

Periodic Table of Elements and X-ray Energies

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1 H 1.01 0.0007 Hydrogen																	2 He 4.00 0.0002 Helium						
3 Li 6.94 0.53 Lithium	4 Be 9.01 1.85 Beryllium K α 0.108																	5 B 10.81 2.34 Boron K α 0.183	6 C 12.01 2.27 Carbon K α 0.277	7 N 14.01 0.001 Nitrogen K α 0.392	8 O 16.00 0.001 Oxygen K α 0.525	9 F 19.00 0.001 Fluorine K α 0.677	10 Ne 20.18 0.0009 Neon K α 0.849
11 Na 22.99 0.97 Sodium K α 1.040	12 Mg 24.31 1.74 Magnesium K α 1.254																	13 Al 26.98 2.70 Aluminium K α 1.486	14 Si 28.09 2.33 Silicon K α 1.740	15 P 30.97 1.82 Phosphorus K α 2.010	16 S 32.07 2.07 Sulfur K α 2.309	17 Cl 35.45 0.003 Chlorine K α 2.622	18 Ar 39.95 0.002 Argon K α 2.958
19 K 39.10 0.86 Potassium K α 3.314	20 Ca 40.08 1.54 Calcium K α 3.692 L α 0.341	21 Sc 44.96 2.99 Scandium K α 4.093 L α 0.395	22 Ti 47.87 4.54 Titanium K α 4.512 L α 0.452	23 V 50.94 6.11 Vanadium K α 4.953 L α 0.510	24 Cr 52.00 7.15 Chromium K α 5.415 L α 0.572	25 Mn 54.94 7.44 Manganese K α 5.900 L α 0.637	26 Fe 55.85 7.87 Iron K α 6.405 L α 0.705	27 Co 58.93 8.86 Cobalt K α 6.931 L α 0.775	28 Ni 58.69 8.91 Nickel K α 7.480 L α 0.849	29 Cu 63.55 8.93 Copper K α 8.046 L α 0.928	30 Zn 65.38 7.13 Zinc K α 8.637 L α 1.012	31 Ga 69.72 5.91 Gallium K α 9.251 L α 1.098	32 Ge 72.64 5.32 Germanium K α 9.886 L α 1.188	33 As 74.92 5.78 Arsenic K α 10.543 L α 1.282	34 Se 78.96 4.81 Selenium K α 11.224 L α 1.379	35 Br 79.90 3.12 Bromine K α 11.924 L α 1.481	36 Kr 83.80 0.004 Krypton K α 12.648 L α 1.585						
37 Rb 85.47 1.53 Rubidium K α 13.396 L α 1.692	38 Sr 87.62 2.64 Strontium K α 14.165 L α 1.806	39 Y 88.91 4.47 Yttrium K α 14.958 L α 1.924	40 Zr 91.22 6.51 Zirconium K α 15.775 L α 2.044	41 Nb 92.91 8.57 Niobium K α 16.615 L α 2.169	42 Mo 95.94 10.22 Molybdenum K α 17.480 L α 2.292	43 Tc (98) 11.50 Technetium K α 18.367 L α 2.423	44 Ru 101.07 12.37 Ruthenium K α 19.279 L α 2.558	45 Rh 102.91 12.41 Rhodium K α 20.216 L α 2.697	46 Pd 106.42 12.02 Palladium K α 21.177 L α 2.838	47 Ag 107.87 10.50 Silver K α 22.163 L α 2.983	48 Cd 112.41 8.69 Cadmium K α 23.173 L α 3.133	49 In 114.82 7.31 Indium K α 24.210 L α 3.286	50 Sn 118.71 7.29 Tin K α 25.271 L α 3.444	51 Sb 121.76 6.69 Antimony K α 26.359 L α 3.604	52 Te 127.60 6.23 Tellurium K α 27.473 L α 3.768	53 I 126.90 4.93 Iodine K α 28.612 L α 3.938	54 Xe 131.29 0.006 Xenon K α 29.775 L α 4.110						
55 Cs 132.91 1.87 Cesium K α 30.973 L α 4.285	56 Ba 137.33 3.59 Barium K α 32.194 L α 4.466	57 La 138.91 6.15 Lanthanum K α 33.442 L α 4.647	72 Hf 178.49 13.31 Hafnium K α 7.899 M α 1.646	73 Ta 180.95 16.65 Tantalum K α 8.146 M α 1.712	74 W 183.84 19.25 Tungsten K α 8.398 M α 1.775	75 Re 186.21 21.02 Rhenium K α 8.652 M α 1.843	76 Os 190.23 22.61 Osmium K α 8.911 M α 1.907	77 Ir 192.22 22.65 Iridium K α 9.175 M α 1.980	78 Pt 195.08 21.46 Platinum K α 9.442 M α 2.050	79 Au 196.97 19.28 Gold K α 9.713 M α 2.123	80 Hg 200.59 13.53 Mercury K α 9.989 M α 2.195	81 Tl 204.37 11.85 Thallium K α 10.269 M α 2.271	82 Pb 207.20 11.34 Lead K α 10.551 M α 2.342	83 Bi 208.98 9.81 Bismuth K α 10.839 M α 2.423	84 (209) Po 9.32 Polonium K α 11.131 M α 2.499	85 (210) At 7.00 Astatine K α 11.427 M α 2.577	86 (222) Rn 0.01 Radon K α 11.727 M α 2.654						
87 Fr (223) 1.87 Francium L α 12.031 M α 2.732	88 Ra (226) 5.50 Radium L α 12.339 M α 2.806	89 Ac (227) 10.07 Actinium L α 12.652 M α 2.900																					

58 Ce 140.12 6.77 Cerium L α 4.839 M α 0.884	59 Pr 140.91 6.77 Praseodymium L α 5.035 M α 0.927	60 Nd 144.24 7.01 Neodymium L α 5.228 M α 0.979	61 Pm (145) 7.26 Promethium L α 5.432 M α 1.023	62 Sm 150.36 7.52 Samarium L α 5.633 M α 1.078	63 Eu 151.96 5.24 Europium L α 5.849 M α 1.131	64 Gd 157.25 7.90 Gadolinium L α 6.053 M α 1.181	65 Tb 158.93 8.23 Terbium L α 6.273 M α 1.240	66 Dy 162.50 8.55 Dysprosium L α 6.498 M α 1.293	67 Ho 164.93 8.80 Holmium L α 6.720 M α 1.348	68 Er 167.26 9.07 Erbium L α 6.949 M α 1.404	69 Tm 168.93 9.32 Thulium L α 7.180 M α 1.462	70 Yb 173.04 6.97 Ytterbium L α 7.416 M α 1.526	71 Lu 174.47 9.84 Lutetium L α 7.655 M α 1.580
90 Th 232.04 11.72 Thorium L α 12.968 M α 2.996	91 Pa 231.04 15.37 Protactinium L α 13.291 M α 3.082	92 U 238.03 18.95 Uranium L α 13.614 M α 3.171	93 Np (237) 20.45 Neptunium L α 13.946 M α 3.250	94 Pu (244) 19.84 Plutonium L α 14.282 M α 3.339	95 Am (243) 13.69 Americium L α 14.620 M α 3.438	96 Cm (247) 13.51 Curium L α 14.79	97 Bk (247) 14.79 Berkelium L α 14.79	98 Cf (251) 15.1 Californium L α 15.1	99 Es (252) 13.5 Einsteinium L α 15.1	100 Fm (257) Fermium L α 15.1	101 Md (258) Mendelevium L α 15.1	102 No (259) Nobelium L α 15.1	103 Lr (262) Lawrencium L α 15.1

Atomic number	Atomic weight	Density (g/cm ³)	Symbol	Element name	Energy (keV)	Spectral line
35	79.90	3.12	Br	Bromine	11.924	L α 1.481



Z	Element	$K\alpha_1$	$K\beta_1$	$L\alpha_1$	$L\beta_1$
3	Li Lithium				
4	Be Beryllium	0.108			
5	B Boron	0.183			
6	C Carbon	0.277			
7	N Nitrogen	0.392			
8	O Oxygen	0.525			
9	F Fluorine	0.677			
10	Ne Neon	0.849			
11	Na Sodium	1.040			
12	Mg Magnesium	1.254	1.302		
13	Al Aluminium	1.486	1.557		
14	Si Silicon	1.740	1.837		
15	P Phosphorus	2.010	2.139		
16	S Sulfur	2.309	2.465		
17	Cl Chlorine	2.622	2.812		
18	Ar Argon	2.958	3.190		
19	K Potassium	3.314	3.590		
20	Ca Calcium	3.692	4.013	0.341	0.345
21	Sc Scandium	4.093	4.464	0.395	0.400
22	Ti Titanium	4.512	4.933	0.452	0.458
23	V Vanadium	4.953	5.428	0.510	0.518
24	Cr Chromium	5.415	5.947	0.572	0.582
25	Mn Manganese	5.900	6.492	0.637	0.648
26	Fe Iron	6.405	7.059	0.705	0.718
27	Co Cobalt	6.931	7.649	0.775	0.790
28	Ni Nickel	7.480	8.267	0.849	0.866
29	Cu Copper	8.046	8.904	0.928	0.947
30	Zn Zinc	8.637	9.570	1.012	1.035
31	Ga Gallium	9.251	10.267	1.098	1.125
32	Ge Germanium	9.886	10.982	1.188	1.218
33	As Arsenic	10.543	11.726	1.282	1.317

Z	Element	$K\alpha_1$	$K\beta_1$	$L\alpha_1$	$L\beta_1$
34	Se Selenium	11.224	12.497	1.379	1.419
35	Br Bromine	11.924	13.292	1.481	1.526
36	Kr Krypton	12.648	14.112	1.585	1.636
37	Rb Rubidium	13.396	14.961	1.692	1.751
38	Sr Strontium	14.165	15.835	1.806	1.871
39	Y Yttrium	14.958	16.739	1.924	1.998
40	Zr Zirconium	15.775	17.668	2.044	2.126
41	Nb Niobium	16.615	18.625	2.169	2.260
42	Mo Molybdenum	17.480	19.606	2.292	2.394
43	Tc Technetium	18.367	20.626	2.423	2.535
44	Ru Ruthenium	19.279	21.656	2.558	2.683
45	Rh Rhodium	20.216	22.724	2.697	2.834
46	Pd Palladium	21.177	23.818	2.838	2.990
47	Ag Silver	22.163	24.941	2.983	3.150
48	Cd Cadmium	23.173	26.093	3.133	3.315
49	In Indium	24.210	27.275	3.286	3.487
50	Sn Tin	25.271	28.485	3.444	3.663
51	Sb Antimony	26.359	29.725	3.604	3.842
52	Te Tellurium	27.473	30.993	3.768	4.029
53	I Iodine	28.612	32.294	3.938	4.221
54	Xe Xenon	29.775	33.620	4.110	4.418
55	Cs Cesium	30.973	34.982	4.285	4.619
56	Ba Barium	32.194	36.378	4.466	4.828
57	La Lanthanum	33.442	37.797	4.647	5.038
58	Ce Cerium	34.720	39.256	4.839	5.262
59	Pr Praseodymium	36.027	40.749	5.035	5.492
60	Nd Neodymium	37.361	42.272	5.228	5.719
61	Pm Promethium	38.725	43.827	5.432	5.961
62	Sm Samarium	40.118	45.414	5.633	6.201
63	Eu Europium	41.542	47.038	5.849	6.458
64	Gd Gadolinium	42.996	48.695	6.053	6.708

Z	Element	$K\alpha_1$	$K\beta_1$	$L\alpha_1$	$L\beta_1$	$M\alpha_1$	$M\beta_1$
65	Tb Terbium	44.482	50.385	6.273	6.975	1.240	1.269
66	Dy Dysprosium	45.999	52.113	6.498	7.248	1.293	1.325
67	Ho Holmium	47.547	53.877	6.720	7.526	1.348	1.383
68	Er Erbium	49.128	55.674	6.949	7.811	1.404	1.448
69	Tm Thulium	50.742	57.505	7.180	8.102	1.462	1.503
70	Yb Ytterbium	52.388	59.382	7.416	8.402	1.526	1.573
71	Lu Lutetium	54.070	61.290	7.655	8.710	1.580	1.630
72	Hf Hafnium	55.790	63.244	7.899	9.023	1.646	1.700
73	Ta Tantalum	57.535	65.222	8.146	9.343	1.712	1.770
74	W Tungsten	59.318	67.244	8.398	9.672	1.775	1.838
75	Re Rhenium	61.141	69.309	8.652	10.010	1.843	1.906
76	Os Osmium	63.000	71.414	8.911	10.354	1.907	1.978
77	Ir Iridium	64.896	73.560	9.175	10.708	1.980	2.052
78	Pt Platinum	66.831	75.750	9.442	11.071	2.050	2.127
79	Au Gold	68.806	77.982	9.713	11.443	2.123	2.203
80	Hg Mercury	70.818	80.255	9.989	11.824	2.195	2.281
81	Tl Thallium	72.872	82.573	10.269	12.213	2.271	2.363
82	Pb Lead	74.970	84.939	10.551	12.614	2.342	2.444
83	Bi Bismuth	77.107	87.349	10.839	13.023	2.423	2.526
84	Po Polonium	79.291	89.803	11.131	13.446	2.499	2.614
85	At Astatine	81.516	92.304	11.427	13.876	2.577	2.699
86	Rn Radon	83.785	94.866	11.727	14.315	2.654	2.784
87	Fr Francium	86.106	97.474	12.031	14.771	2.732	2.868
88	Ra Radium	88.478	100.130	12.339	15.236	2.806	2.949
89	Ac Actinium	90.884	102.846	12.652	15.713	2.900	3.051
90	Th Thorium	93.351	105.605	12.968	16.202	2.996	3.149
91	Pa Protactinium	95.868	108.427	13.291	16.703	3.082	3.240
92	U Uranium	98.440	111.303	13.614	17.220	3.171	3.336
93	Np Neptunium	101.059	114.234	13.946	17.751	3.250	3.435
94	Pu Plutonium	103.734	117.228	14.282	18.296	3.339	3.534
95	Am Americium	106.472	120.284	14.620	18.856	3.438	3.646

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