

Z = 3 .. 18

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Li Be B C N O F Ne Na Mg Al Si P S Cl Ar

Z	Name	Ka1	Ka2	Kβ1	Kβ2	KL	KM	Ec(K)	La1	Lβ1	Lβ2	Lγ1	LI	Lγ3	LK	LM	Ec(L3)	Ma12	Mβ	Mx	Mγ	N4-M2	MK	ML	Ec(M5)	name	Z	
3	Li Lithium	0,054	keV	keV	keV	12	35	0,055	keV	keV	keV	keV	keV	keV			keV	keV	keV	keV	keV	keV	keV	keV	keV	Lithium	Li	3
4	Be Beryllium	0,108				14	37	0,112																		Beryllium	Be	4
5	B Bor	0,183				16	40	0,188																		Boron	B	5
6	C Kohlenstoff	0,277				19	44	0,284																		Carbon	C	6
7	N Stickstoff	0,392				21	48	0,401									0,01									Nitrogen	N	7
8	O Sauerstoff	0,525				23	51	0,532									0,007									Oxygen	O	8
9	F Fluor	0,677				26	54	0,685									0,009									Fluorine	F	9
10	Ne Neon	0,849				28	57	0,87									0,022									Neon	Ne	10
11	Na Natrium	1,041		1,067		30	61	1,072									0,031									Sodium	Na	11
12	Mg Magnesium	1,254		1,302		33	66	1,305							3	30	0,051									Magnesium	Mg	12
13	Al Aluminium	1,487		1,557		35	70	1,56							3	31	0,073									Aluminium	Al	13
14	Si Silicium	1,74	1,739	1,826		37	74	1,839							4	32	0,099									Silicon	Si	14
15	P Phosphor	2,014	2,013	2,139		40	78	2,145							4	34	0,135									Phosphorus	P	15
16	S Schwefel	2,308	2,307	2,464		42	82	2,472					0,1487		5	35	0,164									Sulfur	S	16
17	Cl Chlor	2,622	2,621	2,816		44	86	2,822					0,1826		5	37	0,2									Chlorine	Cl	17
18	Ar Argon	2,998	2,956	3,191		47	90	3,203					0,221		6	38	0,249									Argon	Ar	18

1--> 2[19..34] 3[35..50] 4[51..66] 5[67..82] 6[83..92] 7[element chart] 8[hints]

Z = 19 .. 34

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K Ca Sc Ti V Cr Mn Fe Co Ni Cu Zn Ga Ge As Se

Z	Name	Ka1	Ka2	Kβ1	Kβ2	KL	KM	Ec(K)	La1	Lβ1	Lβ2	Lγ1	LI	Lγ3	LK	LM	Ec(L3)	Ma12	MB	Mx	Mg	N4-M2	MK	ML	Ec(M5)	name	Z		
19	K Kalium	3,314	3,311	3,59		49		3,607					0,2603		6	40	0,294									Potassium	K	19	
20	Ca Calcium	3,692	3,688	4,013		52		4,038	0,341	0,345			0,3027		7	42	0,347									Calcium	Ca	20	
21	Sc Scandium	4,091	4,086	4,46		54		4,493	0,395	0,3996			0,348		7	44	0,402									Scandium	Sc	21	
22	Ti Titan	4,511	4,505	4,932		56		4,966	0,452	0,458			0,395		7	46	0,455									Titanium	Ti	22	
23	V Vanadium	4,952	4,945	5,427		59		5,465	0,511	0,519			0,447		8	48	0,513									Vanadium	V	23	
24	Cr Chromium	5,415	5,405	5,947		61		5,989	0,573	0,583			0,5		8	50	0,574								0,002	Chromium	Cr	24	
25	Mn Mangan	5,899	5,888	6,49		63		6,539	0,637	0,649			0,556		9	52	0,64									0,003	Manganese	Mn	25
26	Fe Eisen	6,404	6,391	7,057		66		7,113	0,705	0,719			0,615		9	54	0,708									0,003	Iron	Fe	26
27	Co Cobalt	6,93	6,913	7,649		68		7,709	0,776	0,791			0,678		10	56	0,779									0,003	Cobalt	Co	27
28	Ni Nickel	7,478	7,461	8,265		70		8,333	0,851	0,869			0,743		10	57	0,855									0,003	Nickel	Ni	28
29	Cu Kupfer	8,048	8,028	8,905	8,977	73		8,979	0,923	0,95			0,811		10	59	0,931									0,001	Copper	Cu	29
30	Zn Zink	8,639	8,616	9,572	9,658	75		9,659	1,012	1,035			0,884		11	61	1,02									0,008	Zinc	Zn	30
31	Ga Gallium	9,252	9,225	10,263	10,366	77		10,367	1,098	1,125			0,957		11	62	1,115									0,016	Gallium	Ga	31
32	Ge Germanium	9,886	9,885	10,982	11,1	80		11,103	1,188	1,219			1,036		12	64	1,217									0,028	Germanium	Ge	32
33	As Arsen	10,544	10,508	11,724	11,864	82		11,867	1,282	1,317			1,12		12	66	1,323									0,041	Arsenic	As	33
34	Se Selen	11,222	11,184	12,494	12,652	84		12,658	1,379	1,419			1,204		13	67	1,436									0,056	Selenium	Se	34

1[3..18] <-2- > 3[35..50] 4[51..66] 5[67..82] 6[83..92] 7[element chart] 8[hints]

## Z = 35 .. 50

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Br Kr Rb Sr Y Zr Nb Mo Tc Ru Rh Pd Ag Cd In Sn

Z		Name	Ka1	Ka2	Kβ1	Kβ2	KL	KM	Ec(K)	La1	Lβ1	Lβ2	Lγ1	LI	Lγ3	LK	LM	Ec(L3)	Ma12	Mβ	Mx	Mγ	N4-M2	MK	ML	Ec(M5)	name		Z
35	Br	Brom	11,924	11,878	13,289	13,469	87		13,474	1,48	1,526			1,294		13	69	1,55								0,069	Bromine	Br	35
36	Kr	Krypton	12,649	12,598	14,109	14,315	89		14,326	1,586	1,637					13	71	1,675	0,093							0,094	Krypton	Kr	36
37	Rb	Rubidium	13,395	13,337	14,958	15,185	91		15,2	1,694	1,752			1,482	2,051	14	73	1,804	0,097		0,112					0,11	Rubidium	Rb	37
38	Sr	Strontium	14,165	14,098	15,832	16,085	92		16,105	1,806	1,872			1,582	2,197	14	75	1,94	0,114		0,134					0,133	Strontium	Sr	38
39	Y	Yttrium	14,958	14,883	16,734	17,015			17,038	1,922	1,996			1,685	2,347	15	76	2,08	0,133		0,155					0,157	Yttrium	Y	39
40	Zr	Zirconium	15,775	15,691	17,663	17,97			17,998	2,042	2,124	2,219	2,304	1,792	2,503	15	78	2,223	0,151		0,178					0,18	Zirconium	Zr	40
41	Nb	Niob	16,615	16,521	18,617	18,953			18,986	2,166	2,257	2,367	2,462	1,902	2,664	16	79	2,371	0,171		0,202					0,205	Niobium	Nb	41
42	Mo	Molybdän	17,479	17,364	19,602	19,965			19,999	2,293	2,395	2,518	2,624	2,016	2,831	16	81	2,52	0,192		0,227					0,227	Molybdenum	Mo	42
43	Tc	Technetium	18,367	18,251	20,612	21,005			21,044	2,424	2,537	2,67	2,79	2,13	3	16	83	2,677	0,214		0,253					0,253	Technetium	Tc	43
44	Ru	Ruthenium	19,279	19,15	21,649	22,074			22,117	2,559	2,683	2,836	2,964	2,253	3,181	17	85	2,838	0,237		0,28					0,279	Ruthenium	Ru	44
45	Rh	Rhodium	20,216	20,07	22,72	23,17			23,22	2,697	2,834	3,001	3,144	2,376	3,364	17	86	3,004	0,26		0,307					0,307	Rhodium	Rh	45
46	Pd	Palladium	21,177	21,02	23,82	24,29			24,35	2,839	2,99	3,172	3,329	2,503	3,553	18	88	3,173	0,284		0,335					0,335	Palladium	Pd	46
47	Ag	Silber	22,163	21,99	24,94	25,45			25,514	2,984	3,151	3,348	3,52	2,644	3,747	18	90	3,351	0,31		0,368					0,367	Silver	Ag	47
48	Cd	Cadmium	23,174	22,98	26,1	26,64			26,711	3,134	3,317	3,528	3,717	2,767	3,951	19	92	3,537	0,341		0,405					0,404	Cadmium	Cd	48
49	In	Indium	24,21	24	27,28	27,86			27,94	3,287	3,487	3,714	3,921	2,904	4,161	19		3,73	0,37		0,443					0,443	Indium	In	49
50	Sn	Zinn	25,271	25,04	28,49	29,1			29,2	3,444	3,663	3,905	4,131	3,045	4,377	19		3,929	0,401		0,484					0,485	Tin	Sn	50

1[3..18] 2[19..34] <-3-> 4[51..66] 5[67..82] 6[83..92] 7[element chart] 8[hints]

Z = 51 .. 66

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Sb Te I Xe Cs Ba La Ce Pr Nd Pm Sm Eu Gd Tb Dy

Z	Name	Ka1	Ka2	Kβ1	Kβ2	KL	KM	Ec(K)	La1	Lβ1	Lβ2	Lγ1	LI	Lγ3	LK	LM	Ec(L3)	Ma12	Mβ	Mx	Mγ	N4-M2	MK	ML	Ec(M5)	name	Z	
51	Sb Antimon	26,359	26,111	29,726	30,39			30,491	3,605	3,844	4,101	4,348	3,189	4,6	20		4,132	0,433		0,528					0,527	Antimony	Sb	51
52	Te Tellur	27,472	27,202	30,995	31,7			31,814	3,769	4,03	4,302	4,571	3,336	4,829	20		4,341	0,47		0,573					0,572	Tellurium	Te	52
53	I Iod	28,612	28,317	32,295	33,042			33,169	3,938	4,221	4,508	4,801	3,485	5,066	21		4,557	0,497		0,62					0,619	Iodine	I	53
54	Xe Xenon	29,779	29,458	33,624	34,415			34,561	4,11	4,42	4,72	5,04	3,64	5,3	21		4,782	0,531		0,676					0,675	Xenon	Xe	54
55	Cs Caesium	30,973	30,625	34,987	35,822			35,985	4,286	4,62	4,936	5,28	3,795	5,553	21		5,012	0,565		0,726					0,726	Cesium	Cs	55
56	Ba Barium	32,194	31,817	36,378	37,257			37,441	4,466	4,827	5,156	5,531	3,954	5,809	22		5,247	0,6		0,78					0,781	Barium	Ba	56
57	La Lanthan	33,442	33,034	37,801	38,73			38,925	4,651	5,042	5,384	5,788	4,124	6,074	22		5,483	0,833		0,638					0,832	Lanthanum	La	57
58	Ce Cerium	34,72	34,279	39,257	40,233			40,443	4,84	5,262	5,613	6,052	4,287	6,341	23		5,723	0,883	0,902	0,677	1,075				0,883	Cerium	Ce	58
59	Pr Praseodym	36,026	35,55	40,748	41,773			41,991	5,034	5,489	5,85	6,322	4,453	6,616	23		5,964	0,929	0,95	0,714	1,127				0,931	Praseodymium	Pr	59
60	Nd Neodym	37,361	36,847	42,271	43,33			43,569	5,23	5,722	6,089	6,602	4,633	6,902	24		6,208	0,979	0,997	0,753	1,18				0,978	Neodymium	Nd	60
61	Pm Promethium	38,725	38,171	43,826	44,94			45,184	5,432	5,961	6,339	6,892	4,811	7,191	24		6,459	1,029	1,049	0,791	1,24	1,349	11	30	1,027	Promethium	Pm	61
62	Sm Samarium	40,118	39,522	45,413	46,58			46,834	5,636	6,205	6,587	7,178	4,995	7,487	24		6,716	1,081	1,1	0,831	1,291	1,414	11	31	1,08	Samarium	Sm	62
63	Eu Europium	41,542	40,902	47,038	48,256			48,519	5,846	6,456	6,843	7,48	5,177	7,796	25		6,977	1,131	1,147	0,872	1,346	1,481	11	32	1,131	Europium	Eu	63
64	Gd Gadolinium	42,996	42,309	48,697	49,959			50,239	6,057	6,713	7,11	7,786	5,362	8,105	25		7,243	1,185	1,209	0,914	1,402	1,549	11	32	1,185	Gadolinium	Gd	64
65	Tb Terbium	44,482	43,744	50,382	51,72			51,996	6,273	6,978	7,367	8,102	5,547	8,423	26		7,514	1,19	1,216	0,905	1,411	1,618	12	33	1,241	Terbium	Tb	65
66	Dy Dysprosium	45,998	45,208	52,119	53,51			53,788	6,495	7,248	7,636	8,419	5,743	8,753	26		7,79	1,293	1,325	0,998	1,522	1,688	12	33	1,295	Dysprosium	Dy	66

1[3..18] 2[19..34] 3[35..50] <-4-> 5[67..82] 6[83..92] 7[element chart] 8[hints]

Z = 67 .. 82

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Ho Er Tm Yb Lu Hf Ta W Re Os Ir Pt Au Hg Tl Pb

Z	Name	Ka1	Ka2	Kβ1	Kβ2	KL	KM	Ec(K)	La1	Lβ1	Lβ2	Lγ1	LI	Lγ3	LK	LM	Ec(L3)	Ma12	Mβ	Mx	Mγ	N4-M2	MK	ML	Ec(M5)	name	Z	
67	Ho	47,547	46,7	53,877	55,32			55,618	6,72	7,525	7,911	8,747	5,943	9,087	26		8,071	1,348	1,383	1,045	1,567	1,758	12	34	1,351	Holmium	Ho	67
68	Er	49,128	48,221	55,681	57,21			57,485	6,949	7,811	8,189	9,089	6,152	9,431	27		8,358	1,406	1,443	1,09	1,632	1,829	13	34	1,409	Erbium	Er	68
69	Tm	50,742	49,773	57,517	59,09			59,39	7,18	8,101	8,468	9,426	6,342	9,779	27		8,648	1,402	1,503	1,137	1,699	1,903	13	35	1,468	Thulium	Tm	69
70	Yb	52,389	51,254	59,37	60,39			61,332	7,416	8,402	8,759	9,78	6,545	10,143	28		8,944	1,521	1,567	1,183	1,765	1,977	13	36	1,528	Ytterbium	Yb	70
71	Lu	54,07	52,965	61,283	62,97			63,314	7,655	8,709	9,049	10,143	6,753	10,511	28		9,244	1,581	1,631	1,232	1,832	2,057	13	36	1,588	Lutetium	Lu	71
72	Hf	55,79	54,611	63,234	64,98			65,351	7,899	9,023	9,347	10,516	6,96	10,891	29		9,561	1,645	1,698	1,28	1,895	2,14	14	37	1,662	Hafnium	Hf	72
73	Ta	57,532	56,277	65,223	67,013			67,416	8,146	9,343	9,651	10,895	7,173	11,278	29		9,881	1,71	1,765	1,329	1,964	2,226	14	37	1,735	Tantalum	Ta	73
74	W	59,318	57,982	67,244	69,101			69,525	8,398	9,672	9,96	11,286	7,388	11,674	29		10,207	1,775	1,835	1,383	2,035	2,314	14	38	1,809	Tungsten	W	74
75	Re	61,14	59,718	69,31	71,232			71,676	8,654	10,01	10,274	11,685	7,604	12,082	30		10,535	1,899	1,75	1,437	2,09	1,75	14	38	1,883	Rhenium	Re	75
76	Os	63,001	61,487	71,413	73,402			73,871	8,912	10,355	10,597	12,095	7,822	12,5	30		10,871	1,91	1,8	1,483	2,182	2,502	15	39	1,96	Osmium	Os	76
77	Ir	64,896	63,287	73,561	75,619			76,111	9,175	10,708	10,919	12,513	8,046	12,924	31		11,215	1,98	2,053	1,537	2,254	2,594	15	39	2,04	Iridium	Ir	77
78	Pt	66,832	65,122	75,748	77,878			78,395	9,442	11,071	11,249	12,942	8,268	13,361	31		11,564	2,05	2,127	1,592	2,331	2,695	15	40	2,121	Platinum	Pt	78
79	Au	68,804	66,99	77,984	80,185			80,725	9,713	11,442	11,583	13,382	8,494	13,809	32		11,919	2,123	2,205	1,661	2,41	2,797	15	41	2,206	Gold	Au	79
80	Hg	70,819	68,895	80,253	82,54			83,102	9,989	11,823	11,922	13,83	8,721	14,265	32		12,29	2,195	2,283	1,712	2,487	2	16	41	2,295	Mercury	Hg	80
81	Tl	72,872	70,832	82,576	84,946			85,53	10,269	12,213	12,269	14,292	8,953	14,737	33		12,657	2,271	2,362	1,763	2,571	3,013	16	42	2,389	Thallium	Tl	81
82	Pb	74,969	72,804	84,936	87,346			88,005	10,552	12,614	12,62	14,764	9,184	15,218	33		13,035	2,346	2,443	1,839	2,653	3,124	16	42	2,484	Lead	Pb	82

1[3..18] 2[19..34] 3[35..50] 4[51..66] <-5-> 6[83..92] 7[element chart] 8[hints]

Z = 83 .. 92

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Bi Po At Rn Fr Ra Ac Th Pa U

Z	Name	Ka1	Ka2	Kβ1	Kβ2	KL	KM	Ec(K)	La1	Lβ1	Lβ2	Lγ1	LI	Lγ3	LK	LM	Ec(L3)	Ma12	Mβ	Mx	Mγ	N4-M2	MK	ML	Ec(M5)	name	Z	
83	Bi Bismut	77,108	74,817	87,343	89,864			90,526	10,839	13,024	12,977	15,248	9,42	15,71	33		13,419	2,423	2,526	1,901	2,735	3,234	16	43	2,58	Bismuth	Bi	83
84	Po Polonium	79,29	76,862	89,8	92,4			93,1	11,131	13,447	13,338	15,744	9,664	16,217	34		13,811	2,494	2,609	1,951	2,82	3,351	17	43	2,679	Polonium	Po	84
85	At Astatin	81,52	78,95	92,3	91,72			95,724	11,414	13,876	13,71	16,251	9,89	16,58	34		14,208	2,576	2,694	2,013	2,91	3,473	17	44	2,781	Astatine	At	85
86	Rn Radon	83,78	81,07	94,87	97,64			98,397	11,727	14,32	14,08	16,77	10,13	17,1	35		14,611	2,657	2,781	2,077	3	3,597	17	45	2,884	Radon	Rn	86
87	Fr Francium	86,1	83,23	97,47	100,33			101,13	12,031	14,77	14,45	17,3	10,38	17,63	35		15,026	2,738	2,869	2,142	3,09	3,723	17	45	2,995	Francium	Fr	87
88	Ra Radium	88,47	85,43	100,13	103,07			103,92	12,34	15,24	14,84	17,85	10,62	18,35	36		15,444	2,822	2,952	2,207	3,18	3,852	18	46	3,105	Radium	Ra	88
89	Ac Actinium	90,884	87,67	102,85	105,86			106,76	12,652	15,71	15,14	18,41	10,87	18,74	36		15,871	2,905	3,051	2,275	3,28	3,983	18	47	3,22	Actinium	Ac	89
90	Th Thorium	93,35	89,953	105,61	108,72			109,65	12,969	16,2	15,62	18,98	11,12	19,5	36		16,3	2,996	3,146	2,365	3,37	4,117	18	47	3,332	Thorium	Th	90
91	Pa Protactium	95,868	92,287	108,43	111,62			112,6	13,29	16,7	16	19,57	11,36	20,09	37		16,729	3,082	3,24	2,435	3,466	4,26	18	48	3,439	Protactinium	Pa	91
92	U Uranium	98,439	94,665	111,3	114,6			115,6	13,61	17,22	16,43	20,17	11,62	20,71	37		17,166	3,171	3,336	2,507	3,563	4,401	19	48	3,552	Uranium	U	92

relative line highs

Ka1	Ka2	Kβ1	Kβ2	La1	Lβ1	Lβ2	Lγ1	LI	Lγ3	Ma12	Mβ	Mx	Mγ	N4-M2
53	27	14	6	54	21	12	4	3	6	53	33	6	7	1
80		20		54	33		4	3	6	86	6	7	1	

1[3..18] 2[19..34] 3[35..50] 4[51..66] 5[67..82] <-6-> 7[element chart] 8[hints]



Element Chart																	
1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89 Ac	104 Ku	105 Bo													
			58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu	
			90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr	

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1[3..18] 2[19..34] 3[35..50] 4[51..66] 5[67..82] 6[83..92] <-7-> 8[hints]

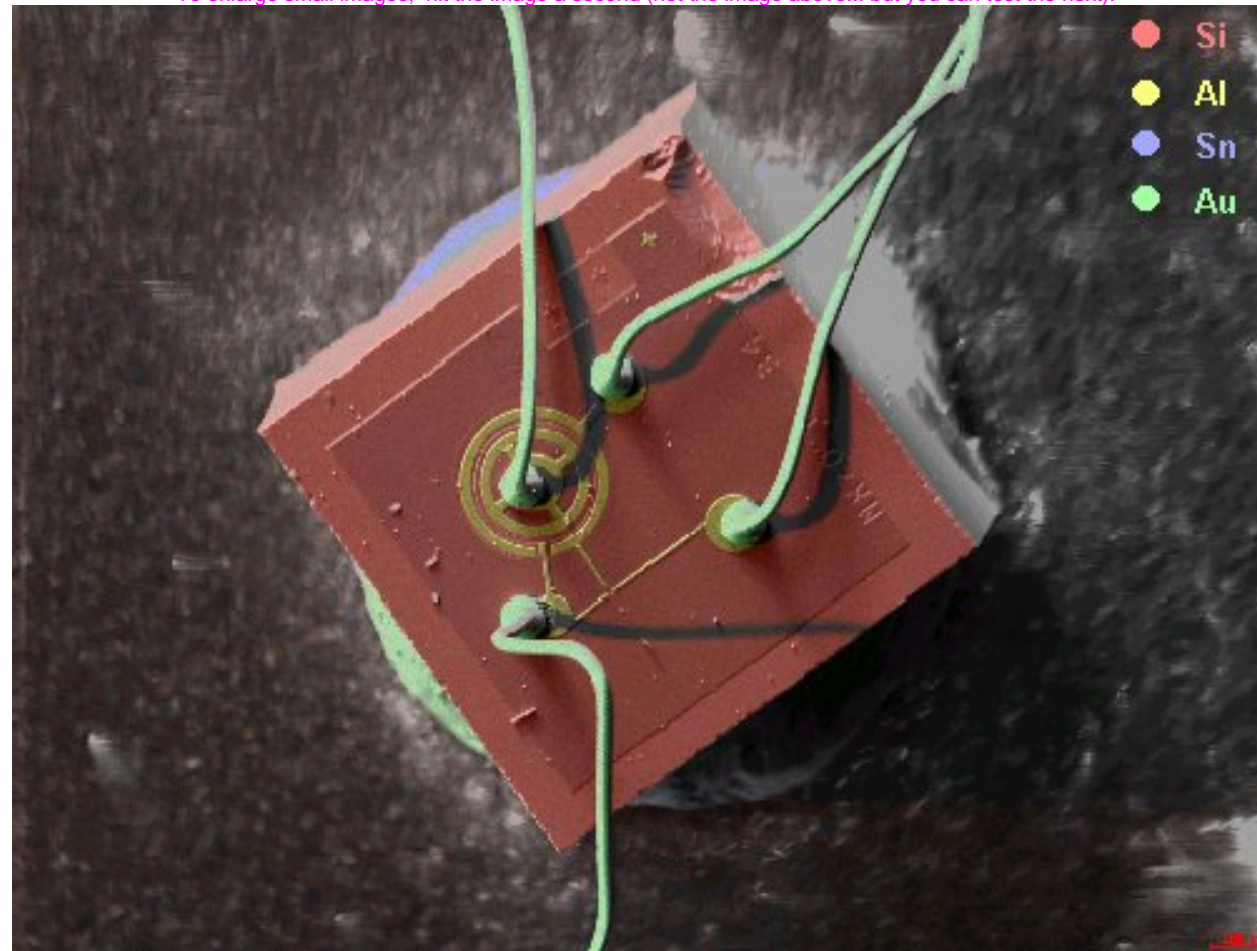
## How to use?

<http://www.microanalyst.net>

white: emission line energies [keV] ...  
red: excitation energy of the main shell [keV] ...  
yellow: overlaps with other elements [Z]



To enlarge small images, hit the image a second (not the image above... but you can test the next).



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