	80	4626.33	II	2000	1210.52	III	100	2408.15	I						
4900	3453.66	II	95	4626.56	II	9	1219.07	II	800 r	2421.70	I						
8500	3462.20	II	110	4634.26	II	13	1223.70	II	1000 r	2429.49	I						
210	3467.51	I	120	4655.09	I	11	1243.00	II	15	2448.98	II						
340	3476.69	I	160	4681.92	I	2000	1251.38	V	300	2483.39	I						
340	3480.98	I	120	4691.11	I	1000	1259.92	III	13	2483.48	II						
420	3487.38	I	110	4724.26	I	20	1290.86	II	10	2486.99	II						
340	3499.95	I	680	4733.34	I	200	1294.36	V	200	2495.70	I						
250	3517.60	I	70	4759.90	I	1000	1305.97	III	400	2546.55	I						
1700	3535.52	II	80	4831.20	II	1000	1314.55	IV	500 r	2571.58	I						
420	3537.91	I	140	4957.18	I	20	1316.59	II	200	2594.42	I						
210	3555.82	I	160	5009.77	II	1000	1327.34	III	200 r	2661.24	I						
340	3560.92	I	160	5034.22	II	1000	1347.65	III	700 r	2706.51	I						
420	3563.88	I	150	5060.90	I	1000	1386.74	III	150	2779.81	I						
1300	3566.47	II	95	5113.97	I	25	1400.52	II	1400 r	2839.99	I						
420	3567.36	I	80	5213.38	I	1000	1437.52	IV	1000 r	2863.32	I						
280	3586.07	I	650	5307.12	I	20	1475.15	II	700 r	3009.14	I						
2100	3608.77	II	80	5346.49	II	9	1489.22	II	850 r	3034.12	I						
1000	3629.09	III	270	5631.41	I	1000	1570.36	III	12	3047.50	II						
380	3638.41	I	520	5675.84	I	10 r	1737.21	I	550 r	3175.05	I						
1100	3668.09	II	40	5684.76	II	15 r	1751.46	I	550 r	3262.34	I						
4800	3700.26	II	35	5709.97	II	20 r	1764.98	I	50	3283.21	II						
3800	3701.36	II	190	5764.29	I	30 r	1790.75	I	110	3330.62	I						
7700	3717.91	I	35	5838.76	II	80 r	1804.60	I	60	3351.97	II						
2400	3734.12	II	240	5895.63	I	15	1811.34	II	10	3472.46	II						
5000	3744.06	I	140	5971.26	I	500	1811.71	III	11	3575.45	II						
1700	3751.81	I	200	6460.26	I	40 r	1815.74	I	280 r	3801.02	I						
6000	3761.33	II	95	6604.96	I	120 r	1823.00	I	10	5332.36	II						
4800	3761.91	II	110	6779.77	I	9	1831.89	II	20	5561.95	II						
7100	3795.75	II	120	6844.26	I	50 r	1848.75	I	25	5588.92	II						
770	3798.54	I	80	6845.76	I	200 r	1860.32	I	500	5631.71	I						
600	3807.72	I	10	6937.37	I	80	1886.05	I	15	5799.18	II						
290	3826.39	I	10	7017.90	I	100	1891.40	I	50	5925.44	I						
1300	3838.20	II	12	7034.34	I	12	1899.91	II	100	5970.30	I						
290	3840.87	I	10	7106.14	I	50	1909.30	I	150	6037.70	I						
8900	3848.02	II	17	7272.62	I	80	1925.31	I	250	6069.00	I						
6800	3883.13	I	14	7310.51	I	500	1941.86	III	100	6073.46	I						
1800	3883.44	II	14	7432.18	I	150	1952.15	I	400	6149.71	I						
5400	3887.35	I	75	7481.08	I	50 h	1977.6	I	200	6154.60	I						
440	3896.62	I	75	7490.20	I	80	1984.20	I	150	6171.50	I						
3500	3916.48	I	140	7558.33	I	50	2040.66	I	100	6310.78	I						
1500	3949.27	I	80	7731.53	I	50	2054.03	I	70	6453.50	II						

Line Spectra of the Elements (continued): Tin—Titanium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
25	6844.05	II	24	2563.44	III	600	3461.50	II	6000	4533.24	I
20	7191.40	II	23	2565.42	III	600	3477.18	II	240	4533.97	II
10	7387.79	II	22	2567.56	III	480	3491.05	II	3600	4534.78	I
13	7741.80	II	270	2599.92	I	890	3504.89	II	2400	4535.58	I
100	7754.97	I	340	2605.15	I	600	3510.84	II	1200	4535.92	I
100 h	8030.5	I	510	2611.28	I	17	3576.44	IV	1200	4536.05	I
200	8114.09	I	300	2619.94	I	600	3610.16	I	720	4544.69	I
80	8357.04	I	640	2641.10	I	4800	3635.46	I	950	4548.77	I
300	8422.72	I	800	2644.26	I	6600	3642.68	I	240	4549.63	II
400	8552.60	I	950	2646.64	I	7200	3653.50	I	15	4549.84	III
50 h	8681.7	I	250	2742.32	I	600	3671.67	I	950	4552.46	I
50 h	9410.86	I	250	2802.50	I	3100	3685.20	II	720	4555.49	I
80 h	9415.37	I	190	2841.94	II	600	3689.91	I	240	4571.98	II
150	9616.40	I	180	2877.44	II	2900	3729.82	I	15 d	4572.20	III
50	9741.1	I	280	2884.11	II	3300	3741.06	I	950	4617.27	I
100 h	9742.8	I	450	2912.08	I	330	3741.64	II	480	4623.09	I
300 h	9805.38	I	340	2928.34	I	5200	3752.86	I	720	4656.47	I
500	9850.52	I	1100	2942.00	I	3300	3759.30	II	840	4667.59	I
54	10894.00	I	1300	2948.26	I	2900	3761.32	II	950	4681.92	I
70	11191.85	I	1600	2956.13	I	840	3786.04	I	470	4840.87	I
56	11277.66	I	22	2984.75	III	500	3882.89	I	400	4885.08	I
200	11454.59	I	1300 d	3066.22	II	530	3900.54	II	380	4899.91	I
200	11616.26	I	1100	3072.97	II	2600	3904.78	I	5800	4981.73	I
258	11739.78	I	1600	3075.22	II	500	3913.46	II	4600	4991.07	I
96	11825.18	I	2300	3078.64	II	500	3914.34	I	4000	4999.51	I
106	11835.82	I	3600	3088.02	II	15	3915.47	III	3600	5007.21	I
254	11932.99	I	720	3119.72	I	1100	3924.53	I	3200 d	5014.19	I
48	12009.50	I	500	3161.20	II	890	3929.88	I	840	5020.03	I
111	12313.24	I	780	3161.77	II	1100	3947.78	I	840	5022.87	I
42	12530.87	I	1000	3162.57	II	4500	3948.67	I	1200	5035.91	I
42	12536.5	I	1600	3168.52	II	4500	3956.34	I	840	5036.47	I
89	12888.5	I	2400	3186.45	I	5200	3958.21	I	740	5038.40	I
187	12981.7	I	1000	3190.87	II	950	3962.85	I	1200	5039.95	I
187	13018.5	I	3100	3191.99	I	950	3964.27	I	1400	5064.66	I
68	13081.5	I	3800	3199.92	I	4800	3981.76	I	1100	5173.75	I
378	13460.2	I	780	3202.54	II	570	3982.48	I	1300	5192.98	I
144	13608.2	I	1100	3217.06	II	5700	3989.76	I	1400	5210.39	I
40	20861.7	I	1300	3222.84	II	7800	3998.64	I	17	5278.12	III
4	24738.2	I	6600	3234.52	II	950	4008.93	I	20	5398.93	IV
Titanium			5200	3236.57	II	1200	4024.57	I	340	5512.53	I
Ti Z = 22			4100	3239.04	II	840	4078.47	I	270	5514.35	I
17	252.96	V	2600	3241.99	II	890	4286.01	I	320	5514.54	I
15	498.26	V	1200	3248.60	II	840	4287.40	I	250	5644.14	I
14	502.08	V	1200	3252.91	II	950	4289.07	I	130	5675.44	I
13	526.57	V	1200	3254.25	II	840	4290.94	I	95	5689.47	I
18	779.07	IV	1200	3261.60	II	840	4295.76	I	95	5715.13	I
20	1298.66	III	840	3314.42	I	2000	4298.66	I	85	5739.51	I
20	1298.97	III	2900	3322.94	II	200	4300.05	II	400	5866.46	I
23	1455.19	III	2100	3329.46	II	2900	4300.56	I	230	5899.32	I
20	1467.34	IV	1800	3335.20	II	4100	4301.09	I	120	5918.55	I
11	1717.40	V	1100	3340.34	II	6000	4305.92	I	150	5922.12	I
10	1841.49	V	5700	3341.88	I	1200	4314.80	I	120	5941.76	I
20	2067.56	IV	4300	3349.04	II	330	4395.04	II	300	5953.17	I
18	2103.16	IV	12000	3349.41	II	890	4427.10	I	200	5965.84	I
180	2273.28	I	4100	3354.64	I	230	4443.80	II	270	5978.56	I
190	2279.96	I	7200	3361.21	II	840	4449.15	I	340	5999.04	I
190	2305.67	I	1100	3370.44	I	550	4450.90	I	110	6064.63	I
22	2413.99	III	4300	3371.45	I	840	4453.32	I	120	6085.23	I
25	2516.05	III	5700	3372.80	II	950	4455.33	I	120	6091.17	I
360	2525.60	II	2900 d	3377.48	I	1100	4457.43	I	120	6126.22	I
24	2527.84	III	1400	3380.28	II	240	4468.50	II	17	6246.65	IV
210	2529.85	I	5700	3383.76	II	530	4481.26	I	380	6258.10	I
190	2531.25	II	1400	3385.95	I	780	4512.74	I	380	6258.70	I
190	2534.62	II	1400	3387.84	II	1000	4518.03	I	300	6261.10	I
130	2535.87	II	1100	3394.58	II	1000	4522.80	I	55	6546.28	I
23	2540.06	III	890	3444.31	II	780	4527.31	I	65	6554.23	I

Line Spectra of the Elements (continued): Titanium—Uranium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
75	6556.07	I	1400	2466.85	I	810	2848.02	I	1000	4102.70	I
18	6621.58	III	480	2472.51	I	1500	2896.44	I	540	4137.46	I
18	6667.99	III	1200	2474.15	I	690	2935.00	I	450	4171.17	I
80	6743.12	I	870	2480.13	I	2400	2944.40	I	220	4207.05	I
20	7072.64	III	1500	2481.44	I	2400	2946.99	I	250	4219.37	I
18	7084.57	III	480 d	2482.10	I	730 d	2979.71	I	540	4244.36	I
260	7209.44	I	580	2484.74	I	360	3013.79	I	1400	4269.38	I
130	7244.86	I	390	2487.50	I	520	3016.47	I	4100	4294.61	I
130	7251.72	I	390	2489.23	II	770	3017.44	I	2200	4302.11	I
120	7344.72	I	630	2495.26	I	210	3024.93	I	200	4378.48	I
90	7357.74	I	680	2504.70	I	310 d	3026.67	I	180	4384.85	I
60	7364.11	I	75	2510.47	II	440 d	3041.73	I	200	4408.28	I
60	7978.88	I	310	2520.46	I	270	3043.80	I	640	4484.19	I
55	8024.84	I	780	2521.32	I	440	3046.44	I	170	4588.73	I
75	8364.24	I	270	2522.04	II	810	3049.69	I	640	4659.87	I
100	8377.85	I	780	2523.41	I	180	3073.28	I	640	4680.51	I
100	8382.54	I	430	2527.76	I	180 d	3084.83	I	790	4843.81	I
75	8396.87	I	780	2533.64	I	370	3093.50	I	380	4886.90	I
120	8412.36	I	1200	2547.14	I	240	3107.23	I	220	4982.59	I
170	8426.52	I	780	2550.38	I	240	3108.02	I	820	5053.28	I
490	8434.94	I	2700	2551.35	I	230	3117.57	I	770	5224.66	I
240	8435.70	I	730	2561.97	I	260	3120.18	I	220	5514.68	I
20	8466.87	III	870	2580.49	I	290	3163.42	I	65	5648.37	I
90	8675.39	I	390	2584.39	I	320	3176.60	I	55	5735.09	I
Tungsten W Z = 74			390	2589.17	II	190	3181.82	I	45	5804.85	I
			370	2601.96	I	390	3191.57	I	40	5902.64	I
			680	2606.39	I	390	3198.84	I	55	5947.57	I
5800	2001.71	II	370	2608.32	I	520	3207.25	I	55	5965.86	I
13000	2008.07	II	970	2613.08	I	1000	3215.56	I	55	6012.78	I
5100	2009.98	II	480	2613.82	I	190	3232.49	I	40	6021.52	I
4100	2010.23	II	400	2620.25	I	210	3254.36	I	45	6292.02	I
4100	2014.23	II	400	2622.21	I	210	3259.66	I	35	6404.21	I
7300	2026.08	II	400	2625.22	I	210 d	3266.62	I	40	6445.12	I
15000	2029.98	II	400	2632.48	I	730	3300.82	I	17	6611.62	I
5300	2049.63	II	400	2632.70	I	440	3311.38	I	13	6678.42	I
9700	2079.11	II	810	2633.13	I	440	3326.20	I	15	6693.08	I
6100	2094.75	II	400 d	2638.62	I	440	3331.69	I	13	6984.27	I
2100	2118.87	II	650	2646.18	I	390	3373.75	I	15	7140.52	I
2400	2121.59	II	400	2646.73	I	230	3429.59	I	9	7162.64	I
1500	2166.32	II	1600	2656.54	I	240	3443.00	I	11	7200.16	I
1300	2204.48	II	810	2662.84	I	400	3495.24	I	10	7278.24	I
460	2249.80	I	810	2671.47	I	650	3545.22	I	15	7285.81	I
510	2277.58	I	650	2677.28	I	240	3570.65	I	15	7296.55	I
530 d	2294.49	I	2100	2681.42	I	1900	3617.52	I	10	7509.00	I
340	2309.02	I	650	2695.67	I	650	3682.08	I	17	7569.92	I
440	2313.17	I	650	2699.59	I	400	3683.30	I	17	7614.15	I
460	2321.63	I	400	2700.01	I	570	3688.06	I	13	7688.97	I
390 d	2326.56	I	400	2706.58	I	810	3707.92	I	11	7784.15	I
320	2354.61	I	400	2708.59	I	510	3757.92	I	22	8017.19	I
580	2360.44	I	400 d	2708.80	I	680	3760.13	I	22	8055.64	I
850	2363.07	I	400	2715.50	I	1000	3768.45	I	13	8123.82	I
510	2374.47	I	2100	2718.91	I	340	3773.71	I	10	8338.08	I
670	2384.82	I	2600	2724.35	I	1000	3780.77	I	27	8585.11	I
730	2397.09	II	400	2725.03	I	290	3809.22	I	10	8594.42	I
560	2397.73	I	650	2748.84	I	190	3810.38	I	13	8865.53	I
560	2397.98	I	400	2762.34	I	260	3810.79	I	Uranium U Z = 92		
1700 d	2405.58	I	400	2764.27	II	1400	3817.48	I			
610	2415.68	I	400	2769.74	I	1100	3835.06	I	440	2565.41	II
870	2424.21	I	810	2770.88	I	730	3846.22	I	610	2635.53	II
1800	2435.96	I	810	2774.00	I	1800	3867.99	I	830	2793.94	II
580	2444.06	I	810	2774.48	I	730	3881.41	I	870	2802.56	II
780	2451.48	II	810	2792.70	I	8600	4008.75	I	630	2807.05	II
870	2452.00	I	400	2799.93	I	540	4015.22	I	630	2817.96	II
630	2454.98	I	810	2818.06	I	910	4045.59	I	870	2821.12	II
780	2455.51	I	1600	2831.38	I	730	4069.95	I	680	2828.90	II
780	2456.53	I	810	2833.63	I	5000	4074.36	I	920	2832.06	II
1100	2459.30	I									

Line Spectra of the Elements (continued): Uranium—Vanadium

Intensity			Wavelength/Å			Intensity			Wavelength/Å			Intensity			Wavelength/Å		
970	2865.68	II	1000	3881.45	II	100	1680.20	V	490	3592.02	II						
1200	2889.62	II	2200	3890.36	II	1000	1694.78	III	560	3592.53	I						
780	2906.80	II	2000	3932.02	II	1000	1760.07	III	100	3679.86	III						
780	2908.28	II	1200	3943.82	I	1000	1788.26	III	1300	3688.07	I						
580	2931.41	II	1200	3985.79	II	1000	1794.60	III	1000	3690.28	I						
530 p	2940.37	II	1000	4042.75	I	1000	1812.19	III	1500	3692.22	I						
1300	2941.92	II	1600	4050.04	II	300	1861.56	IV	1000	3695.86	I						
830	2943.90	II	880	4062.54	II	500	1939.06	IV	3800	3703.58	I						
580	2956.06	II	2200	4090.13	II	400	1951.43	IV	1800	3704.70	I						
580	2967.94	II	810	4116.10	II	500	1997.72	IV	320	3715.47	II						
580	2971.06	II	880	4153.97	I	2100	2092.44	I	250	3727.34	II						
530	2984.61	II	1400	4171.59	II	500	2268.30	IV	280	3732.76	II						
630	3022.21	II	1000	4241.67	II	1000	2292.86	III	520	3790.32	I						
630	3031.99	II	600	4472.33	II	2500	2330.42	III	1100	3794.96	I						
580	3050.20	II	620	4543.63	II	2500	2371.06	III	570	3799.91	I						
630	3057.91	II	170	4689.07	II	1000	2382.46	III	570	3803.47	I						
630	3062.54	II	150	4756.81	I	240	2507.78	I	1000	3813.49	I						
580	3072.78	II	110	5008.21	II	410	2526.22	I	1300	3818.24	I						
580	3093.01	II	170	5027.38	I	210	2527.90	II	1700	3828.56	I						
580	3102.39	II	80	5160.32	II	80 h	2570.72	IV	2600	3840.75	I						
970	3111.62	II	70	5280.38	I	230	2574.02	I	1200	3855.37	I						
530	3119.35	II	80	5475.70	II	250	2593.05	III	3000	3855.84	I						
680	3124.95	II	70	5480.26	II	250	2595.10	III	1300	3864.86	I						
530	3139.61	II	70	5481.20	II	80 h	2645.54	IV	1500	3875.08	I						
680	3149.24	II	160	5492.95	II	180	2661.42	I	700	3890.18	I						
530	3153.11	II	70	5780.59	I	1100	2687.96	II	2400	3902.25	I						
730	3229.50	II	70	5798.53	II	680	2700.94	II	700	3909.89	I						
680	3232.16	II	230	5915.39	I	530	2706.17	II	540	3990.57	I						
730	3291.33	II	100	5976.32	I	640	2715.69	II	430	3998.73	I						
1100	3305.89	II	90	6077.29	I	180	2731.35	I	170	4005.71	II						
730	3390.38	I	55	6372.46	I	240	2864.36	I	1100	4090.58	I						
580	3424.56	II	90	6395.42	I	900	2891.64	II	1800	4092.69	I						
580	3435.49	I	110	6449.16	I	900	2892.66	II	890	4095.49	I						
630	3466.30	I	90	6826.92	I	1400	2893.32	II	2800	4099.80	I						
680	3482.49	II	45	7533.93	I	900	2906.46	II	590	4102.16	I						
1600	3489.37	I	50	7881.94	I	2400	2908.82	II	2800	4105.17	I						
530	3496.41	II	35	8445.39	I	710	2923.62	I	2300	4109.79	I						
630	3500.08	I	75	8607.95	I	2400	2924.02	II	8900	4111.78	I						
780	3507.34	I	30	8757.76	I	1700	2924.64	II	4300	4115.18	I						
1600	3514.61	I	100	10554.93	I	900	2941.37	II	1800	4116.47	I						
630	3533.57	II	75	11167.84	I	1100	2944.57	II	2000	4123.57	I						
530	3540.47	II	100	11384.13	I	410	2962.77	I	3100	4128.07	I						
1200	3550.82	II	100	11859.42	I	600	2968.38	II	3100	4132.02	I						
680	3555.32	I	100	11908.83	I	1200	3056.33	I	2300	4134.49	I						
1200	3561.80	I	100	12250.46	I	1400	3060.46	I	20	4200.32	V						
2300	3566.59	I	100	13185.16	I	2400	3066.38	I	360	4232.46	I						
530	3569.08	I	75	13306.23	I	3800	3093.11	II	560	4268.64	I						
630	3578.72	II	100	13961.58	I	3000	3102.30	II	460	4271.55	I						
3200	3584.88	I	75	18634.43	I	2600	3110.71	II	460	4276.96	I						
840	3638.20	I	75	21910.22	I	2000	3118.38	II	430	4284.06	I						
2800	3670.07	II	Vanadium			1500	3125.28	II	460	4330.02	I						
1100	3701.52	II	V Z = 23			3200	3183.41	I	510	4332.82	I						
600	3738.04	II	20	225.46	V	5300	3183.98	I	760	4341.01	I						
680	3746.42	II	20	251.66	V	3800	3185.40	I	1000	4352.87	I						
950	3748.68	II	20	286.84	V	410	3187.71	II	12000	4379.24	I						
600	3751.17	I	35	483.01	V	530	3188.51	II	7000	4384.72	I						
1900	3782.84	II	50	633.94	III	750	3190.68	II	4800	4389.97	I						
570	3793.10	II	200	677.34	IV	1100	3267.70	II	3600	4395.23	I						
1900	3811.99	I	500	684.37	IV	900	3271.12	II	1400	4400.58	I						
750	3826.51	II	400	737.85	IV	750	3276.12	II	2300	4406.64	I						
2000	3831.46	II	100	864.27	III	80 h	3514.25	IV	2800	4407.64	I						
1200	3839.63	I	500	1006.46	III	560	3517.30	II	3600	4408.20	I						
2400	3854.64	II	500	1149.94	III	560	3533.68	I	4600	4408.51	I						
4900	3859.57	II	100	1426.65	IV	560	3545.20	II	640	4416.47	I						
1900	3865.92	II	1000	1643.03	III	560	3556.80	II	640	4421.57	I						
1500	3871.03	I	1000	1650.14	III	560	3589.76	II	640	4437.84	I						

Line Spectra of the Elements (continued): Vanadium—Xenon

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
830	4441.68	I	29 c	8027.39	I	30	2827.45	III	10	3669.91	I
640	4444.21	I	120 w	8116.80	I	40	2847.65	III	50	3676.67	III
610	4452.01	I	70 c	8161.07	I	30	2862.40	III	40	3685.90	I
1000	4459.76	I	60 c	8919.85	I	200	2864.73	II	40	3693.49	I
2000	4460.29	I	Xenon			80 w	2871.10	III	40	3776.3	III
610	4462.36	I	Xe Z = 54			60 w	2871.24	III	300	3781.02	III
510	4577.17	I	8	657.8	III	30	2871.7	III	100	3841.5	III
640	4580.40	I	8	660.1	III	150 h	2895.22	II	200	3877.8	III
830	4586.36	I	9	673.8	III	30	2896.62	III	60	3880.5	III
1300	4594.11	I	9	674.0	III	50	2906.6	III	100 I	3907.91	II
230	4619.77	I	9	676.6	III	40	2911.89	III	500	3922.55	III
100	4635.18	I	10	694.0	III	80 w	2912.36	III	300	3950.59	III
130	4646.40	I	20	698.5	III	40	2940.2	III	100	4037.59	II
160	4670.49	I	12	705.1	III	60	2945.2	III	200	4050.07	III
130	4776.36	I	10	721.2	III	40	2947.5	III	200 I	4057.46	II
110	4786.51	I	15	731.0	III	40	2948.1	III	60	4060.4	III
130	4796.92	I	10	733.3	III	80 w	2970.47	III	100 h	4098.89	II
130	4807.53	I	350	740.41	II	400	2979.32	II	100	4109.1	III
130	4827.45	I	15	742.6	III	40	2992.87	III	100	4145.7	III
150	4831.64	I	10	756.0	III	30	3004.25	III	200 I	4158.04	II
120	4832.43	I	10	761.5	III	100 h	3017.43	II	1000 h	4180.10	II
320	4851.48	I	10	769.1	III	100	3023.81	III	500 h	4193.15	II
480	4864.74	I	25	779.1	III	40	3083.5	III	300 h	4208.48	II
620	4875.48	I	15	792.9	III	50	3091.1	III	100 h	4209.47	II
740	4881.56	I	12	796.1	III	30	3106.46	III	300 h	4213.72	II
110	5128.53	I	15	802.0	III	300	3128.87	II	100	4215.60	II
110	5138.42	I	350	803.07	II	100 w	3138.3	III	300 h	4223.00	II
110	5192.99	I	25	823.2	III	80 c	3150.82	III	400 h	4238.25	II
110	5194.83	I	30	824.9	III	40	3185.2	III	500 h	4245.38	II
110	5234.07	I	25	853.0	III	100	3242.86	III	100 I	4251.57	II
110	5240.87	I	600	880.80	II	80	3268.98	III	30	4285.9	III
100	5401.93	I	350	885.54	II	30	3287.82	III	500 h	4296.40	II
140	5415.26	I	15	889.3	III	80 w	3301.55	III	500 h	4310.51	II
140	5584.50	I	20	894.0	III	40	3331.6	III	1000 I	4330.52	II
100	5592.42	I	20	896.0	III	30	3358.0	III	200 h	4369.20	II
200	5624.60	I	600	925.87	II	200 h	3366.72	II	100 I	4373.78	II
400	5627.64	I	250	935.40	II	80	3384.12	III	500 h	4393.20	II
110	5657.44	I	10	965.5	III	2	3400.07	I	500 I	4395.77	II
110	5668.36	I	800	972.77	II	2	3418.37	I	200 I	4406.88	II
310	5670.85	I	700	976.68	II	2	3420.00	I	150 I	4416.07	II
1200	5698.52	I	35	1003.4	III	3	3442.66	I	50	4434.2	III
920	5703.56	I	35	1017.7	III	60	3444.2	III	500 h	4448.13	II
570	5706.98	I	500	1032.44	II	70	3454.2	III	100 w	4462.1	III
850	5727.03	I	700	1037.68	II	100 w	3458.7	III	1000 h	4462.19	II
230	5731.25	I	1100	1041.31	II	100 h	3461.26	II	500 I	4480.86	II
230	5737.06	I	10	1047.8	III	40	3468.22	III	100 I	4521.86	II
450	6039.73	I	1000	1048.27	II	4	3469.81	I	100 w	4569.1	III
480	6081.44	I	1200	1051.92	II	4	3472.36	I	100 w	4570.1	III
1300	6090.22	I	12	1066.4	III	5	3506.74	I	100 w	4641.4	III
600	6119.52	I	2000	1074.48	II	80	3522.83	III	30	4673.7	III
450	6199.19	I	600	1083.86	II	50	3542.3	III	60	4683.57	III
450	6216.37	I	1200	1100.43	II	10	3549.86	I	30	4723.60	III
430	6230.74	I	30	1130.3	III	50	3552.1	III	600	4734.152	I
710	6243.10	I	600	1158.47	II	10	3554.04	I	100 w	4757.3	III
280	6251.82	I	250	1169.63	II	40	3561.4	III	150	4792.619	I
130	6268.82	I	800 p	1183.05	II	100	3579.7	III	500	4807.02	I
170	6274.65	I	250	1192.04	I	80	3583.6	III	400	4829.71	I
200	6285.16	I	25	1232.1	III	100 w	3595.4	III	300	4843.29	I
200	6292.83	I	600	1244.76	II	100	3606.06	III	40	4869.5	III
170	6296.49	I	250	1250.20	I	40	3607.0	III	500	4916.51	I
110	6531.43	I	1000	1295.59	I	15	3610.32	I	500	4923.152	I
65 c	6753.00	I	600	1469.61	I	8	3613.06	I	200 I	4971.71	II
50 c	6766.49	I	80	2668.98	III	100 w	3615.9	III	400	4972.71	II
40	6784.98	I	100	2717.33	III	40	3623.1	III	300	4988.77	II
40	7338.92	I	30	2814.45	III	600	3624.08	III	100 I	4991.17	II
35	7356.54	I	40	2815.91	III	6	3633.06	I	200	5028.280	I

Line Spectra of the Elements (continued): Xenon—Ytterbium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
200	5044.92	II	100	6198.26	I	100	8101.98	I	175	25145.84	I
1000	5080.62	II	60	6205.97	III	150 h	8151.80	II	2000	26269.08	I
300	5122.42	II	100	6220.02	II	100	8171.02	I	2500	26510.86	I
100	5125.70	II	25	6221.7	III	700	8206.34	I	250	28381.54	I
100	5178.82	II	60	6238.2	III	10000	8231.635	I	750	28582.25	I
300	5188.04	II	60	6259.05	III	500	8266.52	I	300	29384.41	I
400	5191.37	II	500	6270.82	II	7000	8280.116	I	150	29448.06	I
100	5192.10	II	400	6277.54	II	2000	8346.82	I	100	29649.58	I
60	5239.0	III	100	6284.41	II	100	8347.24	II	100	29813.62	I
500	5260.44	II	100	6286.01	I	2000	8409.19	I	600	30253.14	I
500	5261.95	II	250	6300.86	II	50 h	8515.19	II	1500	30475.46	I
2000	5292.22	II	500	6318.06	I	200	8576.01	I	100	30504.12	I
300	5309.27	II	400	6343.96	II	50 h	8604.23	II	500	30794.18	I
1000	5313.87	II	600	6356.35	II	250	8648.54	I	6000	31069.23	I
2000	5339.33	II	200	6375.28	II	100	8692.20	I	125	31336.01	I
200	5363.20	II	100	6397.99	II	200	8696.86	I	550	31607.91	I
30	5367.1	III	300	6469.70	I	50 h	8716.19	II	100	32293.08	I
200	5368.07	II	150	6472.84	I	300	8739.39	I	1800	32739.26	I
500	5372.39	II	120	6487.76	I	100	8758.20	I	3500	33666.69	I
100	5392.80	I	100	6498.72	I	5000	8819.41	I	150	34014.67	I
50	5401.0	III	200 h	6504.18	I	300	8862.32	I	450	34335.27	I
3000	5419.15	II	300	6512.83	II	200	8908.73	I	170	34744.00	I
800	5438.96	II	200	6528.65	II	200	8930.83	I	5000	35070.25	I
300	5445.45	II	100	6533.16	I	1000	8952.25	I	110	35246.92	I
200	5450.45	II	1000	6595.01	II	100	8981.05	I	250	36209.21	I
400	5460.39	II	100	6595.56	I	200	8987.57	I	150	36231.74	I
1000	5472.61	II	400	6597.25	II	400	9045.45	I	450	36508.36	I
100 I	5494.86	II	100	6598.84	II	500	9162.65	I	850	36788.83	I
40	5524.4	III	150	6668.92	I	100	9167.52	I	140	38685.98	I
200	5525.53	II	300	6694.32	II	100	9374.76	I	175	38737.82	I
600	5531.07	II	200	6728.01	I	200	9513.38	I	270	38939.60	I
100	5566.62	I	150	6788.71	II	50 h	9591.35	II	120	39955.14	I
300	5616.67	II	100	6790.37	II	150	9685.32	I	Ytterbium		
300	5659.38	II	1000	6805.74	II	50 I	9698.68	II	Yb Z = 70		
600	5667.56	II	200	6827.32	I	100	9718.16	I	1000	1050.24	IV
150	5670.91	II	100	6872.11	I	2000	9799.70	I	1000	1054.46	IV
100	5695.75	I	300	6882.16	I	3000	9923.19	I	5000	1134.43	IV
200	5699.61	II	80	6910.22	II	100	10838.37	I	900	1316.04	IV
200	5716.10	II	100	6925.53	I	90	11742.01	I	800	1326.36	IV
500	5726.91	II	800 h	6942.11	II	375	12235.24	I	900	1350.26	IV
500	5751.03	II	100	6976.18	I	100	12257.76	I	80	1561.42	III
300	5758.65	II	2000	6990.88	II	300	12590.20	I	80 h	1765.21	III
300	5776.39	II	150	7082.15	II	2500	12623.391	I	800	1791.06	IV
100	5815.96	II	500	7119.60	I	250	13544.15	I	100	1863.32	III
300	5823.89	I	50 s	7147.50	II	2000	13657.055	I	800	1873.91	III
150	5824.80	I	200	7149.03	II	1250	14142.444	I	500	1898.25	III
100	5875.02	I	500	7164.83	II	800	14240.96	I	500	1998.82	III
300	5893.29	II	100	7284.34	II	375	14364.99	I	900	2116.65	IV
100	5894.99	I	200	7301.80	II	140	14660.81	I	2500	2116.67	II
200	5905.13	II	200	7339.30	II	3000	14732.806	I	800	2123.32	IV
100	5934.17	I	100	7386.00	I	100	15099.72	I	3000	2126.74	II
500	5945.53	II	150	7393.79	I	2500	15418.394	I	800	2139.99	IV
300	5971.13	II	300	7548.45	II	150	15557.13	I	20000	2144.77	IV
2000	5976.46	II	200	7584.68	I	250	15979.54	I	15000	2154.18	IV
200	6008.92	II	80	7618.57	II	100	16039.90	I	370	2161.60	II
1000	6036.20	II	500	7642.02	I	1000	16053.28	I	850	2185.71	II
2000	6051.15	II	100	7643.91	I	125	16554.49	I	640	2224.46	II
600	6093.50	II	200	7670.66	II	1500	16728.15	I	300	2240.11	III
1500	6097.59	II	60	7787.04	II	1500	17325.77	I	300	2305.32	III
400	6101.43	II	100	7802.65	I	350	18788.13	I	140	2320.81	II
100	6115.08	II	100	7881.32	I	150	20187.19	I	170	2390.74	II
100	6146.45	II	300	7887.40	I	3000	20262.242	I	460	2464.50	I
150	6178.30	I	500	7967.34	I	250	21470.09	I	140	2512.06	II
120	6179.66	I	100	8029.67	I	1250	23193.33	I	270	2538.67	II
300	6182.42	I	200	8057.26	I	110	23279.54	I	2000	2567.61	III
500	6194.07	II	150	8061.34	I	1800	24824.71	I	1000	2579.57	III

Line Spectra of the Elements (continued): Ytterbium—Yttrium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
800	2599.14	III	2000	3384.01	III	40	4837.46	I	300	403.45	V
600	2621.11	III	140	3387.50	I	40 h	4894.60	I	300	420.74	V
1000	2642.56	III	50	3412.45	I	27	4912.36	I	600	425.03	IV
1000	2651.74	III	140	3418.39	I	710	4935.50	I	300	473.10	IV
700	2652.25	III	360	3426.04	I	140	4966.90	I	4000	584.98	V
990	2653.75	II	240	3431.11	I	30	5067.80	I	2000	630.97	V
200	2665.04	II	85	3452.40	I	70	5069.14	I	5000	805.20	III
2000	2666.13	III	500	3454.08	II	220	5074.34	I	7000	809.92	III
2000	2666.99	III	190 d	3458.29	II	50	5076.74	I	15000	989.21	III
390	2671.96	I	360	3460.27	I	60	5196.08	I	25000	996.37	III
390	2672.66	II	2400	3464.37	I	85	5211.60	I	5000	1314.51	III
170	2718.35	II	500	3476.30	II	100	5244.11	I	4000	1334.04	III
230	2748.66	II	500	3478.84	II	150 h	5277.04	I	4000	2068.98	III
1300	2750.48	II	50	3517.00	I	170	5335.15	II	10000	2127.98	III
170	2776.28	II	230	3520.29	II	30 h	5351.29	I	16000	2191.16	III
600	2795.60	III	35	3559.03	I	150	5352.95	II	350	2243.06	II
1000	2803.43	III	200	3560.33	II	30	5363.66	I	10000	2284.34	III
600	2816.92	III	170	3560.70	II	40	5449.27	II	10000	2327.31	III
1000	2818.72	III	360	3585.47	II	60	5481.92	I	50	2354.20	I
140	2821.15	II	200	3619.80	II	40	5505.49	I	50000	2367.23	III
190	2830.99	II	240	3637.76	II	17	5524.54	I	40000	2414.64	III
230 h	2847.18	II	70	3648.15	I	85 h	5539.05	I	560	2422.20	II
360	2851.13	II	90	3655.73	I	2400	5556.47	I	60	2694.21	I
430	2859.80	II	240	3669.69	II	60	5651.98	II	95	2723.00	I
140	2861.21	II	140	3675.08	II	220	5719.99	I	70	2742.53	I
200	2867.06	II	32000	3694.19	II	27	5771.66	II	140	2760.10	I
45	2873.49	I	70	3700.58	I	35	5833.99	II	90000	2817.04	III
200	2888.04	II	400	3711.91	III	35	5837.14	II	45	2822.56	I
3600	2891.38	II	180	3734.69	I	27	5854.51	I	70	2854.43	II
600	2898.30	III	550	3770.10	I	17	5989.33	I	95	2886.48	I
1000	2906.31	III	80	3774.32	I	40	5991.51	II	160	2919.05	I
170	2914.21	II	60 h	3791.74	I	60	6152.57	II	99000	2946.01	III
140	2915.28	II	170	3839.91	I	60	6274.78	II	390	2948.40	I
280	2919.35	II	340	3872.85	I	200	6328.52	III	350	2964.96	I
35	2934.36	I	340	3900.85	I	35 h	6400.35	I	480	2974.59	I
140	2945.91	II	140	3911.27	I	35 h	6417.91	I	750	2984.26	I
2000	2970.56	II	500	3931.23	III	340	6489.06	I	140	2996.94	I
200	2983.99	II	32000	3987.99	I	180	6667.82	I	130	3021.73	I
170	2994.80	II	930	3990.88	I	25	6727.61	II	190	3045.37	I
800	2998.00	III	50	4007.36	I	690	6799.60	I	95	3095.88	II
310	3005.77	II	2000	4028.14	III	9 h	7244.41	I	110	3173.06	II
160	3017.56	II	70	4052.28	I	8 h	7305.22	I	220	3179.41	II
160	3026.67	II	440	4089.68	I	10 h	7313.05	I	70	3191.31	I
2000	3029.49	III	470	4149.07	I	16 h	7350.04	I	2300	3195.62	II
920	3031.11	II	120	4174.56	I	25	7448.28	I	2200	3200.27	II
3000	3092.50	III	340	4180.81	II	30 h	7527.46	I	2200	3203.32	II
28	3100.74	I	300	4213.64	III	750	7699.48	I	3900	3216.69	II
170	3107.90	II	150 d	4218.56	II	100	7971.46	III	6200	3242.28	II
190	3117.81	II	120	4231.97	I	70 h	8922.56	II	4700	3327.89	II
4000	3126.01	III	70	4277.74	I	200	10110.60	III	85	3388.59	I
1000	3138.58	III	120	4305.97	I	100	10830.36	III	85	3412.47	I
230	3140.94	II	60 h	4393.69	I	Yttrium Y Z = 39			170	3485.73	I
28	3162.29	I	60 h	4430.21	I				1700	3496.09	II
800	3191.35	III	440	4439.19	I	150	264.64	IV	3900	3549.01	II
390	3192.88	II	85 h	4482.42	I	150	273.03	IV	130	3551.80	I
240	3201.16	II	100	4517.58	III	900	333.09	V	540	3552.69	I
2000	3228.58	III	85 h	4563.95	I	500	333.80	V	170	3558.76	I
35	3239.58	I	640	4576.21	I	400	335.14	V	190	3571.43	I
18000	3289.37	II	200	4582.36	I	500	336.62	V	260	3576.05	I
130	3305.25	I	70	4589.21	I	500	339.02	V	3300	3584.52	II
140	3305.73	II	140	4590.83	I	500	344.59	V	300	3587.75	I
80	3319.41	I	40	4684.27	I	900	355.86	IV	100	3589.69	I
2000	3325.51	III	190	4726.08	II	300	370.42	IV	2800	3592.92	I
240	3337.17	II	170 h	4781.87	I	300	372.05	V	10000	3600.73	II
280 d	3342.93	II	170	4786.61	II	400	379.96	V	6200	3601.92	II
240	3375.48	II	35	4816.43	I	500	386.82	IV	7800	3611.05	II

Line Spectra of the Elements (continued): Yttrium—Zirconium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
4300	3620.94	I	170	4786.89	I	24 h	6950.31	I	200	2670.53	I			
1900	3628.71	II	180	4799.30	I	24	6979.88	I	300	2684.16	I			
7800	3633.12	II	140	4819.64	I	29	7052.94	I	300	2712.49	I			
3000	3664.61	II	120	4822.13	I	35	7191.66	I	200	2756.45	I			
170	3692.53	I	770	4839.87	I	35	7264.17	II	300	2770.86	I			
13000	3710.30	II	550	4845.68	I	50	7346.46	I	300	2770.98	I			
1200	3747.55	II	410	4852.69	I	29	7450.30	II	400	2800.87	I			
10000	3774.33	II	120	4854.25	I	9000	7558.71	III	100	2801.06	I			
1400	3776.56	II	890	4854.87	II	35	7563.13	I	200	3035.78	I			
7400	3788.70	II	330	4859.84	I	29	7855.52	I	200	3072.06	I			
1300	3818.35	II	1900	4883.69	II	110	7881.90	II	300	3196.31	II			
4000	3832.88	II	95	4893.44	I	10000	7991.43	III	500 r	3282.33	I			
80	3876.82	I	1100	4900.12	II	24	8344.43	I	800	3302.58	I			
480	3878.28	II	100	4906.11	I	10000	8796.21	III	700 r	3302.94	I			
4400	3950.36	II	150	4921.87	I	95	8800.62	I	800	3345.02	I			
3600	3982.60	II	120	4974.30	I	19 h	8835.85	II	500	3345.57	I			
940	4039.83	I	100	5006.97	I				50	3883.34	I			
2400	4047.64	I	75	5070.21	I				300	4680.14	I			
9400	4077.38	I	75	5072.19	I				400	4722.15	I			
2000	4083.71	I	1100	5087.42	II	200	425.90	IV	400	4810.53	I			
9900	4102.38	I	180	5135.20	I	200	428.54	IV	800	4911.62	II			
8900	4128.31	I	960	5200.41	II	1000	430.59	IV	500	4924.03	II			
7500	4142.85	I	1500	5205.72	II	750	677.63	III	200	5181.98	I			
100 h	4157.63	I	10000	5238.10	III	200	677.96	III	500	5894.33	II			
2400	4167.52	I	180	5240.81	I	60	713.90	III	500	6021.18	II			
2000	4174.14	I	75	5380.62	I	50	1193.23	II	500	6102.49	II			
8000	4177.54	II	220	5402.78	II	50	1239.12	IV	500	6102.49	II			
160	4217.80	I	90	5424.37	I	500	1249.69	IV	500	6214.61	II			
280 h	4220.63	I	190	5438.24	I	500	1265.74	IV	1000 h	6362.34	I			
600	4235.73	II	710	5466.46	I	500	1306.66	IV	300	7588.5	II			
2200	4235.94	I	100	5468.47	I	200	1456.72	III	300	7732.5	II			
300	4251.20	I	240	5497.41	II	200	1459.98	IV	100	11054.25	I			
360 h	4302.30	I	300	5503.45	I	300	1499.42	III	100	13053.63	I			
2800	4309.63	II	250	5509.90	II	300	1500.42	III	100	13150.59	I			
110	4330.78	I	120	5509.90	II	300	1505.92	III	100	14038.70	I			
440 h	4348.79	I	740	5527.54	I	300	1515.85	III	20	16483.45	I			
120	4357.73	I	120	5544.50	I	300	1552.30	III	20	16491.98	I			
800	4358.73	II	180	5577.42	I	90	1572.99	II	20	16505.23	I			
120	4366.03	I	620	5581.87	I	200	1629.19	III	10	24375.02	I			
12000	4374.94	II	120	5606.33	I	200	1639.33	III						
150 h	4375.61	I	560	5630.13	I	200	1673.05	III						
100	4387.74	I	120	5644.69	I	80 d	1735.61	II						
1800	4398.02	II	120	5648.47	I	100	1767.69	III	500	304.01	V			
890	4422.59	II	740	5662.94	II	100	1797.64	II	60	480.66	IV			
100	4443.66	I	90	5675.27	I	100	1811.05	II	60	497.23	IV			
130	4446.63	I	160	5706.73	I	100 d	1833.57	II	60	500.22	IV			
170	4475.72	I	90	5743.85	I	100 d	1864.12	II	600	628.66	IV			
180	4476.96	I	75	5765.64	I	100	1866.08	II	500	633.56	IV			
160	4477.45	I	100	5781.69	II	100	1872.13	II	50	690.39	III			
110	4487.28	I	120	6009.19	I	100	1918.96	II	2000	740.61	V			
300	4487.47	I	120	6023.41	I	100 d	1929.67	II	10000	800.00	V			
500	4505.95	I	120	6135.04	I	100	1969.40	II	10000	806.89	V			
890	4527.25	I	150	6138.43	I	100	1982.11	II	10000	812.05	V			
440	4527.80	I	1200	6191.73	I	100	1986.99	II	3000	841.40	V			
100	4544.32	I	300	6222.59	I	500	2025.48	II	300	863.65	IV			
100	4559.37	I	1000	6435.00	I	500	2062.00	II	500	864.59	IV			
130	4596.55	I	90	6538.60	I	200	2064.23	II	9000	1183.97	IV			
95	4604.80	I	70	6557.39	I	120	2079.08	I	9000	1201.77	IV			
2000	4643.70	I	95	6613.75	II	300	2099.94	II	10000	1219.86	IV			
200 h	4658.32	I	40	6650.61	I	200	2102.18	II	500 p	1303.93	V			
2000	4674.84	I	150	6687.58	I	800 r	2138.56	I	1000	1469.47	IV			
180	4696.81	I	70	6700.71	I	1000	2501.99	II	10000	1546.17	IV			
170	4728.53	I	190	6793.71	I	150	2515.81	I	10000	1598.95	IV			
160	4752.79	I	21	6815.16	I	1000	2557.95	II	5000	1607.95	IV			
410	4760.98	I	45	6845.24	I	300	2582.49	I	100	1612.38	III			
120	4781.04	I	29	6887.22	I	200	2608.56	I	700	1725.02	V			
						300	2608.64	I	200	1790.19	III			

Line Spectra of the Elements (continued): Zirconium

Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å		Intensity	Wavelength/Å	
150	1793.56	III	350	3120.74	I	3500	3601.19	I	660	4187.56	I
125	1798.13	III	500	3129.18	II	690	3611.89	II	400	4194.76	I
600	1860.86	V	500	3129.76	II	1100	3613.10	II	610	4199.09	I
200	1940.25	III	350	3132.07	I	1100	3614.77	II	610	4201.46	I
600	2028.54	V	690	3138.68	II	1100	3623.86	I	610	4208.98	II
125	2070.43	III	540	3164.31	II	1100	3663.65	I	400	4213.86	I
200	2086.78	III	880	3165.97	II	390	3671.27	II	2000	4227.76	I
10000	2091.49	IV	880	3182.86	II	800	3674.72	II	2000	4239.31	I
10000	2092.36	IV	540	3191.21	I	390	3697.46	II	770	4240.34	I
600	2132.42	V	540	3212.01	I	960	3698.17	II	770	4241.20	I
10000	2163.68	IV	760	3214.19	II	720	3709.26	II	1200	4241.69	I
100	2175.80	III	630	3231.69	II	560	3745.98	II	550	4282.20	I
100	2191.15	III	630	3234.12	I	880	3751.60	II	550	4294.79	I
10000	2286.67	IV	760	3241.05	II	480	3764.39	I	550	4341.13	I
100	2301.60	III	1000	3273.05	II	480	3766.72	I	1000	4347.89	I
90	2539.65	I	1300	3279.26	II	340	3766.82	II	290	4359.74	II
570	2567.64	II	880	3284.71	II	720	3780.54	I	310	4360.81	I
1600	2568.87	II	540	3305.15	II	560	3791.40	I	350	4366.45	I
2100	2571.39	II	880	3306.28	II	560	3822.41	I	550	4507.12	I
250	2620.56	III	380	3322.99	II	2200	3835.96	I	610	4535.75	I
200	2643.79	III	380	3326.80	II	1300	3836.76	II	490	4542.22	I
150	2664.26	III	380	3334.25	II	550	3843.02	II	490	4575.52	I
1800	2678.63	II	760	3340.56	II	550	3847.01	I	350	4602.57	I
90	2687.75	I	380	3344.79	II	550	3849.25	I	700	4633.98	I
750	2700.13	II	760	3356.09	II	2900	3863.87	I	2300	4687.80	I
1300	2722.61	II	540	3357.26	II	770	3864.34	I	510	4688.45	I
800	2726.49	II	380	3374.73	II	990	3877.60	I	1900	4710.08	I
1400	2734.86	II	570	3387.87	II	1500	3885.42	I	1400	4739.48	I
1100	2742.56	II	760	3388.30	II	2900	3890.32	I	870	4772.31	I
660	2745.86	II	5700	3391.98	II	2000	3891.38	I	700	4815.63	I
660	2752.21	II	570	3393.12	II	610	3921.79	I	250	5046.58	I
530	2758.81	II	570	3404.83	II	1200	3929.53	I	360	5064.91	I
620	2814.90	I	760	3410.25	II	940	3958.22	II	470	5078.25	I
390	2818.74	II	380	3414.66	I	490	3966.66	I	300	5155.45	I
530	2825.56	II	1000	3430.53	II	990	3968.26	I	200	5158.00	I
710	2837.23	I	4700	3438.23	II	660	3973.50	I	100	5191.60	II
660	2844.58	II	600	3447.36	I	770	3991.13	II	270	5385.14	I
350	2848.52	I	410	3457.56	II	770	3998.97	II	160	5664.51	I
350	2851.97	II	820	3463.02	II	400	4023.98	I	160	5797.74	I
340	2869.81	II	600	3471.19	I	770	4024.92	I	340	5879.80	I
490	2875.98	I	1200	3479.39	II	990	4027.20	I	170	6045.85	I
300	2915.99	II	1300	3481.15	II	400	4029.68	II	170	6121.91	I
270	2918.24	II	4100	3496.21	II	490	4030.04	I	680	6127.44	I
320	2926.99	II	820	3505.67	II	400	4035.89	I	340	6134.55	I
320	2948.94	II	1000	3509.32	I	610	4043.58	I	440	6143.20	I
320	2955.78	II	2000	3519.60	I	490	4044.56	I	300	6313.02	I
320	2960.87	I	440	3525.81	II	400	4045.61	II	150	6953.84	I
320	2962.68	II	440	3533.22	I	610	4048.67	II	150	6990.84	I
320	2968.96	II	630	3542.62	II	770	4055.03	I	540	7097.70	I
320	2978.05	II	1800	3547.68	I	600	4055.71	I	280	7102.91	I
820	2985.39	I	630	3550.46	I	1500	4064.16	I	170	7103.72	I
320	3003.74	II	1800	3551.95	II	2000	4072.70	I	590	7169.09	I
820	3011.75	I	2100	3556.60	II	240	4078.31	I	160	7944.61	I
350	3020.47	II	1100	3566.10	I	2000	4081.22	I	160	8005.27	I
500	3028.04	II	2100	3572.47	II	400	4121.46	I	150	8063.09	I
880	3029.52	I	1100	3575.79	I	1200	4149.20	II	790	8070.08	I
350 d	3036.39	II	1300	3576.85	II	400	4161.21	II	390	8132.99	I
690	3054.84	II	880	3586.29	I	400	4166.36	I	280	8212.53	I
690	3106.58	II									

SOURCES OF DATA FOR EACH ELEMENT

Numbers following the element name refer to the references on the following pages.

Actinium: 193	Mercury (Natural): 34,45,90,117,133,189,235,304,327,328,343
Aluminum: 6,8,81,89,127,144,146,227,228,282	Molybdenum: 1,383,420
Americium: 92	Neodymium: 1
Antimony: 164,167,194,386,406	Neon: 56,58,69,118,150,230,364,365,371,388,389,400,402,413,430
Argon: 190,203,204,219,367,368,372,373,374,375,414,421	Neptunium: 93
Arsenic: 163,168,197,244,280	Nickel: 1,294,415,416,422
Astatine: 188	Niobium: 1,392,407,431
Barium: 1,78,111,252,259,277,279	Nitrogen: 66,107,108,212,213,318
Berkelium: 53,339	Osmium: 1
Beryllium: 15,44,73,102,115,134,135,171,175,198,335	Oxygen: 23,24,36,66,69,209,210,215
Bismuth: 1,357,358,359,360,361	Palladium: 1,287,424
Boron: 66,69,74,94,104,171,221,222	Phosphorus: 179,180,182,336
Bromine: 42,122,124,139,142,240,243,246,248,249,250,316	Platinum: 1,288
Cadmium: 44,285,296,353,399	Plutonium: 91
Calcium: 16,25,70,150,270	Polonium: 47,48
Californium: 52,331	Potassium: 32,59,60,75,76,86,150,160,172,268,314,322
Carbon: 22,66,211	Praseodymium: 1,149,306,308,337,338
Cerium: 1,136,166,261,305	Promethium: 196,260
Cesium: 78,82,154,155,200,201,259,263,325	Protactinium: 96
Chlorine: 11,28,30,31,85,233,238,239	Radium: 253,254
Chromium: 1,379,380,412	Radon: 251
Cobalt: 1,100,125,159,236,276,291	Rhenium: 1
Copper: 199,273,290,295,324	Rhodium: 1,396
Curium: 51,332	Rubidium: 12,109,130,241,257,258,262,264
Dysprosium: 1	Ruthenium: 1,423
Einsteinium: 333	Samarium: 1
Erbium: 1,301	Scandium: 1,88,150,298,323
Europium: 1,312	Selenium: 9,80,181,216,245,247,275
Fluorine: 68,169,224,225,226	Silicon: 87,170,237,292,319,320
Francium: 408	Silver: 13,99,255,286,289,363,387,398
Gadolinium: 1,46,137,151,152	Sodium: 178,205,206,207,268,299,334
Gallium: 2,19,62,132,140,141,143,195,281	Strontium: 1,109,110,218,231,265,279,313
Germanium: 5,119,293,340,341,342	Sulfur: 29,144,202,209,210,266
Gold: 38,72,234,393,395	Tantalum: 1,411,426
Hafnium: 1,369,404,410,425	Technetium: 35
Helium: 16,94,173,183,317	Tellurium: 1,344,345,346,347
Holmium: 1	Terbium: 1,302
Hydrogen: 214	Thallium: 1,195,348,354,355,356
Indium: 1,132,348,349,350,351,352,353,435,436	Thorium: 1,97,98,156,157,165,434
Iodine: 20,21,58,84,124,153,161,176,184	Thulium: 1,307
Iridium: 1	Tin: 187,191,399,423
Iron: 56,63,71,101,105,138,174,278,381,382	Titanium: 1,378,427,428
Krypton: 61,121,123,147,208,232,366,390,409,417,421	Tungsten: 1
Lanthanum: 1,78,79,220,309	Uranium: 1,303
Lead: 54,64,106,256,274,297,283,329,330	Vanadium: 1,394,397,432
Lithium: 3,15,17,18,37,44,112,284,321,335	Xenon: 33,116,118,120,232,384,391,429
Lutetium: 1,148,310,401	Ytterbium: 1,40,192,311
Magnesium: 4,7,49,83,103,128,129,177,217,269,315,335	Yttrium: 1,77,265,419
Manganese: 1,126,385,405,433	Zinc: 39,55,113,131,185,186,370,376,377
Mercury (198): 43,50,69,145,229,242	Zirconium: 1,362,403,418

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