

X-ray Energy Table

Element	K α	K β	L α	L β 1	L β 2	L γ 1	L δ	M α 1	K α	L-lab	L-llab	L-lllab
1 H									0.014			
2 He									0.025			
3 Li	0.054								0.055			
4 Be	0.109								0.112			
5 B	0.183								0.188			
6 C	0.277								0.284			
7 N	0.392								0.410	0.037		
8 O	0.525								0.543	0.042		
9 F	0.677								0.697			
10 Ne	0.849								0.870	0.049	0.022	0.022
11 Na	1.041	1.071							1.071	0.064	0.030	0.031
12 Mg	1.254	1.302							1.303	0.089	0.050	0.049
13 Al	1.487	1.558							1.559	0.118	0.073	0.073
14 Si	1.740	1.836							1.839	0.150	0.010	0.099
15 P	2.013	2.139							2.146	0.189	0.136	0.135
16 S	2.308	2.464					0.149		2.472	0.231	0.164	0.163
17 Cl	2.622	2.816					0.183		2.822	0.270	0.202	0.200
18 Ar	2.957	3.191					0.220		3.206	0.326	0.251	0.248
19 K	3.313	3.590					0.260		3.608	0.379	0.297	0.295
20 Ca	3.691	4.013	0.341	0.345			0.303		4.039	0.438	0.350	0.346
21 Sc	4.089	4.461	0.395	0.400			0.348		4.492	0.498	0.404	0.399
22 Ti	4.509	4.932	0.452	0.458			0.395		4.966	0.561	0.460	0.454
23 V	4.950	5.427	0.511	0.519			0.446		5.465	0.627	0.520	0.512
24 Cr	5.412	5.947	0.573	0.583			0.500		5.989	0.696	0.584	0.574
25 Mn	5.895	6.491	0.637	0.649			0.556		6.539	0.769	0.650	0.639
26 Fe	6.400	7.058	0.705	0.718			0.615		7.112	0.845	0.720	0.707
27 Co	6.925	7.650	0.776	0.791			0.678		7.709	0.925	0.793	0.778
28 Ni	7.473	8.265	0.851	0.869			0.743		8.333	1.009	0.870	0.853
29 Cu	8.041	8.905	0.930	0.950			0.811		8.979	1.097	0.952	0.933
30 Zn	8.631	9.574	1.012	1.035			0.884		9.659	1.196	1.045	1.022
31 Ga	9.243	10.265	1.098	1.125			0.957		10.367	1.299	1.143	1.116
32 Ge	9.876	10.984	1.188	1.219			1.036		11.103	1.415	1.248	1.217
33 As	10.532	11.731	1.282	1.317			1.120		11.867	1.527	1.359	1.324
34 Se	11.209	12.500	1.379	1.419			1.204		12.658	1.652	1.474	1.434
35 Br	11.909	13.303	1.480	1.526			1.294		13.474	1.782	1.596	1.550
36 Kr	12.633	14.133	1.586	1.637					14.326	1.921	1.731	1.678
37 Rb	13.376	14.984	1.694	1.752			1.482		15.200	2.065	1.864	1.804
38 Sr	14.143	15.860	1.807	1.872			1.582		16.105	2.216	2.007	1.940
39 Y	14.934	16.774	1.923	1.996			1.685		17.038	2.373	2.156	2.080
40 Zr	15.747	17.703	2.042	2.124	2.219	2.303	1.792		17.998	2.532	2.307	2.223
41 Nb	16.584	18.726	2.166	2.257	2.367	2.462	1.902		18.986	2.698	2.465	2.371
42 Mo	17.445	19.660	2.293	2.395	2.518	2.624	2.016		20.000	2.866	2.625	2.520
43 Tc	18.329	20.656	2.424	2.537					21.044	3.043	2.793	2.677
44 Ru	19.237	21.699	2.559	2.683	2.836	2.965	2.253		22.117	3.224	2.967	2.838
45 Rh	20.169	22.782	2.697	2.834	3.001	3.144	2.377		23.220	3.412	3.146	3.004
46 Pd	21.125	23.861	2.839	2.990	3.172	3.329	2.503		24.350	3.604	3.330	3.173

RELATIVE INTENSITIES

$K\alpha \approx 100$

$K\beta \approx 20$

$L\alpha \approx 100$

$L\beta_1 \approx 80$

$L\beta_2 \approx 20$

$L\gamma \approx 10$

Element	K α	K β	L α	L β 1	L β 2	L γ 1	L δ	M α 1	K α	L-lab	L-llab	L-lllab
47 Ag	22.106	25.017	2.984	3.151	3.348	3.520	2.634		25.514	3.806	3.524	3.351
48 Cd	23.111	26.172	3.134	3.317	3.528	3.717	2.767		26.711	4.018	3.727	3.538
49 In	24.141	27.358	3.287	3.487	3.714	3.921	2.904		27.940	4.238	3.938	3.730
50 Sn	25.196	28.569	3.444	3.663	3.905	4.131	3.045		29.200	4.465	4.156	3.929
51 Sb	26.277	29.811	3.605	3.844	4.101	4.348	3.189		30.491	4.698	4.380	4.132
52 Te	27.382	31.102	3.769	4.030	4.302	4.571	3.336		31.814	4.939	4.612	4.341
53 I	28.514	32.407	3.938	4.221	4.508	4.801	3.485		33.169	5.188	4.852	4.557
54 Xe	29.672	33.742	4.110						34.561	5.453	5.107	4.786
55 Cs	30.857	35.107	4.287	4.620	4.936	5.280	3.795		35.985	5.714	5.359	5.012
56 Ba	32.068	36.538	4.466	4.828	5.157	5.531	3.954		37.441	5.989	5.624	5.247
57 La	33.306	37.956	4.651	5.042	5.384	5.789	4.125	0.833	38.925	6.266	5.891	5.483
58 Ce	34.573	39.409	4.840	5.262	5.613	6.052	4.288	0.883	40.443	6.548	6.164	5.723
59 Pr	35.867	40.905	5.034	5.489	5.850	6.322	4.453	0.929	41.991	6.835	6.440	5.964
60 Nd	37.189	42.432	5.231	5.722	6.090	6.602	4.633	0.978	43.569	7.126	6.722	6.208
61 Pm	38.539	44.016	5.433	5.962	6.339	6.892			45.184	7.428	7.013	6.459
62 Sm	39.919	45.611	5.636	6.205	6.587	7.178	4.995	1.081	46.834	7.737	7.312	6.716
63 Eu	41.328	47.231	5.846	6.457	6.843	7.481	5.177	1.131	48.519	8.052	7.617	6.977
64 Gd	42.766	48.897	6.057	6.713	7.103	7.786	5.362	1.185	50.239	8.376	7.930	7.243
65 Tb	44.234	50.593	6.273	6.978	7.367	8.102	5.547	1.240	51.996	8.708	8.252	7.514
66 Dy	45.734	52.364	6.495	7.248	7.636	8.419	5.743	1.293	53.789	9.046	8.581	7.790
67 Ho	47.263	54.110	6.720	7.526	7.912	8.747	5.944	1.348	55.618	9.394	8.918	8.071
68 Er	48.822	55.915	6.949	7.811	8.189	9.089	6.153	1.406	57.486	9.751	9.264	8.358
69 Tm	50.416	57.786	7.180	8.101	8.469	9.426	6.342	1.462	59.390	10.116	9.617	8.648
70 Yb	52.042	59.506	7.416	8.402	8.759	9.780	6.546	1.521	61.332	10.486	9.978	8.944
71 Lu	53.698	61.424	7.656	8.709	9.049	10.144	6.753	1.581	63.314	10.870	10.349	9.244
72 Hf	55.392	63.376	7.899	9.023	9.347	10.516	6.960	1.645	65.351	11.271	10.739	9.561
73 Ta	57.109	65.721	8.146	9.343	9.652	10.895	7.173	1.710	67.416	11.682	11.136	9.881
74 W	58.866	67.803	8.398	9.673	9.962	11.286	7.388	1.776	69.525	12.100	11.544	10.207
75 Re	60.661	69.884	8.653	10.010	10.276	11.686	7.604	1.843	71.676	12.527	11.959	10.535
76 Os	62.489	71.998	8.912	10.356	10.599	12.096	7.822	1.914	73.871	12.968	12.385	10.871
77 Ir	64.351	74.163	9.175	10.709	10.921	12.513	8.042	1.980	76.111	13.419	12.824	11.215
78 Pt	66.256	76.370	9.443	11.071	11.251	12.942	8.268	2.050	78.395	13.880	13.273	11.564
79 Au	68.191	78.604	9.714	11.443	11.585	13.382	8.494	2.123	80.725	14.353	13.734	11.919
80 Hg	70.167	80.886	9.989	11.823	11.924	13.830	8.721	2.195	83.102	14.839	14.209	12.284
81 Tl	72.180	82.937	10.269	12.214	12.272	14.292	8.953	2.271	85.530	15.347	14.698	12.658
82 Pb	74.238	85.304	10.552	12.614	12.623	14.765	9.185	2.346	88.005	15.861	15.200	13.035
83 Bi	76.331	87.721	10.839	13.024	12.980	15.248	9.421	2.423	90.526	16.388	15.711	13.419
84 Po	78.466	90.179	11.131	13.447	13.341	15.744	9.664		93.105	16.939	16.244	13.814
85 At	80.640	93.067	11.427	13.876		16.252			95.730	17.493	16.785	14.214
86 Rn	82.861	95.648	11.727	14.316		16.771			98.404	18.049	17.337	14.619
87 Fr	85.125	98.250	12.032	14.771	14.450	17.304			101.137	18.639	17.907	15.031
88 Ra	87.436	100.913	12.340	15.236	14.842	17.849	10.622		103.922	19.237	18.484	15.444
89 Ac	89.792	103.644	12.652	15.714		18.409			106.755	19.840	19.083	15.871
90 Th	92.195	106.437	12.969	16.203	15.624	18.983	11.119	2.996	109.651	20.472	19.693	16.300
91 Pa	94.644	109.261	13.291	16.702	16.025	19.569	11.366	3.083	112.601	21.105	20.314	16.733
92 U	97.151	112.148	13.615	17.221	16.429	20.168	11.619	3.171	115.606	21.757	20.948	17.166

CONVERSION ENERGY TO WAVELENGTH

$$\lambda = \frac{1.2396}{E}$$

where :

λ wavelength in nm

E energy in keV

X-RAY ABSORPTION

$$I = I_0 \exp \left[- \left(\frac{\mu}{\rho} \right) \rho t \right]$$

where :

$\left(\frac{\mu}{\rho} \right)$ mass absorption coefficient in cm^2/g

ρ density in g/cm^3