Table 1. Line Positions[a] from Mg X-rays, by Element

Element	Atomic No.	Range (eV)	Photoelectron Lines[b] 1s	2s	$2p_1$	$2p_3$	3s	$3p_1$	$3p_3$	$3d_3$	$3d_5$	4s	$4p_1$	$4p_3$	Range (eV)	Auger Lines KL_1L_1	KL_1L_{23}	$KL_{23}L_{23}$[c]	$L_3M_{23}M_{23}$[d]	$L_2M_{23}M_{23}$[d]	$L_3M_{23}M_{45}$ ^1P	$L_3M_{23}M_{45}$ ^3P	$L_2M_{23}M_{45}$ ^1P	$L_3M_{45}M_{45}$[e]	$L_2M_{45}M_{45}$
Li	3		56															1082							
Be	4	4	113																						
B	5	8	191																						
C	6	12	287															993							
N	7	9	402												12			875							
O	8	4	531	23											10	779	764	743							
F	9	6	686	30											8	645	626	599							
Ne	10	0	863	41	14										0	491	468	435							
Na	11	2	1072	64	31										4	332	303	264							
Mg	12	2		90	51																				
Al	13	4		119	74																				
Si	14	6		153	103	102																			
P	15	8		191	134	133	14																		
S	16	8		229	166	165	17								6				1103						
Cl	17	11		270	201	199	17								4				1071						
Ar	18	0		319	243	241	22								0	1037		1035							
K	19	1		378	296	293	33	17								1005		1003							
Ca	20	2		439	350	347	44	25								964		961							
Sc	21	6		501	407	402	53	31							8		920				892				
Ti	22	8		565	464	458	62	37							10		873				839				
V	23	6		630	523	515	69	40							6		822				784				
Cr	24	6		698	586	577	77	46	45								767				729				
Mn	25	4		770	652	641	83	49	48						6		715				670			620	
Fe	26	8		847	723	710	93	56	55						6		659				608			553	
Co	27	6		927	796	781	103	63	61						7	604		597			546	541		483	468
Ni	28	6		1009	873	855	112	69	67						7	548		542			482	476		410	393
Cu	29	4		1098	954	934	124	79	77						5	486		479			416	408	396	337	317
Zn	30	2		1196	1045	1022	140	92	89	10					7	429		422			352	343	329	265	242
Ga	31	2			1144	1117	160	108	105	20					7	368		361			284	275	257	189	162
Ge	32	4					184	128	124	32	31				10	305		297			215	205	184	113	82
As	33	7					207	148	143	45	44														
Se	34	8					232	169	163	58	57														
Br	35	7					256	189	182	70	69														
Kr	36	0					287	216	208	89	88	22													
Rb	37	1					322	247	238	111	110	29		14											
Sr	38						358	280	269	135	133	37		20											
Y	39						395	313	301	160	158	45		25											
Zr	40	6					431	345	331	183	181	51		29											

a) Lines enclosed in boxes are the most intense and are the most suitable for use of line energies in identifying chemical states.

b) For brevity, $2p_3$ equals $2p_{3/2}$, $3d_5$ equals $3d_{5/2}$, etc.

c) Includes KVV designation when L_{23} is not a core level.

d) Designation is oversimplified.

e) Includes LVV when M levels are not in core, and MVV when N levels are not in core.

f) No simple $4p_{1/2}$ line exists for this group of elements.

g) The 4d doublet for these elements is complex and is variable with chemical state because of multiplet splitting and multielectron processes.

Element	Atomic No.	Range (eV)	Photoelectron Lines[b] 3s	3p1	3p3	3d3	3d5	4s	4p1	4p3	4d3	4d5	4f5	4f7	5s	5p1	5p3	5d3	5d5	6s	6p1	6p3	Range (eV)	Auger Lines $M_{45}N_{23}V$	$M_5N_{45}N_{45}$[e]	$M_4N_{45}N_{45}$[e]
Nb	41	8	470	379	364	209	206	59	35															1088	1056	
Mo	42	6	508	413	396	233	230	65	38															1068	1033	
Tc	43		544	445	425	257	253	68	39															1047	1008	
Ru	44	4	587	485	463	286	282	77		45[f]													4	1025	981	
Rh	45	4	629	522	498	314	309	83		49[f]													5	1002	954	
Pd	46	5	673	561	534	342	337	88		54[f]													4	979	928	
Ag	47	2	718	604	573	374	368	97		58[f]													4		903	897
Cd	48	2	772	652	618	412	405	109		68[f]	11												5		889	872
In	49	3	828	704	666	453	445	123		79[f]	19												7		853	846
Sn	50	3	884	757	715	494	486	137		91[f]	26	25											7		827	819
Sb	51	4	946	814	768	539	530	155		105[f]	35	34											10		803	794
Te	52	5	1009	873	822	585	575	171		114[f]	44	43			14								6		775	765
I	53	6	1071	930	874	630	619	186		123[f]	52	50			16								4		748	737
Xe	54	4	1144	997	936	685	672	209		141[f]	65	63			19								4		724	711
Cs	55	2		1064	997	738	724	230	170	158	77	75			24										698	684
Ba	56	2		1137	1062	795	780	254	192	179	92	90			23										671	657
La	57				1126	851	834	274	210	195	104	101			34	17										
Ce	58				1184	900	882	290	222	207	112	108			37	18									632	
Pr	59					950	930	305	237	218		114[g]			38	20									594	
Nd	60					1001	980	318	248	227		120[g]			38	23									555	
Pm	61					1060	1034	337	264	242		129			38	22									519	
Sm	62					1110	1083	349	283	250		132			41	20									481	
Eu	63					1166	1136	366	289	261		136			34	24									440	
Gd	64						1186	380	301	270		141			36	21									402	
Tb	65							398	317	284		150			42	28									362	
Dy	66							412	329	293		154			63	26										
Ho	67							431	345	306		161			51	20										
Er	68							451	362	320		169			61	25										
Tm	69							470	378	333		180			54	32	26									
Yb	70							483	392	342	194	185			55	33	26									
Lu	71							507	412	359	207	197			58	34	27									
Hf	72	6						537	437	382	224	213	19	17	64	37	30									
Ta	73	8						566	464	403	241	229	27	25	71	45	37									
W	74	6						594	491	425	257	245	36	34	77	47	37									
Re	75	6						628	521	449	277	263	45	43	81	44	33									
Os	76	3						657	549	475	294	279	55	52	86	60	48									
																								$N_7O_{45}O_{45}$	$N_6O_{45}O_{45}$	$N_{67}O_{45}V$
Ir	77	4						692	579	497	313	297	65	62	98	65	53									
Pt	78	5						726	610	521	333	316	76	73	105	69	54							1192		
Au	79	3						763	643	547	354	336	89	85	110	75	57							1184		
Hg	80	2						803	681	577	379	359	104	100	127	84	65							1176	1173	
Tl	81	2						845	721	608	406	385	122	118	137	100	76	15	13						1169	
Pb	82	3						893	762	645	435	413	143	138	148	107	84	22	19					1162	1159	
Bi	83	4						942	807	681	467	443	164	159	161	120	94	29	26					1155	1151	
Th	90	3							1168	968	714	677	344	335	290	226	179	94	87	43	26	18				
U	92	5								1046	781	739	391	380	325	262	197	104	96	46	29	19		1100		1005
Np	93									1086	816	771	414	402			206		101		29	18		1064		970
Pu	94									1121	850	802	439	427			216		105		31	18				
Am	95										883	832	463	449	351		216	119	109		31	18				
Cm	96										919	865	487	473			232		113		32	18				
Bk	97										958	901	514	498			246		120		34	18				
Cf	98										994	933	541	523					124		35	19				