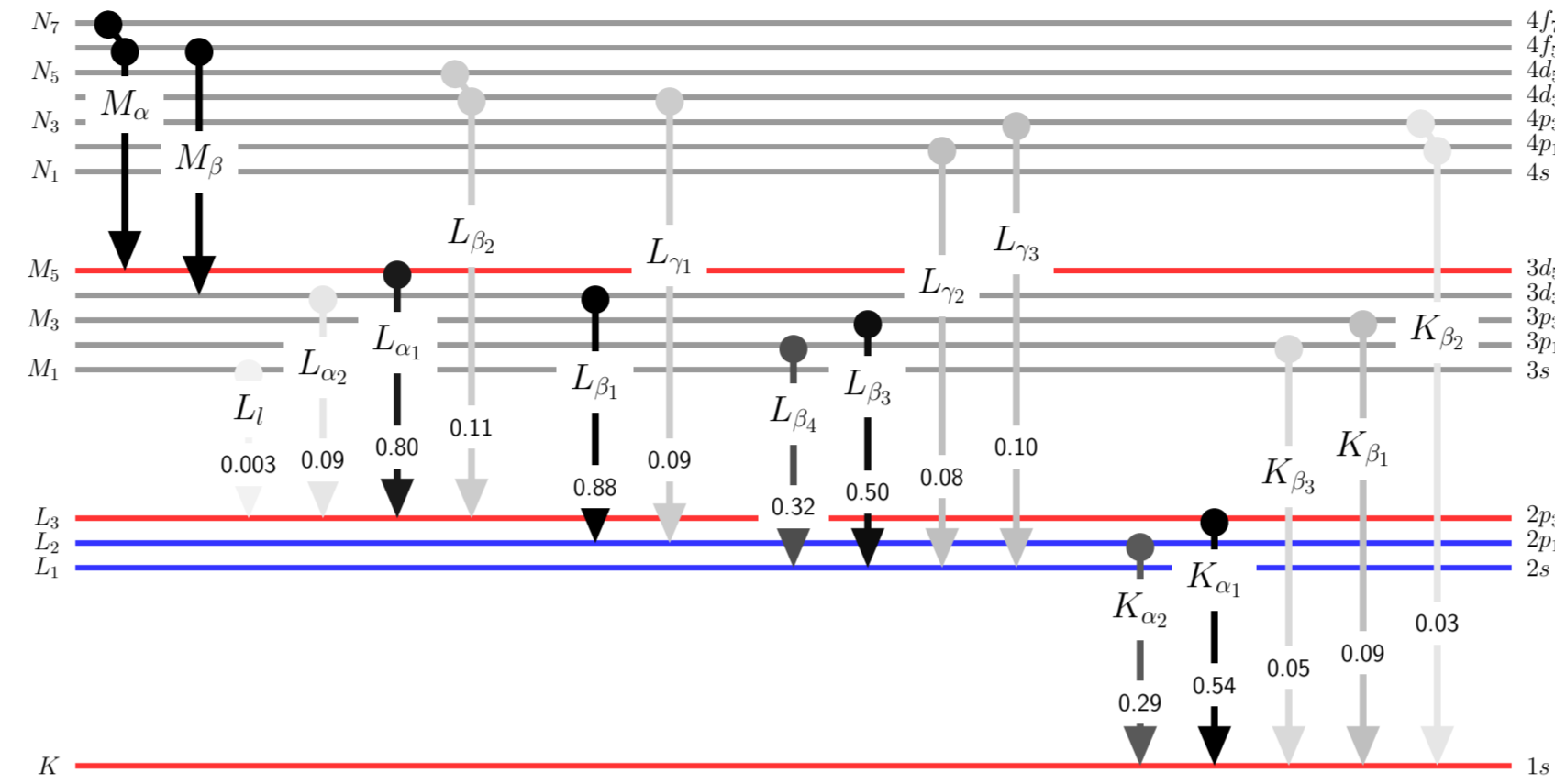


X-ray Absorption and Emission Energies of the Elements



Atomic Data and Energies from
W. T. Elam, B. D. Ravel and J. R. Sieber,
Radiation Physics and Chemistry 63, pp 121-128 (2002)

Common oxidation states from wikipedia.org, after
N. N. Greenwood and A. Earnshaw,
Chemistry of the Elements, 2nd ed. (1997).

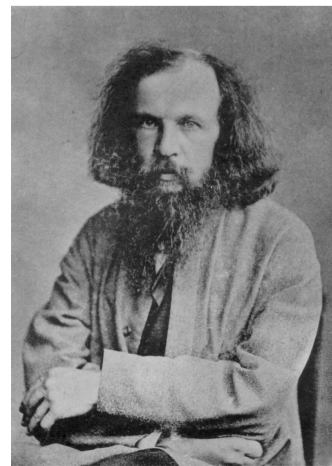
All energies in eV.
Emission line strengths are approximate, and vary with element.

Symbol	name	Z
K edge	K _{α1}	K _{β1}
L ₁ edge	L _{β3}	L _{β1}
L ₂ edge	L _{β2}	L _{γ1}
L ₃ edge	L _{α1}	L _{β2}
M ₅ edge	M _α	M _β
Mass	oxidation states	

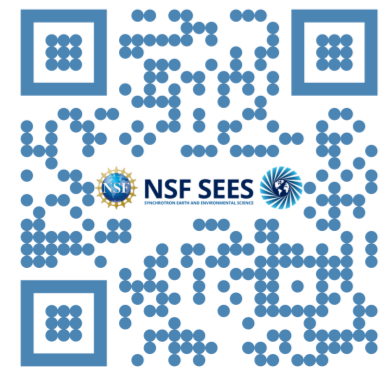
B boron 188 183 13 5 5 10.81	C carbon 284 277 18 7 7 12.011	N nitrogen 410 392 37 18 18 14.007	O oxygen 543 525 42 18 18 15.999	F fluorine 697 677 45 20 20 18.9984	Ne neon 870 849 48 22 22 20.1797
Al aluminum 1559 1486 1557 118 116 116 73 72 26.9815	Si silicon 1839 1740 1837 150 148 148 100 99 28.085	P phosphorus 2146 2010 2140 189 183 182 136 135 30.9738	S sulfur 2472 2310 2465 231 224 223 164 162 32.06	Cl chlorine 2822 2622 2812 270 260 260 202 200 35.453	Ar argon 3206 2958 3190 326 311 310 251 248 39.948
Ga gallium 10367 9251 10267 1299 1199 1196 1143 1124 1124 1116 1098 19 69.72	Ge germanium 11103 9886 10982 1415 1294 1290 1456 1218 1188 29 72.63	As arsenic 11867 10543 11726 1527 1386 1381 1359 1317 1188 42 74.9216	Se selenium 12658 11224 12497 1652 1491 1486 1474 1419 1188 55 78.971	Br bromine 13474 11924 13292 1782 1600 1593 1596 1526 260 1550 1481 69 79.904	Kr krypton 14326 12648 14112 1921 1707 1699 1731 1636 1678 94 83.798
In indium 27940 24210 27275 4238 3573 3535 3938 3487 3920 3730 3286 3712 444 114.818	Sn tin 29200 25271 28485 4465 3750 3708 4156 3663 4131 3929 3604 4099 485 118.71	Sb antimony 30491 26359 29725 4698 3932 3885 4380 3842 4347 4132 3604 4099 528 528 538 121.76	Te tellurium 31814 27473 30993 4939 4118 4068 4612 4029 4570 4341 3768 4299 573 573 583 127.6	I iodine 33169 28612 32294 5188 4313 4257 4852 4221 4801 4557 3938 4506 619 619 631 126.905	Xe xenon 34561 29775 33620 5453 4512 4451 5107 4418 5038 4786 4110 4716 676 676 689 131.293
Tl thallium 85530 72872 82573 15347 12390 11931 14698 12213 14292 12658 10669 12252 2389 2267 2363 204.383	Pb lead 88005 74970 84939 15861 12795 12307 14998 12614 14766 13035 10551 12601 2484 2342 2444 207.2	Bi bismuth 90526 77107 87349 16388 13211 12692 15711 13023 15247 13419 10839 12955 2580 2418 2526 208.98	Po polonium 93105 79291 89803 16939 13637 13085 16244 13446 15744 13814 11131 13314 2683 2499 2614 209.0	At astatine 95730 81516 92304 17493 14067 13485 16785 13876 16252 14214 11127 13681 2787 2577 2699 210.0	Rn radon 98404 83785 94866 18049 14511 13890 17337 14315 16770 14619 11727 14052 2892 2654 2784 222.0

H hydrogen 1 1.0078	Li lithium 3 6.94	Be beryllium 4 9.0122	Na sodium 11 22.9898	Mg magnesium 12 24.305	K potassium 19 39.0983	Rb rubidium 37 85.4678	Cs cesium 55 132.905	Fr francium 87 223.0
He helium 2 4.0026	B boron 5 10.81	C carbon 6 12.011	N nitrogen 7 14.007	O oxygen 8 15.999	Ca calcium 20 40.078	Sr strontium 38 87.62	Ba barium 56 137.327	Ra radium 88 226.0
Sc scandium 21 44.9559	Ti titanium 22 47.867	V vanadium 23 50.9415	Cr chromium 24 51.996	Mn manganese 25 54.938	Zr zirconium 40 91.224	Hf hafnium 72 178.49	La lanthanum 57 138.905	Ac actinium 89 227.0
Sc scandium 21 44.9559	Ti titanium 22 47.867	V vanadium 23 50.9415	Cr chromium 24 51.996	Mn manganese 25 54.938	Zr zirconium 40 91.224	Hf hafnium 72 178.49	La lanthanum 57 138.905	Ac actinium 89 227.0

Ce cerium 58 140.116	Pr praseodymium 59 140.908	Nd neodymium 60 144.242	Pm promethium 61 145.0	Sm samarium 62 150.36	Eu europium 63 151.96	Gd gadolinium 64 157.25	Tb terbium 65 158.925	Dy dysprosium 66 162.5	Ho holmium 67 164.93	Er erbium 68 167.259	Tm thulium 69 168.934	Yb ytterbium 70 173.045	Lu lutetium 71 174.967
Th thorium 90 232.038	Pa protactinium 91 231.036	U uranium 92 238.029	Np neptunium 93 237.048	Pu plutonium 94 239.052	Am americium 95 243.0	Cm curium 96 247.0	Bk berkelium 97 247.0	Cf californium 98 251.0	Es einsteinium 99	Fm fermium 100	Md mendelevium 101	No nobelium 102	Lr lawrencium 103



Dmitri Mendeleev



Version 6, 2025-September-22
<https://xraydb.seescience.org>