X-ray transition energies: new approach to a comprehensive evaluation

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The authors combine modern theoretical calculations with evaluated selected experimental data to produce a comprehensive data resource of K- and L-x-ray transition and absorption edge energies for all of the elements from neon to fermium. The theoretical and experimental components of this work are the result of programs of parallel development extending over more than 20 years. At each of several progressively more refined comparisons, it was possible to identify theoretical components whose systematic improvement then led to the next level of refinement in comparisons with an increasingly robust experimental reference data set. We have now reached a certain practical limit in what can be undertaken with reasonable levels of theoretical effort. This limit is not very different from the practical level of accuracy that can be meaningfully associated with the experimental data. For the more prominent diagram lines, experiment and theory are concordant with a zero-centered distribution of residuals whose statistical metrics allow the uncertainties to be estimated. For the light elements ($Z<20$) and the very heavy elements ($Z>90$) there are significant difficulties, as is also the case for a few isolated elements and transitions for $20<Z<90$. Overall, the results reported here represent improvements over previously available data compilations not only because of their scope but also because of their attempt to offer internal metrics of the database accuracy. The identified regions of difficulty are areas where further experimental work may be directed to see if there may remain theoretical issues that are still unresolved.

CONTENTS

I. INTRODUCTION

We report the results of a long-term effort to produce an improved comprehensive data resource for x-ray transition energies. As described in the historical remarks that follow, the principal compilations in recent use were assembled 35 years ago. Since that time, there have been several developments that encourage us to revisit this problem using an approach that differs from those used for previous work in this area. As described below, earlier tabulations were based entirely on experimental data, except for some interpolations and extrapolations using smooth scaling according to Moseley's Z^2 approximation (Moseley, 1913, 1914). Also, the linkages of x-ray to optical wavelength (frequency) standards available to these tabulations had poor accuracy and were difficult to apply uniformly owing to incompletely documented reference wavelength chains.

Our undertaking was based on several developments. First was an increasing recognition of the need to improve the prior compilations. Second, combined x-ray and optical interferometry provided accurate linkage of

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crystal spacings to optical wavelengths, and through these to the SI definition of length; this allows accurate wavelength values to be obtained from accurate measurement of diffraction angles. Third, in order to provide specific reference lines for various applications in the x-ray region, a number of x-ray lines were accurately measured in the past 25 years; more recently, a systematic study of absorption edges greatly expanded the group of well-documented measurements of these locations. Finally, there has been continuing development of more effective theoretical procedures whose results will be seen to be in generally good agreement with high-quality experimental data.

A preliminary version of parts of the present work is included in the new edition of International Tables for Crystallography as a tabulation of x-ray wavelengths, together with an earlier version of the descriptive material presented here (Deslattes *et al.*, 1998). A brief description of the overall plan was also presented at a 1997 conference (Deslattes *et al.*, 1998a). Since the large majority of x-ray transition intervals have been determined by means of wavelength measurements, we include a brief review of the underlying procedures.

II. BACKGROUND

We begin with an overview of prior tabulations and the problems of the x-ray wavelength scale, after which we describe the main features of modern high accuracy measurements in the x-ray region. This same basis applies also to modern γ-ray measurements (Dewey *et al.*, 1989; Kessler *et al.*, 2001) but these will not be considered further here. We then give a concise accounting of the theoretical developments that have led to the effective use of these procedures as part of the overall quality control effort, and in lieu of absent experimental data. Next, we summarize the presently available results for transition energies between the K shell and the shells with principal quantum number $n=2-4$ and between the L shells and the shells with principal quantum number $n=3$ and 4 as well as the associated absorption edge locations.

A. Previous comprehensive tabulations

A majority of readily accessible x-ray transition energy tabulations simply reproduce the work of the late Professor J. A. Bearden and his collaborators (Bearden, 1967). The original tabulation was made available for some time through the Standard Reference Data Program at the National Institute of Standards and Technology (NIST). Separate efforts in Paris by Professor Y. Cauchois and her collaborators (Cauchois and Hulubei, 1947; Cauchois and Senemaud, 1978) provided the basis for other compilations, especially those appearing in previous editions of the International Tables for Crystallography (Rieck, 1962; Arndt, 1992). Closely associated with the x-ray transition energy tabulations are tabulations of atomic energy levels (Bearden and Burr, 1967; Sevier, 1979) including one specializing in high-Z elements ($84\leqslant Z\leqslant 103$) (Porter and Freedman, 1978). To simplify the following discussion, we use the Bearden database as a frame of reference with respect to which our rather different approach can be compared. Although more detailed comparisons with the earlier databases may be of some historical interest, such comparisons would have only a very small influence on the outcome presented here.

In preparing their compilation, Bearden and his collaborators re-measured a group of five K-series x-ray doublet profiles (Bearden, Henins, *et al.*, 1964; Bearden, Thomsen, *et al.*, 1964). The remaining entries in the wavelength table came from a critically reviewed, and re-scaled, subset of earlier measurements (Bearden, 1967). Wavelengths were given in Å* units, a scale defined by setting the wavelength of W $K\alpha_1$ equal to 0.209 010 0 Å* (Bearden, 1965). It was Bearden's intention that, for all but the most demanding applications, one could simply assign Å*/Å=1, with an uncertainty arising from the uncertainties of the fundamental physical constants, particularly N_A and hc/e, combined with the uncertainty arising from the measurement technology (Bearden, 1965). The transition energies given were obtained from these wavelength values by use of the value for hc/e, also as given by the then current adjustment of the fundamental constants (Cohen *et al.*, 1957). Not long after the publication of the final compilation (Bearden, 1967), it became clear that the fundamental constants used in defining the Å* unit needed significant revision (Taylor *et al.*, 1969; Cohen and Taylor, 1973), and that there were also some inconsistencies in the metrology (Kessler *et al.*, 1979).

B. Other known problems

Aside from the particular issues noted above, all previous wavelength tables had certain limitations arising from the procedures used in their generation. In particular, except for the small group of five $K\alpha$ doublets (Bearden, Henins, *et al.*, 1964), the 1967 Bearden tables relied entirely on data extracted from the literature. The other principal tabulations also depended exclusively on reported experimental values (Cauchois and Hulubei, 1947; Cauchois and Senemaud, 1978). One distinguishing feature of the Bearden compilation was that it arrived at recommended values by weighting available data according to claimed uncertainties, modified in certain cases after investigation of the measurement practices. The complete documentation of this extensive undertaking is not widely accessible. Our evident need to understand the origin of the "recommended" values has been greatly aided by the fortunate availability of a copy of the full documentation (Bearden, Thomsen, *et al.*, 1964).

The experimental data arrays from which the previous tables emerged were not complete, even for the prominent "diagram" lines. In cases where experimental data were not available, as can be identified only in the source documentation (Bearden, Thomsen, *et al.*, 1964), gaps were filled by interpolation of measurements of nearby elements. These were plotted on a modified Moseley diagram in which the Z^2 term dependence is taken into account (Burr, 1996). In the end, such smooth scaling with respect to nuclear charge suppresses the effects of atomic shell structure, a practice that must be avoided in order to obtain the significant improvement in the database that we hope to provide. Also obscured in smooth Z scaling are detectable shifts arising from the fact that nuclear sizes and (average) mass values do not vary smoothly as a function of the nuclear charge Z.

C. Alternative strategies

An improved "all-Z" table of x-ray wavelengths might be obtained from an extensive measurement effort to more fully populate the tabular array, or perhaps a large computational endeavor could be undertaken that would carry out multiconfiguration, relativistic wave-function calculations for the entire Periodic Table. It is clear that there is little interest in, and even less likelihood of obtaining support for, the large effort that would be needed to realize an improved tabulation of x-ray wavelengths experimentally. The alternative of proceeding in an entirely theoretical mode is not consistent with the need that at least some wavelengths, for example, those that are used in crystallography and photoelectron spectroscopy, be reported with uncertainties that approach experimental accuracy limits for x-ray lines. A purely theoretical approach is further complicated by the fact that the actual location of any useful feature of a line is influenced not only by the physical and chemical environment of the atom but also by multielectron excitation processes that perturb and complicate the entire spectral profile. Calculations of such complexity are beyond the limits of practicality, eliminating the option of proceeding without at least a core group of accurate experimental measurements.

In arriving at the tabulation summarized in this report, we followed a new procedure that differs from those described above. We began with a network of well-documented experimental measurements. This network includes not only the lines obtained as specific reference wavelengths, but also some others introduced to expand the test bed for the theoretical methods (Deslattes and Kessler, 1985). This initial small network was the first experimental compilation to use the newly available connection between the x-ray region and *Le Système d'Unités International* (the SI) based on optical interferometry of a lattice period by combined x-ray and optical interferometry. Details of the generation of this network and its subsequent expansion will be given below. Using this network gave a clearer picture of the limitations of the available theoretical modeling than had been evident from other, less selective, experimental reference compilations. Theoretical developments before, and especially after, the appearance of this new experimental reference set have shown a steady convergence toward these data.

Our long-term plan has been to use these new theoretical calculations to provide a more structured and accurate interpolation procedure for estimating the spectra of elements lying between those for which we have accurate measurements and other spectra well connected to directly established reference wavelengths. The results given here show general consistency of theory and experiment through the mid-Z region for the strong K-series and L-series lines. However, certain regions particularly at high and low Z have significant inconsistencies that have not yet been thoroughly investigated. The observed consistency suggests that, in the absence of good experimental data, direct use of the theoretical values should be considered as an alternative only for applications not requiring the highest accuracy.

D. The x-ray wavelength scales, old and new

From the first realizations of refined spectroscopy in the x-ray region (ca. 1915–1925) up to the period 1975–1985, the best x-ray wavelength values had to be expressed in terms of a local base unit specific to the x-ray region most often designated as the xu (x unit) or kxu (kilo-x unit). Uncertainty in the conversion factor between the x-ray and optical scales dominated the total uncertainty in the wavelength values for the sharper x-ray emission lines. (For a discussion of the present values in relation to previously assigned numerical values on the various scales, see Sec. VI.B.) This local unit was, for most of the time, defined by assigning a specific numerical value to the lattice period of a particular reflection from "the purest instance" of a specific crystal. Originally this reference material was rocksalt; later it was calcite. In practice, most work used specific numerical values for Cu $K\alpha_1$ and Mo $K\alpha_1$ as *de facto* standards. The inconsistency of these values, though noted by some crystallographers earlier, was seriously addressed by Bearden and co-workers only in the 1960s (Bearden, Henins, *et al.*, 1964). This early history has been summarized by Thomsen and Burr in 1968 (Thomsen and Burr, 1968).

Connection of the x-ray wavelength scale to the primary realizations of the length (wavelength) unit in the "metric system" was primarily (at least after about 1930) through ruled grating measurements of longer wavelength x-ray lines, particularly Al $K\alpha_{1,2}$. The remainder of the x-ray transition database was derived from relative measurements using crystal diffraction spectroscopy. Unfortunately, even the most refined ruled grating measurements did not give accuracy comparable to the precision accessible by relative wavelength measurements (Henins, 1971). In response to this limitation, and to facilitate preparation of the wavelength table described above, Bearden introduced a new local unit, the Å*, based on an explicit value for the wavelength of W $K\alpha_1$, chosen to give a conversion factor near unity. This transitional period will not be treated further in the present report, since developments described in the following paragraphs have effectively eliminated the need for a local scale for x-ray wavelength metrology.

III. NEW OPPORTUNITIES

Following the demonstration of crystal lattice interferometry in the x-ray region (Bonse and Hart, 1965), efforts to combine such an x-ray interferometer with various optical interferometers were started in several (mostly national standards) laboratories. The earliest of these to obtain results was carried out at the National Bureau of Standards (NBS) (now the National Institute of Standards and Technology, NIST) (Deslattes and Henins, 1973). Although this measurement was subsequently found to have a significant systematic error ($\approx 1.8\times 10^{-6}$) in later work at the Physikalish-Technishe Bundesanstalt (PTB) (Becker *et al.*, 1981, 1982), it became clear that accuracy limitations associated with ruled grating measurements no longer dominated the metrology of x-ray wavelengths. The origin of the systematic error in the early NBS measurement was subsequently understood (Deslattes *et al.*, 1987) and, more recently, excellent results were obtained in Italy (Basile *et al.*, 1994, 1995) and Japan (Nakayama and Fujimoto, 1997). In all cases, the linkage has been realized through an optical measurement of a crystal lattice period (thus far only Si 220), followed by use of the calibrated crystals in diffraction spectrometry to establish optically based x-ray wavelengths. Such exercises have been undertaken for several x-ray lines. The most detailed and well-documented results to date were obtained in Jena (Härtwig *et al.*, 1993, 1994; Hölzer *et al.*, 1997), where the $K\alpha$ (and later $K\beta$) spectra of Cu and other $3d$ elements were evaluated using silicon crystals well connected with the crystal spacings measured at the PTB.

A. *K*-series reference wavelengths

In Table I we give the principal *K*-series emission lines that provide the experimental component of our proposed database. In addition to the Jena measurements noted above, a number of characteristic x-ray lines were measured on the optically based scale at NBS/NIST; these directly measured lines are indicated by footnote a in Table I, which also contains references to the original publications. While several of the early (NBS/NIST) values (as published) were burdened by the 1.8×10^{-6} error in the silicon lattice period (as noted above), the numerical results summarized in the table have been corrected for this error. The directly measured elements and lines appearing in this table were often chosen to meet the need for specific reference values in locations near those of certain optical transitions in the spectra of highly charged ions and in the spectra of pionic atoms. In addition, early NBS measurements specifically addressed the lines most often used in crystallography, and the W $K\alpha_1$ wavelength. In response to the needs of photoelectron spectroscopy, Al and Mg *K* spectra were also determined. (By that time, the original lattice error had already been recognized, so that no re-scaling of these results was required.) The optically based data set was further expanded by noting that several groups of accurate (relative) measurements in the literature either contained one of the directly measured lines in Table I or were explicitly connected to one of them. Most often this situation was found in reports that indicated a specific reference transition, i.e., where numerical values are based on a scale where, for example, the wavelength of Mo $K\alpha_1$ was taken as 707.831 xu. In such cases, and where other indicators of good measurement quality are present, it was easy to re-scale the results reported so that they are consistent with the optically based data. A similar procedure was followed for important groups of measurements from earlier work by Bearden and coworkers, and from the x-ray laboratory at Uppsala. These re-scaled numerical results are included in Table I along with the specific literature citations. The uncertainties are those given by the original authors rescaled, where necessary, to be one standard deviation uncertainties (approximately 67% confidence level) as defined by ISO (International Standards Organization) (Taylor and Kuyatt, 1994; Schwarzenbach *et al.*, 1995).

B. *L*-series reference wavelengths

X-ray lines belonging to the *L* and higher series are more numerous than *K*-series lines. They are also generally weaker, broader, and have more complex profiles. These considerations make them less attractive as reference lines or as measurands. It is therefore unsurprising that so few *L*-series emission lines have been directly measured on an optically based scale. The directly measured *L*-series lines that are available are shown in Table II along with their literature citations. There have also been some systematic studies of *L*-series spectra from groups of neighboring elements that lend themselves to re-scaling, as described above for the expansion of the *K*-series experimental database. These results are included in Table V in Sec. V.

C. Absorption edge locations

Before 1996, only a few absorption edge locations had been directly measured with high accuracy using the currently acceptable protocols. Two such measurements were carried out to provide reference filters for exotic-atom spectra (Bearden, 1960; Lum *et al.*, 1981). The experimental database for absorption edge locations was greatly expanded in 1996 by an important set of new measurements noted above that are well coupled to the optical wavelength scale (Kraft *et al.*, 1996). Still further expansion can be obtained by applying a procedure used by Bearden and Burr in their study of inner shell energy levels (Bearden and Burr, 1967). We describe this procedure in the following paragraphs and subsequently use it to obtain a more extensive empirical edge database than would otherwise be possible.

The procedure needed to expand the experimental absorption edge database is more complex than that used for the emission lines. We begin by noting that absorption edge locations have been variously associated with: (i) the first inflection point of the absorption spectrum; (ii) the energy needed to produce a single inner vacancy with the photoelectron "at rest at infinity"; or (iii) the energy needed to move an electron from an inner shell to the lowest unoccupied level. A general

TABLE I. *K*-series reference transitions in eV. Numbers in parentheses are one standard deviation uncertainties of the quoted value referred to the last figures of the quoted value. Note: Reference numbers are assigned to agree with those in Table V. (1) (Bearden, 1967), (2) (Schweppe *et al.*, 1994), (3) (Mooney, 1996), (4) (Schweppe, 1995), (5) (Deslattes and Kessler, 1985), (7) (Hölzer *et al.*, 1997), (8) (Borchert *et al.*, 1980), (9) (Borchert, 1976), (10) (Barreau *et al.*, 1982).

Z	Symbol	A	$K\alpha_2$	$K\alpha_1$	$K\beta_3$	$K\beta_1$	Ref.
12	Mg		1253.437(13)[a]	1253.688(11)[a]			2
13	Al		1486.295(10)[a]	1486.708(10)[a]			2
14	Si		1739.394(34)[a]	1739.985(19)[a]			3
16	S		2306.700(38)[a]	2307.885(34)[a]			3
17	Cl		2620.846(39)[a]	2622.440(39)[a]			3
18	Ar		2955.566(16)[a]	2957.682(16)[a]			4
19	K		3311.1956(60)[a]	3313.9476(50)[a]			5
24	Cr		5405.5384(71)[a]	5414.8045(71)[a]	5946.823(11)[a]	5946.823(11)[a]	7
25	Mn		5887.6859(84)[a]	5898.8010(84)[a]	6490.585(14)[a]	6490.585(14)[a]	7
26	Fe		6391.0264(99)[a]	6404.0062(99)[a]	7058.175(16)[a]	7058.175(16)[a]	7
27	Co		6915.5380(39)[a]	6930.3780(39)[a]	7649.445(14)[a]	7649.445(14)[a]	7
28	Ni		7461.0343(45)[a]	7478.2521(45)[a]	8264.775(17)[a]	8264.775(17)[a]	7
29	Cu		8027.8416(26)[a]	8047.8227(26)[a]	8905.413(38)[a]	8905.413(38)[a]	7
31	Ga		9224.835(27)[a]	9251.674(66)[a]	10260.28(64)	10264.19(29)	1,3
33	As		11181.53(31)[a]	11222.52(12)[a]	12489.73(100)	12496.03(67)	1,3
34	Se		11877.75(34)	11924.36(34)[a]	13284.7(11)	13291.56(42)	1,3
36	Kr		12595.424(56)[a]	12648.002(52)[a]	14104.96(11)[a]	14112.815(80)[a]	3
40	Zr		15690.645(50)[a]	15774.914(54)[a]	17652.628(75)[a]	17666.578(76)[a]	3
42	Mo		17374.29(29)	17479.372(10)[a]	19590.25(41)	19608.34(42)	1,5
44	Ru		19150.49(18)	19279.16(18)	21634.65(16)	21656.75(16)	1,5
45	Rh		20073.67(20)	20216.12(20)	22698.83(17)	22723.59(17)	1,5
46	Pd		21020.15(22)	21177.08(17)	23791.12(19)	23818.69(19)	1,5
47	Ag		21990.30(10)[a]	22162.917(30)[a]	24911.54(30)	24942.42(30)	1,5
48	Cd		22984.05(20)	23173.98(20)	26061.32(39)	26095.44(39)	1,5
49	In		24002.03(28)	24209.75(22)	27237.50(25)	27275.55(25)	1,5
50	Sn		25044.04(23)	25271.36(23)	28444.43(33)	28486.26(33)	1,5
51	Sb		26110.78(25)	26358.86(25)	29679.20(29)	29725.53(22)	1,5
54	Xe		29458.250(50)[a]	29778.78(10)[a]	33563.20(12)[a]	33624.23(12)[a]	5
56	Ba		31816.615(60)[a]	32193.262(70)[a]	36303.35(12)[a]	36377.445(80)[a]	5
60	Nd		38171.55(70)[a]	38725.11(72)[a]	43712.7(91)	43825.5(69)	1,5
62	Sm		39523.39(10)[a]	40118.481(60)[a]	45288.6(49)	45413.0(49)	1,5
67	Ho		46699.98(15)	47547.10(77)	53711.3(69)	53877.1(70)	1,8
68	Er		48221.61(20)[a]	49127.24(12)[a]	55479.72(35)[a]	55673.52(18)[a]	5
69	Tm		49772.67(12)	50741.475(92)	57303.0(79)	57508.76(15)	1,9
74	W		57982.27(54)	59318.847(50)[a]	66952.0(11)	67245.0(11)	1,5
79	Au		66990.73(22)[a]	68804.50(18)[a]	77575.01(61)[a]	77979.80(38)[a]	5
82	Pb		72805.42(24)[a]	74970.11(17)[a]	84450.45(60)[a]	84939.08(34)[a]	5
83	Bi		74816.21(92)	77109.2(22)	86835.7(67)	87344.1(33)	1,8
90	Th	230	89957.04(20)[a]	93347.38(25)[a]	104816.53(69)[a]	105601.51(53)[a]	5
91	Pa	231	92283.4(20)	95866.4(20)	107585.3(20)	108417.3(20)	10
92	U	238	94650.84(56)[a]	98431.58(28)[a]	110415.67(65)[a]	111295.08(65)[a]	5
93	Np	237	97068.4(30)	101056.3(30)	113307.3(40)	114243.3(30)	10
94	Pu	239	99523.2(12)	103734.05(60)			9
94	Pu	244	99529.4(20)	103740.3(20)	116241.3(20)	117232.2(20)	10
95	Am	243	102031.3(20)	106473.3(30)	119239.2(20)	120279.2(20)	10
96	Cm	248	104590.3(20)	109272.3(20)	122302.2(20)	123403.2(20)	10
97	Bk	249	107194.3(50)	112127.3(50)	125414.2(70)	126577.2(70)	10
98	Cf	250	109837.3(80)	115035.3(80)			10

[a]Directly measured line.

TABLE II. Directly measured L-series reference lines in eV. Numbers in parentheses are one standard deviation uncertainties of the quoted value referred to the last figures of the quoted value. Note: Reference numbers are assigned to agree with those in Table V. (3) (Mooney, 1996), (12) (Mooney *et al.*, 1992).

Z	Symbol	$L\alpha_2$	$L\alpha_1$	$L\beta_1$	Ref.
36	Kr	1585.411(26)	1585.411(26)	1636.876(21)	3
40	Zr	2040.19(16)	2042.489(27)	2124.394(28)	3
54	Xe	4097.378(30)	4110.088(20)	4417.668(30)	12
60	Nd	5207.7(11)	5230.239(35)	5721.446(50)	3
62	Sm	5609.053(61)	5635.970(33)	6204.073(93)	3
67	Ho	6678.484(54)	6719.675(62)	7525.67(15)	3
68	Er	6904.50(17)	6947.913(77)	7810.19(42)	3
69	Tm	7133.715(78)	7180.113(29)	8102.265(37)	3

discussion of these alternatives has been given by Parratt (1959). We shall favor alternative (ii). Then, with care for symmetry restrictions, absorption edge energies can be estimated by combining electron binding energies for outer shells with the energies of emission lines for which the transition terminates in this outer shell. Outer electron binding energies can be conveniently measured by photoelectron spectroscopy, while the situation of emission line energies is as described above. This procedure does not focus on the details of absorption threshold profiles that are important for structural applications. On the other hand, our choice of (ii) gives greater regularity with respect to nuclear charge and facilitates use of available electron binding energy data, since they are referenced to the Fermi energy or the vacuum.

To proceed in this direction, we make use of electron binding energy data that have been tabulated for the principal shells of all the elements considered in the present investigation (Cardona and Ley, 1978; Fuggle and Mårtensson, 1980; Nyholm *et al.*, 1980; Lebugle *et al.*, 1981; Powell, 1995). The available database from photoelectron spectroscopy is quite extensive and, when combined with emission lines, provides redundant routes to edge determinations. For each element for which we have good emission spectra, we made edge location estimates using alternative transition cycles, and used the distribution of results to provide a measure of the uncertainty. Comparison of edge estimates obtained by this procedure with experimental data, as given in Table III, provides a quantitative test of the utility of this approach to estimating edge locations. In cases where both direct and indirect measurements are available, the synthesized estimates are in good enough agreement with direct experimental data to justify use of these edge location estimates to broaden the effective experimental database.

In addition to these two experimental avenues for obtaining edge locations, theoretical methods have been developed to calculate the absorption thresholds (see Sec. IV). Locations for K- and L-absorption thresholds have been calculated and compared with experimental values (Indelicato *et al.*, 1998). For rare gases and metallic vapors (Sevier, 1979; Arp *et al.*, 1990, 1992, 1993, 1994, 1995) the agreement between experiment and theory is good, as demonstrated in Table IV. For experimental values obtained from solid elements, however, deviations between experiment and theory due to solid-state effects can reach 30 eV. This is in contrast with the situation for emission energies, where solid-state effects almost disappear. The theory, however, can still be useful to highlight problems in the experimental data.

IV. OUTLINE OF THE THEORETICAL PROCEDURES

This section outlines the theoretical procedures used; these procedures have been summarized in greater detail elsewhere (Indelicato *et al.*, 1998).

TABLE III. Directly measured and estimated (using outer-shell binding energies) K-absorption edges in eV. Numbers in parentheses are one standard deviation uncertainties of the quoted value referred to the last figures of the quoted value. Note: Reference numbers are assigned to agree with those in Table V. (13) (Kraft *et al.*, 1996), (14) (Lum *et al.*, 1981), (15) (Bearden, 1960).

Z	Symbol	Directly measured	From binding energy	Ref.
23	V	5463.757(50)	5464.43(26)	13
24	Cr	5989.017(40)	5989.16(48)	13
25	Mn	6537.667(20)	6537.68(14)	13
26	Fe	7110.747(20)	7110.86(40)	13
27	Co	7708.776(20)	7708.75(80)	13
28	Ni	8331.486(20)	8331.0(14)	13
29	Cu	8980.476(20)	8980.5(10)	13
30	Zn	9660.755(30)	9660.7(12)	13
39	Y	17036.612(50)	17036.64(55)	13
40	Zr	17995.872(80)	17996.22(79)	13
41	Nb	18982.961(40)	18983.61(85)	13
42	Mo	20000.351(20)	20000.5(21)	13
45	Rh	23221.99(30)	23220.14(44)	13
46	Pd	24352.59(20)	24350.91(51)	13
47	Ag	25515.59(30)	25515.51(48)	13
48	Cd	26713.29(20)	26712.94(71)	13
49	In	27940.39(30)	27940.72(69)	13
50	Sn	29200.39(20)	29200.92(92)	13
51	Sb	30490.49(20)	30491.99(91)	13
68	Er	57485.2(20)	57486.3(13)	14
82	Pb	88005.6(46)	88004.72(69)	15

TABLE IV. Comparison between the energies for the K, L_1, L_2, and L_3 edges obtained from gases and metallic vapors, solids, and theory. Th.−vap.: difference between theoretical and experimental energies from gases and metallic vapors (eV). Th.−sol.: difference between theoretical and experimental energies from solid targets (eV). Values labeled with an (S) are from (Sevier, 1979), and are "reconstructed" vapor data, combining x-ray transition energies in solid with atomic ionization energies of outer shells. They may be affected by a small solid-state shift. Values labeled with a (C) are combined edges values (see Sec. V). Numbers in parentheses are one standard deviation uncertainties of the quoted value referred to the last figures of the quoted value. Note: Reference numbers are assigned to agree with reference numbers in Table V. (1) (Bearden, 1967), (17) (Arp *et al.*, 1993; Arp, 1995), (18) (Arp *et al.*, 1995), (19) (Arp *et al.*, 1992), (20) (Arp *et al.*, 1994), (21) (Arp *et al.*, 1990), (22) (Weber *et al.*, 1988).

Z	Gas/vapor	Ref.	Solid	Theory	Th.−vap.	Th.−sol.
			K edge			
10	870.23(18)	C		870.73(16)	0.50(18)	
11	1079.11(30)	S	1071.52(13)	1080.15(15)	1.04(30)	8.63(13)
12	1311.26(21)	S	1303.33(27)	1312.30(14)	1.04(21)	8.97(27)
13	1567.02(80)	S	1559.53(27)	1569.56(13)	2.54(80)	10.03(27)
18	3206.14(54)	C		3207.44(12)	1.30(54)	
19	3614.34(20)	S	3608.49(16)	3616.22(12)	1.88(20)	7.73(16)
20	4042.8(20)	S	4038.34(14)	4049.35(12)	6.6(20)	11.01(14)
20	4050.48(30)	17			−1.1(30)	
21	4494.0(10)	S	4489.37(47)	4501.68(12)	7.7(10)	12.31(47)
22	4972.3(10)	S	4964.88(59)	4977.92(12)	5.6(10)	13.04(59)
23	5475.1(20)	S	5464.43(26)	5478.28(12)	3.2(20)	13.86(26)
24	5996.10(20)	S	5989.16(48)	5995.66(12)	−0.44(20)	6.50(48)
24	5994.90(50)	17			0.76(50)	
25	6550.00(15)	S	6537.68(14)	6552.12(12)	2.12(15)	14.44(14)
25	6551.39(50)	17			0.73(50)	
26	7124.10(10)	S	7110.86(40)	7125.87(13)	1.77(10)	15.01(40)
27	7725.10(10)	S	7708.75(80)	7724.26(13)	−0.84(10)	15.51(80)
28	8348.10(10)	S	8331.00(14)	8347.42(14)	−0.68(10)	16.42(14)
29	8987.70(30)	S	8980.5(10)	8987.96(15)	0.26(30)	7.5(10)
29	8987.89(50)	17			0.07(50)	
30	9667.50(10)	S	9660.7(12)	9668.55(15)	1.05(10)	7.9(12)
36	14327.19(13)	C		14328.06(20)	0.88(13)	
54	34565.13(33)	C		34566.5(26)	1.39(33)	
			L_1 edge			
10	48.445(50)	C		53.04(40)	4.591(50)	
11	70.860(10)	S		75.16(35)	4.301(10)	
12	95.840(26)	S	62.84(47)	100.75(29)	4.912(26)	37.91(47)
13	125.600(80)	S	87.01(90)	130.62(25)	5.019(80)	43.61(90)
18	326.30(10)	C		327.31(23)	1.03(26)	
19	384.30(70)	S		386.25(22)	1.95(70)	
20	442.50(20)	S		450.46(20)	7.96(20)	
21	503.20(10)	S		510.11(29)	6.91(10)	
22	569.00(10)	S		573.33(33)	4.33(10)	
23	638.00(20)	S		639.78(37)	1.78(20)	
24	703.00(20)	S	742.40(66)	702.31(40)	−0.69(20)	−40.09(66)
25	781.60(15)	S		782.94(44)	1.34(15)	
26	857.00(20)	S		859.80(48)	2.80(20)	
27	940.00(10)	S		940.18(51)	0.18(10)	
28	1024.00(20)	S		1024.13(55)	0.13(20)	
29	1105.71(50)	S		1103.12(59)	−2.59(50)	
30	1203.00(10)	S	949.30(11)	1203.31(58)	0.32(10)	254.02(11)
36	1920.4(12)	C		1925.49(79)	5.09(12)	0.00
54	5452.57(17)	C		5453.7(13)	1.10(17)	

TABLE IV. (*Continued*).

Z	Gas/vapor	Ref.	Solid	Theory	Th.−vap.	Th.−sol.
			L_2 edge			
10	21.661(10)	C		21.63(39)	−0.027(10)	
11	38.380(10)	S	30.61(56)	38.38(37)	0.002(10)	7.77(56)
12	57.741(98)	S	49.73(30)	58.16(35)	0.418(98)	8.43(30)
13	80.700(80)	S	72.76(63)	82.44(34)	1.738(80)	9.68(63)
18	250.57(27)	C		251.55(32)	0.99(68)	
19	303.67(97)	S	294.50(10)	304.25(33)	0.58(97)	9.75(10)
20	360.02(98)	S	352.92(15)	361.79(32)	1.77(98)	8.87(15)
21	408.40(10)	S		416.25(33)	7.85(10)	
22	468.00(10)	S	454.31(25)	473.85(33)	5.85(10)	19.54(25)
23	532.00(20)	S		534.69(33)	2.69(20)	
24	591.00(20)	S	692.60(57)	591.60(33)	0.60(20)	−101.00(57)
25	662.80(10)	S		665.92(33)	3.12(10)	
26	733.00(10)	S	720.74(31)	736.35(34)	3.35(10)	15.61(31)
27	810.00(20)	S	793.84(38)	810.18(34)	0.18(20)	16.34(38)
28	887.00(10)	S	870.54(45)	887.46(34)	0.46(10)	16.92(45)
29	960.31(40)	S	952.68(11)	959.58(34)	−0.73(40)	6.90(11)
29	959.70(50)	20			−0.12(50)	
30	1052.06(21)	S	1045.21(13)	1052.33(36)	0.27(21)	7.12(13)
36	1730.90(50)	C		1732.49(36)	1.59(50)	
54	5106.72(20)	C		5108.10(37)	1.39(20)	
62	7312.8(20)	21	7313.30(64)	7314.76(44)	2.0(20)	1.46(64)
64	7940.5(20)	21	7931.32(75)	7942.02(41)	1.5(20)	10.70(75)
68	9263.9(20)	21	9266.9(18)	9264.40(42)	0.5(20)	−2.49(18)
70	9978.1(20)	21	9971.46(56)	9978.70(44)	0.6(20)	7.24(56)
			L_3 edge			
10	21.564(10)	C		21.55(38)	−0.010(10)	
11	38.020(10)	S	30.61(56)	38.21(37)	0.192(10)	7.60(56)
12	57.464(98)	S	49.45(29)	57.90(35)	0.440(98)	8.45(29)
13	80.300(80)	S	72.76(63)	82.03(34)	1.730(80)	9.27(63)
18	248.46(53)	C		249.54(31)	1.08(53)	
19	300.88(97)	S	294.50(10)	301.62(31)	0.74(97)	7.12(10)
20	357.39(98)	S	346.61(66)	358.37(30)	0.98(98)	11.76(66)
20	356.28(50)	22			2.09(50)	
21	403.90(10)	S		411.53(31)	7.63(10)	
22	462.00(10)	S	454.31(25)	467.55(31)	5.55(10)	13.24(25)
23	524.00(20)	S		526.50(31)	2.50(20)	
24	582.00(20)	S	574.36(13)	581.78(30)	−0.22(20)	7.42(13)
24	576.28(50)	18			5.50(50)	
25	651.70(10)	S	638.89(14)	654.02(31)	2.32(10)	15.13(14)
25	649.00(50)	19			5.02(50)	
26	720.00(10)	S	720.74(31)	722.74(31)	2.74(10)	2.00(31)
27	795.00(20)	S	793.84(38)	794.62(31)	−0.38(20)	0.78(38)
28	870.00(10)	S	870.54(45)	869.70(31)	−0.30(10)	−0.84(45)
29	940.00(31)	S	932.68(45)	939.85(31)	−0.15(31)	7.17(45)
29	939.50(50)	20			0.35(50)	
30	1029.06(21)	S	1045.21(13)	1029.45(31)	0.39(21)	−15.76(13)
36	1679.07(39)	C		1680.06(31)	0.99(39)	
54	4786.47(17)	C		4788.22(32)	1.76(17)	
62	6717.9(20)	21	6717.36(54)	6719.67(37)	1.8(20)	2.32(54)
64	7251.9(20)	21	7243.23(63)	7254.88(33)	3.0(20)	11.65(63)
68	8358.7(20)	21	8359.4(15)	8358.66(34)	0.0(20)	−0.7(15)

It has only recently become possible to understand the relativistic many-body problem in atoms in sufficient detail to allow meaningful calculation of transition energies between hole states (Indelicato and Lindroth, 1992, 1996; Mooney *et al.*, 1992; Lindroth and Indelicato, 1993, 1994). To deal with hole states for atomic numbers ranging from 10 to 100, one needs to consider five kinds of contributions, all of which must be calculated in a relativistic framework. The relative size of these contributions can change rapidly with atomic number. These effects are specifically: (i) nuclear size; (ii) relativistic effects (corrections to Coulomb energy, magnetic and retardation energy); (iii) Coulomb and Breit correlation; (iv) radiative (QED) corrections (one- and two-electron Lamb shift, etc.); and (v) Auger shift.

Such a program, although much more advanced than any past effort, still has important limitations that need to be understood to make the best use of the tabulation. The main limitation is that x-ray spectra are obtained from atoms in elemental or compound solids, while calculations at present deal only with isolated atoms in vacuum. (A purely experimental database would have closely related problems.) The second limitation is that it is not presently possible to include the effects of coupling between the hole and open outer shells. Coupling between a $j=1/2$, $j=3/2$, or $j=5/2$ hole and an external $3d$ or $4f$ shell can generate hundreds of levels, with energy splittings that can reach the eV level. One should then calculate radiative and Auger transition probabilities between hundreds of initial and final states. (The Auger final state would have one extra vacancy, leading to thousands of final states.) Such an approach would give not only the mean line energy but also its shape, which would be very desirable. However, present day theoretical tools and computers are not capable of realizing this program. We have accordingly limited ourselves to an approach in which one computes the weighted average energy for each hole state, and ignores possible distortion of the line profile due to the coupling between inner vacancies and outer shells. Uncertainties resulting from such an approach are discussed in Sec. IV.E.

Since we want to have good energy estimates for both light and heavy atoms, we must include relativity nonperturbatively. To get a result approaching a relative uncertainty of 10^{-6} for uranium $K\alpha$ by applying perturbation theory to the Schrödinger equation, for example, one would need to go to order 22 in powers of $Z\alpha$. The natural framework in this case is thus to do a calculation exact to all orders in $(Z\alpha)$ by using the Dirac equation. We have accordingly used many-body methods, based on the Dirac equation, in which the main contributions to the transition energy are evaluated using the Dirac-Fock method. We use the Breit operator for the electron-electron interaction, to include magnetic spin-spin, spin-other orbit, and orbit-orbit interactions in the lower orders in $Z\alpha$ and $(v/c)^2$ retardation effects. Higher-order retardation effects are also included. Many-body effects are calculated by using relativistic many-body perturbation theory (RMBPT). Since inner vacancy levels are autoionizing, one must include shifts in their energy due to the coupling between the discrete levels and Auger decay continuua.

In the following subsections we describe the calculation of the different contributions in more detail.

A. Evaluation of the uncorrelated energy with the Dirac-Fock method

The first step in the calculation, following Indelicato and collaborators (Indelicato and Desclaux, 1990; Mooney *et al.*, 1992; Lindroth and Indelicato, 1993; Indelicato and Lindroth, 1996), consists of estimating the best possible energy (with relativistic corrections), within the independent electron approximation for each hole state (here $1s_{1/2}$, $2s_{1/2}$, $2p_{1/2}$, $2p_{3/2}$, $3s_{1/2}$, $3p_{1/2}$, $3p_{3/2}$, $3d_{3/2}$, $3d_{5/2}$, $4s_{1/2}$, $4p_{1/2}$, $4p_{3/2}$, $4d_{3/2}$, $4d_{5/2}$, $4f_{5/2}$, and $4f_{7/2}$ corresponding to K, L_1, L_2, L_3, M_1, M_2, M_3, M_4, M_5, N_1, N_2, N_3, N_4, N_5, N_6, N_7) and neutral (to evaluate edge energies). Such a calculation must also provide a suitable starting point for adding all many-body and QED contributions. We have thus chosen the Dirac-Fock method in the implementation of Desclaux (1975, 1993). This method, based on the Dirac equation, allows treatment of arbitrary atoms with arbitrary structure, and has been widely used for these kinds of calculations. We have used it with full exchange and relaxation (to account for inactive orbital rearrangement due to the presence of the hole). In this program, the electron-electron interaction used contains all magnetic and retardation effects, which is very important to have good results at large Z. The magnetic interaction is treated on an equal footing with the Coulomb interaction in order to account for higher-order effects in the wave function (that are also useful for evaluating radiative corrections to the electron-electron interaction).

All these calculations must be done with proper nuclear charge models in order to account for finite-nuclear-size corrections to all contributions. For heavy nuclei, nuclear deformations must be accounted for (Blundell *et al.*, 1990; Indelicato and Desclaux, 1990). We used experimental nuclear charge radii wherever available. For the others we used a formula from Johnson and Soff (1985), corrected for nuclear deformations for $Z>90$. Contribution of deformation to the rms radius (the only parameter of importance to the atomic calculation) is roughly constant (0.11 fm) for $Z>90$. Between Bi and Th $(83<Z<90)$ deformation effects start to be important, but have not been evaluated. When experimental radii are available for different isotopes, we calculated separately the energies for each isotope.

As mentioned in the introduction to this section, there are special difficulties involved when dealing with atoms with open outer shells (obviously the most common case). Computing all energies E_J for total angular momentum J would be both impossible and useless. The Dirac-Fock method circumvents this difficulty. One can evaluate directly an average energy that corresponds to the barycenter of all E_J with weight $(2J+1)$. There are still a few cases for which the average calculation cannot converge (when the open shells have identical symmetry). In these cases the outer electrons have been rearranged in an identical fashion for all hole-states of the atom, to minimize possible shifts due to this procedure. This procedure, however, proved to be inapplicable for edge calculations. In the most recent work (Indelicato *et al.*, 1998), a more advanced procedure is used. The calculation is performed with the real electronic configuration for all cases that converge. A second calculation is then done with an electronic configuration that enables one to obtain all level energies. The difference between the two calculations, for the cases in which both work, is then used to correct the modified electronic configuration values. Tests in cases where both methods work for all configurations show that such an extrapolation procedure gives rise to errors that are negligible compared to other uncalculated contributions.

B. Correlation and Auger shifts

Once the Dirac-Fock energy is obtained, many-body effects beyond Dirac-Fock relaxation must be taken into account. These include relaxation beyond the spherical average, correlation (due to both Coulomb and magnetic interaction), and corrections due to admixtures of configurations with two holes and a particle. This latter correction is called Auger shift (or sometimes Auger and core-core contributions) because when energeticaly allowed it corresponds to the shift due to the autoionizing nature of the hole state. The many-body generalization of the Dirac-Fock method, the so-called MCDF (multiconfiguration Dirac-Fock method) is very inefficient for hole-states; we therefore turned to RMBPT to evaluate those quantities. These many-body effects contribute very significantly to the final value. Coulomb correlation is mostly constant along the Periodic Table (at the level of a few eV). The small variation is given by relativistic contributions which scale as $\approx\alpha^2 Z^2$ and by many-body contributions which scale as $1/Z$ compared to the constant term. Higher-order correlations (beyond second order), neglected here, scale as $1/Z$ compared to the constant term and give a small contribution to the theoretical uncertainty. Magnetic correlation scales as $\approx\alpha^2 Z^2$ and is very strong at high Z. Neglected higher-order many-body contributions scale as $1/Z$ compared to their leading term and give an uncertainty comparable to that from the Coulomb correlation. The Auger shift does not always have such a smooth Z dependence as the other many-body effects since the admixture of two other holes (and a particle) can grow drastically when the energy difference between the sum of the energies of these holes and the original hole gets small. The shift can then amount to more than 15 eV for certain shells, such as the $4p$ and $4d$, of some elements. The interested reader will find more details of these complicated calculations in the original references (Indelicato and Lindroth, 1992, 1996; Mooney *et al.*, 1992; Lindroth and Indelicato, 1993). As these calculations are time consuming, they are performed only for selected elements and the results interpolated to obtain values for other elements. Since the Auger shifts do not always have a smooth Z dependence, care has been taken to evaluate them for as many elements as practical to ensure a good reproduction of irregularities.

C. Special problems with the $n=4$ hole states

The $n=4$ hole states are considerably more sensitive to many-body effects than lower-lying shells. In the region around Xe the binding energy of a $4p_{1/2}$ electron is, e.g., very similar to that of a pair of $4d_j$ electrons and the Auger shift given by second-order perturbation theory amounts to as much as 50 eV. The situation for $4d_{1/2}^{-1}$ states in the Sm region is similar. In these cases, second order perturbation theory is clearly not sufficient and a more accurate approximation is needed. Since, in general, the perturbation expansion does not even converge, we diagonalize the matrix for the most important admixtures of configurations with two holes and a particle.

In fact these admixtures are sometimes so large that the single-particle picture loses its meaning. It has been shown, for example, in x-ray photoelectron spectroscopy measurements (Svensson *et al.*, 1976) that instead of a single state which can be attributed to the $4p_{1/2}^{-1}$ configuration in Xe there are many closely lying states, all with a modest $4p_{1/2}^{-1}$ admixture.

For the $4p_{1/2}$ and $4d_{3/2}$ shells in the range of atomic numbers $60\leqslant Z\leqslant 70$ the structure is so complicated that it is impossible to decide which state should be used to compare with experiment from theoretical arguments alone. As the experimental papers are very old and do not provide spectra, neither is it possible to use experimental arguments to choose. The theoretical energies for those cases are thus marked with a special symbol # in Table V. The experimental values for the N_4 $(4d_{3/2})$ shell are not consistent either: if one evaluates the L_2-L_3 $(2p_{1/2}-2p_{3/2})$ splitting from the difference between the KL_2 and KL_3 transitions or by difference between the L_2M_4 and L_3M_4 transitions, one obtains very similar values. But if one obtains this difference from L_2N_4 and L_3N_4, the deviation with respect to either theory or the two previous experimental values can reach 15 eV, for $64\leqslant Z\leqslant 78$ (Fig. 1). Only new measurements can provide an answer to this puzzle. A detailed account of the theoretical calculation and comparison with x-ray photoelectron and emission spectra will be published separately (Anton *et al.*, 2003).

D. QED corrections

The QED corrections originate in the quantum nature of both the electromagnetic and electron fields. They can be divided into two categories: radiative and nonradiative. The first includes self-energy and vacuum polarization corrections, which are the main contributions to the Lamb shift in one-electron atoms. These corrections scale as Z^4/n^3 (n being the principal quantum number) and are thus very important for inner shells and high Z.

TABLE V. X-ray energies and wavelengths ordered by element. Numbers in parentheses are one standard deviation uncertainties of the quoted value referred to the last figures of the quoted value. † indicates that the line energy was obtained by interpolation with Moseley plots in Ref. (1). ‡ indicates that the measurement has an unreasonably large disagreement with theory, i.e., a disagreement much larger than the difference between theory and experiment ΔE for neighboring elements. # indicates that the level structure is too complex to obtain a proper assignment of the theoretical transition energy (see Sec. IV.C). For edges, a (c) denotes a value obtained by combining transition and electron binding energies and a (v) denotes a measurement in a metallic vapor. (1) (Bearden, 1967), (2) (Schweppe *et al.*, 1994), (3) (Mooney, 1996), (4) (Schweppe, 1995), (5) (Deslattes and Kessler, 1985), (6) (Härtwig *et al.*, 1994), (7) (Hölzer *et al.*, 1997), (8) (Borchert *et al.*, 1980), (9) (Borchert, 1976), (10) (Barreau *et al.*, 1982), (11) (Indelicato and Lindroth, 1992), (12) (Mooney *et al.*, 1992), (13) (Kraft *et al.*, 1996), (14) (Lum *et al.*, 1981), (15) (Bearden, 1960), (16) (Revel *et al.*, 1999), (17) (Arp *et al.*, 1993; Arp, 1995), (18) (Arp *et al.*, 1995), (19) (Arp *et al.*, 1992), (20) (Arp *et al.*, 1994), (21) (Arp *et al.*, 1990), (22) (Weber *et al.*, 1988), (23) (Anagnostopoulos *et al.*, 2002), (24) (Ohno and LaVilla, 1988), (25) (Ohno and LaVilla, 1989a), (26) (Shrivastava *et al.*, 1976a), (27) (Shrivastava *et al.*, 1976b), (28) (Gokhale and Shukla, 1970a), (29) (Gokhale and Shukla, 1970b), (30) (Shrivastava *et al.*, 1977), (31) (Rai and Deodhar, 1975), (32) (Gokhale and Shukla, 1969), (33) (Shrivastava, Martins, *et al.*, 1976), (34) (Gokhale and Shukla, 1970c), (35) (Shrivastava *et al.*, 1975), (36) (Shrivastava *et al.*, 1976c), (37) (Deodhar and Varma, 1969a), (38) (Nigam and Kapoor, 1968), (39) (Nigam and Kapoor, 1973a), (40) (Nigam and Kapoor, 1970), (41) (Deodhar *et al.*, 1969), (42) (Nigam and Garg, 1967), (43) (Nigam and Garg, 1969a), (44) (Deodhar and Varma, 1969b), (45) (Nigam and Mathur, 1975), (46) (Nigam and Garg, 1969c), (47) (Nigam and Kapoor, 1973b), (48) (Nigam *et al.*, 1976), (49) (Nigam and Kapoor, 1969), (50) (Nigam and Mathur, 1979), (51) (Nigam and Mathur, 1980), (52) (Nigam and Mathur, 1984), (53) (Deodhar *et al.*, 1968), (54) (Nigam and Garg, 1969b), (55) (Nigam and Mathur, 1976b), (56) (Nigam and Mathur, 1976a), (57) (Rai *et al.*, 1970), (58) (Nigam *et al.*, 1974), (59) (Gupta and Duby, 1969), (60) (Gupta *et al.*, 1976), (61) (Nordling and Hagström, 1964), (62) (Nordling and Hagström, 1959), (63) (Nelson *et al.*, 1970), (64) (Yamazaki and Hollander, 1966), (65) (Porter *et al.*, 1972), (66) (Porter *et al.*, 1974), (67) (Porter and Freedman, 1978), (68) (Chu *et al.*, 1972), (69) (Dittner and Bemis, 1972), (70) (Hollander *et al.*, 1965), (71) (Freedman *et al.*, 1977), (72) (Ahmad *et al.*, 1971), (73) (Dittner *et al.*, 1971), (74) (Porter and Freedman, 1971), (75) (Raboud *et al.*, 1999), (76) (Raboud *et al.*, 2002), (77) H. Börner in (Porter and Freedman, 1978), (78) (Ahmad *et al.*, 1973), (79) (Wolfson and Park, 1964), (80) (Den Auwer, 2001), (81) (Manil *et al.*, 2002).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Experiment Blend	Ref.
10	**Neon**		**Ne**	
KL_1	817.69(56)			
KL_2 ($K\alpha_2$)	849.09(54)	848.61(26)	$KL_{2,3}$	1
KL_3 ($K\alpha_1$)	849.17(54)	848.61(26)	$KL_{2,3}$	1
KM_1		857.89(44)	KM	1
KM_2 ($K\beta_3$)		857.89(44)	KM	1
KM_3 ($K\beta_1$)		857.89(44)	KM	1
KM_4 ($K\beta_5^{II}$)		857.89(44)	KM	1
KM_5 ($K\beta_5^{I}$)		857.89(44)	KM	1
K edge	870.73(16)	866.9001(90)		1
K edge (c)		870.23(18)		
L_1 edge	53.04(40)			
L_1 edge (c)		48.445(50)		
L_2 edge	21.63(39)			
L_2 edge (c)		21.661(10)		
L_3 edge	21.55(38)			
L_3 edge (c)		21.564(10)		
11	**Sodium**		**Na**	
KL_1	1004.99(49)			
KL_2 ($K\alpha_2$)	1041.77(51)	1040.98(12)	$KL_{2,3}$	1
KL_3 ($K\alpha_1$)	1041.94(51)	1040.98(12)	$KL_{2,3}$	1
KM_1	1073.0(12)	1071.12(27)	KM	1
KM_2 ($K\beta_3$)		1071.12(27)	KM	1
KM_3 ($K\beta_1$)		1071.12(27)	KM	1
KM_4 ($K\beta_5^{II}$)		1071.12(27)	KM	1
KM_5 ($K\beta_5^{I}$)		1071.12(27)	KM	1
K edge	1080.15(15)	1071.68(14)		1
K edge (c)		1071.52(13)		
L_1M_1	68.0(14)			
L_1 edge	75.16(35)			
L_1 edge (c)		63.57(20)		
L_2M_1 ($L\eta$)	31.3(14)			
L_2 edge	38.38(37)	30.61(56)		1
L_2 edge (c)		30.60(10)		
L_3M_1 (Ll)	31.09(37)			
L_3 edge	38.21(37)	30.61(56)		1
L_3 edge (c)		30.40(20)		
12	**Magnesium**		**Mg**	
KL_1	1211.54(43)			
KL_2 ($K\alpha_2$)	1254.14(49)	1253.437(13)		2
KL_3 ($K\alpha_1$)	1254.39(49)	1253.688(11)		2
KM_1	1303.5(12)	1302.20(40)	KM	1
KM_2 ($K\beta_3$)		1302.20(40)	KM	1
KM_3 ($K\beta_1$)		1302.20(40)	KM	1
KM_4 ($K\beta_5^{II}$)		1302.20(40)	KM	1
KM_5 ($K\beta_5^{I}$)		1302.20(40)	KM	1
K edge	1312.30(14)	1303.403(20)		1
K edge (c)		1303.33(27)		
L_1M_1	92.0(14)			
L_1 edge	100.75(29)	62.839(47)		1
L_1 edge (c)		88.62(20)		
L_2M_1 ($L\eta$)	49.4(14)			
L_2 edge	58.16(35)	49.732(30)		1
L_2 edge (c)		49.50(10)		
L_3M_1 (Ll)	49.14(36)			
L_3 edge	57.90(35)	49.454(29)		1
L_3 edge (c)		49.790(61)		
13	**Aluminum**		**Al**	
KL_1	1438.94(38)			
KL_2 ($K\alpha_2$)	1487.12(47)	1486.295(10)		2
KL_3 ($K\alpha_1$)	1487.53(47)	1486.708(10)		2
KM_1	1556.63(98)	1557.57(58)	KM	1

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
KM_2 ($K\beta_3$)	1561.28(96)	1557.57(58)	*KM*	1
KM_3 ($K\beta_1$)		1557.57(58)	*KM*	1
KM_4 ($K\beta_5^{II}$)		1557.57(58)	*KM*	1
KM_5 ($K\beta_5^{I}$)		1557.57(58)	*KM*	1
K edge	1569.56(13)	1559.893(15)		1
K edge (c)		1559.53(27)		
L_1M_1	117.7(11)			
L_1M_2 ($L\beta_4$)	122.3(11)			
L_1 edge	130.62(25)	87.005(90)		1
L_1 edge (c)		117.87(30)		
L_2M_1 ($L\eta$)	69.5(12)			
L_2M_2	74.2(12)			
L_2 edge	82.44(34)	72.760(63)		1
L_2 edge (c)		72.75(20)		
L_3M_1 (Ll)	69.1(12)			
L_3M_2 (Lt)	73.7(12)			
L_3 edge	82.03(34)	72.760(63)		1
L_3 edge (c)		72.870(61)		
14	**Silicon**		**Si**	
KL_1	1686.54(33)			
KL_2 ($K\alpha_2$)	1739.67(47)	1739.394(34)		3
KL_3 ($K\alpha_1$)	1741.16(47)	1739.985(19)		3
KM_1	1834.97(84)	1835.96(40)	*KM*	1
KM_2 ($K\beta_3$)	1841.79(72)	1835.96(40)	*KM*	1
KM_3 ($K\beta_1$)		1835.96(40)	*KM*	1
KM_4 ($K\beta_5^{II}$)		1835.96(40)	*KM*	1
KM_5 ($K\beta_5^{I}$)		1835.96(40)	*KM*	1
K edge	1850.26(13)	1840.05(40)		1
K edge (c)		1839.13(37)		
L_1M_1	148.42(91)			
L_1M_2 ($L\beta_4$)	155.24(79)			
L_1 edge	163.72(20)			
L_1 edge (c)		149.80(50)		
L_2M_1 ($L\eta$)	95.3(11)			
L_2M_2	102.11(93)			
L_2 edge	110.59(34)	100.8(12)		1
L_2 edge (c)		99.20(10)		
L_3M_1 (Ll)	93.81(93)			
L_3M_2 (Lt)	100.63(93)			
L_3 edge	109.10(34)	100.8(12)		1
L_3 edge (c)		99.340(61)		
15	**Phosphorus**		**P**	
KL_1	1954.45(27)			
KL_2 ($K\alpha_2$)	2013.14(45)	2012.70(48)†		1
KL_3 ($K\alpha_1$)	2014.73(44)	2013.68(48)†		1
KM_1	2136.1(10)	2139.1(11)	*KM*	1
KM_2 ($K\beta_3$)	2143.79(58)	2139.1(11)	*KM*	1
KM_3 ($K\beta_1$)	2140.8(10)	2139.1(11)	*KM*	1
KM_4 ($K\beta_5^{II}$)		2139.1(11)	*KM*	1
KM_5 ($K\beta_5^{I}$)		2139.1(11)	*KM*	1
K edge	2154.24(12)	2143.54(55)		1
K edge (c)		2144.5(25)		
L_1M_1	181.7(10)			
L_1M_2 ($L\beta_4$)	189.34(62)			
L_1M_3 ($L\beta_3$)	186.4(10)			
L_1 edge	199.79(16)			
L_1 edge (c)		189.0(10)		
L_2M_1 ($L\eta$)	123.0(12)			
L_2M_2	130.65(79)			
L_2M_3 ($L\beta_{17}$)	127.7(12)			
L_2 edge	141.10(33)	131.9(21)		1
L_2 edge (c)		136.0(10)		
L_3M_1 (Ll)	121.41(78)			
L_3M_2 (Lt)	129.07(78)			
L_3M_3 (Ls)	126.1(12)			
L_3 edge	139.51(32)	131.9(21)		1
L_3 edge (c)		130.010(61)		
16	**Sulfur**		**S**	
KL_1	2242.56(23)			
KL_2 ($K\alpha_2$)	2307.01(45)	2306.700(38)		3
KL_3 ($K\alpha_1$)	2308.80(44)	2307.885(34)		3
KM_1	2460.1(11)			
KM_2 ($K\beta_3$)	2469.73(62)			
KM_3 ($K\beta_1$)	2467.53(72)	2464.07(14)		1
K edge	2481.71(12)	2470.506(73)		1
K edge (c)		2471.63(70)		
L_1M_1	217.5(11)			
L_1M_2 ($L\beta_4$)	227.17(60)			
L_1M_3 ($L\beta_3$)	224.96(72)			
L_1 edge	239.15(11)			
L_2M_1 ($L\eta$)	153.1(14)	148.66(79)	$L_{2,3}M_1$	1
L_2M_2	162.72(81)			
L_2M_3 ($L\beta_{17}$)	160.52(93)			
L_2 edge	174.70(33)			
L_2 edge (c)		163.60(30)		
L_3M_1 (Ll)	151.29(80)	148.66(79)	$L_{2,3}M_1$	1
L_3M_2 (Lt)	160.93(80)			
L_3M_3 (Ls)	158.73(92)			
L_3 edge	172.91(32)			
L_3 edge (c)		163.820(61)		
17	**Chlorine**		**Cl**	
KL_1	2550.96(26)			
KL_2 ($K\alpha_2$)	2621.27(44)	2620.846(39)		3
KL_3 ($K\alpha_1$)	2623.67(43)	2622.440(39)		3
KM_1	2807.0(13)	2815.60(28)	*KM*	1
KM_2 ($K\beta_3$)	2819.04(64)	2815.60(28)	*KM*	1
KM_3 ($K\beta_1$)	2817.58(49)	2815.60(28)	*KM*	1
KM_4 ($K\beta_5^{II}$)		2815.60(28)	*KM*	1
KM_5 ($K\beta_5^{I}$)		2815.60(28)	*KM*	1
K edge	2832.76(12)	2819.639(95)		1
K edge (c)		2822.64(71)		
L_1M_1	256.0(13)			

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Experiment Blend	Ref.
L_1M_2 ($L\beta_4$)	268.08(66)			
L_1M_3 ($L\beta_3$)	266.62(52)			
L_1 edge	281.80(15)			
L_1 edge (c)		270.0(10)		
L_2M_1 ($L\eta$)	185.7(15)	184.14(36)		1
L_2M_2	197.77(84)			
L_2M_3 ($L\beta_{17}$)	196.31(70)			
L_2 edge	211.49(33)			
L_2 edge (c)		202.0(10)		
L_3M_1 (Ll)	183.31(83)	182.60(36)		1
L_3M_2 (Lt)	195.37(83)			
L_3M_3 (Ls)	193.91(69)			
L_3 edge	209.09(31)			
L_3 edge (c)		200.0(10)		
18	**Argon**		**Ar**	
KL_1	2880.13(33)			
KL_2 ($K\alpha_2$)	2955.89(43)	2955.566(16)		4
KL_3 ($K\alpha_1$)	2957.90(42)	2957.682(16)		4
KM_1	3177.4(15)			
KM_2 ($K\beta_3$)	3191.31(58)	3190.49(24)	$KM_{2,3}$	1
KM_3 ($K\beta_1$)	3191.47(58)	3190.49(24)	$KM_{2,3}$	1
K edge	3207.44(12)	3202.933(61)		1
K edge (c)		3206.14(54)		
L_1M_1	297.3(16)			
L_1M_2 ($L\beta_4$)	311.18(69)			
L_1M_3 ($L\beta_3$)	311.35(69)			
L_1 edge	327.31(23)			
L_1 edge (c)		326.32(10)		
L_2M_1 ($L\eta$)	221.5(17)	221.79(59)		1
L_2M_2	235.41(78)			
L_2M_3 ($L\beta_{17}$)	235.58(78)			
L_2 edge	251.55(32)			
L_2 edge (c)		250.57(24)		
L_3M_1 (Ll)	219.52(77)	220.22(58)		1
L_3M_2 (Lt)	233.40(77)			
L_3M_3 (Ls)	233.57(77)			
L_3 edge	249.54(31)			
L_3 edge (c)		248.46(53)		
19	**Potassium**		**K**	
KL_1	3229.98(32)			
KL_2 ($K\alpha_2$)	3311.97(44)	3311.1956(60)		5
KL_3 ($K\alpha_1$)	3314.60(42)	3313.9476(50)		5
KM_1	3375.0(14)			
KM_2 ($K\beta_3$)	3591.78(42)	3589.63(31)	$KM_{2,3}$	1
KM_3 ($K\beta_1$)	3591.49(61)	3589.63(31)	$KM_{2,3}$	1
KM_4 ($K\beta_5^{II}$)		3602.78(62)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)		3602.78(62)	$KM_{4,5}$	1
KN_1	3611.14(17)			
K edge	3616.22(12)	3607.81(16)		1
K edge (c)		3608.49(16)		
L_1M_1	345.0(15)			
L_1M_2 ($L\beta_4$)	361.81(82)			
L_1M_3 ($L\beta_3$)	361.52(71)			
L_1N_1	381.16(27)			
L_1 edge	386.25(22)			
L_1 edge (c)		378.60(30)		
L_2M_1 ($L\eta$)	263.0(17)	262.45(16)		1
L_2M_2	279.81(93)			
L_2M_3 ($L\beta_{17}$)	279.52(81)			
L_2N_1 ($L\gamma_5$)	299.17(38)			
L_2 edge	304.25(33)	294.5(10)		1
L_2 edge (c)		297.28(23)		
L_3M_1 (Ll)	260.38(91)	259.703(81)		1
L_3M_2 (Lt)	277.18(91)			
L_3M_3 (Ls)	276.90(80)			
L_3N_1 ($L\beta_6$)	296.54(36)			
L_3 edge	301.62(31)	294.5(10)		1
L_3 edge (c)		294.55(22)		
20	**Calcium**		**Ca**	
KL_1	3598.89(31)			
KL_2 ($K\alpha_2$)	3687.56(43)	3688.128(49)		1
KL_3 ($K\alpha_1$)	3690.98(41)	3691.719(49)		1
KM_1	3993.8(14)			
KM_2 ($K\beta_3$)	4014.32(59)	4012.76(38)	$KM_{2,3}$	1
KM_3 ($K\beta_1$)	4014.68(58)	4012.76(38)	$KM_{2,3}$	1
KM_4 ($K\beta_5^{II}$)		4032.47(58)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)		4032.47(58)	$KM_{4,5}$	1
KN_1	4043.20(18)			
K edge	4049.35(12)	4038.12(19)		1
K edge (c)		4038.34(14)		
K edge (v)		4050.48(30)		17
L_1M_1	394.9(15)			
L_1M_2 ($L\beta_4$)	415.43(68)			
L_1M_3 ($L\beta_3$)	415.80(67)			
L_1N_1	444.32(27)			
L_1 edge	450.46(20)			
L_2 edge (c)		438.50(50)		
L_2M_1 ($L\eta$)	306.2(16)	306.43(22)		1
L_2M_2	326.76(79)			
L_2M_3 ($L\beta_{17}$)	327.12(78)			
L_2M_4 ($L\beta_1$)		344.97(28)		1
L_2N_1 ($L\gamma_5$)	355.64(39)			
L_2 edge	361.79(32)	352.92(15)		1
L_2 edge (c)		350.40(39)		
L_3M_1 (Ll)	302.80(77)	302.69(22)		1
L_3M_2 (Lt)	323.34(77)			1
L_3M_3 (Ls)	323.71(77)			
L_3M_4 ($L\alpha_2$)		341.27(28)	$L_3M_{4,5}$	1
L_3M_5 ($L\alpha_1$)		341.27(28)	$L_3M_{4,5}$	1
L_3N_1 ($L\beta_6$)	352.23(37)			
L_3 edge	358.37(30)	349.34(15)		1
L_3 edge (c)		346.611(66)		
L_3 edge (v)		356.28(50)		22

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Experiment Blend	Ref.
21	**Scandium**		**Sc**	
KL_1	3991.57(39)			
KL_2 ($K\alpha_2$)	4085.43(44)	4085.9526(85)		1,23
KL_3 ($K\alpha_1$)	4090.15(42)	4090.735(19)		23
KM_1	4438.8(15)			
KM_2 ($K\beta_3$)	4461.16(80)	4460.44(47)	$KM_{2,3}$	1
KM_3 ($K\beta_1$)	4462.93(80)	4460.44(47)	$KM_{2,3}$	1
KM_4 ($K\beta_5^{II}$)	4490.79(41)	4486.59(72)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)		4486.59(72)	$KM_{4,5}$	1
KN_1	4495.16(18)			
K edge	4501.68(12)	4488.9(24)		1
K edge (c)		4489.37(47)		
L_1M_1	447.3(17)			
L_1M_2 ($L\beta_4$)	469.59(98)			
L_1M_3 ($L\beta_3$)	471.36(97)			
L_1M_4 ($L\beta_{10}$)	499.22(59)			
L_1N_1	503.60(36)			
L_1 edge	53.04(40)			
L_1 edge (c)		498.00(30)		
L_2M_1 ($L\eta$)	353.4(17)	352.92(30)		1
L_2M_2	375.7(10)			
L_2M_3 ($L\beta_{17}$)	377.5(10)			
L_2M_4 ($L\beta_1$)	405.35(62)	399.69(38)		1
L_2N_1 ($L\gamma_5$)	409.73(40)			
L_2 edge	21.63(39)			
L_2 edge (c)		403.62(22)		
L_3M_1 (Ll)	348.70(99)	348.36(43)		1
L_3M_2 (Lt)	371.01(99)			
L_3M_3 (Ls)	372.78(99)			
L_3M_4 ($L\alpha_2$)	400.64(60)	395.48(56)	$L_3M_{4,5}$	1
L_3M_5 ($L\alpha_1$)		395.48(56)	$L_3M_{4,5}$	1
L_3N_1 ($L\beta_6$)	405.01(37)			
L_3 edge	411.53(31)			
L_3 edge (c)		398.55(47)		
22	**Titanium**		**Ti**	
KL_1	4404.59(43)			
KL_2 ($K\alpha_2$)	4504.07(44)	4504.9201(94)		1,6,23
KL_3 ($K\alpha_1$)	4510.38(42)	4510.8991(94)		1,6,23
KM_1	4907.1(15)			
KM_2 ($K\beta_3$)	4930.86(85)	4931.827(59)	$KM_{2,3}$	1
KM_3 ($K\beta_1$)	4934.46(87)	4931.827(59)	$KM_{2,3}$	1
KM_4 ($K\beta_5^{II}$)	4965.95(43)	4962.27(59)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)		4962.27(59)	$KM_{4,5}$	1
KN_1	4971.09(18)			
K edge	4977.92(12)	4964.58(15)		1
K edge (c)		4964.881(59)		
L_1M_1	502.5(18)			
L_1M_2 ($L\beta_4$)	526.3(11)			
L_1M_3 ($L\beta_3$)	529.9(11)			
L_1M_4 ($L\beta_{10}$)	561.36(64)			
L_1N_1	566.50(40)			
L_1 edge	573.33(33)			
L_1 edge (c)		561.05(60)		
L_2M_1 ($L\eta$)	403.0(18)	401.37(58)		1
L_2M_2	426.8(11)			
L_2M_3 ($L\beta_{17}$)	430.4(11)			
L_2M_4 ($L\beta_1$)	461.88(64)	458.35(50)		1
L_2N_1 ($L\gamma_5$)	467.03(40)			
L_2 edge	473.85(33)	454.31(25)		1
L_2 edge (c)		460.00(23)		
L_3M_1 (Ll)	396.7(10)	395.35(37)		1
L_3M_2 (Ll)	420.5(10)			
L_3M_3 (Ls)	424.1(11)			
L_3M_4 ($L\alpha_2$)	455.57(61)	452.16(49)	$L_3M_{4,5}$	1
L_3M_5 ($L\alpha_1$)		452.16(49)	$L_3M_{4,5}$	1
L_3N_1 ($L\beta_6$)	460.72(37)			
L_3 edge	467.55(31)	454.31(25)		1
L_3 edge (c)		453.979(61)		
23	**Vanadium**		**V**	
KL_1	4838.50(47)			
KL_2 ($K\alpha_2$)	4943.59(45)	4944.671(59)		1,6
KL_3 ($K\alpha_1$)	4951.79(42)	4952.216(59)		1,6
KM_1	5399.3(15)			
KM_2 ($K\beta_3$)	5424.42(89)	5427.320(71)	$KM_{2,3}$	1
KM_3 ($K\beta_1$)	5430.00(94)	5427.320(71)	$KM_{2,3}$	1
KM_4 ($K\beta_5^{II}$)	5465.33(44)	5462.96(21)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)		5462.96(21)	$KM_{4,5}$	1
KN_1	5471.17(19)			
K edge	5478.28(12)	5463.757(50)		13
K edge (c)		5464.43(26)		
L_1M_1	560.5(18)			
L_1M_2 ($L\beta_4$)	585.9(11)	585.1(37)†	$L_1M_{2,3}$	1
L_1M_3 ($L\beta_3$)	591.5(12)	585.1(37)†	$L_1M_{2,3}$	1
L_1M_4 ($L\beta_{10}$)	626.83(69)			
L_1N_1	632.67(44)			
L_1 edge	639.78(37)			
L_1 edge (c)		626.86(60)		
L_2M_1 ($L\eta$)	455.7(18)	453.48(74)		1
L_2M_2	480.8(11)			
L_2M_3 ($L\beta_{17}$)	486.4(12)			
L_2M_4 ($L\beta_1$)	521.74(65)	519.2(13)		1
L_2N_1 ($L\gamma_5$)	527.58(40)			
L_2 edge	534.69(33)			
L_2 edge (c)		519.72(19)		
L_3M_1 (Ll)	447.5(11)	446.46(24)		1
L_3M_2 (Lt)	472.6(11)			
L_3M_3 (Ls)	478.2(11)			
L_3M_4 ($L\alpha_2$)	513.54(63)	511.27(94)	$L_3M_{4,5}$	1
L_3M_5 ($L\alpha_1$)		511.27(94)	$L_3M_{4,5}$	1
L_3N_1 ($L\beta_6$)	519.38(38)			
L_3 edge	526.50(31)			
L_3 edge (c)		512.21(22)		

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Experiment Blend	Ref.
24	**Chromium**		**Cr**	
KL_1	5293.35(50)			
KL_2 ($K\alpha_2$)	5404.06(45)	5405.5384(71)		7
KL_3 ($K\alpha_1$)	5413.88(42)	5414.8045(71)		7
KM_1	5914.2(15)			
KM_2 ($K\beta_3$)	5940.74(92)	5946.823(11)	$KM_{2,3}$	7
KM_3 ($K\beta_1$)	5947.1(10)	5946.823(11)	$KM_{2,3}$	7
KM_4 ($K\beta_5^{II}$)	5986.82(46)	5986.97(26)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	5990.83(12)	5986.97(26)	$KM_{4,5}$	1
KN_1	5989.03(19)			
K edge	5995.66(12)	5989.017(40)		13
K edge (c)		5989.16(48)		
K edge (v)		5994.90(50)		17
L_1M_1	620.9(18)			
L_1M_2 ($L\beta_4$)	647.4(12)	653.9(10)	$L_1M_{2,3}$	1
L_1M_3 ($L\beta_3$)	653.8(13)	653.9(10)	$L_1M_{2,3}$	1
L_1M_4 ($L\beta_{10}$)	693.47(74)			
L_1M_5 ($L\beta_9$)	697.48(40)			
L_1N_1	695.68(47)			
L_1 edge	702.31(40)	742.4(66)		1
L_1 edge (c)		696.37(60)		
L_2M_1 ($L\eta$)	510.2(18)	510.22(93)		1
L_2M_2	536.7(11)			
L_2M_3 ($L\beta_{17}$)	543.0(12)			
L_2M_4 ($L\beta_1$)	582.76(67)	582.90(41)		1
L_2M_5	586.76(33)			
L_2N_1 ($L\gamma_5$)	584.96(41)			
L_2 edge	591.60(33)	692.6(57)		1
L_2 edge (c)		583.57(48)		
L_3M_1 (Ll)	500.3(11)	500.33(30)		1
L_3M_2 (Lt)	526.9(11)			
L_3M_3 (Ls)	533.2(12)			
L_3M_4 ($L\alpha_2$)	572.94(64)	572.9(12)	$L_3M_{4,5}$	1
L_3M_5 ($L\alpha_1$)	576.95(30)	572.9(12)	$L_3M_{4,5}$	1
L_3N_1 ($L\beta_6$)	575.15(38)			
L_3 edge	581.78(30)	598.9(43)		1
L_3 edge (c)		574.36(13)		
L_3 edge (v)		576.28(50)		18
25	**Manganese**		**Mn**	
KL_1	5769.18(54)			
KL_2 ($K\alpha_2$)	5886.20(45)	5887.6859(84)		7
KL_3 ($K\alpha_1$)	5898.10(42)	5898.8010(84)		7
KM_1	6455.7(15)			
KM_2 ($K\beta_3$)	6485.39(96)	6490.585(14)	$KM_{2,3}$	7
KM_3 ($K\beta_1$)	6492.7(10)	6490.585(14)	$KM_{2,3}$	7
KM_4 ($K\beta_5^{II}$)	6537.52(48)	6535.36(51)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	6538.54(51)	6535.36(51)	$KM_{4,5}$	1
KN_1	6544.46(20)			
K edge	6552.12(12)	6537.667(20)		13
K edge (c)		6537.68(14)		
K edge (v)		6551.39(50)		17
L_1M_1	686.5(18)			
L_1M_2 ($L\beta_4$)	716.2(13)	721.2(12)	$L_1M_{2,3}$	1
L_1M_3 ($L\beta_3$)	723.5(14)	721.2(12)	$L_1M_{2,3}$	1
L_1M_4 ($L\beta_{10}$)	768.34(80)			
L_1M_5 ($L\beta_9$)	769.36(82)			
L_1N_1	775.27(51)			
L_1 edge	782.94(44)			
L_1 edge (c)		769.48(90)		
L_2M_1 ($L\eta$)	569.5(17)	567.42(77)		1
L_2M_2	599.2(12)			
L_2M_3 ($L\beta_{17}$)	606.5(13)			
L_2M_4 ($L\beta_1$)	651.32(69)	64.8(10)		1
L_2M_5	652.34(72)			
L_2N_1 ($L\gamma_5$)	658.26(41)			
L_2 edge	665.92(33)			
L_2 edge (c)		649.88(19)		
L_3M_1 (Ll)	557.6(11)	556.22(37)		1
L_3M_2 (Lt)	587.3(11)			
L_3M_3 (Ls)	594.6(12)			
L_3M_4 ($L\alpha_2$)	639.42(66)	637.44(49)	$L_3M_{4,5}$	1
L_3M_5 ($L\alpha_1$)	640.44(69)	637.44(49)	$L_3M_{4,5}$	1
L_3N_1 ($L\beta_6$)	646.36(38)			
L_3 edge	654.02(31)			
L_3 edge (c)		638.89(14)		
L_3 edge (v)		649.00(50)		19
26	**Iron**		**Fe**	
KL_1	6266.07(58)			
KL_2 ($K\alpha_2$)	6389.51(46)	6391.0264(99)		7
KL_3 ($K\alpha_1$)	6403.13(43)	6404.0062(99)		7
KM_1	7020.2(15)			
KM_2 ($K\beta_3$)	7053.2(10)	7058.175(16)	$KM_{2,3}$	7
KM_3 ($K\beta_1$)	7059.9(11)	7058.175(16)	$KM_{2,3}$	7
KM_4 ($K\beta_5^{II}$)	7110.59(50)	7108.26(60)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	7111.50(52)	7108.26(60)	$KM_{4,5}$	1
KN_1	7117.93(20)			
K edge	7125.87(13)	7110.747(20)		13
K edge (c)		7110.86(40)		
L_1M_1	754.1(18)			
L_1M_2 ($L\beta_4$)	787.2(13)	792.2(15)	$L_1M_{2,3}$	1
L_1M_3 ($L\beta_3$)	793.8(14)	792.2(15)	$L_1M_{2,3}$	1
L_1M_4 ($L\beta_{10}$)	844.52(85)			
L_1M_5 ($L\beta_9$)	845.44(87)			
L_1N_1	851.86(55)			
L_1 edge	859.80(48)			
L_1 edge (c)		848.6(20)		
L_2M_1 ($L\eta$)	630.6(17)	627.8(19)		1
L_2M_2	663.7(12)			
L_2M_3 ($L\beta_{17}$)	670.4(13)			
L_2M_4 ($L\beta_1$)	721.07(70)	718.32(62)		1
L_2M_5	721.99(73)			
L_2N_1 ($L\gamma_5$)	728.41(41)			
L_2 edge	736.35(34)	720.74(31)		1
L_2 edge (c)		719.80(39)		

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Experiment Blend	Ref.
L_3M_1 (Ll)	617.0(12)	615.30(45)		1
L_3M_2 (Lt)	650.1(12)			
L_3M_3 (Ls)	656.8(13)			
L_3M_4 ($L\alpha_2$)	707.46(67)	704.8(12)	$L_3M_{4,5}$	1
L_3M_5 ($L\alpha_1$)	708.38(70)	704.8(12)	$L_3M_{4,5}$	1
L_3N_1 ($L\beta_6$)	714.80(38)			
L_3 edge	722.74(31)	707.46(30)		1
L_3 edge (c)		706.86(14)		
27	**Cobalt**		**Co**	
KL_1	6784.08(61)			
KL_2 ($K\alpha_2$)	6914.08(47)	6915.5380(39)		7
KL_3 ($K\alpha_1$)	6929.63(43)	6930.3780(39)		7
KM_1	7609.0(15)			
KM_2 ($K\beta_3$)	7645.5(10)	7649.445(14)	$KM_{2,3}$	7
KM_3 ($K\beta_1$)	7651.5(11)	7649.445(14)	$KM_{2,3}$	7
KM_4 ($K\beta_5^{\mathrm{II}}$)	7708.35(52)	7705.98(21)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{\mathrm{I}}$)	7709.15(54)	7705.98(21)	$KM_{4,5}$	1
KN_1	7716.05(21)			
K edge	7724.26(13)	7708.776(20)		13
K edge (c)		7708.75(80)		
L_1M_1	824.9(19)			
L_1M_2 ($L\beta_4$)	861.4(14)	866.4(27)	$L_1M_{2,3}$	1
L_1M_3 ($L\beta_3$)	867.4(15)	866.4(27)	$L_1M_{2,3}$	1
L_1M_4 ($L\beta_{10}$)	924.27(90)			
L_1M_5 ($L\beta_9$)	925.07(92)			
L_1N_1	931.97(59)			
L_1 edge	940.18(51)			
L_1 edge (c)		925.26(59)		
L_2M_1 ($L\eta$)	694.9(17)	693.8(17)		1
L_2M_2	731.5(12)			
L_2M_3 ($L\beta_{17}$)	737.4(13)			
L_2M_4 ($L\beta_1$)	794.27(72)	791.41(60)		1
L_2M_5	795.08(74)			
L_2N_1 ($L\gamma_5$)	801.98(42)			
L_2 edge	810.18(34)	793.84(38)		1
L_2 edge (c)		793.38(71)		
L_3M_1 (Ll)	679.3(12)	677.80(44)		1
L_3M_2 (Lt)	715.9(12)			
L_3M_3 (Ls)	721.9(13)			
L_3M_4 ($L\alpha_2$)	778.71(69)	776.25(43)	$L_3M_{4,5}$	1
L_3M_5 ($L\alpha_1$)	779.52(71)	776.25(43)	$L_3M_{4,5}$	1
L_3N_1 ($L\beta_6$)	786.42(39)			
L_3 edge	794.62(31)	779.03(36)		1
L_3 edge (c)		778.36(21)		
28	**Nickel**		**Ni**	
KL_1	7323.29(65)			
KL_2 ($K\alpha_2$)	7459.96(47)	7461.0343(45)		7
KL_3 ($K\alpha_1$)	7477.72(44)	7478.2521(45)		7
KM_1	8222.2(14)			
KM_2 ($K\beta_3$)	8262.4(11)	8264.775(17)	$KM_{2,3}$	7
KM_3 ($K\beta_1$)	8267.6(11)	8264.775(17)	$KM_{2,3}$	7
KM_4 ($K\beta_5^{\mathrm{II}}$)	8330.91(54)	8328.68(33)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{\mathrm{I}}$)	8331.59(56)	8328.68(33)	$KM_{4,5}$	1
KN_1	8338.94(22)			
K edge	8347.42(14)	8331.486(20)		13
K edge (c)		8331.0(14)		
L_1M_1	898.9(19)			
L_1M_2 ($L\beta_4$)	939.1(15)	940.7(11)	$L_1M_{2,3}$	1
L_1M_3 ($L\beta_3$)	944.3(16)	940.7(11)	$L_1M_{2,3}$	1
L_1M_4 ($L\beta_{10}$)	1007.62(95)			
L_1M_5 ($L\beta_9$)	1008.30(97)			
L_1N_1	1015.65(63)			
L_1 edge	1024.13(55)			
L_1 edge (c)		1008.4(11)		
L_2M_1 ($L\eta$)	762.2(17)	762.0(21)		1
L_2M_2	802.4(13)			
L_2M_3 ($L\beta_{17}$)	807.6(13)			
L_2M_4 ($L\beta_1$)	870.95(74)	868.77(54)		1
L_2M_5	871.63(76)			
L_2N_1 ($L\gamma_5$)	878.98(42)			
L_2 edge	887.46(34)	870.54(45)		1
L_2 edge (c)		870.0(14)		
L_3M_1 (Ll)	744.5(12)	742.72(59)		1
L_3M_2 (Lt)	784.7(12)			
L_3M_3 (Ls)	789.9(13)			
L_3M_4 ($L\alpha_2$)	853.19(71)	851.47(26)	$L_3M_{4,5}$	1
L_3M_5 ($L\alpha_1$)	853.87(72)	851.47(26)	$L_3M_{4,5}$	1
L_3N_1 ($L\beta_6$)	861.23(39)			
L_3 edge	869.70(31)	853.58(43)		1
L_3 edge (c)		852.74(34)		
29	**Copper**		**Cu**	
KL_1	7884.83(68)			
KL_2 ($K\alpha_2$)	8028.38(48)	8027.8416(26)		7
KL_3 ($K\alpha_1$)	8048.11(45)	8047.8227(26)		7
KM_1	8859.8(14)			
KM_2 ($K\beta_3$)	8904.0(11)	8905.413(38)	$KM_{2,3}$	7
KM_3 ($K\beta_1$)	8906.9(12)	8905.413(38)	$KM_{2,3}$	7
KM_4 ($K\beta_5^{\mathrm{II}}$)	8977.49(56)	8977.14(29)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{\mathrm{I}}$)	8977.82(58)	8977.14(29)	$KM_{4,5}$	1
KN_1	8980.22(23)			
K edge	8987.96(15)	8980.476(20)		13
K edge (c)		8980.5(10)		
K edge (v)		8987.89(50)		17
L_1M_1	975.0(18)			
L_1M_2 ($L\beta_4$)	1019.1(15)	1022.8(10)	$L_1M_{2,3}$	1
L_1M_3 ($L\beta_3$)	1022.0(16)	1022.8(10)	$L_1M_{2,3}$	1
L_1M_4 ($L\beta_{10}$)	1092.7(10)			
L_1M_5 ($L\beta_9$)	1093.0(10)			
L_1N_1	1095.39(67)			
L_1 edge	1103.12(59)			
L_1 edge (c)		1098.0(15)		
L_2M_1 ($L\eta$)	831.4(16)	832.1(17)		1
L_2M_2	875.6(13)			
L_2M_3 ($L\beta_{17}$)	878.5(14)			

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
L_2M_4 ($L\beta_1$)	949.11(76)	949.84(32)		1
L_2M_5	949.44(77)			
L_2N_1 ($L\gamma_5$)	951.84(43)			
L_2 edge	959.58(34)	952.68(11)		1
L_2 edge (c)		952.2(10)		
L_2 edge (v)		959.70(50)		20
L_3M_1 (Ll)	811.7(13)	811.08(71)		1
L_3M_2 (Lt)	855.8(13)			
L_3M_3 (Ls)	858.8(13)			
L_3M_4 ($L\alpha_2$)	929.38(72)	929.68(31)	$L_3M_{4,5}$	1
L_3M_5 ($L\alpha_1$)	929.71(74)	929.68(31)	$L_3M_{4,5}$	1
L_3N_1 ($L\beta_6$)	932.11(39)			
L_3 edge	939.85(31)	933.04(10)		1
L_3 edge (c)		932.68(45)		
L_3 edge (v)		939.50(50)		20
30	**Zinc**		**Zn**	
KL_1	8465.23(68)			
KL_2 ($K\alpha_2$)	8616.22(50)	8615.823(73)		1,6
KL_3 ($K\alpha_1$)	8639.10(45)	8638.906(73)		1,6
KM_1	9522.7(14)			
KM_2 ($K\beta_3$)	9570.8(12)	9572.03(22)	$KM_{2,3}$	1
KM_3 ($K\beta_1$)	9573.6(12)	9572.03(22)	$KM_{2,3}$	1
KM_4 ($K\beta_5^{II}$)	9650.97(59)	9649.9(11)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	9651.31(59)	9649.9(11)	$KM_{4,5}$	1
KN_1	9659.54(23)			
KN_2 ($K\beta_2^{II}$)		9658.05(22)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)		9658.05(22)	$KN_{2,3}$	1
K edge	9668.55(15)	9660.755(30)		13
K edge (c)		9660.7(12)		
L_1M_1	1057.5(19)			
L_1M_2 ($L\beta_4$)	1105.6(17)	1107.0(10)	$L_1M_{2,3}$	1
L_1M_3 ($L\beta_3$)	1108.4(16)	1107.0(10)	$L_1M_{2,3}$	1
L_1M_4 ($L\beta_{10}$)	1185.7(10)			
L_1M_5 ($L\beta_9$)	1186.1(10)			
L_1N_1	1194.31(66)			
L_1 edge	1203.31(58)	949.3(11)‡		1
L_1 edge (c)		1196.7(14)		
L_2M_1 ($L\eta$)	906.5(17)	906.3(20)		1
L_2M_2	954.6(14)			
L_2M_3 ($L\beta_{17}$)	957.4(14)			
L_2M_4 ($L\beta_1$)	1034.76(80)	1034.65(38)		1
L_2M_5	1035.10(80)			
L_2N_1 ($L\gamma_5$)	1043.33(45)			
L_2 edge	1052.33(36)	1045.21(13)		1
L_2 edge (c)		1044.94(58)		
L_3M_1 (Ll)	883.6(14)	884.3(19)		1
L_3M_2 (Lt)	931.7(14)			
L_3M_3 (Ls)	934.5(13)			
L_3M_4 ($L\alpha_2$)	1011.87(75)	1011.77(37)	$L_3M_{4,5}$	1
L_3M_5 ($L\alpha_1$)	1012.21(75)	1011.77(37)	$L_3M_{4,5}$	1
L_3N_1 ($N\beta_6$)	1020.44(40)			
L_3 edge	1029.45(31)	1022.03(12)		1
L_3 edge (c)		1021.8(12)		
31	**Gallium**		**Ga**	
KL_1	9067.89(75)			
KL_2 ($K\alpha_2$)	9225.10(49)	9224.835(27)		3
KL_3 ($K\alpha_1$)	9251.89(45)	9251.674(66)		3
KM_1	10210.4(13)			
KM_2 ($K\beta_3$)	10261.8(11)	10260.28(64)		1,3
KM_3 ($K\beta_1$)	10265.8(12)	10264.19(29)		1,3
KM_4 ($K\beta_5^{II}$)	10349.92(60)	10348.2(26)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	10350.49(61)	10348.2(26)	$KM_{4,5}$	1
KN_1	10365.69(34)			
KN_2 ($K\beta_2^{II}$)	10370.50(21)	10366.42(26)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)		10366.42(26)	$KN_{2,3}$	1
K edge	10377.76(16)	10368.1(13)		1
K edge (c)		10368.31(44)		
L_1M_1	1142.5(18)			
L_1M_2 ($L\beta_4$)	1193.9(16)	1196.9(14)†	$L_1M_{2,3}$	1
L_1M_3 ($L\beta_3$)	1197.9(17)	1196.9(14)†	$L_1M_{2,3}$	1
L_1M_4 ($L\beta_{10}$)	1282.0(11)			
L_1M_5 ($L\beta_9$)	1282.6(11)			
L_1N_1	1297.80(83)			
L_1N_2 ($L\gamma_2$)	1302.61(70)			
L_1 edge	1309.87(65)	1302.7(10)		1
L_1 edge (c)		1302.6(15)		
L_2M_1 ($L\eta$)	985.3(16)	984.22(23)		1
L_2M_2	1036.7(13)			
L_2M_3 ($L\beta_{17}$)	1040.7(14)			
L_2M_4 ($L\beta_1$)	1124.82(79)	1124.76(30)		1
L_2M_5	1125.39(80)			
L_2N_1 ($L\gamma_5$)	1140.59(54)			
L_2N_2	1145.40(40)			
L_2 edge	1152.66(35)	1145.02(78)		1
L_2 edge (c)		1143.62(31)		
L_3M_1 (Ll)	958.5(13)	957.17(22)		1
L_3M_2 (Lt)	1009.9(13)			
L_3M_3 (Ls)	1013.9(13)			
L_3M_4 ($L\alpha_2$)	1098.03(75)	1097.97(14)	$L_3M_{4,5}$	1
L_3M_5 ($L\alpha_1$)	1098.59(76)	1097.97(14)	$L_3M_{4,5}$	1
L_3N_1 ($N\beta_6$)	1113.79(49)			
L_3N_2	1118.61(36)			
L_3 edge	1125.86(31)	1116.96(15)		1
L_3 edge (c)		1116.57(30)		
32	**Germanium**		**Ge**	
KL_1	9692.08(84)			
KL_2 ($K\alpha_2$)	9855.67(51)	9855.42(10)		1
KL_3 ($K\alpha_1$)	9886.67(46)	9886.52(11)		1
KM_1	10924.0(13)			
KM_2 ($K\beta_3$)	10979.4(13)	10978.1(13)		1
KM_3 ($K\beta_1$)	10984.0(13)	10982.19(29)		1
KM_4 ($K\beta_5^{II}$)	11074.59(63)	11074.8(15)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	11075.33(63)	11074.8(15)	$KM_{4,5}$	1
KN_1	11098.72(52)			

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Experiment Blend	Ref.
KN_2 ($K\beta_2^{II}$)	11105.84(37)	11100.97(29)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)		11100.97(29)	$KN_{2,3}$	1
K edge	11113.82(16)	11103.76(74)		1
K edge (c)		11103.63(55)		
L_1M_1	1231.9(19)			
L_1M_2 ($L\beta_4$)	1287.3(19)	1286.12(39)		1
L_1M_3 ($L\beta_3$)	1292.0(18)	1294.04(40)		1
L_1M_4 ($L\beta_{10}$)	1382.5(12)			
L_1M_5 ($L\beta_9$)	1383.2(12)			
L_1N_1	1406.6(11)			
L_1N_2 ($L\gamma_2$)	1413.76(93)			
L_1 edge	1421.74(73)	1413.23(24)		1
L_1 edge (c)		1412.9(19)		
L_2M_1 ($L\eta$)	1068.3(15)	1067.98(27)		1
L_2M_2	1123.7(15)			
L_2M_3 ($L\beta_{17}$)	1128.4(15)			
L_2M_4 ($L\beta_1$)	1218.91(82)	1218.50(18)		1
L_2M_5	1219.65(83)			
L_2N_1 ($L\gamma_5$)	1243.05(72)			
L_2N_2	1250.17(56)			
L_2 edge	1258.15(35)	1249.32(19)		1
L_2 edge (c)		1248.08(34)		
L_3M_1 (Ll)	1037.3(14)	1036.21(51)		1
L_3M_2 (Lt)	1092.7(14)			
L_3M_3 (Ls)	1097.4(14)			
L_3M_4 ($L\alpha_2$)	1187.91(78)	1188.01(13)	$L_3M_{4,5}$	1
L_3M_5 ($L\alpha_1$)	1188.66(78)	1188.01(13)	$L_3M_{4,5}$	1
L_3N_1 ($L\beta_6$)	1212.05(67)			
L_3N_2	1219.17(51)			
L_3 edge	1227.15(31)	1217.06(18)		1
L_3 edge (c)		1217.33(55)		
33	**Arsenic**		**As**	
KL_1	10336.70(82)			
KL_2 ($K\alpha_2$)	10507.84(51)	10507.50(15)		3
KL_3 ($K\alpha_1$)	10543.48(47)	10543.2674(81)		3
KM_1	11663.0(13)			
KM_2 ($K\beta_3$)	11721.6(12)	11719.86(84)		1,3
KM_3 ($K\beta_1$)	11727.1(12)	11725.73(37)		1,3
KM_4 ($K\beta_5^{II}$)	11825.05(64)	11821.4(17)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	11825.89(65)	11821.4(17)	$KM_{4,5}$	1
KN_1	11858.67(77)			
KN_2 ($K\beta_2^{II}$)	11867.94(64)	11864.34(50)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	11866.38(23)	11864.34(50)	$KN_{2,3}$	1
K edge	11876.74(18)	11864.3(17)		1
K edge (c)		11867.15(85)		
L_1M_1	1326.3(18)			
L_1M_2 ($L\beta_4$)	1384.9(17)	1388.54(23)	$L_1M_{2,3}$	1
L_1M_3 ($L\beta_3$)	1390.4(17)	1388.54(23)	$L_1M_{2,3}$	1
L_1M_4 ($L\beta_{10}$)	1488.3(12)			
L_1M_5 ($L\beta_9$)	1489.2(12)			
L_1N_1	1522.0(13)			
L_1N_2 ($L\gamma_2$)	1531.2(12)			
L_1N_3 ($L\gamma_3$)	1529.68(76)			
L_1 edge	1540.04(70)	1529.32(28)		1
L_1 edge (c)		1532.2(25)		
L_2M_1 ($L\eta$)	1155.2(15)	1155.04(16)		1
L_2M_2	1213.8(14)			
L_2M_3 ($L\beta_{17}$)	1219.3(14)			
L_2M_4 ($L\beta_1$)	1317.21(82)	1316.99(17)		1
L_2M_5	1318.06(82)			
L_2N_1 ($L\gamma_5$)	1350.84(95)			
L_2N_2	1360.10(82)			
L_2N_3	1358.54(41)			
L_2 edge	1368.90(35)	1358.71(22)		1
L_2 edge (c)		1359.74(26)		
L_3M_1 (Ll)	1119.5(13)	1119.78(15)		1
L_3M_2 (Lt)	1178.1(13)			
L_3M_3 (Ls)	1183.7(13)			
L_3M_4 ($L\alpha_2$)	1281.56(79)	1282.01(16)	$L_3M_{4,5}$	1
L_3M_5 ($L\alpha_1$)	1282.41(79)	1282.01(16)	$L_3M_{4,5}$	1
L_3N_1 ($L\beta_6$)	1315.19(91)			
L_3N_2	1324.46(78)			
L_3N_3	1322.90(37)			
L_3 edge	1333.26(31)	1323.61(21)		1
L_3 edge (c)		1323.92(41)		
34	**Selenium**		**Se**	
KL_1	11003.49(84)			
KL_2 ($K\alpha_2$)	11181.82(52)	11181.53(31)		3
KL_3 ($K\alpha_1$)	11222.55(48)	11222.52(12)		3
KM_1	12427.9(13)			
KM_2 ($K\beta_2$)	12490.3(12)	12489.7(10)		1,3
KM_3 ($K\beta_1$)	12496.5(12)	12496.03(67)		1,3
KM_4 ($K\beta_5^{II}$)	12601.47(68)	12596.0(19)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	12602.42(67)	12596.0(19)	$KM_{4,5}$	1
KN_1	12645.7(11)			
KN_2 ($K\beta_2^{II}$)	12656.38(73)	12652.29(96)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	12655.11(33)	12652.29(96)	$KN_{2,3}$	1
K edge	12666.72(19)	12654.61(19)		1
K edge (c)		12656.72(54)		
L_1M_1	1424.4(18)			
L_1M_2 ($L\beta_4$)	1486.8(18)	1490.0(24)†	$L_1M_{2,3}$	1
L_1M_3 ($L\beta_3$)	1493.0(18)	1490.0(24)†	$L_1M_{2,3}$	1
L_1M_4 ($L\beta_{10}$)	1598.0(12)			
L_1M_5 ($L\beta_9$)	1598.9(12)			
L_1N_1	1642.2(16)			
L_1N_2 ($L\gamma_2$)	1652.9(13)			
L_1N_3 ($L\gamma_3$)	1651.62(88)			
L_1 edge	1663.23(73)	1652.44(33)		1
L_1 edge (c)		1653.6(29)		
L_2M_1 ($L\eta$)	1246.0(15)	1244.55(18)		1
L_2M_2	1308.4(14)			
L_2M_3 ($L\beta_{17}$)	1314.7(14)			
L_2M_4 ($L\beta_1$)	1419.65(84)	1419.24(12)		1
L_2M_5	1420.60(84)			

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
L_2N_1 ($L\gamma_5$)	1463.9(13)			
L_2N_2	1474.55(89)			
L_2N_3	1473.29(50)			
L_2 edge	1484.90(35)	1474.72(26)		1
L_2 edge (c)		1474.2(10)		
L_3M_1 (Ll)	1205.3(13)	1204.41(17)		1
L_3M_2 (Lt)	1267.7(13)			
L_3M_3 (Ls)	1273.9(13)			
L_3M_4 ($L\alpha_2$)	1378.92(80)	1379.11(11)	$L_3M_{4,5}$	1
L_3M_5 ($L\alpha_1$)	1379.88(80)	1379.11(11)	$L_3M_{4,5}$	1
L_3N_1 ($L\beta_6$)	1423.1(12)			
L_3N_2	1433.83(86)			
L_3N_3	1432.57(46)			
L_3 edge	1444.18(31)	1433.98(25)		1
L_3 edge (c)		1434.24(13)		
35	**Bromine**		**Br**	
KL_1	11692.04(88)			
KL_2 ($K\alpha_2$)	11877.69(53)	11877.75(34)		1
KL_3 ($K\alpha_1$)	11924.02(48)	11924.36(34)		1
KM_1	13218.6(13)			
KM_2 ($K\beta_3$)	13284.8(12)	13284.7(11)		1
KM_3 ($K\beta_1$)	13292.1(12)	13291.56(42)		1
KM_4 ($K\beta_5^{II}$)	13403.97(70)	13396.3(21)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	13405.04(70)	13396.3(21)	$KM_{4,5}$	1
KN_1	13459.8(15)			
KN_2 ($K\beta_2^{II}$)	13471.50(71)	13469.60(43)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	13470.84(41)	13469.60(43)	$KN_{2,3}$	1
K edge	13483.86(19)	13470.5(22)		1
K edge (c)		13474.10(65)		
L_1M_1	1526.5(18)			
L_1M_2 ($L\beta_4$)	1592.8(18)	1596.3(27)†	$L_1M_{2,3}$	1
L_1M_3 ($L\beta_3$)	1600.0(18)	1596.3(27)†	$L_1M_{2,3}$	1
L_1M_4 ($L\beta_{10}$)	1711.9(13)			
L_1M_5 ($L\beta_9$)	1713.0(13)			
L_1N_1	1767.8(21)			
L_1N_2 ($L\gamma_2$)	1779.5(13)			
L_1N_3 ($L\gamma_3$)	1778.79(97)			
L_1 edge	1791.81(76)	1781.6(19)		1
L_1 edge (c)		1781.8(35)		
L_2M_1 ($L\eta$)	1340.9(14)	1339.63(21)		1
L_2M_2	1407.2(14)			
L_2M_3 ($L\beta_{17}$)	1414.4(14)			
L_2M_4 ($L\beta_1$)	1526.28(86)	1525.92(14)		1
L_2M_5	1527.35(85)			
L_2N_1 ($L\gamma_5$)	1582.1(17)			
L_2N_2	1593.81(87)			
L_2N_3	1593.15(56)			
L_2 edge	1606.17(35)	1599.2(5)		1
L_2 edge (c)		1596.31(71)		
L_3M_1 (Ll)	1294.5(14)	1293.50(20)		1
L_3M_2 (Lt)	1360.8(14)			
L_3M_3 (Ls)	1368.1(13)			
L_3M_4 ($L\alpha_2$)	1479.95(82)	1480.46(13)	$L_3M_{4,5}$	1
L_3M_5 ($L\alpha_1$)	1481.02(81)	1480.46(13)	$L_3M_{4,5}$	1
L_3N_1 ($L\beta_6$)	1535.8(6)			
L_3N_2	1547.49(83)			
L_3N_3	1546.82(52)			
L_3 edge	1559.84(31)	1552.9(14)		1
L_3 edge (c)		1549.98(58)		
36	**Krypton**		**Kr**	
KL_1	12402.57(92)			
KL_2 ($K\alpha_2$)	12595.58(54)	12595.424(56)		3
KL_3 ($K\alpha_1$)	12648.00(49)	12648.002(52)		3
KM_1	14034.9(12)			
KM_2 ($K\beta_3$)	14105.7(13)	14104.96(11)		3
KM_3 ($K\beta_1$)	14113.3(12)	14112.815(80)		3
KM_4 ($K\beta_5^{II}$)	14232.63(72)	14237.7(48)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	14233.88(72)	14237.7(48)	$KM_{4,5}$	1
KN_1	14301.2(20)			
KN_2 ($K\beta_2^{II}$)	14313.43(59)	14315.0(24)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	14314.10(58)	14315.0(24)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)		14328.2(49)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{II}$)		14328.2(49)	$KN_{4,5}$	1
K edge	14328.06(20)	14324.61(24)		1
K edge (c)		14327.19(13)		1
L_1M_1	1632.4(18)			
L_1M_2 ($L\beta_4$)	1703.1(19)	1697.5(17)		1
L_1M_3 ($L\beta_3$)	1710.7(18)	1706.8(17)		1
L_1M_4 ($L\beta_{10}$)	1830.1(13)			
L_1M_5 ($L\beta_9$)	1831.3(13)			
L_1N_1	1898.7(25)			
L_1N_2 ($L\gamma_2$)	1910.9(12)			
L_1N_3 ($L\gamma_3$)	1911.5(12)			
L_1 edge	1925.49(79)	1916.3(44)		1
L_1 edge (c)		1920.4(12)		
L_2M_1 ($L\gamma$)	1439.4(14)			
L_2M_2	1510.1(14)			
L_2M_3 ($L\beta_{17}$)	1517.7(14)			
L_2M_4 ($L\beta_1$)	1637.05(87)	1636.876(21)		3
L_2M_5	1638.30(87)			
L_2N_1 ($L\gamma_5$)	1705.7(21)	1703.3(17)		1
L_2N_2	1717.86(75)			
L_2N_3	1718.52(73)			
L_2 edge	1732.49(36)	1729.66(36)		1
L_2 edge (c)		1730.90(50)		
L_3M_1 (Ll)	1386.9(14)			
L_3M_2 (Lt)	1457.7(14)			
L_3M_3 (Ls)	1465.3(13)			
L_3M_4 ($L\alpha_2$)	1584.63(83)	1585.411(26)	$L_3M_{4,5}$	3
L_3M_5 ($L\alpha_1$)	1585.88(83)	1585.411(26)	$L_3M_{4,5}$	3
L_3N_1 ($L\beta_6$)	1653.2(21)	1650.9(13)		1
L_3N_2	1665.43(70)			
L_3N_3	1666.09(68)			
L_3 edge	1680.06(31)	1677.25(34)		1
L_3 edge (c)		1679.07(39)		

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Experiment Blend	Ref.
37	**Rubidium**		**Rb**	
KL_1	13135.18(93)			
KL_2 ($K\alpha_2$)	13335.75(56)	13335.88(21)		1
KL_3 ($K\alpha_1$)	13395.05(51)	13395.49(19)		1
KM_1	14878.6(12)			
KM_2 ($K\beta_3$)	14952.7(13)	14951.86(80)		1
KM_3 ($K\beta_1$)	14961.6(12)	14961.42(53)		1
KM_4 ($K\beta_5^{II}$)	15088.21(76)	15084.8(27)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	15089.65(75)	15084.8(27)	$KM_{4,5}$	1
KN_1	15166.8(20)			
KN_2 ($K\beta_2^{II}$)	15185.59(61)	15185.54(83)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	15186.55(61)	15185.54(83)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)		15205.1(55)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{II}$)		15205.1(55)	$KN_{4,5}$	1
K edge	15207.74(22)	15202.5(14)		1
K edge (c)		15201.5(20)		
L_1M_1	1743.4(18)			
L_1M_2 ($L\beta_4$)	1817.6(19)	1817.74(12)		1
L_1M_3 ($L\beta_3$)	1826.4(18)	1826.60(12)		1
L_1M_4 ($L\beta_{10}$)	1953.0(14)			
L_1M_5 ($L\beta_9$)	1954.5(13)			
L_1N_1	2031.6(25)			
L_1N_2 ($L\gamma_2$)	2050.4(12)	2050.72(15)	$L_1N_{2,3}$	1
L_1N_3 ($L\gamma_3$)	2051.4(12)	2050.72(15)	$L_1N_{2,3}$	1
L_1 edge	2072.55(81)	2063.6(25)		1
L_1 edge (c)		2066.07(37)		
L_2M_1 ($L\eta$)	1542.9(14)	1541.78(11)		1
L_2M_2	1617.0(14)			
L_2M_3 ($L\beta_{17}$)	1625.9(13)			
L_2M_4 ($L\beta_1$)	1752.46(90)	1752.18(11)		1
L_2M_5	1753.90(88)			
L_2N_1 ($L\gamma_5$)	1831.0(21)	1835.33(12)		1
L_2N_2	1849.84(75)			
L_2N_3	1850.79(74)			
L_2 edge	1871.98(36)	1866.08(42)		1
L_2 edge (c)		1865.9(17)		
L_3M_1 (Ll)	1483.6(14)	1482.40(10)		1
L_3M_2 (Lt)	1557.7(14)			
L_3M_3 (Ls)	1566.6(13)			
L_3M_4 ($L\alpha_2$)	1693.16(85)	1692.57(10)		1
L_3M_5 ($L\alpha_1$)	1694.60(84)	1694.141(69)		1
L_3N_1 ($L\beta_6$)	1771.7(20)	1775.18(11)		1
L_3N_2	1790.54(70)			
L_3N_3	1791.50(70)			
L_3 edge	1812.69(31)	1806.80(39)		1
L_3 edge (c)		1806.2(18)		
38	**Strontium**		**Sr**	
KL_1	13889.75(96)			
KL_2 ($K\alpha_2$)	14098.01(57)	14098.03(24)		1
KL_3 ($K\alpha_1$)	14164.80(51)	14165.20(24)		1
KM_1	15748.1(12)			
KM_2 ($K\beta_3$)	15826.2(13)	15825.17(90)		1
KM_3 ($K\beta_1$)	15836.3(12)	15835.89(60)		1
KM_4 ($K\beta_5^{II}$)	15970.20(77)	15968.9(30)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	15971.90(76)	15968.9(30)	$KM_{4,5}$	1
KN_1	16068.8(21)			
KN_2 ($K\beta_2^{II}$)	16085.68(68)	16084.68(93)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	16086.84(41)	16084.68(93)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)		16103.9(15)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{II}$)		16103.9(15)	$KN_{4,5}$	1
K edge	16115.26(23)	16107.2(15)		1
K edge (c)		16105.55(81)		
L_1M_1	1858.4(18)			
L_1M_2 ($L\beta_4$)	1936.4(19)	1936.44(13)		1
L_1M_3 ($L\beta_3$)	1946.6(18)	1947.20(14)		1
L_1M_4 ($L\beta_{10}$)	2080.5(14)			
L_1M_5 ($L\beta_9$)	2082.2(14)			
L_1N_1	2179.0(27)			
L_1N_2 ($L\gamma_2$)	2195.9(13)	2196.52(17)	$L_1N_{2,3}$	1
L_1N_3 ($L\gamma_3$)	2197.1(10)	2196.52(17)	$L_1N_{2,3}$	1
L_1 edge	2225.51(83)	2217.1(29)		1
L_1 edge (c)		2216.17(63)		
L_2M_1 ($L\eta$)	1650.1(14)	1649.337(97)		1
L_2M_2	1728.1(14)			
L_2M_3 ($L\beta_{17}$)	1738.3(13)			
L_2M_4 ($L\beta_1$)	1872.19(92)	1871.74(13)		1
L_2M_5	1873.88(89)			
L_2N_1 ($L\gamma_5$)	1970.7(22)	1969.19(14)		1
L_2N_2	1987.67(82)			
L_2N_3	1988.82(55)			
L_2 edge	2017.25(36)	2008.46(48)		1
L_2 edge (c)		2007.44(23)		
L_3M_1 (Ll)	1583.3(14)	1582.174(90)		1
L_3M_2 (Lt)	1661.4(14)			
L_3M_3 (Ls)	1671.5(13)			
L_3M_4 ($L\alpha_2$)	1805.40(86)	1804.77(12)		1
L_3M_5 ($L\alpha_1$)	1807.10(85)	1806.585(78)		1
L_3N_1 ($L\beta_6$)	1904.0(22)	1901.83(13)		1
L_3N_2	1920.88(76)			
L_3N_3	1922.04(50)			
L_3 edge	1950.46(31)	1941.17(45)		1
L_3 edge (c)		1940.48(26)		
39	**Yttrium**		**Y**	
KL_1	14667.13(99)			
KL_2 ($K\alpha_2$)	14883.00(58)	14882.94(26)		1
KL_3 ($K\alpha_1$)	14958.14(53)	14958.54(27)		1
KM_1	16644.7(12)			
KM_2 ($K\beta_3$)	16726.8(13)	16725.9(10)		1
KM_3 ($K\beta_1$)	16738.4(12)	16738.08(67)		1
KM_4 ($K\beta_5^{II}$)	16879.20(81)	16879.8(34)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	16881.39(79)	16879.8(34)	$KM_{4,5}$	1
KN_1	16994.8(23)			
KN_2 ($K\beta_2^{II}$)	17012.08(62)	17015.6(14)	$KN_{2,3}$	1

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
KN_3 ($K\beta_2^{I}$)	17015.30(49)	17015.6(14)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	17040.90(59)	17036.2(17)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{II}$)		17036.2(17)	$KN_{4,5}$	1
K edge	17047.90(24)	17036.612(50)		13
K edge (c)		17036.64(55)		
L_1M_1	1977.5(18)			
L_1M_2 ($L\beta_4$)	2059.6(19)	2059.99(15)		1
L_1M_3 ($L\beta_3$)	2071.3(18)	2072.17(15)		1
L_1M_4 ($L\beta_{10}$)	2212.1(14)			
L_1M_5 ($L\beta_9$)	2214.3(14)			
L_1N_1	2327.7(29)			
L_1N_2 ($L\gamma_2$)	2345.0(12)	2346.82(20)	$L_1N_{2,3}$	1
L_1N_3 ($L\gamma_3$)	2348.2(11)	2346.82(20)	$L_1N_{2,3}$	1
L_1N_4	2373.8(12)			
L_1 edge	2380.76(85)	2376.5(34)		1
L_1 edge (c)		2370.78(24)		
L_2M_1 ($L\eta$)	1761.7(13)	1760.96(11)		1
L_2M_2	1843.8(14)			
L_2M_3 ($L\beta_{17}$)	1855.4(13)			
L_2M_4 ($L\beta_1$)	1996.20(93)	1995.85(14)		1
L_2M_5	1998.39(91)			
L_2N_1 ($L\gamma_5$)	2111.8(24)	2110.19(16)		1
L_2N_2	2129.08(74)			
L_2N_3	2132.30(61)			
L_2N_4 ($L\gamma_1$)	2157.90(71)			
L_2 edge	2164.89(36)	2153.97(55)		1
L_2 edge (c)		2153.47(31)		
L_3M_1 (Ll)	1686.5(14)	1685.39(10)		1
L_3M_2 (Lt)	1768.6(14)			
L_3M_3 (Ls)	1780.3(13)			
L_3M_4 ($L\alpha_2$)	1921.07(88)	1920.48(13)		1
L_3M_5 ($L\alpha_1$)	1923.26(86)	1922.564(88)		1
L_3N_1 ($L\beta_6$)	2036.7(24)	2034.43(15)		1
L_3N_2	2053.95(69)			
L_3N_3	2057.16(56)			
L_3N_4 ($L\beta_{15}$)	2082.77(66)			
L_3 edge	2089.76(31)	2079.54(52)		1
L_3 edge (c)		2078.26(54)		
40	**Zirconium**		**Zr**	
KL_1	15467.0(10)			
KL_2 ($K\alpha_2$)	15690.61(60)	15690.645(50)		3
KL_3 ($K\alpha_1$)	15774.87(54)	15774.914(54)		3
KM_1	17568.0(12)			
KM_2 ($K\beta_3$)	17654.1(13)	17652.628(75)		3
KM_3 ($K\beta_1$)	17667.4(12)	17666.578(76)		3
KM_4 ($K\beta_5^{II}$)	17815.21(83)	17816.1(38)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	17817.98(81)	17816.1(38)	$KM_{4,5}$	1
KN_1	17948.5(25)			
KN_2 ($K\beta_2^{II}$)	17966.67(73)	17970.3(15)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	17971.47(56)	17970.3(15)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	18000.09(75)	17994.3(19)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)		17994.3(19)	$KN_{4,5}$	1
K edge	18008.15(26)	17995.872(80)		13
K edge (c)		17996.22(79)		
L_1M_1	2101.0(18)			
L_1M_2 ($L\beta_4$)	2187.1(19)	2187.714(36)		3
L_1M_3 ($L\beta_3$)	2200.4(18)	2201.063(32)		3
L_1M_4 ($L\beta_{10}$)	2348.2(14)			
L_1M_5 ($L\beta_9$)	2350.9(14)			
L_1N_1	2481.5(31)			
L_1N_2 ($L\gamma_2$)	2499.6(13)	2502.87(22)	$L_1N_{2,3}$	1
L_1N_3 ($L\gamma_3$)	2504.4(12)	2502.87(22)	$L_1N_{2,3}$	1
L_1N_4	2533.0(14)			
L_1 edge	2541.10(87)	2541.1(39)		1
L_1 edge (c)		2530.90(21)		
L_2M_1 ($L\eta$)	1877.4(13)	1876.56(13)		1
L_2M_2	1963.5(14)			
L_2M_3 ($L\beta_{17}$)	1976.8(13)			
L_2M_4 ($L\beta_1$)	2124.59(94)	2124.394(28)		3
L_2M_5	2127.36(93)			
L_2N_1 ($L\gamma_5$)	2257.9(26)	2255.17(18)		1
L_2N_2	2276.06(83)			
L_2N_3	2280.86(66)			
L_2N_4 ($L\gamma_1$)	2309.48(86)	2302.66(19)		1
L_2 edge	2317.53(36)	2305.36(63)		1
L_2 edge (c)		2305.68(64)		
L_3M_1 (Ll)	1793.2(14)	1792.111(23)		3
L_3M_2 (Lt)	1879.2(14)			
L_3M_3 (Ls)	1892.6(13)			
L_3M_4 ($L\alpha_2$)	2040.34(89)	2040.19(16)		3
L_3M_5 ($L\alpha_1$)	2043.11(87)	2042.489(27)		3
L_3N_1 ($L\beta_6$)	2173.7(25)	2171.28(17)		1
L_3N_2	2191.80(78)			
L_3N_3	2196.60(62)			
L_3N_4 ($L\beta_{15}$)	2225.22(81)	2219.40(18)	$L_3N_{4,5}$	1
L_3N_5 ($L\beta_2$)		2219.40(18)	$L_3N_{4,5}$	1
L_3 edge	2233.28(32)	2222.30(59)		1
L_3 edge (c)		2221.29(59)		
41	**Niobium**		**Nb**	
KL_1	16290.1(10)			
KL_2 ($K\alpha_2$)	16521.35(62)	16521.28(33)		1
KL_3 ($K\alpha_1$)	16615.65(56)	16615.16(33)		1
KM_1	18518.9(12)			
KM_2 ($K\beta_3$)	18608.8(14)	18606.5(12)		1
KM_3 ($K\beta_1$)	18624.0(12)	18622.68(83)		1
KM_4 ($K\beta_5^{II}$)	18778.45(87)			
KM_5 ($K\beta_5^{I}$)	18782.22(85)			
KN_1	18930.5(26)			
KN_2 ($K\beta_2^{II}$)	18948.34(90)	18952.9(17)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	18955.56(63)	18952.9(17)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	18985.99(83)	18981.3(22)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)		18981.3(22)	$KN_{4,5}$	1
K edge	18990.67(27)	18982.961(40)		13
K edge (c)		18983.61(85)		

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
L_1M_1	2228.7(18)			
L_1M_2 ($L\beta_4$)	2318.7(20)	2319.38(19)		1
L_1M_3 ($L\beta_3$)	2333.9(18)	2334.80(20)		1
L_1M_4 ($L\beta_{10}$)	2488.3(15)			
L_1M_5 ($L\beta_9$)	2492.1(15)			
L_1N_1	2640.4(33)			
L_1N_2 ($L\gamma_2$)	2658.2(15)	2663.88(17)	$L_1N_{2,3}$	1
L_1N_3 ($L\gamma_3$)	2665.4(13)	2663.88(17)	$L_1N_{2,3}$	1
L_1N_4	2695.8(14)			
L_1 edge	2700.53(88)	2710.0(44)		1
L_1 edge (c)		2695.46(25)		
L_2M_1 ($L\eta$)	1997.5(13)	1996.21(14)		1
L_2M_2	2087.5(15)			
L_2M_3 ($L\beta_{17}$)	2102.7(13)			
L_2M_4 ($L\beta_1$)	2257.11(96)	2257.38(18)		1
L_2M_5	2260.88(94)			
L_2N_1 ($L\gamma_5$)	2409.2(28)	2406.63(21)		1
L_2N_2	2426.99(98)			
L_2N_3	2434.21(72)			
L_2N_4 ($L\gamma_1$)	2464.64(91)	2461.87(22)		1
L_2 edge	2469.32(35)	2464.37(72)		1
L_2 edge (c)		2462.54(31)		
L_3M_1 (Ll)	1903.2(14)	1902.27(13)		1
L_3M_2 (Lt)	1993.2(14)			
L_3M_3 (Ls)	2008.4(13)			
L_3M_4 ($L\alpha_2$)	2162.80(90)	2163.02(17)		1
L_3M_5 ($L\alpha_1$)	2166.57(88)	2165.89(11)		1
L_3N_1 ($L\beta_6$)	2314.8(27)	2312.54(19)		1
L_3N_2	2332.68(93)			
L_3N_3	2339.90(66)			
L_3N_4 ($L\beta_{15}$)	2370.34(86)	2367.02(20)	$L_3N_{4,5}$	1
L_3N_5 ($L\beta_2$)		2367.02(20)	$L_3N_{4,5}$	1
L_3 edge	2375.01(30)	2370.60(67)		1
L_3 edge (c)		2368.24(44)		
42	**Molybdenum**		**Mo**	
KL_1	17135.0(11)			
KL_2 ($K\alpha_2$)	17374.18(62)	17374.29(29)		5
KL_3 ($K\alpha_1$)	17479.10(55)	17479.372(10)		5
KM_1	19495.8(12)			
KM_2 ($K\beta_3$)	19589.9(14)	19590.25(41)		1,5
KM_3 ($K\beta_1$)	19607.1(12)	19608.34(42)		1,5
KM_4 ($K\beta_5^{II}$)	19768.70(89)	19771.4(23)		1
KM_5 ($K\beta_5^{I}$)	19772.81(85)	19776.4(23)		1
KN_1	19940.3(28)			
KN_2 ($K\beta_2^{II}$)	19960.0(11)	19965.27(95)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	19967.16(68)	19965.27(95)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	20000.73(83)	19996.8(43)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)	19999.84(35)	19996.8(43)	$KN_{4,5}$	1
K edge	20008.81(28)	20000.351(20)		13
K edge (c)		20000.5(21)		
L_1M_1	2360.9(18)			
L_1M_2 ($L\beta_4$)	2454.9(20)	2455.68(22)		1
L_1M_3 ($L\beta_3$)	2472.1(18)	2473.07(22)		1
L_1M_4 ($L\beta_{10}$)	2633.7(15)			
L_1M_5 ($L\beta_9$)	2637.8(15)			
L_1N_1	2805.3(34)			
L_1N_2 ($L\gamma_2$)	2825.1(17)	2830.65(19)	$L_1N_{2,3}$	1
L_1N_3 ($L\gamma_3$)	2832.2(13)	2830.65(19)	$L_1N_{2,3}$	1
L_1N_4	2865.8(14)			
L_1N_5	2864.87(96)			
L_1 edge	2873.84(88)	2880.6(50)		1
L_1 edge (c)		2867.20(26)		
L_2M_1 ($L\eta$)	2121.7(13)	2120.26(16)		1
L_2M_2	2215.7(15)			
L_2M_3 ($L\beta_{17}$)	2232.9(13)			
L_2M_4 ($L\beta_1$)	2394.52(97)	2394.831(55)		1
L_2M_5	2398.63(95)			
L_2N_1 ($L\gamma_5$)	2566.1(29)	2563.26(16)		1
L_2N_2	2585.9(12)			
L_2N_3	2592.98(78)			
L_2N_4 ($L\gamma_1$)	2626.55(92)	2623.52(16)		1
L_2N_5	2625.66(44)			
L_2 edge	2634.63(36)	2627.30(82)		1
L_2 edge (c)		2625.98(33)		
L_3M_1 (Ll)	2016.7(14)	2015.71(15)		1
L_3M_2 (Lt)	2110.8(14)			
L_3M_3 (Ls)	2128.0(12)			
L_3M_4 ($L\alpha_2$)	2289.60(92)	2289.875(50)		1
L_3M_5 ($L\alpha_1$)	2293.71(89)	2293.187(50)		1
L_3N_1 ($L\beta_6$)	2461.2(29)	2455.68(36)		1
L_3N_2	2480.9(11)			
L_3N_3	2488.06(72)			
L_3N_4 ($L\beta_{15}$)	2521.63(86)	2518.33(15)	$L_3N_{4,5}$	1
L_3N_5 ($L\beta_2$)	2520.74(38)	2518.33(15)	$L_3N_{4,5}$	1
L_3 edge	2529.71(31)	2523.56(76)		1
L_3 edge (c)		2521.1(16)		
43	**Technetium**		**Tc**	
KL_1	18003.8(11)			
KL_2 ($K\alpha_2$)	18251.28(65)	18250.9(12)†		1
KL_3 ($K\alpha_1$)	18367.56(58)	18367.2(12)†		1
KM_1	20501.2(12)			
KM_2 ($K\beta_3$)	20599.4(14)	20599.2(20)†		1
KM_3 ($K\beta_1$)	20618.7(12)	20619.0(20)†		1
KM_4 ($K\beta_5^{II}$)	20787.80(92)			
KM_5 ($K\beta_5^{I}$)	20792.02(89)			
KN_1	20977.3(30)			
KN_2 ($K\beta_2^{II}$)	20999.2(14)	21005.4(26)†	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	21006.03(79)	21005.4(26)†	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	21042.72(85)			
KN_5 ($K\beta_4^{I}$)	21043.05(75)			
K edge	21050.47(30)	21047.49(53)		1
K edge (c)		21045.67(85)		
L_1M_1	2497.4(18)			
L_1M_2 ($L\beta_4$)	2595.6(20)			

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Experiment Blend	Ref.
L_1M_3 ($L\beta_3$)	2614.9(18)			
L_1M_4 ($L\beta_{10}$)	2784.0(15)			
L_1M_5 ($L\beta_9$)	2788.2(15)			
L_1N_1	2973.4(36)			
L_1N_2 ($L\gamma_2$)	2995.4(20)			
L_1N_3 ($L\gamma_3$)	3002.2(14)			
L_1N_4	3038.9(15)			
L_1N_5	3039.2(14)			
L_1 edge	3046.63(91)	3055.3(56)		1
L_2M_1 ($L\eta$)	2249.9(13)			
L_2M_2	2348.2(15)			
L_2M_3 ($L\beta_{17}$)	2367.5(13)			
L_2M_4 ($L\beta_1$)	2536.52(99)	2536.83(61)†		1
L_2M_5	2540.74(96)			
L_2N_1 ($L\gamma_5$)	2726.0(30)			
L_2N_2	2747.9(15)			
L_2N_3	2754.75(86)			
L_2N_4 ($L\gamma_1$)	2791.44(91)			
L_2N_5	2791.77(81)			
L_2 edge	2799.19(36)	2794.91(93)		1
L_2 edge (c)		2794.43(79)		
L_3M_1 (Ll)	2133.6(14)			
L_3M_2 (Lt)	2231.9(14)			
L_3M_3 (Ls)	2251.2(12)			
L_3M_4 ($L\alpha_2$)	2420.24(93)			
L_3M_5 ($L\alpha_1$)	2424.46(90)	2423.99(21)†		1
L_3N_1 ($L\beta_6$)	2609.7(30)			
L_3N_2	2631.7(14)			
L_3N_3	2638.46(80)			
L_3N_4 ($L\beta_{15}$)	2675.15(86)			
L_3N_5 ($L\beta_2$)	2675.49(76)			
L_3 edge	2682.91(31)	2677.80(86)		1
L_3 edge (c)		2677.90(54)		
44	**Ruthenium**		**Ru**	
KL_1	18895.0(11)			
KL_2 ($K\alpha_2$)	19150.67(66)	19150.49(18)		1,5
KL_3 ($K\alpha_1$)	19279.51(60)	19279.16(18)		1,5
KM_1	21533.3(12)			
KM_2 ($K\beta_3$)	21635.7(14)	21634.65(16)		1,5
KM_3 ($K\beta_1$)	21657.5(12)	21656.75(16)		1,5
KM_4 ($K\beta_5^{II}$)	21833.74(95)	21828.(11)		1
KM_5 ($K\beta_5^{I}$)	21838.57(92)	21833.6(51)		1
KN_1	22046.6(31)			
KN_2 ($K\beta_2^{II}$)	22071.1(17)	22074.3(17)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	22077.45(88)	22074.3(17)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	22117.30(84)	22104.6(52)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)	22117.91(83)	22104.6(52)	$KN_{4,5}$	1
K edge	22127.70(32)	22119.56(58)		1
K edge (c)		22117.91(55)		
L_1M_1	2638.3(18)			
L_1M_2 ($L\beta_4$)	2740.7(20)	2741.15(18)		1
L_1M_3 ($L\beta_3$)	2762.5(18)	2763.39(27)		1
L_1M_4 ($L\beta_{10}$)	2938.7(16)			
L_1M_5 ($L\beta_9$)	2943.6(15)			
L_1N_1	3151.6(37)			
L_1N_2 ($L\gamma_2$)	3176.1(23)	3180.91(24)	$L_1N_{2,3}$	1
L_1N_3 ($L\gamma_3$)	3182.5(15)	3180.91(24)	$L_1N_{2,3}$	1
L_1N_4	3222.3(15)			
L_1N_5	3222.9(14)			
L_1 edge	3232.69(93)	3232.9(62)		1
L_1 edge (c)		3225.1(14)		
L_2M_1 ($L\eta$)	2382.6(13)	2381.99(14)		1
L_2M_2	2485.1(15)			
L_2M_3 ($L\beta_{17}$)	2506.8(13)			
L_2M_4 ($L\beta_1$)	2683.1(10)	2683.263(26)		1
L_2M_5	2687.90(97)			
L_2N_1 ($L\gamma_5$)	2895.9(32)	2891.85(20)		1
L_2N_2	2920.5(18)			
L_2N_3	2926.79(93)			
L_2N_4 ($L\gamma_1$)	2966.64(89)	2964.52(21)		1
L_2N_5	2967.25(88)			
L_2 edge	2977.03(37)	2966.1(11)		1
L_2 edge (c)		2967.45(55)		
L_3M_1 (Ll)	2253.8(14)	2252.79(18)		1
L_3M_2 (Lt)	2356.2(14)			
L_3M_3 (Ls)	2377.9(12)			
L_3M_4 ($L\alpha_2$)	2554.23(94)	2554.330(55)		1
L_3M_5 ($L\alpha_1$)	2559.06(91)	2558.579(39)		1
L_3N_1 ($L\beta_6$)	2767.1(31)	2763.39(27)		1
L_3N_2	2791.6(17)			
L_3N_3	2797.95(87)			
L_3N_4 ($L\beta_{15}$)	2837.79(83)	2835.96(19)	$L_3N_{4,5}$	1
L_3N_5 ($L\beta_2$)	2838.40(82)	2835.96(19)	$L_3N_{4,5}$	1
L_3 edge	2848.19(32)	2837.77(96)		1
L_3 edge (c)		2838.62(21)		
45	**Rhodium**		**Rh**	
KL_1	19809.3(11)			
KL_2 ($K\alpha_2$)	20073.48(67)	20073.67(20)		1,5
KL_3 ($K\alpha_1$)	20215.75(60)	20216.12(20)		1,5
KM_1	22586.0(12)			
KM_2 ($K\beta_3$)	22699.8(14)	22698.83(17)		1,5
KM_3 ($K\beta_1$)	22724.1(12)	22723.59(17)		1,5
KM_4 ($K\beta_5^{II}$)	22907.81(97)	22909.6(56)		1
KM_5 ($K\beta_5^{I}$)	22913.04(94)	22916.8(56)		1
KN_1	23142.4(32)			
KN_2 ($K\beta_2^{II}$)	23169.9(2)	23173.0(13)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	23175.60(96)	23173.0(13)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	23218.69(83)	23217.2(58)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)	23219.47(87)	23217.2(58)	$KN_{4,5}$	1
K edge	23230.23(32)	23221.99(30)		13
K edge (c)		23220.14(44)		
L_1M_1	2776.6(18)			
L_1M_2 ($L\beta_4$)	2890.5(20)	2890.84(20)		1

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Experiment Blend	Ref.
L_1M_3 ($L\beta_3$)	2914.8(18)	2915.72(20)		1
L_1M_4 ($L\beta_{10}$)	3098.5(16)			
L_1M_5 ($L\beta_9$)	3103.7(15)			
L_1N_1	3333.0(38)			
L_1N_2 ($L\gamma_2$)	3360.5(27)	3364.06(27)	$L_1N_{2,3}$	1
L_1N_3 ($L\gamma_3$)	3366.3(16)	3364.06(27)	$L_1N_{2,3}$	1
L_1N_4	3409.4(14)			
L_1N_5	3410.1(15)			
L_1 edge	3420.89(92)	3416.4(70)		1
L_1 edge (c)		3412.4(16)		
L_2M_1 ($L\eta$)	2512.5(12)	2519.10(15)‡		1
L_2M_2	2626.3(15)			
L_2M_3 ($L\beta_{17}$)	2650.6(13)			
L_2M_4 ($L\beta_1$)	2834.3(10)	2834.439(38)		1
L_2M_5	2839.56(98)			
L_2N_1 ($L\gamma_5$)	3068.9(33)	3065.00(22)		1
L_2N_2	3096.4(21)			
L_2N_3	3102.1(10)			
L_2N_4 ($L\gamma_1$)	3145.21(87)	3143.81(24)		1
L_2N_5	3145.99(91)			
L_2 edge	3156.74(37)	3144.76(59)		1
L_2 edge (c)		3146.39(44)		
L_3M_1 (Ll)	2370.2(14)	2376.55(20)‡		1
L_3M_2 (Lt)	2484.1(14)			
L_3M_3 (Ls)	2508.4(12)			
L_3M_4 ($L\alpha_2$)	2692.06(96)	2692.078(78)		1
L_3M_5 ($L\alpha_1$)	2697.29(92)	2696.775(78)		1
L_3N_1 ($L\beta_6$)	2926.6(32)	2922.94(20)		1
L_3N_2	2954.1(21)			
L_3N_3	2959.86(94)			
L_3N_4 ($L\beta_{15}$)	3002.94(82)	3001.27(22)	$L_3N_{4,5}$	1
L_3N_5 ($L\beta_2$)	3003.73(86)	3001.27(22)	$L_3N_{4,5}$	1
L_3 edge	3014.48(31)	3002.07(54)		1
L_3 edge (c)		3004.00(37)		
46	**Palladium**		**Pd**	
KL_1	20747.8(11)			
KL_2 ($K\alpha_2$)	21020.61(70)	21020.15(22)		1,5
KL_3 ($K\alpha_1$)	21177.25(64)	21177.08(17)		1,5
KM_1	23681.7(12)			
KM_2 ($K\beta_3$)	23792.0(13)	23791.12(19)		1,5
KM_3 ($K\beta_1$)	23819.5(12)	23818.69(19)		1,5
KM_4 ($K\beta_5^{II}$)	24011.0(10)	23995.0(62)‡	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	24016.22(99)	23995.0(62)‡	$KM_{4,5}$	1
KN_1	24267.0(36)			
KN_2 ($K\beta_2^{II}$)	24297.2(22)	24299.40(28)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	24302.2(24)	24229.40(28)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	24348.74(89)	24344.(14)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)	24349.18(88)	24344.(14)	$KN_{4,5}$	1
K edge	24357.63(36)	24352.59(20)		13
K edge (c)		24350.91(51)		
L_1M_1	2934.0(18)			
L_1M_2 ($L\beta_4$)	3044.3(19)	3045.43(22)		1

Designation	Theory Energy (eV)	Experiment Energy (eV)	Experiment Blend	Ref.
L_1M_3 ($L\beta_3$)	3071.8(18)	3072.98(23)		1
L_1M_4 ($L\beta_{10}$)	3263.2(16)	3263.72(25)		1
L_1M_5 ($L\beta_9$)	3268.5(16)	3269.58(26)		1
L_1N_1	3519.3(41)			
L_1N_2 ($L\gamma_2$)	3549.4(28)	3553.32(30)	$L_1N_{2,3}$	1
L_1N_3 ($L\gamma_3$)	3554.5(30)	3553.32(30)	$L_1N_{2,3}$	1
L_1N_4	3601.0(15)			
L_1N_5	3601.4(15)			
L_1 edge	3609.87(93)	3607.3(16)		1
L_1 edge (c)		3604.74(64)		
L_2M_1 ($L\eta$)	2661.1(13)	2660.28(17)		1
L_2M_2	2771.4(13)			
L_2M_3 ($L\beta_{17}$)	2798.9(12)			
L_2M_4 ($L\beta_1$)	2990.4(10)	2990.250(53)		1
L_2M_5	2995.6(10)			
L_2N_1 ($L\gamma_5$)	3246.4(36)	3243.74(25)		1
L_2N_2	3276.5(22)			
L_2N_3	3281.6(24)			
L_2N_4 ($L\gamma_1$)	3328.13(90)	3328.74(26)		1
L_2N_5	3328.56(89)			
L_2 edge	3337.01(37)	3330.35(13)		1
L_2 edge (c)		3330.66(46)		
L_3M_1 (Ll)	2504.5(13)	2503.43(22)		1
L_3M_2 (Lt)	2614.8(13)			
L_3M_3 (Ls)	2642.3(12)			
L_3M_4 ($L\alpha_2$)	2833.74(98)	2833.312(67)		1
L_3M_5 ($L\alpha_1$)	2838.97(95)	2838.638(48)		1
L_3N_1 ($L\beta_6$)	3089.8(35)	3087.06(23)		1
L_3N_2	3119.9(22)			
L_3N_3	3125.0(24)			
L_3N_4 ($L\beta_{15}$)	3171.50(85)	3171.820(48)	$L_3N_{4,5}$	1
L_3N_5 ($L\beta_2$)	3171.93(84)	3171.820(48)	$L_3N_{4,5}$	1
L_3 edge	3180.38(32)	3173.01(12)		1
L_3 edge (c)		3173.75(51)		
47	**Silver**		**Ag**	
KL_1	21709.4(12)			
KL_2 ($K\alpha_2$)	21990.67(72)	21990.30(10)		5
KL_3 ($K\alpha_1$)	22162.99(66)	22162.917(30)		5
KM_1	24797.4(12)			
KM_2 ($K\beta_3$)	24912.8(15)	24911.54(30)		1,5
KM_3 ($K\beta_1$)	24943.1(13)	24942.42(30)		1,5
KM_4 ($K\beta_5^{II}$)	25141.7(11)	25145.5(15)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	25147.6(10)	25145.5(15)	$KM_{4,5}$	1
KN_1	25421.1(35)			
KN_2 ($K\beta_2^{II}$)	25455.6(29)	25456.71(31)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	25457.8(20)	25456.71(31)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	25509.99(91)	25511.8(31)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)	25510.83(99)	25511.8(31)	$KN_{4,5}$	1
K edge	25523.71(39)	25515.59(30)		13
K edge (c)		25515.51(48)		
L_1M_1	3088.0(17)			
L_1M_2 ($L\beta_4$)	3203.4(21)	3203.487(61)		1

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.	Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
L_1M_3 ($L\beta_3$)	3233.6(18)	3234.49(11)		1	L_1M_3 ($L\beta_3$)	3400.6(19)	3401.48(12)		1
L_1M_4 ($L\beta_{10}$)	3432.3(16)	3432.91(13)		1	L_1M_4 ($L\beta_{10}$)	3606.7(17)	3607.60(31)		1
L_1M_5 ($L\beta_9$)	3438.2(16)	3439.21(13)		1	L_1M_5 ($L\beta_9$)	3613.3(16)	3614.49(14)		1
L_1N_1	3711.7(40)				L_1N_1	3910.4(41)			
L_1N_2 ($L\gamma_2$)	3746.2(35)	3743.25(15)		1	L_1N_2 ($L\gamma_2$)	3949.6(41)	3951.38(37)		1
L_1N_3 ($L\gamma_3$)	3748.3(26)	3749.82(15)		1	L_1N_3 ($L\gamma_3$)	3949.0(22)			
L_1N_4	3800.6(15)				L_1N_4	4006.6(15)			
L_1N_5	3801.4(16)				L_1N_5	4008.0(16)			
L_1 edge	3814.27(97)	3807.34(17)		1	L_1 edge	4026.07(98)	4019.01(19)		1
L_1 edge (c)		3807.41(34)			L_1 edge (c)		4019.68(22)		
L_2M_1 ($L\eta$)	2806.8(12)	2806.11(19)		1	L_2M_1 ($L\eta$)	2957.1(12)	2956.782(94)		1
L_2M_2	2922.1(15)				L_2M_2	3076.9(15)			
L_2M_3 ($L\beta_{17}$)	2952.4(13)				L_2M_3 ($L\beta_{17}$)	3110.6(13)			
L_2M_4 ($L\beta_1$)	3151.1(10)	3150.974(36)		1	L_2M_4 ($L\beta_1$)	3316.7(11)	3316.605(53)		1
L_2M_5	3156.9(10)				L_2M_5	3323.3(10)			
L_2N_1 ($L\gamma_5$)	3430.4(35)	3428.35(13)		1	L_2N_1 ($L\gamma_5$)	3620.4(35)	3619.38(14)		1
L_2N_2	3465.0(29)				L_2N_2	3659.6(35)			
L_2N_3	3467.1(20)				L_2N_3	3659.0(16)			
L_2N_4 ($L\gamma_1$)	3519.32(89)	3519.625(59)		1	L_2N_4 ($L\gamma_1$)	3716.67(85)	3716.898(99)		1
L_2N_5	3520.17(97)				L_2N_5	3718.0(10)			
L_2 edge	3533.04(38)	3525.83(15)		1	L_2 edge	3736.10(39)	3728.01(17)		1
L_3 edge (c)		3525.24(26)			L_2 edge (c)		3728.54(33)		
L_3M_1 (Ll)	2634.4(14)	2633.66(17)		1	L_3M_1 (Ll)	2767.9(14)	2767.376(82)		1
L_3M_2 (Lt)	2749.8(14)				L_3M_2 (Lt)	2887.7(14)			
L_3M_3 (Ls)	2780.1(12)				L_3M_3 (Ls)	2921.4(12)			
L_3M_4 ($L\alpha_2$)	2978.72(99)	2978.240(53)		1	L_3M_4 ($L\alpha_2$)	3127.5(10)	3126.950(70)		1
L_3M_5 ($L\alpha_1$)	2984.60(95)	2984.340(32)		1	L_3M_5 ($L\alpha_1$)	3134.06(96)	3133.755(47)		1
L_3N_1 ($L\beta_6$)	3258.1(34)	3256.06(11)		1	L_3N_1 ($L\beta_6$)	3431.2(34)	3429.98(13)		1
L_3N_2	3292.7(28)				L_3N_2	3470.4(35)			
L_3N_3	3294.8(19)				L_3N_3	3469.7(15)			
L_3N_4 ($L\beta_{15}$)	3346.99(84)	3347.842(40)	$L_3N_{4,5}$	1	L_3N_4 ($L\beta_{15}$)	3527.42(79)	3528.159(59)	$L_3N_{4,5}$	1
L_3N_5 ($L\beta_2$)	3347.84(92)	3347.842(40)	$L_3N_{4,5}$	1	L_3N_5 ($L\beta_2$)	3528.74(97)	3528.159(59)	$L_3N_{4,5}$	1
L_3 edge	3360.71(32)	3350.96(13)		1	L_3 edge	3546.84(32)	3537.60(15)		1
L_3 edge (c)		3352.58(48)			L_3 edge (c)		3538.88(45)		
48	**Cadmium**		**Cd**		49	**Indium**		**In**	
KL_1	22694.5(12)				KL_1	23703.5(12)			
KL_2 ($K\alpha_2$)	22984.48(75)	22984.05(20)		1,5	KL_2 ($K\alpha_2$)	24002.31(77)	24002.03(28)		1,5
KL_3 ($K\alpha_1$)	23173.73(67)	23173.98(20)		1,5	KL_3 ($K\alpha_1$)	24209.78(69)	24209.75(22)		1,5
KM_1	25941.6(12)				KM_1	27114.4(12)			
KM_2 ($K\beta_3$)	26061.4(15)	26061.32(39)		1,5	KM_2 ($K\beta_3$)	27238.6(15)	27237.50(25)		1,5
KM_3 ($K\beta_1$)	26095.1(13)	26095.44(39)		1,5	KM_3 ($K\beta_1$)	27276.1(13)	27275.55(25)		1,5
KM_4 ($K\beta_5^{II}$)	26301.2(11)				KM_4 ($K\beta_5^{II}$)	27489.7(11)	27491.8(18)		1
KM_5 ($K\beta_5^{I}$)	26307.8(11)				KM_5 ($K\beta_5^{I}$)	27497.1(11)	27499.1(18)		1
KN_1	26604.9(35)				KN_1	27819.7(37)			
KN_2 ($K\beta_2^{II}$)	26644.1(35)	26644.07(59)	$KN_{2,3}$	1	KN_2 ($K\beta_2^{II}$)	27860.7(36)	27861.20(93)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	26643.5(16)	26644.07(59)	$KN_{2,3}$	1	KN_3 ($K\beta_2^{I}$)	27860.9(17)	27861.20(93)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	26701.15(88)				KN_4 ($K\beta_4^{II}$)	27923.03(99)	27928.4(37)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)	26702.5(11)				KN_5 ($K\beta_4^{I}$)	27924.2(10)	27928.4(37)	$Kn_{4,5}$	1
K edge	26720.58(41)	26713.29(20)		13	K edge	27949.69(44)	27940.39(30)		13
K edge (c)		26712.94(71)			K edge (c)		27940.72(69)		
L_1M_1	3247.1(17)				L_1M_1	3410.9(17)			
L_1M_2 ($L\beta_4$)	3366.9(21)	3367.23(12)		1	L_1M_2 ($L\beta_4$)	3535.1(21)	3535.31(13)		1

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.	Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
L_1M_3 ($L\beta_3$)	3572.6(19)	3573.14(14)		1	L_1M_3 ($L\beta_3$)	3749.8(19)	3750.392(50)		1
L_1M_4 ($L\beta_{10}$)	3786.1(17)	3786.83(15)		1	L_1M_4 ($L\beta_{10}$)	3970.8(17)	3971.63(17)		1
L_1M_5 ($L\beta_9$)	3793.5(16)	3794.26(15)		1	L_1M_5 ($L\beta_9$)	3979.0(16)	3980.00(17)		1
L_1N_1	4116.2(43)				L_1N_1	4327.6(42)			
L_1N_2 ($L\gamma_2$)	4157.2(42)	4160.48(41)	$L_1N_{2,3}$	1	L_1N_2 ($L\gamma_2$)	4359.5(13)	4376.83(46)	$L_1N_{2,3}$	1
L_1N_3 ($L\gamma_3$)	4157.4(22)	4160.48(41)	$L_1N_{2,3}$	1	L_1N_3 ($L\gamma_3$)	4372.6(23)	4376.83(46)	$L_1N_{2,3}$	1
L_1N_4	4219.5(15)				L_1N_4	4438.8(16)			
L_1N_5	4220.6(16)				L_1N_5	4440.1(16)			
L_1 edge	4246.17(99)	4237.26(21)		1	L_1 edge	4473.20(99)	4464.77(24)		1
L_1 edge (c)		4238.30(27)			L_1 edge (c)		4465.02(11)		
L_2M_1 ($L\eta$)	3112.1(12)	3112.58(10)		1	L_2M_1 ($L\eta$)	3271.8(12)	3272.37(12)		1
L_2M_2	3236.3(15)				L_2M_2	3400.4(15)			
L_2M_3 ($L\beta_{17}$)	3273.8(13)				L_2M_3 ($L\beta_{17}$)	3442.1(13)			
L_2M_4 ($L\beta_1$)	3487.3(11)	3487.244(58)		1	L_2M_4 ($L\beta_1$)	3663.1(11)	3662.839(48)		1
L_2M_5	3494.8(10)				L_2M_5	3671.3(10)			
L_2N_1 ($L\gamma_5$)	3817.4(37)	3815.93(16)		1	L_2N_1 ($L\gamma_5$)	4019.9(36)	4019.20(17)		1
L_2N_2	3858.4(36)				L_2N_2	4051.76(72)			
L_2N_3	3858.6(16)				L_2N_3	4064.9(17)			
L_2N_4 ($L\gamma_1$)	3920.72(93)	3920.848(73)		1	L_2N_4 ($L\gamma_1$)	4131.1(10)	4131.161(61)		1
L_2N_5	3921.84(98)				L_2N_5	4132.4(10)			
L_2 edge	3947.38(39)	3939.32(19)		1	L_2 edge	4165.49(39)	4157.27(21)		1
L_2 edge (c)		3938.71(59)			L_2 edge (c)		4156.23(78)		
L_3M_1 (Ll)	2904.6(14)	2904.431(91)		1	L_3M_1 (Ll)	3044.7(14)	3045.01(10)		1
L_3M_2 (Lt)	3028.9(14)				L_3M_2 (Lt)	3173.4(14)			
L_3M_3 (Ls)	3066.4912				L_3M_3 (Ls)	3215.0(12)			
L_3M_4 ($L\alpha_2$)	3279.9(10)	3279.322(77)		1	L_3M_4 ($L\alpha_2$)	3436.0(10)	3437.356(56)		1
L_3M_5 ($L\alpha_1$)	3287.28(97)	3286.982(52)		1	L_3M_5 ($L\alpha_1$)	3444.29(98)	3444.011(42)		1
L_3N_1 ($L\beta_6$)	3609.9(36)	3608.27(14)		1	L_3N_1 ($L\beta_6$)	3792.9(36)	3792.66(15)		1
L_3N_2	3651.0(35)				L_3N_2	3824.71(66)			
L_3N_3	3651.1(15)				L_3N_3	3837.9(17)			
L_3N_4 ($L\beta_{15}$)	3713.24(87)	3713.847(49)	$L_3N_{4,5}$	1	L_3N_4 ($L\beta_{15}$)	3904.07(95)	3904.894(55)	$L_3N_{4,5}$	1
L_3N_5 ($L\beta_2$)	3714.37(92)	3713.847(49)	$L_3N_{4,5}$	1	L_3N_5 ($L\beta_2$)	3905.32(95)	3904.894(55)	$L_3N_{4,5}$	1
L_3 edge	3739.91(33)	3730.25(17)		1	L_3 edge	3938.45(33)	3928.84(18)		1
L_3 edge (c)		3730.84(48)			L_3 edge (c)		3929.51(87)		
50	**Tin**		**Sn**		51	**Antimony**		**Sb**	
KL_1	24736.6(12)				KL_1	25793.9(12)			
KL_2 ($K\alpha_2$)	25044.30(79)	25044.04(23)		1,5	KL_2 ($K\alpha_2$)	26110.73(82)	26110.78(25)		1,5
KL_3 ($K\alpha_1$)	25271.34(72)	25271.36(23)		1,5	KL_3 ($K\alpha_1$)	26358.69(74)	26358.86(25)		1,5
KM_1	28316.1(12)				KM_1	29546.8(12)			
KM_2 ($K\beta_3$)	28444.7(16)	28444.43(33)		1,5	KM_2 ($K\beta_3$)	29680.0(16)	29679.20(29)		1,5
KM_3 ($K\beta_1$)	28486.4(13)	28486.26(33)		1,5	KM_3 ($K\beta_1$)	29726.0(14)	29725.53(22)		1,5
KM_4 ($K\beta_5^{II}$)	28707.3(12)	28710.2(30)		1	KM_4 ($K\beta_5^{II}$)	29954.6(12)	29956.1(11)		1
KM_5 ($K\beta_5^{I}$)	28715.6(11)	28716.2(30)		1	KM_5 ($K\beta_5^{I}$)	29963.8(12)	29963.3(11)		1
KN_1	29064.2(37)				KN_1	30340.1(39)			
KN_2 ($K\beta_2^{II}$)	29096.05(80)	29109.64(81)	$KN_{2,3}$	1	KN_2 ($K\beta_2^{II}$)	30387.1(43)	30389.84(55)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	29109.2(18)	29109.64(81)	$KN_{2,3}$	1	KN_3 ($K\beta_2^{I}$)	30388.0(19)	30389.84(55)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	29175.4(11)	29175.7(30)	$KN_{4,5}$	1	KN_4 ($K\beta_4^{II}$)	30458.3(11)	30461.0(11)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)	29176.7(11)	29175.7(30)	$KN_{4,5}$	1	KN_5 ($K\beta_4^{I}$)	30459.7(11)	30461.0(11)	$KN_{4,5}$	1
K edge	29209.79(47)	29200.39(20)		13	K edge	30501.27(49)	30490.49(20)		13
K edge (c)		29200.92(92)			K edge (c)		30491.99(91)		
L_1M_1	3579.5(17)				L_1M_1	3752.9(17)			
L_1M_2 ($L\beta_4$)	3708.1(21)	3708.33(15)		1	L_1M_2 ($L\beta_4$)	3886.1(21)	3886.42(16)		1

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.	Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
L_1M_3 ($L\beta_3$)	3932.1(19)	3932.73(17)		1	L_1M_3 ($L\beta_3$)	4119.7(19)	4120.48(18)		1
L_1M_4 ($L\beta_{10}$)	4160.6(17)	4161.64(19)		1	L_1M_4 ($L\beta_{10}$)	4355.9(17)	4355.16(20)		1
L_1M_5 ($L\beta_9$)	4169.9(17)	4170.82(19)		1	L_1M_5 ($L\beta_9$)	4366.1(17)	4367.16(20)		1
L_1N_1	4546.2(44)				L_1N_1	4770.8(45)			
L_1N_2 ($L\gamma_2$)	4593.1(48)	4599.95(51)	$L_1N_{2,3}$	1	L_1N_2 ($L\gamma_2$)	4820.7(50)	4829.10(56)	$L_1N_{2,3}$	1
L_1N_3 ($L\gamma_3$)	4594.0(24)	4599.95(51)	$L_1N_{2,3}$	1	L_1N_3 ($L\gamma_3$)	4822.8(27)	4829.10(56)	$L_1N_{2,3}$	1
L_1N_4	4664.3(16)				L_1N_4	4896.6(16)			
L_1N_5	4665.8(16)				L_1N_5	4898.2(16)			
L_1 edge	4707.3(10)	4698.44(26)		1	L_1 edge	4948.5(10)	4939.73(29)		1
L_1 edge (c)		4699.15(12)			L_1 edge (c)		4939.65(99)		
L_2M_1 ($L\eta$)	3436.1(12)	3436.65(13)		1	L_2M_1 ($L\eta$)	3605.2(11)	3605.90(14)		1
L_2M_2	3569.3(15)				L_2M_2	3743.0(15)			
L_2M_3 ($L\beta_{17}$)	3615.3(13)				L_2M_3 ($L\beta_{17}$)	3793.7(13)			
L_2M_4 ($L\beta_1$)	3843.9(11)	3843.615(71)		1	L_2M_4 ($L\beta_1$)	4029.9(11)	4029.63(12)		1
L_2M_5	3853.1(10)				L_2M_5	4040.1(11)			
L_2N_1 ($L\gamma_5$)	4229.4(38)	4228.78(19)		1	L_2N_1 ($L\gamma_5$)	4444.8(38)	4443.70(21)		1
L_2N_2	4276.3(42)				L_2N_2	4494.7(44)			
L_2N_3	4277.2(18)				L_2N_3	4496.8(20)			
L_2N_4 ($L\gamma_1$)	4347.56(96)	4347.831(68)		1	L_2N_4 ($L\gamma_1$)	4570.67(97)	4570.93(15)		1
L_2N_5	4348.99(96)				L_2N_5	4572.25(97)			
L_2 edge	4390.54(40)	4381.9(11)		1	L_2 edge	4622.56(40)	4612.61(25)		1
L_2 edge (c)		4381.22(79)			L_2 edge (c)		4613.05(15)		
L_3M_1 (Ll)	3188.1(14)	3188.63(11)		1	L_3M_1 (Ll)	3334.8(14)	3335.58(12)		1
L_3M_2 (Lt)	3321.3(14)				L_3M_2 (Lt)	3472.6(14)			
L_3M_3 (Ls)	3367.3(12)				L_3M_3 (Ls)	3523.4(12)			
L_3M_4 ($L\alpha_2$)	3595.9(10)	3595.358(93)		1	L_3M_4 ($L\alpha_2$)	3759.5(11)	3758.79(15)		1
L_3M_5 ($L\alpha_1$)	3605.10(98)	3604.756(62)		1	L_3M_5 ($L\alpha_1$)	3769.73(99)	3769.38(10)		1
L_3N_1 ($L\beta_6$)	3981.4(37)	3980.00(17)		1	L_3N_1 ($L\beta_6$)	4174.4(38)	4173.25(19)		1
L_3N_2	4028.4(41)				L_3N_2	4224.4(44)			
L_3N_3	4029.3(17)				L_3N_3	4226.5(20)			
L_3N_4 ($L\beta_{15}$)	4099.59(89)	4100.826(60)	$L_3N_{4,5}$	1	L_3N_4 ($L\beta_{15}$)	4300.31(91)	4301.70(18)	$L_3N_{4,5}$	1
L_3N_5 ($L\beta_2$)	4101.02(91)	4100.826(60)	$L_3N_{4,5}$	1	L_3N_5 ($L\beta_2$)	4301.89(91)	4301.70(18)	$L_3N_{4,5}$	1
L_3 edge	4142.58(33)	4132.33(20)		1	L_3 edge	4352.20(34)	4341.88(23)		1
L_3 edge (c)		4132.99(91)			L_3 edge (c)		4342.35(53)		
52	**Tellurium**		**Te**		53	**Iodine**		**I**	
KL_1	26875.7(13)				KL_1	27982.3(13)			
KL_2 ($K\alpha_2$)	27201.73(85)	27201.99(26)		1	KL_2 ($K\alpha_2$)	28317.62(87)	28317.52(67)		1
KL_3 ($K\alpha_1$)	27472.09(77)	27472.57(27)		1	KL_3 ($K\alpha_1$)	28611.94(79)	28612.32(49)		1
KM_1	30806.9(12)				KM_1	32096.7(12)			
KM_2 ($K\beta_3$)	30944.7(16)	30944.60(46)		1	KM_2 ($K\beta_3$)	32239.2(16)	32239.71(50)		1
KM_3 ($K\beta_1$)	30995.5(14)	30995.97(34)		1	KM_3 ($K\beta_1$)	32295.1(14)	32295.05(50)		1
KM_4 ($K\beta_5^{II}$)	31231.6(12)				KM_4 ($K\beta_5^{II}$)	32538.8(13)			
KM_5 ($K\beta_5^{I}$)	31241.8(12)				KM_5 ($K\beta_5^{I}$)	32550.1(12)			
KN_1	31646.5(40)				KN_1	32984.4(40)			
KN_2 ($K\beta_2^{II}$)	31696.4(45)	31700.76(72)	$KN_{2,3}$	1	KN_2 ($K\beta_2^{II}$)	33037.3(48)	33041.7(26)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	31698.6(22)	31700.76(72)	$KN_{2,3}$	1	KN_3 ($K\beta_2^{I}$)	33041.8(26)	33041.7(26)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	31772.4(11)				KN_4 ($K\beta_4^{II}$)	33118.2(11)			
KN_5 ($K\beta_4^{I}$)	31774.0(11)				KN_5 ($K\beta_4^{I}$)	33120.0(11)			
K edge	31824.29(52)	31811.5(12)		1	K edge	33179.46(54)	33167.2(13)		1
K edge (c)		31815.0(11)			K edge (c)		33169.69(89)		
L_1M_1	3931.2(17)				L_1M_1	4114.4(17)			
L_1M_2 ($L\beta_4$)	4069.0(21)	4069.52(18)		1	L_1M_2 ($L\beta_4$)	4256.9(21)	4257.53(19)		1

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Experiment Blend	Ref.
L_1M_3 ($L\beta_3$)	4312.8(19)	4313.49(20)		1
L_1M_4 ($L\beta_{10}$)	4556.5(17)	4556.43(22)		1
L_1M_5 ($L\beta_9$)	4567.8(17)	4569.06(22)		1
L_1N_1	5002.1(45)			
L_1N_2 ($L\gamma_2$)	5055.0(52)	5065.67(61)	$L_1N_{2,3}$	1
L_1N_3 ($L\gamma_3$)	5059.5(30)	5065.67(61)	$L_1N_{2,3}$	1
L_1N_4	5135.9(16)			
L_1N_5	5137.7(16)			
L_1 edge	5197.2(10)	5191.9(16)		1
L_1 edge (c)		5188.38(81)		
L_2M_1 ($L\eta$)	3779.1(11)	3780.19(15)		1
L_2M_2	3921.6(15)			
L_2M_3 ($L\beta_{17}$)	3977.5(13)			
L_2M_4 ($L\beta_1$)	4221.2(11)	4220.76(13)		1
L_2M_5	4232.5(11)			
L_2N_1 ($L\gamma_5$)	4666.8(39)	4666.08(23)		1
L_2N_2	4719.6(46)			
L_2N_3	4724.2(24)			
L_2N_4 ($L\gamma_1$)	4800.58(96)	4800.98(22)		1
L_2N_5	4802.33(95)			
L_2 edge	4861.84(38)	4854.1(14)		1
L_2 edge (c)		4852.01(59)		
L_3M_1 (Ll)	3484.8(14)	3485.06(13)		1
L_3M_2 (Lt)	3627.3(14)			
L_3M_3 (Ls)	3683.2(12)			
L_3M_4 ($L\alpha_2$)	3926.9(11)	3926.09(11)		1
L_3M_5 ($L\alpha_1$)	3938.2(10)	3937.70(11)		1
L_3N_1 ($L\beta_6$)	4372.5(38)	4370.62(21)		1
L_3N_2	4425.3(45)			
L_3N_3	4429.9(24)			
L_3N_4 ($L\beta_{15}$)	4506.26(89)	4507.58(19)	$L_3N_{4,5}$	1
L_3N_5 ($L\beta_2$)	4508.01(89)	4507.58(19)	$L_3N_{4,5}$	1
L_3 edge	4567.52(32)	4558.8(12)		1
L_3 edge (c)		4557.12(54)		
54	**Xenon**		**Xe**	
KL_1	29112.8(31)			
KL_2 ($K\alpha_2$)	29458.4(30)	29458.250(50)		5
KL_3 ($K\alpha_1$)	29778.3(29)	29778.78(10)		5
KM_1	33416.0(32)			
KM_2 ($K\beta_3$)	33563.0(36)	33563.20(12)		5
KM_3 ($K\beta_1$)	33624.6(35)	33624.23(12)		5
KM_4 ($K\beta_5^{II}$)	33876.0(33)			
KM_5 ($K\beta_5^{I}$)	33888.6(33)			
KN_1	34353.4(60)			
KN_2 ($K\beta_2^{II}$)	34408.9(69)	34414.7(42)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	34408.(11)	34414.7(42)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	34495.4(32)			
KN_5 ($K\beta_4^{I}$)	34497.2(31)			
K edge	34566.5(26)	34593.(71)		1
K edge (c)		34565.13(33)		
L_1M_1	4303.2(19)			
L_1M_2 ($L\beta_4$)	4450.2(23)	4450.328(30)		12
L_1M_3 ($L\beta_3$)	4511.8(22)	4512.028(30)		12
L_1M_4 ($L\beta_{10}$)	4763.2(20)			
L_1M_5 ($L\beta_9$)	4775.8(20)			
L_1N_1	5240.5(47)			
L_1N_2 ($L\gamma_2$)	5296.0(55)	5306.71(20)	$L_1N_{2,3}$	24
L_1N_3 ($L\gamma_3$)	5294.8(98)	5306.71(20)	$L_1N_{2,3}$	24
L_1N_4	5382.5(18)			
L_1N_5	5384.3(18)			
L_1 edge	5453.7(13)	5452.89(35)		1
L_1 edge (c)		5452.57(17)		
L_2M_1 ($L\eta$)	3957.6(12)	3958.368(50)		12
L_2M_2	4104.6(14)			
L_2M_3 ($L\beta_{17}$)	4166.2(13)			
L_2M_4 ($L\beta_1$)	4417.6(11)	4417.668(30)		12
L_2M_5	4430.2(11)			
L_2N_1 ($L\gamma_5$)	4895.0(39)			
L_2N_2	4950.5(46)			
L_2N_3	4949.2(89)			
L_2N_4 ($L\gamma_1$)	5036.95(93)			
L_2N_5	5038.78(89)			
L_2 edge	5108.10(37)	5103.83(31)		1
L_2 edge (c)		5106.72(20)		
L_3M_1 (Ll)	3637.8(14)	3638.008(59)		12
L_3M_2 (Lt)	3784.7(14)			
L_3M_3 (Ls)	3846.3(12)			
L_3M_4 ($L\alpha_2$)	4097.7(11)	4097.378(30)		12
L_3M_5 ($L\alpha_1$)	4110.3(10)	4110.088(20)		12
L_3N_1 ($L\beta_6$)	4575.1(38)			
L_3N_2	4630.6(46)			
L_3N_3	4629.3(89)			
L_3N_4 ($L\beta_{15}$)	4717.08(89)			
L_3N_5 ($L\beta_2$)	4718.90(84)			
L_3 edge	4788.22(32)	4782.16(27)		1
L_3 edge (c)		4786.47(17)		
55	**Cesium**		**Cs**	
KL_1	30270.5(13)			
KL_2 ($K\alpha_2$)	30624.87(95)	30625.40(45)		1
KL_3 ($K\alpha_1$)	30972.05(86)	30973.13(46)		1
KM_1	34766.7(12)			
KM_2 ($K\beta_3$)	34918.5(17)	34919.68(58)		1
KM_3 ($K\beta_1$)	34985.8(15)	34987.3(10)		1
KM_4 ($K\beta_5^{II}$)	35244.9(14)			
KM_5 ($K\beta_5^{I}$)	35258.6(13)			
KN_1	35755.7(41)			
KN_2 ($K\beta_2^{II}$)	35813.2(51)	35821.7(31)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	35823.0(38)	35821.7(31)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	35905.3(13)			
KN_5 ($K\beta_4^{I}$)	35907.4(12)			
K edge	35991.92(62)	35988.0(15)		1
K edge (c)		35985.6(61)		
L_1M_1	4496.1(17)			
L_1M_2 ($L\beta_4$)	4648.0(21)	4649.45(52)		1

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Experiment Blend	Ref.
L_1M_3 ($L\beta_3$)	4715.2(20)	4716.85(53)		1
L_1M_4 ($L\beta_{10}$)	4974.4(18)	4975.21(59)		1
L_1M_5 ($L\beta_9$)	4988.1(17)	5002.72(60)		1
L_1N_1	5485.2(46)			
L_1N_2 ($L\gamma_2$)	5542.6(55)	5542.10(73)		1
L_1N_3 ($L\gamma_3$)	5552.5(43)	5552.77(74)		1
L_1N_4	5634.8(17)			
L_1N_5	5636.9(17)			
L_1 edge	5721.4(10)	5720.6(20)		1
L_1 edge (c)		5719.8(76)		
L_2M_1 ($L\eta$)	4141.8(11)	4142.13(41)		1
L_2M_2	4293.7(15)			
L_2M_3 ($L\beta_{17}$)	4360.9(13)			
L_2M_4 ($L\beta_1$)	4620.0(11)	4619.83(51)		1
L_2M_5	4633.8(11)			
L_2N_1 ($L\gamma_5$)	5130.8(40)	5128.75(63)		1
L_2N_2	5188.3(48)			
L_2N_3	5198.1(36)			
L_2N_4 ($L\gamma_1$)	5280.4(11)	5280.34(67)		1
L_2N_5	5282.54(98)			
L_2 edge	5367.05(39)	5358.15(34)		1
L_2 edge (c)		5359.2(40)		
L_3M_1 (Ll)	3794.6(14)	3794.99(34)		1
L_3M_2 (Lt)	3946.5(14)			
L_3M_3 (Ls)	4013.7(12)			
L_3M_4 ($L\alpha_2$)	4272.9(11)	4272.31(44)		1
L_3M_5 ($L\alpha_1$)	4286.6(10)	4286.49(44)		1
L_3N_1 ($L\beta_6$)	4783.7(39)	4781.06(55)		1
L_3N_2	4841.1(48)			
L_3N_3	4851.0(35)			
L_3N_4 ($L\beta_{15}$)	4933.27(98)	4936.00(58)	$L_3N_{4,5}$	1
L_3N_5 ($L\beta_2$)	4935.36(92)	4936.00(58)	$L_3N_{4,5}$	1
L_3 edge	5019.87(32)	5011.41(30)		1
L_3 edge (c)		5012.98(33)		
56	**Barium**		**Ba**	
KL_1	31452.5(14)			
KL_2 ($K\alpha_2$)	31816.56(97)	31816.615(60)		5
KL_3 ($K\alpha_1$)	32192.87(88)	32193.262(70)		5
KM_1	36147.3(13)			
KM_2 ($K\beta_3$)	36303.9(17)	36303.35(12)		5
KM_3 ($K\beta_1$)	36377.5(16)	36377.445(80)		5
KM_4 ($K\beta_5^{II}$)	36644.4(14)	36643.2(32)		1
KM_5 ($K\beta_5^{I}$)	36659.5(14)	36666.0(32)		1
KN_1	37188.0(42)			
KN_2 ($K\beta_2^{II}$)	37249.(16)	37257.7(17)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	37262.9(13)	37257.7(17)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	37347.7(52)	37311.5(33)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)	37349.84(86)	37311.5(33)	$KN_{4,5}$	1
K edge	37450.23(63)	37452.4(17)		1
K edge (c)		37440.00(34)		
L_1M_1	4694.8(17)			
L_1M_2 ($L\beta_4$)	4851.4(21)	4851.97(56)		1
L_1M_3 ($L\beta_3$)	4925.0(20)	4926.97(58)		1
L_1M_4 ($L\beta_{10}$)	5191.9(18)	5194.28(64)		1
L_1M_5 ($L\beta_9$)	5207.0(17)	5217.23(65)		1
L_1N_1	5735.5(46)			
L_1N_2 ($L\gamma_2$)	5797.(16)	5810.11(20)	$L_1N_{2,3}$	25
L_1N_3 ($L\gamma_3$)	5810.4(17)	5810.11(20)	$L_1N_{2,3}$	25
L_1N_4	5895.2(56)			
L_1N_5	5897.3(13)			
L_1 edge	5997.7(10)	5995.9(21)		1
L_1 edge (c)		5990.4(45)		
L_2M_1 ($L\eta$)	4330.7(11)	4330.96(67)		1
L_2M_2	4487.4(15)			
L_2M_3 ($L\beta_{17}$)	4560.9(13)			
L_2M_4 ($L\beta_1$)	4827.8(12)	4827.58(14)		1
L_2M_5	4842.9(11)			
L_2N_1 ($L\gamma_5$)	5371.5(40)	5370.7(10)		1
L_2N_2	5433.(15)			
L_2N_3	5446.4(11)			
L_2N_4 ($L\gamma_1$)	5531.1(50)	5531.22(73)		1
L_2N_5	5533.28(61)			
L_2 edge	5633.67(39)	5623.29(38)		1
L_2 edge (c)		5623.32(32)		
L_3M_1 (Ll)	3954.4(14)	3954.15(37)		1
L_3M_2 (Lt)	4111.1(14)			
L_3M_3 (Ls)	4184.6(13)			
L_3M_4 ($L\alpha_2$)	4451.5(11)	4450.94(12)		1
L_3M_5 ($L\alpha_1$)	4466.6(10)	4466.30(12)		1
L_3N_1 ($L\beta_6$)	4995.2(39)	4994.05(60)		1
L_3N_2	5056.(15)			
L_3N_3	5070.1(10)			
L_3N_4 ($L\beta_{15}$)	5154.8(49)	5156.58(19)	$L_3N_{4,5}$	1
L_3N_5 ($L\beta_2$)	5156.97(55)	5156.58(19)	$L_3N_{4,5}$	1
L_3 edge	5257.36(32)	5247.04(33)		1
L_3 edge (c)		5246.71(22)		
57	**Lanthanum**		**La**	
KL_1	32660.4(14)			
KL_2 ($K\alpha_2$)	33034.2(10)	33034.38(26)		1
KL_3 ($K\alpha_1$)	33441.62(91)	33442.12(27)		1
KM_1	37559.0(13)			
KM_2 ($K\beta_3$)	37720.5(18)	37720.60(68)		1
KM_3 ($K\beta_1$)	37800.9(16)	37801.45(51)		1
KM_4 ($K\beta_5^{II}$)	38075.4(15)	38074.6(35)		1
KM_5 ($K\beta_5^{I}$)	38092.1(14)	38094.5(35)		1
KN_1	38654.0(42)			
KN_2 ($K\beta_2^{II}$)	38717.(16)	38730.3(13)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	38732.9(14)	38730.3(13)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	38823.1(50)	38828.2(36)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)	38825.05(90)	38828.2(36)	$KN_{4,5}$	1
K edge	38939.45(67)	38934.3(90)		1
K edge (c)		38929.3(42)		
L_1M_1	4898.6(17)			

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Experiment Blend	Ref.
L_1M_2 ($L\beta_4$)	5060.1(22)	5061.79(38)		1,27
L_1M_3 ($L\beta_3$)	5140.5(20)	5143.40(39)		1,27
L_1M_4 ($L\beta_{10}$)	5415.0(18)	5416.99(71)		1,27
L_1M_5 ($L\beta_9$)	5431.7(18)	5435.79(71)		1,27
L_1N_1	5993.6(46)			
L_1N_2 ($L\gamma_2$)	6057.(16)	6060.73(29)		1,27
L_1N_3 ($L\gamma_3$)	6072.4(17)	6075.32(29)		1,27
L_1N_4	6162.7(53)	6167.10(61)	$L_1N_{4,5}$	27
L_1N_5	6164.6(13)	6167.10(61)	$L_1N_{4,5}$	27
$L_1N_{6,7}$		6264.8(16)	$L_1N_{6,7}$	26
L_1 edge	6279.0(10)	6268.1(23)		1
L_1 edge (c)		6271.17(90)		
L_2M_1 ($L\eta$)	4524.8(11)	4524.9(73)		1
L_2M_2	4686.2(15)			
L_2M_3 ($L\beta_{17}$)	4766.7(13)			
L_2M_4 ($L\beta_1$)	5041.2(12)	5042.17(15)		1
L_2M_5	5057.8(11)			
L_2N_1 ($L\gamma_5$)	5619.8(40)	5620.13(48)		1,27
L_2N_2	5683.(15)			
L_2N_3	5698.6(11)			
L_2N_4 ($L\gamma_1$)	5788.8(47)	5788.30(26)		1,27
L_2N_5	5790.83(61)			
$L_2N_{6,7}$ (Lv)		5887.7(14)	$L_2N_{6,7}$	26
L_2 edge	5905.22(39)	5889.1(21)		1
L_2 edge (c)		5895.10(29)		
L_3M_1 (Ll)	4117.4(14)	4124.5(61)		1
L_3M_2 (Lt)	4278.9(14)			
L_3M_3 (Ls)	4359.3(13)			
L_3M_4 ($L\alpha_2$)	4633.8(11)	4634.26(10)		1,27
L_3M_5 ($L\alpha_1$)	4650.4(10)	4651.02(13)		1
L_3N_1 ($L\beta_6$)	5212.4(39)	5211.63(42)		1,27
L_3N_2	5276.(15)			
L_3N_3	5291.2(10)			
L_3N_4 ($L\beta_{15}$)	5381.4(46)	5382.87(23)	$L_3N_{4,5}$	1,27
L_3N_5 ($L\beta_2$)	5383.43(55)	5382.87(23)	$L_3N_{4,5}$	1,27
$L_3N_{6,7}$ (Lu)		5479.1(12)	$L_3N_{6,7}$	26
L_3 edge	5497.83(32)	5483.5(36)		1
L_3 edge (c)		5487.05(49)		
58	**Cerium**		**Ce**	
KL_1	33896.2(14)			
KL_2 ($K\alpha_2$)	34279.6(10)	34279.28(28)		1
KL_3 ($K\alpha_1$)	34720.09(94)	34720.00(29)		1
KM_1	39006.9(14)			
KM_2 ($K\beta_3$)	39172.7(18)	39170.46(73)		1
KM_3 ($K\beta_1$)	39260.9(17)	39257.77(37)		1
KM_4 ($K\beta_5^{II}$)	39542.1(15)	39539.0(37)		1
KM_5 ($K\beta_5^{I}$)	39561.2(14)	39557.9(37)		1
KN_1	40155.1(43)			
KN_2 ($K\beta_2^{II}$)	40220.(16)	40233.1(19)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	40237.4(14)	40233.1(19)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	40330.4(47)	40336.5(39)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)	40334.22(93)	40336.5(39)	$KN_{4,5}$	1
K edge	40446.57(71)	40453.6(98)		1
K edge (c)		40444.7(17)		
L_1M_1	5110.7(17)			
L_1M_2 ($L\beta_4$)	5276.5(22)	5277.35(43)		1,28
L_1M_3 ($L\beta_3$)	5364.7(20)	5365.29(42)		1,28
L_1M_4 ($L\beta_{10}$)	5645.9(18)	5644.98(50)		1,28
L_1M_5 ($L\beta_9$)	5665.0(18)	5664.63(47)		1,28
L_1N_1	6258.9(46)			
L_1N_2 ($L\gamma_2$)	6323.(16)	6326.39(59)		1,28
L_1N_3 ($L\gamma_3$)	6341.2(17)	6342.00(59)		1,28
L_1N_4	6434.2(51)	6439.95(34)	$L_1N_{4,5}$	28
L_1N_5	6438.0(13)	6439.95(34)	$L_1N_{4,5}$	28
L_1N_6	6538.6(15)			
L_1 edge	6550.4(11)	6548.1(26)		1
L_1 edge (c)		6548.9(25)		
L_2M_1 ($L\eta$)	4727.4(11)	4731.6(11)		1
L_2M_2	4893.1(15)			
L_2M_3 ($L\beta_{17}$)	4981.4(14)			
L_2M_4 ($L\beta_1$)	5262.5(12)	5262.93(41)		1,28
L_2M_5	5281.6(11)			
L_2N_1 ($L\gamma_5$)	5875.5(40)	5874.90(51)		1,28
L_2N_2	5940.(15)			
L_2N_3	5957.9(11)			
L_2N_4 ($L\gamma_1$)	6050.8(44)	6052.15(29)		1,28
L_2N_5	6054.66(61)			
L_2N_6 (Lv)	6155.21(84)	6161.57(61)	$L_2N_{6,7}$	28
L_2 edge	6167.01(39)	6160.9(23)		1
L_2 edge (c)		6165.80(44)		
L_3M_1 (Ll)	4286.8(14)	4287.52(88)		1
L_3M_2 (Lt)	4452.6(14)			
L_3M_3 (Ls)	4540.8(13)			
L_3M_4 ($L\alpha_2$)	4822.0(11)	4823.17(34)		1,28
L_3M_5 ($L\alpha_1$)	4841.1(11)	4840.06(31)		1,28
L_3N_1 ($L\beta_6$)	5435.0(39)	5433.24(43)		1,28
L_3N_2	5499.(15)			
L_3N_3	5517.34(99)			
L_3N_4 ($L\beta_{15}$)	5610.3(43)	5612.67(42)	$L_3N_{4,5}$	1,28
L_3N_5 ($L\beta_2$)	5614.13(54)	5612.67(42)	$L_3N_{4,5}$	1,28
L_3N_6 (Lu)	5714.67(78)	5721.10(53)	$L_3N_{6,7}$	28
L_3 edge	5726.47(32)	5724.0(39)		1
L_3 edge (c)		5724.5(10)		
59	**Praseodymium**		**Pr**	
KL_1	35157.3(14)			
KL_2 ($K\alpha_2$)	35550.5(11)	35550.59(30)		1
KL_3 ($K\alpha_1$)	36026.27(98)	36026.71(31)		1
KM_1	40484.3(14)			
KM_2 ($K\beta_3$)	40654.5(19)	40653.27(99)		1
KM_3 ($K\beta_1$)	40750.9(18)	40748.67(79)		1
KM_4 ($K\beta_5^{II}$)	41039.2(15)			
KM_5 ($K\beta_5^{I}$)	41060.5(15)			
KN_1	41688.1(43)			
KN_2 ($K\beta_2^{II}$)	41754.(16)	41774.4(42)	$KN_{2,3}$	1

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
KN_3 ($K\beta_2^{\mathrm{I}}$)	41774.3(14)	41774.4(42)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{\mathrm{II}}$)	41872.4(45)			
KN_5 ($K\beta_4^{\mathrm{I}}$)	41876.35(97)			
K edge	41994.11(75)	42002.(11)		1
L_1M_1	5326.9(17)			
L_1M_2 ($L\beta_4$)	5497.2(22)	5498.1(14)		1
L_1M_3 ($L\beta_3$)	5593.5(21)	5591.8(11)		1
L_1M_4 ($L\beta_{10}$)	5881.9(19)	5884.0(17)		1
L_1M_5 ($L\beta_9$)	5903.2(18)	5902.8(17)		1
L_1N_1	6530.7(46)			
L_1N_2 ($L\gamma_2$)	6597.(16)	6598.0(21)		1
L_1N_3 ($L\gamma_3$)	6617.0(17)	6615.9(21)		1
L_1N_4	6715.1(48)			
L_1N_5	6719.0(13)			
L_1N_6	6824.3(15)			
L_1 edge	6836.8(11)	6834.4(28)		1
L_1 edge (c)		6832.0(12)		
L_2M_1 ($L\eta$)	4933.7(12)	4935.6(87)		1
L_2M_2	5104.0(15)			
L_2M_3 ($L\beta_{17}$)	5200.4(14)			
L_2M_4 ($L\beta_1$)	5488.7(12)	5488.9(11)		1
L_2M_5	5510.0(11)			
L_2N_1 ($L\gamma_5$)	6137.5(40)	6136.2(18)		1
L_2N_2	6204.(15)			
L_2N_3	6223.8(10)			
L_2N_4 ($L\gamma_1$)	6321.9(41)	6322.1(14)		1
L_2N_5	6325.84(61)			
L_2N_6 (Lv)	6431.16(81)			
L_2 edge	6443.60(39)	6439.0(25)		1
L_2 edge (c)		6437.2(12)		
L_3M_1 (Ll)	4458.0(14)	4453.23(95)		1
L_3M_2 (Lt)	4628.2(14)			
L_3M_3 (Ls)	4724.6(13)			
L_3M_4 ($L\alpha_2$)	5012.9(11)	5013.64(90)		1
L_3M_5 ($L\alpha_1$)	5034.3(11)	5033.79(60)		1
L_3N_1 ($L\beta_6$)	5661.8(39)	5659.7(15)		1
L_3N_2	5728.(15)			
L_3N_3	5748.06(97)			
L_3N_4 ($L\beta_{15}$)	5846.1(41)	5849.9(16)	$L_3N_{4,5}$	1
L_3N_5 ($L\beta_2$)	5850.08(54)	5849.9(16)	$L_3N_{4,5}$	1
L_3N_6 (Lu)	5955.40(75)			
L_3 edge	5967.84(33)	5963.3(21)		1
L_3 edge (c)		5962.35(62)		
60	**Neodymium**		**Nd**	
KL_1	36445.1(15)			
KL_2 ($K\alpha_2$)	36848.2(11)	36847.502(80)		5
KL_3 ($K\alpha_1$)	37361.4(10)	37360.739(70)		5
KM_1	41993.8(15)			
KM_2 ($K\beta_3$)	42168.5(19)	42166.24(57)		5
KM_3 ($K\beta_1$)	42273.6(18)	42270.90(57)		5
KM_4 ($K\beta_5^{\mathrm{II}}$)	42569.0(16)			
KM_5 ($K\beta_5^{\mathrm{I}}$)	42592.8(15)			
KN_1	43254.5(43)			
KN_2 ($K\beta_2^{\mathrm{II}}$)	43322.(16)$^{\#}$	43335.(22)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{\mathrm{I}}$)	43344.9(14)	43335.(22)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{\mathrm{II}}$)	43449.2(42)$^{\#}$			
KN_5 ($K\beta_4^{\mathrm{I}}$)	43452.3(10)			
K edge	43575.27(79)	43574.(11)		1
K edge (c)		43571.90(60)		
L_1M_1	5548.7(18)			
L_1M_2 ($L\beta_4$)	5723.4(22)	5721.6(12)		1
L_1M_3 ($L\beta_3$)	5828.5(21)	5827.801(52)		3
L_1M_4 ($L\beta_{10}$)	6123.9(19)	6124.97(41)		1,29,30
L_1M_5 ($L\beta_9$)	6147.7(18)	6148.82(41)		1,29,30
L_1N_1	6809.4(46)			
L_1N_2 ($L\gamma_2$)	6877.(16)$^{\#}$	6884.03(34)		1,29,30
L_1N_3 ($L\gamma_3$)	6899.8(17)	6900.44(34)		1,29,30
L_1N_4	7004.1(45)$^{\#}$	7007.74(36)	$L_1N_{4,5}$	29,30
L_1N_5	7007.2(13)	7007.74(36)	$L_1N_{4,5}$	29,30
L_1N_6	7117.2(15)	7122.1(20)	$L_1N_{6,7}$	30
L_1 edge	7130.2(11)	7129.52(61)		1
L_1 edge (c)		7129.47(72)		
L_2M_1 ($L\eta$)	5145.6(12)	5145.25(17)		3
L_2M_2	5320.3(15)			
L_2M_3 ($L\beta_{17}$)	5425.4(14)	5424.4(12)		30
L_2M_4 ($L\beta_1$)	5720.8(12)	5721.446(50)		3
L_2M_5	5744.6(11)			
L_2N_1 ($L\gamma_5$)	6406.3(39)	6405.29(33)		1,30
L_2N_2	6474.(15)$^{\#}$			
L_2N_3	6496.8(10)			
L_2N_4 ($L\gamma_1$)	6601.0(38)$^{\#}$	6601.16(24)		1,29,30
L_2N_5	6604.15(61)			
L_2N_6 (Lv)	6714.16(78)	6718.98(61)	$L_2N_{6,7}$	29,30
L_2 edge	6727.09(40)	6723.55(54)		1
L_2 edge (c)		6724.63(59)		
L_3M_1 (Ll)	4632.4(15)	4631.849(52)		3
L_3M_2 (Lt)	4807.1(15)			
L_3M_3 (Ls)	4912.2(14)			
L_3M_4 ($L\alpha_2$)	5207.6(11)	5207.7(11)		3
L_3M_5 ($L\alpha_1$)	5231.4(11)	5230.239(35)		3
L_3N_1 ($L\beta_6$)	5893.1(38)	5892.99(25)		1,29,30
L_3N_2	5961.(15)$^{\#}$			
L_3N_3	5983.57(95)			
L_3N_4 ($L\beta_{15}$)	6087.8(38)$^{\#}$	6091.25(26)	$L_3N_{4,5}$	1,29,30
L_3N_5 ($L\beta_2$)	6090.96(55)	6091.25(26)	$L_3N_{4,5}$	1,29,30
L_3N_6 (Lu)	6200.97(71)	6202.34(52)	$L_3N_{6,7}$	29,30
L_3 edge	6213.90(33)	6209.36(46)		1
L_3 edge (c)		6211.15(60)		
61	**Promethium**		**Pm**	
KL_1	37759.6(15)			
KL_2 ($K\alpha_2$)	38172.7(12)	38171.55(70)		1
KL_3 ($K\alpha_1$)	38725.6(11)	38725.11(72)		1
KM_1	43535.6(16)			
KM_2 ($K\beta_3$)	43714.8(20)	43712.7(91)		1
KM_3 ($K\beta_1$)	43829.2(19)	43825.5(69)		1
KM_4 ($K\beta_5^{\mathrm{II}}$)	44131.7(16)			

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
$KM_5\ (K\beta_5^{I})$	44158.1(16)			
KN_1	44854.1(43)			
$KN_2\ (K\beta_2^{II})$	44923.(16)$^{\#}$	44937.(24)	$KN_{2,3}$	1
$KN_3\ (K\beta_2^{I})$	44948.9(15)	44937.(24)	$KN_{2,3}$	1
$KN_4\ (K\beta_4^{II})$	45060.8(40)$^{\#}$			
$KN_5\ (K\beta_4^{I})$	45061.8(11)			
K edge	45189.77(87)	45198.(12)		1
L_1M_1	5776.1(18)			
$L_1M_2\ (L\beta_4)$	5955.2(22)			
$L_1M_3\ (L\beta_3)$	6069.6(21)	6071.3(18)		1
$L_1M_4\ (L\beta_{10})$	6372.1(19)			
$L_1M_5\ (L\beta_9)$	6398.5(18)			
L_1N_1	7094.5(46)			
$L_1N_2\ (L\gamma_2)$	7163.(16)$^{\#}$			
$L_1N_3\ (L\gamma_3)$	7189.3(17)			
L_1N_4	7301.2(43)$^{\#}$			
L_1N_5	7302.3(14)			
L_1N_6	7416.9(15)			
L_1 edge	7430.2(11)	7435.7(33)		1
$L_2M_1\ (L\eta)$	5363.0(13)			
L_2M_2	5542.1(15)			
$L_2M_3\ (L\beta_{17})$	5656.5(15)			
$L_2M_4\ (L\beta_1)$	5959.1(12)	5961.5(17)		1
L_2M_5	5985.4(11)			
$L_2N_1\ (L\gamma_5)$	6681.4(39)			
L_2N_2	6750.(15)$^{\#}$			
L_2N_3	6776.2(10)			
$L_2N_4\ (L\gamma_1)$	6888.1(36)$^{\#}$	6892.1(51)		1
L_2N_5	6889.17(65)			
$L_2N_6\ (Lv)$	7003.78(80)			
L_2 edge	7017.09(44)	7014.2(29)		1
$L_3M_1\ (Ll)$	4810.0(15)			
$L_3M_2\ (Lt)$	4989.2(15)			
$L_3M_3\ (Ls)$	5103.6(14)			
$L_3M_4\ (L\alpha_2)$	5406.1(11)	5407.9(14)		1
$L_3M_5\ (L\alpha_1)$	5432.5(11)	5432.6(11)		1
$L_3N_1\ (L\beta_6)$	6128.5(38)			
L_3N_2	6197.(15)$^{\#}$			
L_3N_3	6223.31(97)			
$L_3N_4\ (L\beta_{15})$	6335.2(35)$^{\#}$	6338.9(29)	$L_3N_{4,5}$	1
$L_3N_5\ (L\beta_2)$	6336.23(59)	6338.9(29)	$L_3N_{4,5}$	1
$L_3N_6\ (Lu)$	6450.84(72)			
L_3 edge	6464.15(36)	6460.44(50)		1
62	**Samarium**		**Sm**	
KL_1	39101.2(16)			
$KL_2\ (K\alpha_2)$	39524.3(12)	39523.39(10)		5
$KL_3\ (K\alpha_1)$	40119.4(11)	40118.481(60)		5
KM_1	45110.3(17)			
$KM_2\ (K\beta_3)$	45293.9(20)	45288.6(49)		5
$KM_3\ (K\beta_1)$	45418.1(19)	45413.0(49)		5
$KM_4\ (K\beta_5^{II})$	45728.1(18)	45731.4(75)	$KM_{4,5}$	1
$KM_5\ (K\beta_5^{I})$	45756.9(16)	45731.4(75)	$KM_{4,5}$	1
KN_1	46488.6(44)			
$KN_2\ (K\beta_2^{II})$	46530.(16)$^{\#}$	46575.(26)	$KN_{2,3}$	1
$KN_3\ (K\beta_2^{I})$	46588.2(15)	46575.(26)	$KN_{2,3}$	1
$KN_4\ (K\beta_4^{II})$	46709.1(38)$^{\#}$			
$KN_5\ (K\beta_4^{I})$	46706.4(11)			
K edge	46839.02(91)	46849.(13)		1
K edge (c)		46837.7(15)		
L_1M_1	6009.1(19)			
$L_1M_2\ (L\beta_4)$	6192.8(23)	6196.19(26)		1,32
$L_1M_3\ (L\beta_3)$	6317.0(22)	6316.36(13)		3
$L_1M_4\ (L\beta_{10})$	6627.0(20)	6628.69(26)		76
$L_1M_5\ (L\beta_9)$	6655.7(19)	6655.60(14)		76
L_1N_1	7387.5(47)			
$L_1N_2\ (L\gamma_2)$	7429.(16)$^{\#}$	7467.19(37)		1,32
$L_1N_3\ (L\gamma_3)$	7487.1(18)	7486.82(20)		1,32
L_1N_4	7608.0(40)$^{\#}$	7606.24(38)	$L_1N_{4,5}$	31,32,33
L_1N_5	7605.2(14)	7606.24(38)	$L_1N_{4,5}$	31,32,33
L_1N_6	7724.4(15)	7734.03(90)	$L_1N_{6,7}$	31,33
L_1 edge	7737.9(12)	7747.93(72)		1
L_1 edge (c)		7739.29(58)		
$L_2M_1\ (L\eta)$	5586.0(14)	5585.55(91)		3
L_2M_2	5769.7(16)			
$L_2M_3\ (L\beta_{17})$	5893.8(15)	5891.6(14)		33
$L_2M_4\ (L\beta_1)$	6203.9(13)	6204.073(93)		3
L_2M_5	6232.6(12)			
$L_2N_1\ (L\gamma_5)$	6964.4(39)	6967.67(17)		1,32
L_2N_2	7006.(15)$^{\#}$			
L_2N_3	7064.0(11)	7064.27(81)		31
$L_2N_4\ (L\gamma_1)$	7184.9(33)$^{\#}$	7178.09(17)		1,32
L_2N_5	7182.12(66)			
$L_2N_6\ (Lv)$	7301.27(77)	7308.00(86)	$L_2N_{6,7}$	32
L_2 edge	7314.76(44)	7313.30(64)		1
L_2 edge (c)		7314.92(57)		
L_2 edge (v)		7312.8(20)		21
$L_3M_1\ (Ll)$	4990.9(15)	4990.43(17)		3
$L_3M_2\ (Lt)$	5174.6(15)			
$L_3M_3\ (Ls)$	5298.8(14)			
$L_3M_4\ (L\alpha_2)$	5608.8(12)	5609.053(61)		3
$L_3M_5\ (L\alpha_1)$	5637.6(11)	5635.970(33)		3
$L_3N_1\ (L\beta_6)$	6369.3(39)	6369.72(14)		1,32
L_3N_2	6411.(15)$^{\#}$			
L_3N_3	6468.88(99)	6469.72(68)		31
$L_3N_4\ (L\beta_{15})$	6589.8(32)$^{\#}$	6587.17(14)	$L_3N_{4,5}$	1,32
$L_3N_5\ (L\beta_2)$	6587.03(58)	6587.17(14)	$L_3N_{4,5}$	1,32
$L_3N_6\ (Lu)$	6706.19(71)	6711.75(73)	$L_3N_{6,7}$	32
L_3 edge	6719.67(37)	6717.36(54)		1
L_3 edge (c)		6718.8(15)		
L_3 edge (v)		6717.9(20)		21
63	**Europium**		**Eu**	
KL_1	40470.1(16)			
$KL_2\ (K\alpha_2)$	40903.5(12)	40902.33(40)		1
$KL_3\ (K\alpha_1)$	41543.3(11)	41542.63(41)		1
KM_1	46718.4(18)			
$KM_2\ (K\beta_3)$	46906.5(21)	46904.0(13)		1

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Experiment Blend	Ref.
KM_3 ($K\beta_1$)	47040.8(20)	47038.4(13)		1
KM_4 ($K\beta_5^{II}$)	47358.3(17)			
KM_5 ($K\beta_5^{I}$)	47389.4(17)			
KN_1	48157.3(43)			
KN_2 ($K\beta_2^{II}$)	48230.(16)$^{\#}$	48256.6(22)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	48261.1(15)	48256.6(22)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	48382.0(35)$^{\#}$			
KN_5 ($K\beta_4^{I}$)	48384.3(12)			
K edge	48523.77(96)	48519.7(28)		1
L_1M_1	6248.4(21)			
L_1M_2 ($L\beta_4$)	6436.5(23)	6437.81(55)		1,34
L_1M_3 ($L\beta_3$)	6570.7(22)	6571.57(58)		1,34
L_1M_4 ($L\beta_{10}$)	6888.3(20)	6889.81(70)		1,34
L_1M_5 ($L\beta_9$)	6919.3(19)	6919.15(71)		1,34
L_1N_1	7687.2(45)	7687.6(24)		35
L_1N_2 ($L\gamma_2$)	7760.(16)$^{\#}$	7768.10(81)		1,34
L_1N_3 ($L\gamma_3$)	7791.0(18)	7794.11(81)		1,34
L_1N_4	7911.9(38)$^{\#}$	7914.56(36)	$L_1N_{4,5}$	34,35
L_1N_5	7914.2(14)	7914.56(36)	$L_1N_{4,5}$	34,35
L_1N_6	8040.1(15)			
L_1N_7	8042.8(15)			
L_1 edge	8053.7(12)	8060.75(78)		1
L_1 edge (c)		8047.53(88)		
L_2M_1 ($L\eta$)	5814.9(15)	5816.67(81)		1
L_2M_2	6003.0(16)			
L_2M_3 ($L\beta_{17}$)	6137.3(15)	6137.7(15)		35
L_2M_4 ($L\beta_1$)	6454.8(12)	6455.72(56)		1,34
L_2M_5	6485.9(12)			
L_2N_1 ($L\gamma_5$)	7253.8(38)	7255.47(70)		1,34
L_2N_2	7326.(15)$^{\#}$	7331.4(22)		36
L_2N_3	7357.6(10)			
L_2N_4 ($L\gamma_1$)	7478.5(30)$^{\#}$	7479.12(43)		1,34
L_2N_5	7480.82(67)			
L_2N_6 (Lv)	7606.73(76)	7612.87(94)	$L_2N_{6,7}$	34
L_2N_7	7609.40(75)	7612.87(94)	$L_2N_{6,7}$	34
L_2 edge	7620.28(45)	7619.83(69)		1
L_2 edge (c)		7614.32(98)		
L_3M_1 (Ll)	5175.1(15)	5177.15(64)		1
L_3M_2 (Lt)	5363.2(15)			
L_3M_3 (Ls)	5497.5(14)	5498.6(12)		35
L_3M_4 ($L\alpha_2$)	5815.0(12)	5816.61(45)		1,34
L_3M_5 ($L\alpha_1$)	5846.1(11)	5846.46(26)		1,34
L_3N_1 ($L\beta_6$)	6614.0(37)	6614.56(59)		1,34
L_3N_2	6687.(15)$^{\#}$			
L_3N_3	6717.81(94)			
L_3N_4 ($L\beta_{15}$)	6838.6(29)$^{\#}$	6841.83(63)	$L_3N_{4,5}$	1,34
L_3N_5 ($L\beta_2$)	6841.01(59)	6841.83(63)	$L_3N_{4,5}$	1,34
L_3N_6 (Lu)	6966.92(69)	6971.57(79)	$L_3N_{6,7}$	34
L_3N_7	6969.59(67)	6971.57(79)	$L_3N_{6,7}$	34
L_3 edge	6980.47(37)	6980.59(58)		1
L_3 edge (c)		6974.53(63)		
64	**Gadolinium**		**Gd**	
KL_1	41865.8(16)			
KL_2 ($K\alpha_2$)	42309.7(13)	42309.30(43)		1
KL_3 ($K\alpha_1$)	42996.8(12)	42996.72(44)		1
KM_1	48357.9(20)			
KM_2 ($K\beta_3$)	48550.5(21)	48555.8(56)		1
KM_3 ($K\beta_1$)	48695.7(21)	48696.9(57)		1
KM_4 ($K\beta_5^{II}$)	49020.8(18)	49053.3(86)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	49054.6(17)	49053.3(86)	$KM_{4,5}$	1
KN_1	49860.6(43)			
KN_2 ($K\beta_2^{II}$)	49935.3(47)$^{\#}$	49960.6(89)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	49969.7(15)	49960.6(89)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	50090.7(33)$^{\#}$			
KN_5 ($K\beta_4^{I}$)	50098.6(12)			
K edge	50251.67(97)	50233.9(30)		1
K edge (c)		50243.4(11)		
L_1M_1	6492.2(22)			
L_1M_2 ($L\beta_4$)	6684.8(23)	6687.3(11)		1
L_1M_3 ($L\beta_3$)	6829.9(23)	6831.0(11)		1
L_1M_4 ($L\beta_{10}$)	7155.0(20)	7160.4(18)		1
L_1M_5 ($L\beta_9$)	7188.8(19)	7191.6(19)		1
L_1N_1	7994.8(44)			
L_1N_2 ($L\gamma_2$)	8069.6(49)$^{\#}$	8087.0(16)		1
L_1N_3 ($L\gamma_3$)	8104.0(17)	8105.0(16)		1
L_1N_4	8224.9(34)$^{\#}$	8237.2(10)	$L_1N_{4,5}$	37,38
L_1N_5	8232.8(14)	8237.2(10)	$L_1N_{4,5}$	37,38
L_1N_6	8365.2(15)			
L_1N_7	8368.5(15)			
L_1 edge	8385.9(12)	8386.25(84)		1
L_1 edge (c)		8381.7(14)		
L_2M_1 ($L\eta$)	6048.3(16)	6049.69(44)		1
L_2M_2	6240.9(16)			
L_2M_3 ($L\beta_{17}$)	6386.0(15)			
L_2M_4 ($L\beta_1$)	6711.1(12)	6713.4(11)		1
L_2M_5	6744.9(12)	6743.32(74)		37
L_2N_1 ($L\gamma_5$)	7550.9(37)	7554.4(14)		1
L_2N_2	7625.7(41)$^{\#}$	7642.67(47)		39
L_2N_3	7660.08(97)	7657.7(12)		37,38
L_2N_4 ($L\gamma_1$)	7781.0(27)$^{\#}$	7785.9(14)		1
L_2N_5	7788.91(63)			
L_2N_6 (Lv)	7921.33(71)			
L_2N_7 (Lv)	7924.64(71)			
L_2 edge	7942.02(41)	7931.32(75)		1
L_2 edge (c)		7934.3(11)		
L_2 edge (v)		7940.5(20)		21
L_3M_1 (Ll)	5361.1(15)	5362.09(69)		1
L_3M_2 (Lt)	5553.7(15)			
L_3M_3 (Ls)	5698.9(15)	5698.3(13)		40
L_3M_4 ($L\alpha_2$)	6024.0(12)	6024.99(87)		1
L_3M_5 ($L\alpha_1$)	6057.8(11)	6057.37(88)		1
L_3N_1 ($L\beta_6$)	6863.8(36)	6867.3(11)		1
L_3N_2	6938.5(40)$^{\#}$			
L_3N_3	6972.94(89)			
L_3N_4 ($L\beta_{15}$)	7093.9(26)$^{\#}$	7103.0(12)	$L_3N_{4,5}$	1
L_3N_5 ($L\beta_2$)	7101.77(55)	7103.0(12)	$L_3N_{4,5}$	1

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
L_3N_6 (Lu)	7234.19(63)			
L_3N_7 (Lu)	7237.50(63)			
L_3 edge	7254.88(33)	7243.23(63)		1
L_3 edge (c)		7246.66(90)		
L_3 edge (v)		7251.9(20)		21
65	**Terbium**	**Tb**		
KL_1	43291.4(17)			
KL_2 ($K\alpha_2$)	43745.6(13)	43744.62(46)		1
KL_3 ($K\alpha_1$)	44482.9(12)	44482.75(47)		1
KM_1	50035.5(22)			
KM_2 ($K\beta_3$)	50233.0(22)	50229.8(60)		1
KM_3 ($K\beta_1$)	50389.1(22)	50382.9(61)		1
KM_4 ($K\beta_5^{II}$)	50722.7(19)			
KM_5 ($K\beta_5^{I}$)	50757.8(18)			
KN_1	51600.7(43)			
KN_2 ($K\beta_2^{II}$)	51678.3(46)#	51724.(64)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	51714.0(16)	51724.(64)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	51837.5(31)#			
KN_5 ($K\beta_4^{I}$)	51846.4(13)			
K edge	51999.5(11)	52003.8(32)		1
K edge (c)		51996.4(26)		
L_1M_1	6744.2(23)			
L_1M_2 ($L\beta_4$)	6941.7(24)	6940.3(11)		1
L_1M_3 ($L\beta_3$)	7097.7(24)	7096.1(12)		1
L_1M_4 ($L\beta_{10}$)	7431.3(20)	7436.1(20)		1
L_1M_5 ($L\beta_9$)	7466.5(20)			
L_1N_1	8309.3(44)	8313.88(56)		42
L_1N_2 ($L\gamma_2$)	8386.9(48)#	8397.6(17)		1
L_1N_3 ($L\gamma_3$)	8422.7(18)	8423.9(17)		1
L_1N_4	8546.2(32)#	8558.88(59)	$L_1N_{4,5}$	42
L_1N_5	8555.0(15)	8558.88(59)	$L_1N_{4,5}$	42
L_1N_6	8694.9(15)			
L_1N_7	8697.5(15)			
L_1 edge	8708.1(12)	8717.03(91)		1
L_1 edge (c)		8713.8(60)		
L_2M_1 ($L\eta$)	6290.0(17)	6283.95(94)		1
L_2M_2	6487.4(16)			
L_2M_3 ($L\beta_{17}$)	6643.5(16)			
L_2M_4 ($L\beta_1$)	6977.1(13)	6977.8(17)		1
L_2M_5	7012.3(12)	7009.37(79)		41
L_2N_1 ($L\gamma_5$)	7855.1(37)	7853.4(15)		1
L_2N_2	7932.7(40)#	7935.81(51)		43
L_2N_3	7968.5(10)	7968.42(49)		41,43
L_2N_4 ($L\gamma_1$)	8091.9(25)#	8101.8(16)		1
L_2N_5	8100.81(68)			
L_2N_6 (Lv)	8240.74(75)			
L_2N_7 (Lv)	8243.33(77)			
L_2 edge	8253.93(46)	8252.83(81)		1
L_2 edge (c)		8254.9(44)		
L_3M_1 (Ll)	5552.7(15)	5546.81(73)		1
L_3M_2 (Lt)	5750.1(15)			
L_3M_3 (Ls)	5906.2(15)			
L_3M_4 ($L\alpha_2$)	6239.8(12)	6238.10(93)		1
L_3M_5 ($L\alpha_1$)	6275.0(11)	6272.82(94)		1
L_3N_1 ($L\beta_6$)	7117.8(36)	7116.4(12)		1
L_3N_2	7195.4(39)#			
L_3N_3	7231.17(92)	7226.9(13)		41
L_3N_4 ($L\beta_{15}$)	7354.6(24)#	7366.7(13)	$L_3N_{4,5}$	1
L_3N_5 ($L\beta_2$)	7363.50(60)	7366.7(13)	$L_3N_{4,5}$	1
L_3N_6 (Lu)	7503.43(68)			
L_3N_7 (Lu)	7506.02(69)			
L_3 edge	7516.62(39)	7515.45(67)		1
L_3 edge (c)		7513.2(20)		
66	**Dysprosium**		**Dy**	
KL_1	44744.3(17)			
KL_2 ($K\alpha_2$)	45209.1(14)	45208.27(49)		1
KL_3 ($K\alpha_1$)	45999.4(13)	45998.94(51)		1
KM_1	51745.4(23)			
KM_2 ($K\beta_3$)	51947.7(23)	51958.1(64)		1
KM_3 ($K\beta_1$)	52115.7(23)	52119.7(65)		1
KM_4 ($K\beta_5^{II}$)	52457.4(19)	52494.8(99)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	52494.8(19)	52494.8(99)	$KM_{4,5}$	1
KN_1	53372.0(27)			
KN_2 ($K\beta_2^{II}$)	53451.7(29)#	53510.(68)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	53483.2(12)	53510.(68)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	53619.4(28)#			
KN_5 ($K\beta_4^{I}$)	53629.4(13)			
K edge	53792.3(11)	53793.1(35)		1
K edge (c)		53786.2(25)		
L_1M_1	7001.1(25)			
L_1M_2 ($L\beta_4$)	7203.4(24)	7203.96(43)		1
L_1M_3 ($L\beta_3$)	7371.4(24)	7370.2(13)		1
L_1M_4 ($L\beta_{10}$)	7713.1(21)	7712.79(58)		1,44
L_1M_5 ($L\beta_9$)	7750.4(20)	7749.57(59)		1,44
L_1N_1	8627.7(29)			
L_1N_2 ($L\gamma_2$)	8707.4(30)#	8714.09(63)		1
L_1N_3 ($L\gamma_3$)	8738.9(14)	8753.34(64)		1
L_1N_4	8875.1(29)#			
L_1N_5	8885.1(14)	8889.3(32)		45
L_1N_6	9035.2(15)			
L_1N_7	9037.6(15)			
L_1 edge	9048.0(12)	9055.09(98)		1
L_1 edge (c)		9046.1(27)		
L_2M_1 ($L\eta$)	6536.3(18)	6534.22(36)		1
L_2M_2	6738.6(16)			
L_2M_3 ($L\beta_{17}$)	6906.6(16)	6905.61(77)		44
L_2M_4 ($L\beta_1$)	7248.3(13)	7247.80(44)		1
L_2M_5	7285.7(12)	7277.2(13)		44
L_2N_1 ($L\gamma_5$)	8162.9(21)	8166.19(56)		1
L_2N_2	8242.6(22)#			
L_2N_3	8274.10(56)	8286.4(11)		44
L_2N_4 ($L\gamma_1$)	8410.3(21)#	8418.94(59)		1
L_2N_5	8420.27(63)			
L_2N_6 (Lv)	8570.38(71)			
L_2N_7 (Lv)	8572.86(72)			
L_2 edge	8583.26(42)	8583.06(88)		1

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Experiment Blend	Ref.
L_2 edge (c)		8580.2(12)		
L_3M_1 (Ll)	5746.0(15)	5743.05(26)		1,44
L_3M_2 (Lt)	5948.3(15)			
L_3M_3 (Ls)	6116.3(15)	6114.8(15)		46
L_3M_4 ($L\alpha_2$)	6458.0(12)	6457.72(15)		1
L_3M_5 ($L\alpha_1$)	6495.3(11)	6495.27(15)		1
L_3N_1 ($L\beta_6$)	7372.5(20)	7370.56(45)		1
L_3N_2	7452.3(21)#			
L_3N_3	7483.74(48)	7494.77(91)		44
L_3N_4 ($L\beta_{15}$)	7620.0(21)#	7635.84(49)	$L_3N_{4,5}$	1
L_3N_5 ($L\beta_2$)	7629.92(55)	7635.84(49)	$L_3N_{4,5}$	1
L_3N_6 (Lu)	7780.03(62)			
L_3N_7 (Lu)	7782.50(65)			
L_3 edge	7792.90(34)	7789.79(72)		1
L_3 edge (c)		7786.0(16)		
67	**Holmium**		**Ho**	
KL_1	46225.6(18)			
KL_2 ($K\alpha_2$)	46701.0(14)	46699.98(15)		8
KL_3 ($K\alpha_1$)	47547.5(13)	47547.10(77)		8
KM_1	53489.7(25)			
KM_2 ($K\beta_3$)	53696.9(23)	53711.3(69)		8
KM_3 ($K\beta_1$)	53877.5(24)	53877.1(70)		8
KM_4 ($K\beta_5^{II}$)	54227.4(20)	54247.(11)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	54267.1(19)	54247.(11)	$KM_{4,5}$	1
KN_1	55188.2(41)			
KN_2 ($K\beta_2^{II}$)	55271.2(44)#	55325.(73)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	55312.1(16)	55325.(73)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	55442.0(26)#			
KN_5 ($K\beta_4^{I}$)	55453.7(13)			
K edge	55620.8(11)	55619.9(37)		1
K edge (c)		55614.6(12)		
L_1M_1	7264.1(26)			
L_1M_2 ($L\beta_4$)	7471.3(25)	7471.1(13)		1
L_1M_3 ($L\beta_3$)	7651.9(25)	7651.8(14)		1
L_1M_4 ($L\beta_{10}$)	8001.8(21)	8004.08(15)		76
L_1M_5 ($L\beta_9$)	8041.5(20)	8044.61(14)		76
L_1N_1	8962.6(42)			
L_1N_2 ($L\gamma_2$)	9045.6(45)#	9051.1(20)		1
L_1N_3 ($L\gamma_3$)	9086.5(18)	9087.6(20)		1
L_1N_4	9216.4(27)#			
L_1N_5	9228.1(15)			
L_1N_6	9382.7(15)			
L_1N_7	9385.0(16)			
L_1 edge	9395.2(12)	9399.7(11)		1
L_1 edge (c)		9395.8(20)		
L_2M_1 ($L\eta$)	6788.7(20)	6786.94(27)		3
L_2M_2	6995.9(16)			
L_2M_3 ($L\beta_{17}$)	7176.5(17)			
L_2M_4 ($L\beta_1$)	7526.4(13)	7525.67(15)		3
L_2M_5	7566.1(12)			
L_2N_1 ($L\gamma_5$)	8487.3(35)	8481.5(17)		1
L_2N_2	8570.2(37)#			
L_2N_3	8611.15(93)			
L_2N_4 ($L\gamma_1$)	8741.0(18)#	8747.2(18)		1
L_2N_5	8752.71(63)			
L_2N_6 (Lv)	8907.28(70)			
L_2N_7 (Lv)	8909.60(74)			
L_2 edge	8919.77(42)	8916.38(95)		1
L_2 edge (c)		8913.9(17)		
L_3M_1 (Ll)	5942.2(16)	5939.963(71)		3
L_3M_2 (Lt)	6149.4(16)			
L_3M_3 (Ls)	6330.0(16)			
L_3M_4 ($L\alpha_2$)	6680.0(12)	6678.484(54)		3
L_3M_5 ($L\alpha_1$)	6719.6(11)	6719.675(62)		3
L_3N_1 ($L\beta_6$)	7640.8(34)	7635.8(14)		1
L_3N_2	7723.8(36)#	7727.16(48)		47
L_3N_3	7764.70(85)	7763.52(49)		47
L_3N_4 ($L\beta_{15}$)	7894.5(18)#	7902.86(25)		47
L_3N_5 ($L\beta_2$)	7906.26(55)	7911.35(25)		47
L_3N_6 (Lu)	8060.83(62)			
L_3N_7 (Lu)	8063.15(65)			
L_3 edge	8073.31(34)	8067.56(78)		1
L_3 edge (c)		8071.1(18)		
68	**Erbium**		**Er**	
KL_1	47736.8(19)			
KL_2 ($K\alpha_2$)	48223.0(15)	48221.61(20)		5
KL_3 ($K\alpha_1$)	49128.7(14)	49127.24(12)		5
KM_1	55270.1(27)			
KM_2 ($K\beta_3$)	55482.3(24)	55479.72(35)		5
KM_3 ($K\beta_1$)	55676.3(24)	55673.52(18)		5
KM_4 ($K\beta_5^{II}$)	56034.5(20)	56040.(11)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	56076.6(20)	56040.(11)	$KM_{4,5}$	1
KN_1	57037.5(41)			
KN_2 ($K\beta_2^{II}$)	57123.3(43)#	57214.(78)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	57167.0(17)	57214.(78)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	57301.1(23)#			
KN_5 ($K\beta_4^{I}$)	57313.3(14)			
K edge	57487.4(12)	57485.2(20)		14
K edge (c)		57486.3(13)		
L_1M_1	7533.4(28)			
L_1M_2 ($L\beta_4$)	7745.5(25)	7744.75(14)		3
L_1M_3 ($L\beta_3$)	7939.5(26)	7939.007(86)		3
L_1M_4 ($L\beta_{10}$)	8297.8(21)	8298.1(25)		1
L_1M_5 ($L\beta_9$)	8339.9(21)	8340.66(56)		1,52
L_1N_1	9300.7(42)			
L_1N_2 ($L\gamma_2$)	9386.6(44)#	9385.5(21)		1
L_1N_3 ($L\gamma_3$)	9430.3(18)	9431.2(11)		1
L_1N_4	9564.3(24)#	9569.15(74)	$L_1N_{4,5}$	51
L_1N_5	9576.5(15)	9569.15(74)	$L_1N_{4,5}$	51
L_1N_6	9738.6(16)			
L_1N_7	9740.7(16)			
L_1 edge	9750.6(13)	9757.8(11)		1
L_1 edge (c)		9751.4(11)		
L_2M_1 ($L\eta$)	7047.1(21)	7045.167(90)		3
L_2M_2	7259.3(17)			
L_2M_3 ($L\beta_{17}$)	7453.3(17)	7461.31(45)		50

TABLE V. (*Continued*).

	Theory	Experiment		
Designation	Energy (eV)	Energy (eV)	Blend	Ref.
L_2M_4 ($L\beta_1$)	7811.5(13)	7810.19(42)		3
L_2M_5	7853.6(12)			
L_2N_1 ($L\gamma_5$)	8814.5(34)	8813.7(28)		1
L_2N_2	8900.3(35)#			
L_2N_3	8944.03(93)	8946.94(65)		49
L_2N_4 ($L\gamma_1$)	9078.1(16)#	9088.9(20)		1
L_2N_5	9090.26(63)			
L_2N_6 (Lv)	9252.38(70)			
L_2N_7 (Lv)	9254.50(74)			
L_2 edge	9264.40(42)	9262.1(10)		1
L_2 edge (c)		9266.9(18)		
L_2 edge (v)		9263.9(20)		21
L_3M_1 (Ll)	6141.4(16)	6138.86(14)		3
L_3M_2 (Lt)	6353.6(16)			
L_3M_3 (Ls)	6547.6(16)			
L_3M_4 ($L\alpha_2$)	6905.8(12)	6904.50(17)		3
L_3M_5 ($L\alpha_1$)	6947.9(11)	6947.913(77)		3
L_3N_1 ($L\beta_6$)	7908.7(33)	7909.6(15)		1
L_3N_2	7994.6(35)#			
L_3N_3	8038.29(84)			
L_3N_4 ($L\beta_{15}$)	8172.4(15)#	8189.11(72)	$L_3N_{4,5}$	1
L_3N_5 ($L\beta_2$)	8184.52(55)	8189.11(72)	$L_3N_{4,5}$	1
L_3N_6 (Lu)	8346.63(63)			
L_3N_7 (Lu)	8348.75(65)			
L_3 edge	8358.66(34)	8357.42(83)		1
L_3 edge (c)		8359.4(15)		
L_3 edge (v)		8358.7(20)		21
69	**Thulium**		**Tm**	
KL_1	49276.7(19)			
KL_2 ($K\alpha_2$)	49773.8(15)	49772.67(12)		9
KL_3 ($K\alpha_1$)	50742.2(14)	50741.475(92)		9
KM_1	57085.6(28)			
KM_2 ($K\beta_3$)	57302.8(25)	57303.0(79)		9
KM_3 ($K\beta_1$)	57511.0(25)	57508.76(15)		9
KM_4 ($K\beta_5^{II}$)	57877.6(21)	57924.8(80)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	57922.3(20)	57924.8(80)	$KM_{4,5}$	1
KN_1	58923.4(40)			
KN_2 ($K\beta_2^{II}$)	59012.3(43)#	59095.(83)	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	59058.9(17)	59095.(83)	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	59197.7(21)#			
KN_5 ($K\beta_4^{I}$)	59209.8(15)			
K edge	59391.1(13)	59379.(21)		1
K edge (c)		59389.0(13)		
L_1M_1	7808.9(29)	7814.0(25)		54
L_1M_2 ($L\beta_4$)	8026.1(26)	8025.8(15)		1
L_1M_3 ($L\beta_3$)	8234.3(26)	8230.9(16)		1
L_1M_4 ($L\beta_{10}$)	8600.9(22)	8600.8(15)		1,53
L_1M_5 ($L\beta_9$)	8645.6(21)	8648.6(15)		1,53
L_1N_1	9646.7(41)			
L_1N_2 ($L\gamma_2$)	9735.6(43)#	9730.2(23)		1
L_1N_3 ($L\gamma_3$)	9782.2(18)	9779.3(23)		1
L_1N_4	9921.0(22)#			
L_1N_5	9933.1(15)			
L_1N_6	10102.9(16)			
L_1N_7	10104.8(17)			
L_1 edge	10114.4(13)	10121.0(12)		1
L_1 edge (c)		10111.9(23)		
L_2M_1 ($L\eta$)	7311.8(22)	7309.30(56)		3
L_2M_2	7529.0(17)			
L_2M_3 ($L\beta_{17}$)	7737.2(17)	7728.6(24)		54
L_2M_4 ($L\beta_1$)	8103.8(13)	8102.265(37)		3
L_2M_5	8148.5(12)	8146.0(16)		53
L_2N_1 ($L\gamma_5$)	9149.6(33)	9144.6(20)		1
L_2N_2	9238.5(34)#	9225.2(21)		53
L_2N_3	9285.08(92)			
L_2N_4 ($L\gamma_1$)	9423.9(13)#	9426.2(21)		1
L_2N_5	9436.02(63)			
L_2N_6 (Lv)	9605.83(72)			
L_2N_7 (Lv)	9607.72(76)			
L_2 edge	9617.34(43)	9617.0(11)		1
L_2 edge (c)		9615.5(20)		
L_3M_1 (Ll)	6343.5(16)	6341.96(83)		1,54
L_3M_2 (Lt)	6560.7(16)	6557.5(17)		54
L_3M_3 (Ls)	6768.9(16)			
L_3M_4 ($L\alpha_2$)	7135.4(12)	7133.715(78)		3
L_3M_5 ($L\alpha_1$)	7180.1(11)	7180.113(29)		3
L_3N_1 ($L\beta_6$)	8181.2(31)	8177.2(16)		1
L_3N_2	8270.1(34)#	8263.1(17)		53
L_3N_3	8316.72(83)			
L_3N_4 ($L\beta_{15}$)	8455.6(12)#	8468.7(17)	$L_3N_{4,5}$	1
L_3N_5 ($L\beta_2$)	8467.65(55)	8468.7(17)	$L_3N_{4,5}$	1
L_3N_6 (Lu)	8637.46(63)			
L_3N_7 (Lu)	8639.35(67)			
L_3 edge	8648.97(34)	8649.53(89)		1
L_3 edge (c)		8648.1(16)		
70	**Ytterbium**		**Yb**	
KL_1	50846.5(20)			
KL_2 ($K\alpha_2$)	51354.7(16)	51354.60(63)		1
KL_3 ($K\alpha_1$)	52389.1(15)	52389.48(66)		1
KM_1	58937.5(30)			
KM_2 ($K\beta_3$)	59160.1(26)	59152.(42)†		1
KM_3 ($K\beta_1$)	59383.3(27)	59367.1(84)‡		1
KM_4 ($K\beta_5^{II}$)	59758.2(22)	59782.2(85)‡	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	59805.4(21)	59782.2(85)‡	$KM_{4,5}$	1
KN_1	60847.3(39)			
KN_2 ($K\beta_2^{II}$)	60939.1(41)	60985.(89)†	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	60988.5(18)	60985.(89)†	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	61132.8(19)			
KN_5 ($K\beta_4^{I}$)	61144.8(15)			
K edge	61333.3(13)	61305.(22)		1
K edge (c)		61330.8(68)		
L_1M_1	8091.0(31)			
L_1M_2 ($L\beta_4$)	8313.6(27)	8313.26(25)		1
L_1M_3 ($L\beta_3$)	8536.8(28)	8536.79(43)		1
L_1M_4 ($L\beta_{10}$)	8911.7(23)	8913.31(14)		76
L_1M_5 ($L\beta_9$)	8958.9(22)	8960.64(19)		76

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
L_1N_1	10000.8(40)			
L_1N_2 ($L\gamma_2$)	10092.6(42)	10089.79(85)		1
L_1N_3 ($L\gamma_3$)	10142.0(18)	10143.20(61)		1
L_1N_4	10286.3(19)	10297.90(86)	$L_1N_{4,5}$	55
L_1N_5	10298.3(16)	10297.90(86)	$L_1N_{4,5}$	55
L_1N_6	10475.9(17)			
L_1N_7	10477.7(17)			
L_1 edge	10486.8(14)	10491.0(13)		1
L_1 edge (c)		10483.5(54)		
L_2M_1 ($L\eta$)	7582.8(23)	7580.24(34)		1
L_2M_2	7805.4(18)	7805.29(65)		1
L_2M_3 ($L\beta_{17}$)	8028.6(18)	8024.08(52)		55
L_2M_4 ($L\beta_1$)	8403.6(14)	8401.88(42)		1
L_2M_5	8450.8(12)			
L_2N_1 ($L\gamma_5$)	9492.7(31)	9491.1(11)		1
L_2N_2	9584.4(32)			
L_2N_3	9633.83(89)			
L_2N_4 ($L\gamma_1$)	9778.2(10)	9780.18(57)		1
L_2N_5	9790.13(65)			
L_2N_6 (Lv)	9967.79(73)			
L_2N_7 (Lv)	9969.53(78)			
L_2 edge	9978.70(44)	9976.0(12)		1
L_2 edge (c)		9971.46(56)		
L_2 edge (v)		9978.1(20)		21
L_3M_1 (Ll)	6548.4(17)	6545.54(26)		1
L_3M_2 (Lt)	6771.0(17)	6771.62(49)		1
L_3M_3 (Ls)	6994.2(17)	6995.85(40)		55
L_3M_4 ($L\alpha_2$)	7369.1(13)	7367.40(32)		1
L_3M_5 ($L\alpha_1$)	7416.3(12)	7415.70(26)		1
L_3N_1 ($L\beta_6$)	8458.2(30)	8456.61(85)		1
L_3N_2	8550.0(31)			
L_3N_3	8599.39(79)			
L_3N_4 ($L\beta_{15}$)	8743.73(91)	8758.91(46)	$L_3N_{4,5}$	1
L_3N_5 ($L\beta_2$)	8755.69(55)	8758.91(46)	$L_3N_{4,5}$	1
L_3N_6 (Lu)	8933.35(64)			
L_3N_7 (Lu)	8935.09(68)			
L_3 edge	8944.26(35)	8944.04(95)		1
L_3 edge (c)		8946.6(65)		
71	**Lutetium**		**Lu**	
KL_1	52445.5(21)			
KL_2 ($K\alpha_2$)	52965.3(17)	52965.57(67)		1
KL_3 ($K\alpha_1$)	54069.5(15)	54070.39(70)		1
KM_1	60823.9(31)			
KM_2 ($K\beta_3$)	61051.8(27)	61048.(18)†		1
KM_3 ($K\beta_1$)	61291.2(27)	61283.(13)†		1
KM_4 ($K\beta_5^{II}$)	61674.4(22)	61731.9(91)‡	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	61725.3(22)	61731.9(91)	$KM_{4,5}$	1
KN_1	62809.2(40)			
KN_2 ($K\beta_2^{II}$)	62903.9(42)	62967.(95)†	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	62957.6(18)	62967.(95)†	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	63106.5(25)			
KN_5 ($K\beta_4^{I}$)	63119.0(16)			
K edge	63322.7(14)	63305.(24)		1
K edge (c)		63315.52(64)		
L_1M_1	8378.4(31)			
L_1M_2 ($L\beta_4$)	8606.3(27)	8606.54(44)		1
L_1M_3 ($L\beta_3$)	8845.6(27)	8847.03(47)		1
L_1M_4 ($L\beta_{10}$)	9228.9(23)	9231.7(20)		1
L_1M_5 ($L\beta_9$)	9279.7(22)	9281.5(10)		1
L_1N_1	10363.7(40)			
L_1N_2 ($L\gamma_2$)	10458.4(42)	10460.0(26)		1
L_1N_3 ($L\gamma_3$)	10512.0(19)	10511.16(53)		1
L_1N_4	10661.0(25)	10667.3(12)		1
L_1N_5	10673.5(16)	10678.3(12)		1
L_1N_6	10858.7(17)			
L_1N_7	10860.6(17)			
L_1 edge	10877.2(14)	10873.7(14)		1
L_1 edge (c)		10871.7(21)		
L_2M_1 ($L\eta$)	7858.6(24)	7857.43(74)		1
L_2M_2	8086.5(17)	8085.82(70)		1
L_2M_3 ($L\beta_{17}$)	8325.9(18)	8323.17(56)		56
L_2M_4 ($L\beta_1$)	8709.1(13)	8709.13(27)		1
L_2M_5	8760.0(12)			
L_2N_1 ($L\gamma_5$)	9843.9(31)	9843.0(12)		1
L_2N_2	9938.7(33)			
L_2N_3	9992.28(91)			
L_2N_4 ($L\gamma_1$)	10141.2(15)	10143.53(49)		1
L_2N_5	10153.73(64)			
L_2N_6 (Lv)	10338.91(74)			
L_2N_7 (Lv)	10340.83(78)			
L_2 edge	10357.43(44)	10344.8(13)		1
L_2 edge (c)		10349.66(52)		
L_3M_1 (Ll)	6754.4(16)	6752.85(54)		1
L_3M_2 (Lt)	6982.4(16)	6980.99(58)		1
L_3M_3 (Ls)	7221.7(17)			
L_3M_4 ($L\alpha_2$)	7605.0(12)	7604.92(35)		1
L_3M_5 ($L\alpha_1$)	7655.8(12)	7655.55(21)		1
L_3N_1 ($L\beta_6$)	8739.8(30)	8737.92(91)		1
L_3N_2	8834.5(32)			
L_3N_3	8888.09(81)			
L_3N_4 ($L\beta_{15}$)	9037.0(14)	9039.91(98)		1
L_3N_5 ($L\beta_2$)	9049.54(56)	9049.01(29)		1
L_3N_6 (Lu)	9234.72(65)			
L_3N_7 (Lu)	9236.64(68)			
L_3 edge	9253.24(35)	9249.0(10)		1
L_3 edge (c)		9245.28(64)		
72	**Hafnium**		**Hf**	
KL_1	54074.8(21)			
KL_2 ($K\alpha_2$)	54606.4(17)	54612.0(11)‡		1
KL_3 ($K\alpha_1$)	55784.1(16)	55790.8(11)‡		1
KM_1	62747.2(32)			
KM_2 ($K\beta_3$)	62980.8(27)	62980.(19)†		1
KM_3 ($K\beta_1$)	63237.2(28)	63234.(14)†		1
KM_4 ($K\beta_5^{II}$)	63628.8(23)			
KM_5 ($K\beta_5^{I}$)	63683.2(22)			

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
KN_1	64810.0(41)			
KN_2 ($K\beta_2^{II}$)	64907.3(43)	64980.(101)†	$KN_{2,3}$	1
KN_3 ($K\beta_2^{I}$)	64965.3(19)	64980.(101)†	$KN_{2,3}$	1
KN_4 ($K\beta_4^{II}$)	65119.3(26)			
KN_5 ($K\beta_4^{I}$)	65132.6(17)			
K edge	65352.0(14)	65316.(25)		1
K edge (c)		65350.36(98)		
L_1M_1	8672.4(31)	8668.58(81)		1
L_1M_2 ($L\beta_4$)	8906.0(27)	8905.50(47)		1
L_1M_3 ($L\beta_3$)	9162.4(28)	9163.51(50)		1
L_1M_4 ($L\beta_{10}$)	9554.0(23)	9550.40(98)		1
L_1M_5 ($L\beta_9$)	9608.4(22)	9609.17(99)		1
L_1N_1	10735.2(40)			
L_1N_2 ($L\gamma_2$)	10832.5(42)	10833.64(70)		1
L_1N_3 ($L\gamma_3$)	10890.5(19)	10890.83(71)		1
L_1N_4	11044.5(26)	11045.2(13)		1
L_1N_5	11057.8(16)	11055.4(13)		1
L_1N_6	11250.5(17)			
L_1N_7	11252.7(17)			
L_1 edge	11277.2(14)	11268.585(50)		13
L_1 edge (c)		11270.3(25)		
L_2M_1 ($L\eta$)	8140.8(24)	8139.33(40)		1
L_2M_2	8374.4(17)	8373.56(75)		1
L_2M_3 ($L\beta_{17}$)	8630.8(18)	8631.28(80)		1
L_2M_4 ($L\beta_1$)	9022.4(13)	9022.80(49)		1
L_2M_5	9076.9(13)			
L_2N_1 ($L\gamma_5$)	10203.6(32)	10201.20(62)		1
L_2N_2	10301.0(33)			
L_2N_3	10358.90(90)			
L_2N_4 ($L\gamma_1$)	10512.9(16)	10515.89(66)		1
L_2N_5	10526.26(65)	10525.9(12)		1
L_2N_6 (Lv)	10718.95(75)	10703.8(12)‡		1
L_2N_7 (Lv)	10721.18(78)			
L_2 edge	10745.60(45)	10735.875(20)		13
L_2 edge (c)		10734.9(98)		
L_3M_1 (Ll)	6963.1(17)	6959.63(29)		1
L_3M_2 (Lt)	7196.7(17)	7195.52(56)		1
L_3M_3 (Ls)	7453.1(18)	7453.28(60)		1
L_3M_4 ($L\alpha_2$)	7844.7(12)	7844.70(37)		1
L_3M_5 ($L\alpha_1$)	7899.1(12)	7899.08(37)		1
L_3N_1 ($L\beta_6$)	9025.9(30)	9022.80(49)		1
L_3N_2	9123.2(32)	9123.93(89)		1
L_3N_3	9181.18(81)	9180.27(91)		1
L_3N_4 ($L\beta_{15}$)	9335.2(15)	9337.21(52)		1
L_3N_5 ($L\beta_2$)	9348.54(55)	9347.35(52)		1
L_3N_6 (Lu)	9541.24(66)	9525.01(97)	$L_3N_{6,7}$	1
L_3N_7 (Lu)	9543.46(69)	9525.01(97)	$L_3N_{6,7}$	1
L_3 edge	9567.88(36)	9558.286(50)		13
L_3 edge (c)		9558.(11)		
73	**Tantalum**		**Ta**	
KL_1	55735.0(21)			
KL_2 ($K\alpha_2$)	56278.7(18)	56277.6(15)		1
KL_3 ($K\alpha_1$)	57533.9(17)	57533.2(16)		1
KM_1	64708.3(32)			
KM_2 ($K\beta_3$)	64947.7(28)	64949.6(10)		1
KM_3 ($K\beta_1$)	65222.1(29)	65223.3(20)		1
KM_4 ($K\beta_5^{II}$)	65622.1(24)	65626.9(31)		1
KM_5 ($K\beta_5^{I}$)	65680.4(23)	65683.6(31)		1
KN_1	66866.7(42)			
KN_2 ($K\beta_2^{II}$)	66966.8(43)	66949.4(48)		1
KN_3 ($K\beta_2^{I}$)	67029.3(20)	67013.5(43)‡		1
KN_4 ($K\beta_4^{II}$)	67242.1(28)	67195.4(54)‡	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)	67202.7(17)	67195.4(54)‡	$KN_{4,5}$	1
K edge	67431.9(15)	67403.7(54)		1
K edge (c)		67411.24(79)		
L_1M_1	8973.2(31)			
L_1M_2 ($L\beta_4$)	9212.6(27)	9212.47(30)		1
L_1M_3 ($L\beta_3$)	9487.1(28)	9487.62(32)		1
L_1M_4 ($L\beta_{10}$)	9887.0(23)	9889.3(23)		1
L_1M_5 ($L\beta_9$)	9945.3(22)	9945.6(24)		1
L_1N_1	11131.6(41)	11117.4(13)		1
L_1N_2 ($L\gamma_2$)	11231.7(42)	11217.1(15)‡		1
L_1N_3 ($L\gamma_3$)	11294.2(19)	11277.68(61)‡		1
L_1N_4	11507.0(27)	11439.9(11)‡		1
L_1N_5	11467.6(16)	11458.1(11)		1
L_1N_6	11667.8(17)			
L_1N_7	11670.4(18)			
L_1 edge	11696.9(14)	11682.1(16)		1
L_1 edge (c)		11679.8(33)		
L_2M_1 ($L\eta$)	8429.6(24)	8428.09(42)		1
L_2M_2	8669.0(18)	8668.56(49)		1,57
L_2M_3 ($L\beta_{17}$)	8943.4(19)	8941.76(54)		1,57
L_2M_4 ($L\beta_1$)	9343.4(13)	9343.19(31)		1
L_2M_5	9401.7(13)	9399.94(95)		1
L_2N_1 ($L\gamma_5$)	10588.0(32)	10570.6(13)‡		1
L_2N_2	10688.1(32)	10674.04(87)		1,57
L_2N_3	10750.59(90)	10731.6(14)‡		1
L_2N_4 ($L\gamma_1$)	10963.4(17)	10895.33(43)		1
L_2N_5	10923.97(65)	10906.84(77)‡		1,57
L_2N_6 (Lv)	11124.17(77)	11107.82(83)‡		1,57
L_2N_7 (Lv)	11126.71(80)			
L_2 edge	11153.23(46)	11132.5(15)		1
L_2 edge (c)		11132.9(14)		
L_3M_1 (Ll)	7174.4(17)	7173.20(31)		1
L_3M_2 (Lt)	7413.8(17)	7412.13(35)		1,57
L_3M_3 (Ls)	7688.2(18)	7686.65(38)		1,57
L_3M_4 ($L\alpha_2$)	8088.2(12)	8087.93(16)		1
L_3M_5 ($L\alpha_1$)	8146.5(12)	8146.17(16)		1
L_3N_1 ($L\beta_6$)	9332.8(31)	9315.40(83)‡		1
L_3N_2	9432.9(32)	9416.1(11)‡		1
L_3N_3	9495.40(80)	9474.4(11)‡		1
L_3N_4 ($L\beta_{15}$)	9708.2(16)	9639.50(55)‡		1
L_3N_5 ($L\beta_2$)	9668.78(56)	9651.89(22)‡		1
L_3N_6 (Lu)	9868.99(67)	9857.23(46)	$L_3N_{6,7}$	1
L_3N_7 (Lu)	9871.52(70)	9857.23(46)	$L_3N_{6,7}$	1
L_3 edge	9898.04(36)	9876.7(12)		1

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
L_3 edge (c)		9878.7(27)		
74	**Tungsten**		**W**	
KL_1	57426.1(22)	57420.(16)		1
KL_2 ($K\alpha_2$)	57981.9(19)	57981.77(14)		5,81
KL_3 ($K\alpha_1$)	59318.8(17)	59318.847(50)		5
KM_1	66706.9(33)			
KM_2 ($K\beta_3$)	66952.1(29)	66952.19(25)		5,81
KM_3 ($K\beta_1$)	67245.6(30)	67245.0(11)		5
KM_4 ($K\beta_5^{II}$)	67654.0(25)	67652.3(27)		1
KM_5 ($K\beta_5^{I}$)	67716.4(24)	67715.9(38)		1
KN_1	68932.0(43)			
KN_2 ($K\beta_2^{II}$)	69035.5(46)	69032.5(57)		1
KN_3 ($K\beta_2^{I}$)	69102.2(20)	69101.3(40)		1
KN_4 ($K\beta_4^{II}$)	69267.3(32)	69295.(11)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)	69281.8(18)	69295.(11)	$KN_{4,5}$	1
K edge	69533.0(16)	69508.5(58)		1
K edge (c)		69524.9(25)		
L_1M_1	9280.7(31)	9278.10(68)		1,60
L_1M_2 ($L\beta_4$)	9526.0(28)	9525.23(54)		1
L_1M_3 ($L\beta_3$)	9819.5(29)	9818.91(46)		1,58
L_1M_4 ($L\beta_{10}$)	10227.8(23)	10228.29(24)		76
L_1M_5 ($L\beta_9$)	10290.3(22)	10291.13(22)		76
L_1N_1	11505.8(42)	11502.8(11)		60
L_1N_2 ($L\gamma_2$)	11609.4(44)	11610.50(44)		1,58
L_1N_3 ($L\gamma_3$)	11676.1(19)	11680.49(73)		1,58
L_1N_4	11841.2(30)	11843.9(33)		1
L_1N_5	11855.6(16)	11861.9(11)		1,58
L_1N_6	12063.2(18)			
L_1N_7	12065.8(17)			
L_1 edge	12106.9(14)	12099.73(87)		1
L_1 edge (c)		12102.4(41)		
L_2M_1 ($L\eta$)	8725.0(24)	8724.42(25)		1,58
L_2M_2	8970.3(18)	8953.03(65)		58
L_2M_3 ($L\beta_{17}$)	9263.7(19)	9268.72(48)		1,58,60
L_2M_4 ($L\beta_1$)	9672.1(13)	9672.58(10)		1,58
L_2M_5	9734.5(13)	9735.08(73)		1,60
L_2N_1 ($L\gamma_5$)	10950.1(33)	10948.91(39)		1,58
L_2N_2	11053.7(35)	11045.20(96)		1,60
L_2N_3	11120.32(90)	11120.5(30)		1
L_2N_4 ($L\gamma_1$)	11285.4(21)	11286.00(46)		1
L_2N_5	11299.89(66)			
L_2N_6 (Lv)	11507.48(79)	11504.83(89)		1,58
L_2N_7 (Lv)	11510.08(78)	11514.6(11)		60
L_2 edge	11551.16(47)	11538.6(16)		1
L_2 edge (c)		11540.8(41)		
L_3M_1 (Ll)	7388.1(17)	7387.82(65)		1
L_3M_2 (Lt)	7633.4(17)	7631.41(86)		1,59
L_3M_3 (Ls)	7926.8(18)	7926.44(93)		1,59
L_3M_4 ($L\alpha_2$)	8335.2(12)	8335.34(17)		1
L_3M_5 ($L\alpha_1$)	8397.6(12)	8398.242(54)		1,58
L_3N_1 ($L\beta_6$)	9613.2(31)	9608.199(74)		1,58
L_3N_2	9716.8(34)	9712.7(23)		1
L_3N_3	9783.42(79)	9767.238(77)		1,58
L_3N_4 ($L\beta_{15}$)	9948.5(20)	9947.95(35)		1
L_3N_5 ($L\beta_2$)	9962.99(56)	9964.133(78)		1,58
L_3N_6 (Lu)	10170.58(69)	10173.49(62)	$L_3N_{6,7}$	1
L_3N_7 (Lu)	10173.18(68)	10173.49(62)	$L_3N_{6,7}$	1
L_3 edge	10214.26(36)	10200.1(12)		1
L_3 edge (c)		10200.9(83)		
75	**Rhenium**		**Re**	
KL_1	59150.0(22)			
KL_2 ($K\alpha_2$)	59718.3(19)	59718.57(43)		1
KL_3 ($K\alpha_1$)	61141.2(18)	61141.00(89)		1
KM_1	68745.6(34)			
KM_2 ($K\beta_3$)	68996.8(30)	68995.2(17)		1
KM_3 ($K\beta_1$)	69310.4(32)	69310.3(17)		1
KM_4 ($K\beta_5^{II}$)	69727.3(25)	69719.6(58)		1
KM_5 ($K\beta_5^{I}$)	69793.9(25)	69786.3(58)		1
KN_1	71053.6(44)			
KN_2 ($K\beta_2^{II}$)	71159.6(45)	71152.0(60)		1
KN_3 ($K\beta_2^{I}$)	71231.9(21)	71232.1(36)		1
KN_4 ($K\beta_4^{II}$)	71402.1(32)	71410.(12)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)	71417.6(19)	71410.(12)	$KN_{4,5}$	1
K edge	71687.5(17)	71657.8(61)		1
K edge (c)		71677.41(74)		
L_1M_1	9595.6(32)			
L_1M_2 ($L\beta_4$)	9846.8(28)	9846.35(58)		1
L_1M_3 ($L\beta_3$)	10160.4(29)	10159.90(62)		1
L_1M_4 ($L\beta_{10}$)	10577.3(23)	10577.07(67)		1
L_1M_5 ($L\beta_9$)	10643.9(23)	10643.45(54)		1
L_1N_1	11903.6(42)	11898.5(17)		1
L_1N_2 ($L\gamma_2$)	12009.5(43)	12009.95(86)		1
L_1N_3 ($L\gamma_3$)	12081.9(19)	12082.5(12)		1
L_1N_4	12252.1(30)	12252.4(18)		1
L_1N_5	12267.6(16)	12265.8(18)		1
L_1N_6	12483.0(23)			
L_1N_7	12486.0(23)			
L_1 edge	12537.5(14)	12531.1(19)		1
L_1 edge (c)		12527.8(27)		
L_2M_1 ($L\eta$)	9027.3(24)	9027.27(49)		1
L_2M_2	9278.5(18)	9275.9(10)		1
L_2M_3 ($L\beta_{17}$)	9592.1(20)	9591.0(11)		1
L_2M_4 ($L\beta_1$)	10009.0(14)	10010.04(24)		1
L_2M_5	10075.6(13)	10075.8(12)		1
L_2N_1 ($L\gamma_5$)	11335.3(33)	11334.18(77)		1
L_2N_2	11441.2(33)	11438.5(16)		1
L_2N_3	11513.59(90)	11515.0(16)		1
L_2N_4 ($L\gamma_1$)	11683.8(21)	11685.53(82)		1
L_2N_5	11699.29(67)			
L_2N_6 (Lv)	11914.7(13)	11916.8(17)		1
L_2N_7 (Lv)	11917.7(14)			
L_2 edge	11969.17(47)	11954.7(17)		1
L_2 edge (c)		11959.6(23)		
L_3M_1 (Ll)	7604.4(17)	7603.67(35)		1
L_3M_2 (Lt)	7855.7(17)	7852.45(74)		1
L_3M_3 (Ls)	8169.3(19)	8168.55(80)		1

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Experiment Blend	Ref.
L_3M_4 $(L\alpha_2)$	8586.2(12)	8586.27(44)		1
L_3M_5 $(L\alpha_1)$	8652.8(12)	8652.55(36)		1
L_3N_1 $(L\beta_6)$	9912.4(31)	9910.66(59)		1
L_3N_2	10018.4(32)			
L_3N_3	10090.77(79)	10093.8(12)		1
L_3N_4 $(L\beta_{15})$	10261.0(19)	10261.82(63)		1
L_3N_5 $(L\beta_2)$	10276.46(57)	10275.35(50)		1
L_3N_6 (Lu)	10491.9(12)	10493.6(13)	$L_3N_{6,7}$	1
L_3N_7 (Lu)	10494.9(13)	10493.6(13)	$L_3N_{6,7}$	1
L_3 edge	10546.35(36)	10531.1(13)		1
L_3 edge (c)		10536.3(25)		
76	**Osmium**		**Os**	
KL_1	60905.6(23)			
KL_2 $(K\alpha_2)$	61486.6(20)	61487.27(90)		1
KL_3 $(K\alpha_1)$	62999.99(19)	63001.07(95)		1
KM_1	70823.2(35)			
KM_2 $(K\beta_3)$	71080.5(31)	71078.1(18)		1
KM_3 $(K\beta_1)$	71415.3(33)	71413.9(18)		1
KM_4 $(K\beta_5^{II})$	71840.9(26)	71823.8(62)		1
KM_5 $(K\beta_5^{II})$	71911.8(26)	71894.7(62)‡		1
KN_1	73217.2(45)			
KN_2 $(K\beta_2^{II})$	73326.3(46)	73318.9(64)		1
KN_3 $(K\beta_2^{I})$	73404.0(22)	73403.2(39)		1
KN_4 $(K\beta_4^{II})$	73579.9(35)	73615.(13)	$KN_{4,5}$	1
KN_5 $(K\beta_4^{I})$	73595.9(20)	73615.(13)	$KN_{4,5}$	1
K edge	73884.0(17)	73856.2(65)		1
K edge (c)		73876.4(12)		
L_1M_1	9917.6(32)			
L_1M_2 $(L\beta_4)$	10174.9(28)	10175.50(62)		1
L_1M_3 $(L\beta_3)$	10509.7(30)	10510.99(92)		1
L_1M_4 $(L\beta_{10})$	10935.3(23)	10937.72(71)		1
L_1M_5 $(L\beta_9)$	11006.2(23)	11007.25(87)		1
L_1N_1	12311.6(42)			
L_1N_2 $(L\gamma_2)$	12420.7(43)	12422.46(92)		1
L_1N_3 $(L\gamma_3)$	12498.4(19)	12499.98(93)		1
L_1N_4	12674.3(32)	12687.5(58)		1
L_1N_5	12690.3(16)	12696.6(58)		1
L_1N_6	12913.5(23)			
L_1N_7	12916.6(24)			
L_1 edge	12978.4(15)	12971.6(20)		1
L_1 edge (c)		12971.3(50)		
L_2M_1 $(L\eta)$	9336.6(24)	9337.07(73)		1
L_2M_2	9593.9(19)	9585.8(22)		1
L_2M_3 $(L\beta_{17})$	9928.7(20)	9934.5(24)		1
L_2M_4 $(L\beta_1)$	10354.3(14)	10355.42(65)		1
L_2M_5	10425.2(13)	10420.70(91)		1
L_2N_1 $(L\gamma_5)$	11730.6(33)	11730.42(82)		1
L_2N_2	11839.7(33)			
L_2N_3	11917.40(90)	11924.47(85)		1
L_2N_4 $(L\gamma_1)$	12093.3(22)	12095.48(87)		1
L_2N_5	12109.35(67)			
L_1N_6 (Lv)	12332.5(14)	12336.5(36)		1
L_2N_7 (Lv)	12335.7(14)			
L_2 edge	12397.42(48)	12380.9(18)		1
L_2 edge (c)		12388.68(71)		
L_3M_1 (Ll)	7823.3(18)	7822.33(51)		1
L_3M_2 (Lt)	8080.6(18)	8078.6(16)		1
L_3M_3 (Ls)	8415.4(19)	8414.1(17)		1
L_3M_4 $(L\alpha_2)$	8841.0(13)	8841.10(47)		1
L_3M_5 $(L\alpha_1)$	8911.9(12)	8911.83(47)		1
L_3N_1 $(L\beta_6)$	10217.4(32)	10217.00(62)		1
L_3N_2	10326.5(32)	10324.46(89)		1
L_3N_3	10404.12(78)			
L_3N_4 $(L\beta_{15})$	10580.0(21)	10581.68(67)		1
L_3N_5 $(L\beta_2)$	10596.08(56)	10598.7(11)		1
L_3N_6 (Lu)	10819.2(13)	10824.65(98)	$L_3N_{6,7}$	1
L_3N_7 (Lu)	10822.4(13)	10824.65(98)	$L_3N_{6,7}$	1
L_3 edge	10884.14(37)	10868.0(14)		1
L_3 edge (c)		10875.6(22)		
77	**Iridium**		**Ir**	
KL_1	62694.2(23)			
KL_2 $(K\alpha_2)$	63288.1(21)	63287.29(96)		1
KL_3 $(K\alpha_1)$	64896.5(20)	64896.2(10)		1
KM_1	72941.1(36)			
KM_2 $(K\beta_3)$	73204.6(32)	73203.4(13)		1
KM_3 $(K\beta_1)$	73561.8(34)	73561.7(13)		1
KM_4 $(K\beta_5^{II})$	73996.1(27)	73980.(13)		1
KM_5 $(K\beta_5^{I})$	74071.6(28)	74075.5(59)		1
KN_1	75418.4(47)			
KN_2 $(K\beta_2^{II})$	75530.8(48)	75529.9(68)		1
KN_3 $(K\beta_2^{I})$	75614.1(24)	75619.3(48)		1
KN_4 $(K\beta_4^{II})$	75795.7(38)	75821.(14)	$KN_{4,5}$	1
KN_5 $(K\beta_4^{I})$	75812.4(22)	75821.(14)	$KN_{4,5}$	1
K edge	76117.5(18)	76100.1(69)		1
K edge (c)		76112.38(60)		
L_1M_1	10246.9(32)	10244.8(25)		1
L_1M_2 $(L\beta_4)$	10510.4(29)	10510.72(40)		1
L_1M_3 $(L\beta_3)$	10867.5(30)	10867.54(42)		1
L_1M_4 $(L\beta_{10})$	11301.9(23)	11301.74(61)		1
L_1M_5 $(L\beta_9)$	11377.4(24)	11377.13(77)		1
L_1N_1	12724.2(44)	12695.3(38)		1
L_1N_2 $(L\gamma_2)$	12836.6(45)	12841.92(59)		1
L_1N_3 $(L\gamma_3)$	12919.9(20)	12924.1(10)		1
L_1N_4	13101.5(34)	13107.3(41)		1
L_1N_5	13118.2(18)	13125.4(41)		1
L_1N_6	13349.0(25)			
L_1N_7	13352.4(25)			
L_1 edge	13423.3(15)	13423.8(22)		1
L_1 edge (c)		13419.(18)		
L_2M_1 $(L\eta)$	9653.0(25)	9652.34(33)		1
L_2M_2	9916.5(19)	9917.0(35)		1
L_2M_3 $(L\beta_{17})$	10273.7(20)	10272.8(25)		1
L_2M_4 $(L\beta_1)$	10708.0(14)	10708.35(41)		1
L_2M_5	10783.6(14)	10791.4(28)		1
L_2N_1 $(L\gamma_5)$	12130.4(34)	12134.31(88)		1
L_2N_2	12242.7(35)	12251.2(36)		1

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
L_2N_3	12326.0(10)	12331.6(54)		1
L_2N_4 $(L\gamma_1)$	12507.6(25)	12512.72(56)		1
L_2N_5	12524.29(81)			
L_2N_6 (Lv)	12755.2(15)	12760.5(12)		1
L_2N_7 (Lv)	12758.5(16)			
L_2 edge	12829.38(50)	12820.0(20)		1
L_2 edge (c)		12824.8(24)		
L_3M_1 (Ll)	8044.7(18)	8045.89(23)		1
L_3M_2 (Lt)	8308.1(18)	8304.2(25)		1
L_3M_3 (Ls)	8665.3(19)	8659.2(18)		1
L_3M_4 $(L\alpha_2)$	9099.7(13)	9099.62(49)		1
L_3M_5 $(L\alpha_1)$	9175.2(13)	9175.18(30)		1
L_3N_1 $(L\beta_6)$	10522.0(33)	10525.17(40)		1
L_3N_2	10634.3(34)	10638.15(68)		1
L_3N_3	10717.60(91)	10725.1(41)		1
L_3N_4 $(L\beta_{15})$	10899.2(24)	10903.67(43)		1
L_3N_5 $(L\beta_2)$	10915.91(69)	10920.47(43)		1
L_3N_6 (Lu)	11146.8(14)	11155.01(59)	$L_3N_{6,7}$	1
L_3N_7 (Lu)	11150.1(14)	11155.01(59)	$L_3N_{6,7}$	1
L_3 edge	11221.01(38)	11212.0(15)		1
L_3 edge (c)		11216.7(22)		
78	**Platinum**		**Pt**	
KL_1	64515.5(24)			
KL_2 $(K\alpha_2)$	65122.6(21)	65123.3(20)		1
KL_3 $(L\alpha_1)$	66831.1(20)	66832.9(21)		1
KM_1	75099.4(36)			
KM_2 $(K\beta_3)$	75369.1(33)	75368.7(20)		1
KM_3 $(K\beta_1)$	75749.9(34)	75749.1(21)		1
KM_4 $(K\beta_5^{II})$	76193.1(27)	76198.(14)		1
KM_5 $(K\beta_5^{I})$	76273.4(27)	76273.(21)		1
KN_1	77672.2(47)			
KN_2 $(K\beta_2^{II})$	77788.0(48)	77785.5(72)		1
KN_3 $(K\beta_2^{I})$	77877.2(23)	77878.3(72)		1
KN_4 $(K\beta_4^{II})$	78064.5(38)	78070.(15)	$KN_{4,5}$	1
KN_5 $(K\beta_4^{I})$	78081.9(21)	78070.(15)	$KN_{4,5}$	1
K edge	78404.2(19)	78380.5(73)		1
K edge (c)		78398.7(23)		
L_1M_1	10583.9(32)	10600.2(12)		1
L_1M_2 $(L\beta_4)$	10853.6(28)	10854.41(70)		1
L_1M_3 $(L\beta_3)$	11234.4(30)	11230.89(75)		1
L_1M_4 $(L\beta_{10})$	11677.6(23)	11676.3(11)		1
L_1M_5 $(L\beta_9)$	11757.9(23)	11756.79(22)		76
L_1N_1	13156.7(43)	13112.9(41)		1
L_1N_2 $(L\gamma_2)$	13272.5(44)	13270.5(11)		1
L_1N_3 $(L\gamma_3)$	13361.7(18)	13361.5(11)		1
L_1N_4	13549.0(34)			
L_1N_5	13566.4(17)	13560.4(44)		1
L_1N_6	13805.0(24)			
L_1N_7	13808.5(24)			
L_1 edge	13888.7(14)	13880.69(30)		13
L_1 edge (c)		13879.(21)		
L_2M_1 $(L\eta)$	9976.8(24)	9975.2(24)		1
L_2M_2	10246.6(19)	10221.(12)‡		1
L_2M_3 $(L\beta_{17})$	10627.4(21)	10626.8(13)		1
L_2M_4 $(L\beta_1)$	11070.5(14)	11070.84(29)		1
L_2M_5	11150.8(14)	11140.5(30)		1
L_2N_1 $(L\gamma_5)$	12549.6(34)	12552.6(38)		1
L_2N_2	12665.5(35)	12661.6(38)		1
L_2N_3	12754.62(91)	12758.93(78)		1
L_2N_4 $(L\gamma_1)$	12942.0(25)	12942.19(60)		1
L_2N_5	12959.33(76)			
L_2N_6 (Lv)	13198.0(15)	13199.3(10)		1
L_2N_7 (Lv)	13201.5(15)			
L_2 edge	13281.67(51)	13271.894(30)		13
L_2 edge (c)		13275.2(38)		
L_3M_1 (Ll)	8268.3(18)	8268.2(16)		1
L_3M_2 (Lt)	8538.0(18)	8532.9(17)		1
L_3M_3 (Ls)	8918.8(20)	8922.8(19)		1
L_3M_4 $(L\alpha_2)$	9362.0(13)	9361.96(21)		1
L_3M_5 $(L\alpha_1)$	9442.3(13)	9442.39(32)		1
L_3N_1 $(L\beta_6)$	10841.1(32)	10841.88(70)		1
L_3N_2	10956.9(33)	10962.2(29)		1
L_3N_3	11046.07(78)	11044.2(29)		1
L_3N_4 $(L\beta_{15})$	11233.4(24)			
L_3N_5 $(L\beta_2)$	11250.77(64)	11250.66(45)		1
L_3N_6 (Lu)	11489.5(13)	11490.91(79)	$L_3N_{6,7}$	1
L_3N_7 (Lu)	11492.9(13)	11490.91(79)	$L_3N_{6,7}$	1
L_3 edge	11573.11(38)	11562.755(20)		13
L_3 edge (c)		11565.7(38)		
79	**Gold**		**Au**	
KL_1	66372.5(24)	66400.(21)		1
KL_2 $(K\alpha_2)$	66993.0(23)	66990.73(22)		5
KL_3 $(K\alpha_1)$	68806.9(22)	68804.50(18)		5
KM_1	77301.2(37)			
KM_2 $(K\beta_3)$	77577.3(35)	77575.01(61)		5
KM_3 $(K\beta_1)$	77983.0(37)	77979.80(38)		5
KM_4 $(K\beta_5^{II})$	78435.1(30)	78439.0(51)		1
KM_5 $(K\beta_5^{I})$	78520.3(29)	78529.5(37)		1
KN_1	79963.3(48)			
KN_2 $(K\beta_2^{II})$	80082.5(51)	80076.(15)		1
KN_3 $(K\beta_2^{I})$	80177.9(25)	80186.2(69)		1
KN_4 $(K\beta_4^{II})$	80371.0(42)	80391.1(39)	$KN_{4,5}$	1
KN_5 $(K\beta_4^{I})$	80389.0(23)	80391.1(39)	$KN_{4,5}$	1
K edge	80734.7(21)	80721.3(39)		1
K edge (c)		80725.6(15)		
L_1M_1	10928.7(32)	10921.15(71)		1
L_1M_2 $(L\beta_4)$	11204.8(30)	11204.81(45)		1
L_1M_3 $(L\beta_3)$	11610.5(32)	11610.5(14)		1
L_1M_4 $(L\beta_{10})$	12062.6(24)	12061.8(12)		1
L_1M_5 $(L\beta_9)$	12147.8(24)	12147.6(12)		1
L_1N_1	13590.8(43)	13578.2(22)		1
L_1N_2 $(L\gamma_2)$	13710.0(46)	13709.70(67)		1
L_1N_3 $(L\gamma_3)$	13805.4(20)	13809.1(11)		1
L_1N_4	13998.5(36)	13999.3(16)		1
L_1N_5	14016.6(18)	14019.9(16)		1
L_1N_6	14263.1(26)			

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
L_1N_7	14266.8(25)			
L_1 edge	14362.2(16)	14355.29(50)		13
L_1 edge (c)		14352.9(75)		
L_2M_1 ($L\eta$)	10308.2(26)	10308.41(38)		1
L_2M_2	10584.3(20)	10589.5(13)		1
L_2M_3 ($L\beta_{17}$)	10990.0(21)	10991.54(72)		1
L_2M_4 ($L\beta_1$)	11442.0(14)	11442.45(47)		1
L_2M_5	11527.2(13)	11526.8(32)		1
L_2N_1 ($L\gamma_5$)	12970.3(35)	12974.43(60)		1
L_2N_2	13089.4(35)			
L_2N_3	13184.89(91)	13186.8(42)		1
L_2N_4 ($L\gamma_1$)	13377.9(26)	13381.79(64)		1
L_2N_5	13396.01(71)			
L_2N_6 (Lv)	13642.5(15)	13648.9(11)		1
L_2N_7 (Lv)	13646.2(15)			
L_2 edge	13741.67(52)	13734.194(70)		13
L_2 edge (c)		13735.8(18)		
L_3M_1 (Ll)	8494.3(18)	8494.03(78)		1
L_3M_2 (Lt)	8770.4(18)	8770.31(64)		1
L_3M_3 (Ls)	9176.1(20)	9174.97(70)		1
L_3M_4 ($L\alpha_2$)	9628.1(13)	9628.05(33)		1
L_3M_5 ($L\alpha_1$)	9713.3(12)	9713.44(34)		1
L_3N_1 ($L\beta_6$)	11156.4(33)	11160.33(45)		1
L_3N_2	11275.5(34)	11274.4(11)		1
L_3N_3	11371.00(78)	11371.8(11)		1
L_3N_4 ($L\beta_{15}$)	11564.0(25)	11566.81(80)		1
L_3N_5 ($L\beta_2$)	11582.12(57)	11584.75(48)		1
L_3N_6 (Lu)	11828.7(14)	11835.80(84)	$L_3N_{6,7}$	1
L_3N_7 (Lu)	11832.3(14)	11835.80(84)	$L_3N_{6,7}$	1
L_3 edge	11927.78(39)	11919.694(60)		13
L_3 edge (c)		11920.6(30)		
80	**Mercury**		**Hg**	
KL_1	68260.5(25)			
KL_2 ($K\alpha_2$)	68894.3(23)	68895.1(17)		1
KL_3 ($K\alpha_1$)	70819.0(22)	70819.5(18)		1
KM_1	79541.6(38)			
KM_2 ($K\beta_3$)	79824.1(36)	79823.3(23)		1
KM_3 ($K\beta_1$)	80256.1(37)	80254.2(23)		1
KM_4 ($K\beta_5^{II}$)	80717.1(30)	80754.(16)‡	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	80807.6(29)	80754.(16)‡	$KM_{4,5}$	1
KN_1	82302.4(49)			
KN_2 ($K\beta_2^{II}$)	82425.1(52)	82435.(16)		1
KN_3 ($K\beta_2^{I}$)	82527.7(25)	82545.(16)		1
KN_4 ($K\beta_4^{II}$)	82726.0(42)	82776.(16)‡	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)	82745.3(23)	82776.(16)‡	$KN_{4,5}$	1
K edge	83111.3(21)	83109.2(82)		1
K edge (c)		83104.5(32)		
L_1M_1	11281.1(32)	11272.1(30)		1
L_1M_2 ($L\beta_4$)	11563.7(30)	11563.1(11)		1
L_1M_3 ($L\beta_3$)	11995.6(31)	11995.4(12)		1
L_1M_4 ($L\beta_{10}$)	12456.6(24)	12456.97(52)		76
L_1M_5 ($L\beta_9$)	12547.1(23)	12547.52(29)		76
L_1N_1	14042.0(43)	14045.8(47)		1
L_1N_2 ($L\gamma_2$)	14164.7(46)	14162.3(17)		1
L_1N_3 ($L\gamma_3$)	14267.2(19)	14264.8(17)		1
L_1N_4	14465.5(36)			
L_1N_5	14484.8(17)	14474.3(18)		1
L_1N_6	14739.1(26)			
L_1N_7	14743.2(26)			
L_1 edge	14850.8(15)	14842.8(26)		1
L_1 edge (c)		14840.2(76)		
L_2M_1 ($L\eta$)	10647.3(25)	10651.4(14)		1
L_2M_2	10929.8(20)	10888.1(71)‡		1
L_2M_3 ($L\beta_{17}$)	11361.7(21)	11357.9(77)		1
L_2M_4 ($L\beta_1$)	11822.7(14)	11822.70(83)		1
L_2M_5	11913.2(13)			
L_2N_1 ($L\gamma_5$)	13408.1(34)	13410.3(15)		1
L_2N_2	13530.8(36)			
L_2N_3	13633.37(93)	13640.3(16)		1
L_2N_4 ($L\gamma_1$)	13831.7(27)	13830.2(11)		1
L_2N_5	13850.97(72)			
L_2N_6 (Lv)	14105.2(16)	14107.3(17)		1
L_2N_7 (Lv)	14109.3(16)			
L_2 edge	14216.92(53)	14214.9(24)		1
L_2 edge (c)		14212.2(43)		
L_3M_1 (Ll)	8722.6(19)	8721.32(91)		1
L_3M_2 (Lt)	9005.1(19)	9019.5(19)‡		1
L_3M_3 (Ls)	9437.1(20)	9455.6(21)‡		1
L_3M_4 ($L\alpha_2$)	9898.1(13)	9897.68(82)		1
L_3M_5 ($L\alpha_1$)	9988.6(12)	9988.91(60)		1
L_3N_1 ($L\beta_6$)	11483.5(32)	11482.5(11)		1
L_3N_2	11606.1(34)	11642.6(32)‡		1
L_3N_3	11708.73(79)	11713.0(16)		1
L_3N_4 ($L\beta_{15}$)	11907.0(25)	11904.1(12)		1
L_3N_5 ($L\beta_2$)	11926.33(58)	11924.2(12)		1
L_3N_6 (Lu)	12180.6(14)	12182.7(12)		1
L_3N_7 (Lu)	12184.7(14)	12194.1(12)		1
L_3 edge	12292.28(39)	12286.4(18)		1
L_3 edge (c)		12285.5(37)		
81	**Thallium**		**Tl**	
KL_1	70185.1(25)			
KL_2 ($K\alpha_2$)	70832.7(24)	70832.5(12)		1
KL_3 ($K\alpha_1$)	72873.8(23)	72872.5(13)		1
KM_1	81827.0(39)			
KM_2 ($K\beta_3$)	82116.0(37)	82118.4(48)		1
KM_3 ($K\beta_1$)	82575.6(38)	82576.7(41)		1
KM_4 ($K\beta_5^{II}$)	83045.6(31)	83114.8(82)‡	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	83141.7(30)	83114.8(82)‡	$KM_{4,5}$	1
KN_1	84685.5(50)			
KN_2 ($K\beta_2^{II}$)	84811.8(53)	84838.0(86)		1
KN_3 ($K\beta_2^{I}$)	84921.3(45)	84948.5(86)		1
KN_4 ($K\beta_4^{II}$)	85125.4(44)	85194.(17)‡	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)	85145.9(43)	85194.(17)‡	$KN_{4,5}$	1
K edge	85538.2(22)	85534.5(87)		1
K edge (c)		85530.1(13)		
L_1M_1	11641.9(32)	11648.1(32)		1

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
L_1M_2 ($L\beta_4$)	11931.0(30)	11930.78(51)		1
L_1M_3 ($L\beta_3$)	12390.6(32)	12390.55(55)		1
L_1M_4 ($L\beta_{10}$)	12860.6(24)	12862.7(14)		1
L_1M_5 ($L\beta_9$)	12956.6(23)	12958.7(14)		1
L_1N_1	14500.4(43)	14502.6(25)		1
L_1N_2 ($L\gamma_2$)	14626.7(47)	14625.2(13)		1
L_1N_3 ($L\gamma_3$)	14736.2(38)	14737.0(10)		1
L_1N_4	14940.4(37)	14937.4(19)		1
L_1N_5	14960.9(36)	14959.4(13)		1
L_1N_6	15222.7(26)			
L_1N_7	15227.1(25)			
L_1 edge	15353.1(15)	15342.4(28)		1
L_1 edge (c)		15345.6(29)		
L_2M_1 ($L\eta$)	10994.2(25)	10994.36(43)		1
L_2M_2	11283.3(20)	11274.2(15)		1
L_2M_3 ($L\beta_{17}$)	11742.9(22)	11739.7(12)		1
L_2M_4 ($L\beta_1$)	12212.9(14)	12213.44(71)		1
L_2M_5	12309.0(14)	12309.36(90)		1
L_2N_1 ($L\gamma_5$)	13852.8(34)	13852.77(92)		1
L_2N_2	13979.1(37)	14057.(47)‡		1
L_2N_3	14088.6(29)	14089.5(12)		1
L_2N_4 ($L\gamma_1$)	14292.7(28)	14291.58(73)		1
L_2N_5	14313.2(26)			
L_2N_6 (Lv)	14575.0(16)	14577.9(13)		1
L_2N_7 (Lv)	14579.4(16)			
L_2 edge	14705.47(56)	14700.3(26)		1
L_2 edge (c)		14698.6(13)		
L_3M_1 (Ll)	8953.1(19)	8953.28(29)		1
L_3M_2 (Lt)	9242.2(19)	9241.79(51)		1
L_3M_3 (Ls)	9701.8(20)	9700.75(56)		1
L_3M_4 ($L\alpha_2$)	10171.8(13)	10172.91(37)		1
L_3M_5 ($L\alpha_1$)	10267.9(12)	10268.62(50)		1
L_3N_1 ($L\beta_6$)	11811.7(33)	11812.00(83)		1
L_3N_2	11938.0(35)			
L_3N_3	12047.5(27)	12053.5(17)		1
L_3N_4 ($L\beta_{15}$)	12251.6(26)	12251.10(54)		1
L_3N_5 ($L\beta_2$)	12272.1(25)	12271.71(54)		1
L_3N_6 (Lu)	12533.9(15)	12538.7(19)	$L_3N_{6,7}$	1
L_3N_7 (Lu)	12538.3(14)	12538.7(19)	$L_3N_{6,7}$	1
L_3 edge	12664.38(40)	12660.3(19)		1
L_3 edge (c)		12657.5(33)		
82	**Lead**	**Pb**		
KL_1	72145.0(26)			
KL_2 ($K\alpha_2$)	72806.6(25)	72805.42(24)		5
KL_3 ($K\alpha_1$)	74970.2(24)	74970.11(17)		5
KM_1	84156.2(40)			
KM_2 ($K\beta_3$)	84451.8(38)	84450.45(60)		5
KM_3 ($K\beta_1$)	84940.3(39)	84939.08(34)		5
KM_4 ($K\beta_5^{II}$)	85419.7(32)	85434.(17)		1
KM_5 ($K\beta_5^{I}$)	85521.4(31)	85535.(26)		1
KN_1	87114.5(51)			
KN_2 ($K\beta_2^{II}$)	87244.1(54)	87238.(18)		1
KN_3 ($K\beta_2^{I}$)	87362.0(46)	87366.9(91)		1
KN_4 ($K\beta_4^{II}$)	87571.0(44)	87589.(27)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)	87593.2(44)	87589.(27)	$KN_{4,5}$	1
K edge	88012.8(23)	88005.6(46)		1
K edge (c)		88004.72(69)		
L_1M_1	12011.1(33)	12010.3(34)		1
L_1M_2 ($L\beta_4$)	12306.7(31)	12305.9(18)		1
L_1M_3 ($L\beta_3$)	12795.3(32)	12793.4(14)		1
L_1M_4 ($L\beta_{10}$)	13274.6(24)	13275.8(42)		1
L_1M_5 ($L\beta_9$)	13376.3(24)	13377.5(21)		1
L_1N_1	14969.4(43)	14963.0(19)		1
L_1N_2 ($L\gamma_2$)	15099.1(46)	15101.4(54)		1
L_1N_3 ($L\gamma_3$)	15216.9(39)	15218.2(28)		1
L_1N_4	15426.0(37)	15427.6(20)		1
L_1N_5	15448.1(36)	15452.8(26)		1
L_1N_6	15717.7(26)	15725.8(30)	$L_1N_{6,7}$	1
L_1N_7	15722.6(26)	15725.8(30)	$L_1N_{6,7}$	1
L_1 edge	15867.7(15)	15857.99(10)		13
L_1 edge (c)		15860.5(48)		
L_2M_1 ($L\eta$)	11349.5(26)	11349.4(11)		1
L_2M_2	11645.1(21)	11648.1(32)		1
L_2M_3 ($L\beta_{17}$)	12133.7(22)	12127.8(18)		1
L_2M_4 ($L\beta_1$)	12613.0(15)	12613.80(57)		1
L_2M_5	12714.8(14)	12720.0(19)		1
L_2N_1 ($L\gamma_5$)	14307.8(34)	14307.6(12)		1
L_2N_2	14437.5(37)	14441.7(75)		1
L_2N_3	14555.3(29)	14553.3(18)		1
L_2N_4 ($L\gamma_1$)	14764.4(27)	14764.55(78)		1
L_2N_5	14786.6(26)	14791.5(52)		1
L_2N_6 (Lv)	15056.1(16)	15060.(19)		1
L_2N_7 (Lv)	15061.0(16)			
L_2 edge	15206.12(56)	15198.993(30)		13
L_2 edge (c)		15198.7(34)		
L_3M_1 (Ll)	9186.0(19)	9184.56(70)		1
L_3M_2 (Lt)	9481.6(19)	9481.16(75)		1
L_3M_3 (Ls)	9970.2(20)	9967.63(83)		1
L_3M_4 ($L\alpha_2$)	10449.5(13)	10449.59(65)		1
L_3M_5 ($L\alpha_1$)	10551.2(12)	10551.60(27)		1
L_3N_1 ($L\beta_6$)	12144.3(32)	12143.2(18)		1
L_3N_2	12274.0(35)	12270.6(13)		1
L_3N_3	12391.8(27)	12392.0(18)		1
L_3N_4 ($L\beta_{15}$)	12600.9(25)	12601.2(13)		1
L_3N_5 ($L\beta_2$)	12623.0(24)	12622.8(13)		1
L_3N_6 (Lu)	12892.6(15)	12897.0(14)	$L_3N_{6,7}$	1
L_3N_7 (Lu)	12897.5(15)	12897.0(14)	$L_3N_{6,7}$	1
L_3 edge	13042.60(40)	13035.064(30)		13
L_3 edge (c)		13035.4(30)		
83	**Bismuth**		**Bi**	209
KL_1	74141.0(27)			
KL_2 ($K\alpha_2$)	74816.8(26)	74816.21(92)		8
KL_3 ($K\alpha_1$)	77108.9(25)	77109.2(22)		8
KM_1	86529.6(41)			
KM_2 ($K\beta_3$)	86831.9(39)	86835.7(67)		8
KM_3 ($K\beta_1$)	87351.4(41)	87344.1(33)		8

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
KM_4 ($K\beta_5^{II}$)	87839.7(33)	87862.2(92)‡	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	87947.6(32)	87862.2(92)‡	$KM_{4,5}$	1
KN_1	89590.3(52)			
KN_2 ($K\beta_2^{II}$)	89723.9(57)	89731.7(96)		1
KN_3 ($K\beta_2^{I}$)	89849.4(47)	89861.8(96)		1
KN_4 ($K\beta_4^{II}$)	90064.5(47)	90110.(19)‡	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)	90088.0(45)	90110.(19)‡	$KN_{4,5}$	1
K edge	90536.5(24)	90537.7(98)		1
K edge (c)		90528.59(96)		
L_1M_1	12388.5(32)	12392.(16)		1
L_1M_2 ($L\beta_4$)	12690.9(31)	12691.40(77)		1
L_1M_3 ($L\beta_3$)	13210.4(32)	13209.99(62)		1
L_1M_4 ($L\beta_{10}$)	13698.6(24)	13698.87(32)		76
L_1M_5 ($L\beta_9$)	13806.6(24)	13806.82(20)		76
L_1N_1	15449.3(43)	15455.3(29)		1
L_1N_2 ($L\gamma_2$)	15582.9(48)	15582.52(87)		1
L_1N_3 ($L\gamma_3$)	15708.4(38)	15710.5(15)		1
L_1N_4	15923.5(38)	15905.(15)		1
L_1N_5	15947.0(37)	15950.8(15)		1
L_1N_6	16224.1(27)	16226.(16)	$L_1N_{6,7}$	1
L_1N_7	16229.3(26)	16226.(16)	$L_1N_{6,7}$	1
L_1 edge	16395.4(16)	16376.0(32)		1
L_1 edge (c)		16389.(12)		
L_2M_1 ($L\eta$)	11712.7(25)	11712.36(49)		1
L_2M_2	12015.1(21)	11984.(15)‡		1
L_2M_3 ($L\beta_{17}$)	12534.6(23)	12534.48(94)		1
L_2M_4 ($L\beta_1$)	13022.9(15)	13023.65(18)		1
L_2M_5	13130.8(14)	13131.1(10)		1
L_2N_1 ($L\gamma_5$)	14773.5(34)	14773.3(13)		1
L_2N_2	14907.1(38)	14859.(24)‡		1
L_2N_3	15032.6(28)	15031.8(27)		1
L_2N_4 ($L\gamma_1$)	15247.7(28)	15247.92(56)		1
L_2N_5	15271.2(27)			
L_2N_6 (Lv)	15548.3(17)	15552.0(26)		1
L_2N_7 (Lv)	15553.5(16)			
L_2 edge	15719.65(57)	15719.8(29)		1
L_2 edge (c)		15712.1(18)		
L_3M_1 (Ll)	9420.7(19)	9420.43(74)		1
L_3M_2 (Lt)	9723.0(19)	9725.6(11)		1
L_3M_3 (Ls)	10242.6(21)	10242.2(13)		1
L_3M_4 ($L\alpha_2$)	10730.8(13)	10731.06(14)		1
L_3M_5 ($L\alpha_1$)	10838.7(12)	10838.94(28)		1
L_3N_1 ($L\beta_6$)	12481.4(33)	12481.74(56)		1
L_3N_2	12615.0(37)	12615.21(95)		1
L_3N_3	12740.6(27)	12739.52(97)		1
L_3N_4 ($L\beta_{15}$)	12955.7(27)	12955.0(10)		1
L_3N_5 ($L\beta_2$)	12979.2(25)	12980.00(80)		1
L_3N_6 (Lu)	13256.2(15)	13259.4(10)	$L_3N_{6,7}$	1
L_3N_7 (Lu)	13261.5(15)	13259.4(10)	$L_3N_{6,7}$	1
L_3 edge	13427.59(41)	13426.7(22)		1
L_3 edge (c)		13420.1(16)		
84	**Polonium**		**Po**	209
KL_1	76173.9(27)			
KL_2 ($K\alpha_2$)	76864.1(27)	76864.4(71)†		1
KL_3 ($K\alpha_1$)	79291.2(26)	79292.9(75)†		1
KM_1	88948.8(42)			
KM_2 ($K\beta_3$)	89257.9(41)	89247.(19)†		1
KM_3 ($K\beta_1$)	89809.8(42)	89797.(19)†		1
KM_4 ($K\beta_5^{II}$)	90307.3(34)			
KM_5 ($K\beta_5^{I}$)	90421.5(33)			
KN_1	92115.1(53)			
KN_2 ($K\beta_2^{II}$)	92252.5(58)	92262.(20)†		1
KN_3 ($K\beta_2^{I}$)	92386.8(48)	92400.(20)†		1
KN_4 ($K\beta_4^{II}$)	92607.3(48)			
KN_5 ($K\beta_4^{I}$)	92632.5(46)			
K edge	93109.9(25)			
K edge (c)		93107.2(40)		
L_1M_1	12774.9(32)			
L_1M_2 ($L\beta_4$)	13084.0(31)	13085.2(61)		1
L_1M_3 ($L\beta_3$)	13635.8(33)	13637.9(67)		1
L_1M_4 ($L\beta_{10}$)	14133.3(25)			
L_1M_5 ($L\beta_9$)	14247.6(24)			
L_1N_1	15941.2(43)			
L_1N_2 ($L\gamma_2$)	16078.5(49)	16060.(31)		1
L_1N_3 ($L\gamma_3$)	16212.9(38)			
L_1N_4	16433.4(38)			
L_1N_5	16458.6(37)			
L_1N_6	16743.3(27)			
L_1N_7	16749.0(26)			
L_1 edge	16936.0(16)			
L_1 edge (c)		16911.(31)		
L_2M_1 ($L\eta$)	12084.7(25)			
L_2M_2	12393.8(21)			
L_2M_3 ($L\beta_{17}$)	12945.7(23)			
L_2M_4 ($L\beta_1$)	13443.2(15)	13447.1(43)		1
L_2M_5	13557.4(14)			
L_2N_1 ($L\gamma_5$)	15251.0(34)			
L_2N_2	15388.3(39)			
L_2N_3	15522.7(28)			
L_2N_4 ($L\gamma_1$)	15743.2(28)	15744.2(27)		1
L_2N_5	15768.4(27)			
L_2N_6 (Lv)	16053.1(17)			
L_2N_7 (Lv)	16058.8(17)			
L_2 edge	16245.83(59)			
L_2 edge (c)		16244.2(28)		
L_3M_1 (Ll)	9657.6(20)	9664.2(56)		1
L_3M_2 (Lt)	9966.7(20)			
L_3M_3 (Ls)	10518.6(21)			
L_3M_4 ($L\alpha_2$)	11016.1(13)	11015.95(72)		1
L_3M_5 ($L\alpha_1$)	11130.3(12)	11130.87(59)		1
L_3N_1 ($L\beta_6$)	12823.9(32)	12818.7(39)		1
L_3N_2	12961.3(37)			
L_3N_3	13095.6(27)			
L_3N_4 ($L\beta_{15}$)	13316.1(27)	13314.3(42)		1
L_3N_5 ($L\beta_2$)	13341.3(25)	13340.5(11)		1
L_3N_6 (Lu)	13626.0(15)			

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
L_3N_7 (Lu)	13631.7(15)			
L_3 edge	13818.74(42)			
L_3 edge (c)		13813.6(13)		
85	**Astatine**		**At**	210
KL_1	78243.8(28)			
KL_2 ($K\alpha_2$)	78948.5(28)	78944.(15)†		1
KL_3 ($K\alpha_1$)	81517.4(27)	81514.(16)†		1
KM_1	91413.9(43)			
KM_2 ($K\beta_3$)	91729.9(42)	91723.(40)†		1
KM_3 ($K\beta_1$)	92315.8(44)	92304.(41)†		1
KM_4 ($K\beta_5^{II}$)	92822.6(35)			
KM_5 ($K\beta_5^{I}$)	92943.4(35)			
KN_1	94687.9(54)			
KN_2 ($K\beta_2^{II}$)	94829.1(60)	94846.(43)†		1
KN_3 ($K\beta_2^{I}$)	94972.8(49)	94991.(43)†		1
KN_4 ($K\beta_4^{II}$)	95198.7(49)			
KN_5 ($K\beta_4^{I}$)	95225.8(48)			
K edge	95733.5(27)			
K edge (c)		95729.(15)		
L_1M_1	13170.1(32)			
L_1M_2 ($L\beta_4$)	13486.1(32)			
L_1M_3 ($L\beta_3$)	14072.0(33)	14067.3(21)†		1
L_1M_4 ($L\beta_{10}$)	14578.8(25)			
L_1M_5 ($L\beta_9$)	14699.7(24)			
L_1N_1	16444.1(43)			
L_1N_2 ($L\gamma_2$)	16585.4(49)			
L_1N_3 ($L\gamma_3$)	16729.1(38)			
L_1N_4	16955.0(38)			
L_1N_5	16982.0(37)			
L_1N_6	17274.3(27)			
L_1N_7	17280.6(27)			
L_1 edge	17489.7(16)			
L_2M_1 ($L\eta$)	12465.3(25)			
L_2M_2	12781.4(22)			
L_2M_3 ($L\beta_{17}$)	13367.3(23)			
L_2M_4 ($L\beta_1$)	13874.1(15)	13876.2(21)†		1
L_2M_5	13994.9(14)			
L_2N_1 ($L\gamma_5$)	15739.4(33)			
L_2N_2	15880.6(40)			
L_2N_3	16024.3(28)			
L_2N_4 ($L\gamma_1$)	16250.2(28)	16251.7(28)†		1
L_2N_5	16277.3(27)			
L_2N_6 (Lv)	16569.6(17)			
L_2N_7 (Lv)	16575.9(17)			
L_2 edge	16784.96(60)			
L_2 edge (c)		16784.7(30)		
L_3M_1 (Ll)	9896.4(20)			
L_3M_2 (Lt)	10212.4(20)			
L_3M_3 (Ls)	10798.4(21)			
L_3M_4 ($L\alpha_2$)	11305.2(13)	11304.93(76)		1
L_3M_5 ($L\alpha_1$)	11426.0(13)	11426.94(78)		1
L_3N_1 ($L\beta_6$)	13170.4(32)			
L_3N_2	13311.7(38)			
L_3N_3	13455.4(26)			
L_3N_4 ($L\beta_{15}$)	13681.3(27)			
L_3N_5 ($L\beta_2$)	13708.4(26)			
L_3N_6 (Lu)	14000.7(16)			
L_3N_7 (Lu)	14007.0(16)			
L_3 edge	14216.04(45)			
86	**Radon**		**Rn**	222
KL_1	80351.3(29)			
KL_2 ($K\alpha_2$)	81070.7(30)	81066.(24)†		1
KL_3 ($K\alpha_1$)	83788.6(28)	83783.(25)†		1
KM_1	93925.8(44)			
KM_2 ($K\beta_3$)	94248.8(44)	94247.(53)†		1
KM_3 ($K\beta_1$)	94870.2(44)	94867.(54)†		1
KM_4 ($K\beta_5^{II}$)	95386.7(36)			
KM_5 ($K\beta_5^{I}$)	95514.5(36)			
KN_1	97310.5(55)			
KN_2 ($K\beta_2^{II}$)	97455.1(61)	97478.(57)†		1
KN_3 ($K\beta_2^{I}$)	97609.1(50)	97639.(57)†		1
KN_4 ($K\beta_4^{II}$)	97840.1(49)			
KN_5 ($K\beta_4^{I}$)	97868.9(47)			
K edge	98408.1(28)			
K edge (c)		98404.(24)		
L_1M_1	13574.5(32)			
L_1M_2 ($L\beta_4$)	13897.5(32)			
L_1M_3 ($L\beta_3$)	14518.9(33)	14511.7(23)†		1
L_1M_4 ($L\beta_{10}$)	15035.4(25)			
L_1M_5 ($L\beta_9$)	15163.1(24)			
L_1N_1	16959.2(43)			
L_1N_2 ($L\gamma_2$)	17103.8(49)			
L_1N_3 ($L\gamma_3$)	17257.8(39)			
L_1N_4	17488.8(37)			
L_1N_5	17517.5(36)			
L_1N_6	17817.9(27)			
L_1N_7	17824.8(27)			
L_1 edge	18056.8(16)			
L_2M_1 ($L\eta$)	12855.1(26)			
L_2M_2	13178.1(22)			
L_2M_3 ($L\beta_{17}$)	13799.5(23)			
L_2M_4 ($L\beta_1$)	14316.0(15)	14315.8(22)†		1
L_2M_5	14443.7(14)			
L_2N_1 ($L\gamma_5$)	16239.8(34)			
L_2N_2	16384.4(39)			
L_2N_3	16538.4(29)			
L_2N_4 ($L\gamma_1$)	16769.4(27)	16770.7(30)†		1
L_2N_5	16798.1(26)			
L_2N_6 (Lv)	17098.5(17)			
L_2N_7 (Lv)	17105.4(17)			
L_2 edge	17337.38(62)			
L_2 edge (c)		17337.7(32)		
L_3M_1 (Ll)	10137.2(20)			
L_3M_2 (Lt)	10460.2(20)			
L_3M_3 (Ls)	11081.6(21)			
L_3M_4 ($L\alpha_2$)	11598.1(13)	11598.08(80)		1

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
L_3M_5 ($L\alpha_1$)	11725.9(12)	11727.09(82)		1
L_3N_1 ($L\beta_6$)	13521.9(32)			
L_3N_2	13666.6(37)			
L_3N_3	13820.6(27)			
L_3N_4 ($L\beta_{15}$)	14051.5(26)			
L_3N_5 ($L\beta_2$)	14080.3(24)			
L_3N_6 (Lu)	14380.7(16)			
L_3N_7 (Lu)	14387.6(16)			
L_3 edge	14619.53(43)			
87	**Francium**		**Fr**	223
KL_1	82498.8(29)			
KL_2 ($K\alpha_2$)	83233.3(31)	83232.(25)†		1
KL_3 ($K\alpha_1$)	86107.4(30)	86105.(27)†		1
KM_1	96487.3(45)			
KM_2 ($K\beta_3$)	96817.3(46)	96808.(56)†		1
KM_3 ($K\beta_1$)	97476.7(47)	97478.(57)†		1
KM_4 ($K\beta_5^{II}$)	98002.4(38)			
KM_5 ($K\beta_5^{I}$)	98137.4(38)			
KN_1	99984.7(54)			
KN_2 ($K\beta_2^{II}$)	100134.0(64)	100155.(60)†		1
KN_3 ($K\beta_2^{I}$)	100298.1(52)	100326.(60)†		1
KN_4 ($K\beta_4^{II}$)	100535.0(51)			
KN_5 ($K\beta_4^{I}$)	100566.1(51)			
K edge	101141.2(30)			
K edge (c)		101137.(23)		
L_1M_1	13988.5(33)			
L_1M_2 ($L\beta_4$)	14318.5(33)			
L_1M_3 ($L\beta_3$)	14977.9(34)	14975.7(24)†		1
L_1M_4 ($L\beta_{10}$)	15503.6(26)			
L_1M_5 ($L\beta_9$)	15638.6(25)			
L_1N_1	17485.9(42)			
L_1N_2 ($L\gamma_2$)	17635.2(51)			
L_1N_3 ($L\gamma_3$)	17799.3(39)			
L_1N_4	18036.2(39)			
L_1N_5	18067.3(38)			
L_1N_6	18375.3(30)			
L_1N_7	18382.3(28)			
L_1 edge	18642.4(17)			
L_2M_1 ($L\eta$)	13254.0(26)			
L_2M_2	13584.0(22)			
L_2M_3 ($L\beta_{17}$)	14243.4(24)			
L_2M_4 ($L\beta_1$)	14769.1(15)	14770.4(23)†		1
L_2M_5	14904.1(15)			
L_2N_1 ($L\gamma_5$)	16751.5(33)			
L_2N_2	16900.7(40)			
L_2N_3	17064.8(28)			
L_2N_4 ($L\gamma_1$)	17301.7(28)	17303.4(32)†		1
L_2N_5	17332.8(28)			
L_2N_6 (Lv)	17640.8(19)			
L_2N_7 (Lv)	17647.8(18)			
L_2 edge	17907.94(64)			
L_2 edge (c)		17906.4(34)		
L_3M_1 (Ll)	10379.8(20)			
L_3M_2 (Lt)	10709.9(20)			
L_3M_3 (Ls)	11369.3(22)			
L_3M_4 ($L\alpha_2$)	11895.0(13)	11895.07(84)		1
L_3M_5 ($L\alpha_1$)	12029.9(13)	12031.40(86)		1
L_3N_1 ($L\beta_6$)	13877.3(31)			
L_3N_2	14026.6(38)			
L_3N_3	14190.6(26)			
L_3N_4 ($L\beta_{15}$)	14427.5(26)			
L_3N_5 ($L\beta_2$)	14458.6(26)	14450.(50)		1
L_3N_6 (Lu)	14766.6(17)			
L_3N_7 (Lu)	14773.6(16)			
L_3 edge	15033.78(44)			
L_3 edge (c)		15027.(50)		
88	**Radium**		**Ra**	226
KL_1	84685.4(30)			
KL_2 ($K\alpha_2$)	85435.1(32)	85436.(12)		10
KL_3 ($K\alpha_1$)	88473.4(30)	88476.(12)		10
KM_1	99097.5(46)			
KM_2 ($K\beta_3$)	99434.7(46)	99434.(12)		10
KM_3 ($K\beta_1$)	100133.8(48)	100136.(12)		10
KM_4 ($K\beta_5^{II}$)	100669.1(39)			
KM_5 ($K\beta_5^{I}$)	100811.5(38)			
KN_1	102710.7(54)			
KN_2 ($K\beta_2^{II}$)	102864.8(66)	102861.(12)		10
KN_3 ($K\beta_2^{I}$)	103039.3(51)	103045.(12)		10
KN_4 ($K\beta_4^{II}$)	103282.7(54)			
KN_5 ($K\beta_4^{I}$)	103316.0(54)			
K edge	103927.7(30)			
K edge (c)		103920.5(54)		
L_1M_1	14412.1(33)			
L_1M_2 ($L\beta_4$)	14749.3(33)	14747.3(13)		1
L_1M_3 ($L\beta_3$)	15448.4(34)	15445.1(14)		1
L_1M_4 ($L\beta_{10}$)	15983.7(25)	15988.2(15)		1
L_1M_5 ($L\beta_9$)	16126.1(25)	16131.6(16)		1
L_1N_1	18025.3(40)	18036.4(39)		1
L_1N_2 ($L\gamma_2$)	18179.4(52)	18179.5(20)		1
L_1N_3 ($L\gamma_3$)	18353.9(38)	18357.4(20)		1
L_1N_4	18597.3(40)	18599.2(41)		1
L_1N_5	18630.6(40)	18632.8(41)		1
L_1N_6	18945.9(30)			
L_1N_7	18953.1(28)			
L_1 edge	19242.3(17)	19237.0(44)		1
L_1 edge (c)		19237.5(46)		
L_2M_1 ($L\eta$)	13662.4(26)	13663.2(11)		1
L_2M_2	13999.7(23)			
L_2M_3 ($L\beta_{17}$)	14698.7(24)	14693.3(26)		1
L_2M_4 ($L\beta_1$)	15234.0(15)	15235.9(14)		1
L_2M_5	15376.4(15)			
L_2N_1 ($L\gamma_5$)	17275.6(30)	17274.0(18)		1
L_2N_2	17429.7(42)			
L_2N_3	17604.2(28)	17603.6(37)		1
L_2N_4 ($L\gamma_1$)	17847.6(30)	17848.7(19)		1
L_2N_5	17880.9(30)	17885.5(38)		1

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
L_2N_6 (Lv)	18196.2(21)			
L_2N_7 (Lv)	18203.5(18)			
L_2 edge	18492.61(67)	18485.5(41)		1
L_2 edge (c)		18483.8(33)		
L_3M_1 (Ll)	10624.1(21)	10622.29(67)		1
L_3M_2 (Lt)	10961.4(21)			
L_3M_3 (Ls)	11660.4(22)			
L_3M_4 ($L\alpha_2$)	12195.7(13)	12196.26(89)		1
L_3M_5 ($L\alpha_1$)	12338.1(13)	12339.86(91)		1
L_3N_1 ($L\beta_6$)	14237.3(29)	14236.4(12)		1
L_3N_2	14391.4(40)	14386.4(25)		1
L_3N_3	14565.9(26)	14565.6(25)		1
L_3N_4 ($L\beta_{15}$)	14809.3(28)	14808.8(13)		1
L_3N_5 ($L\beta_2$)	14842.6(28)	14841.6(13)		1
L_3N_6 (Lu)	15157.9(18)	15145.7(27)	$L_3N_{6,7}$	1
L_3N_7 (Lu)	15165.2(16)	15145.7(27)	$L_3N_{6,7}$	1
L_3 edge	15454.32(45)	15443.7(28)		1
L_3 edge (c)		15444.59(84)		
89	**Actinium**		**Ac**	227
KL_1	86913.0(31)			
KL_2 ($K\alpha_2$)	87678.2(33)	87676.(18)†		1
KL_3 ($K\alpha_1$)	90888.8(32)	90884.8(79)†		1
KM_1	101758.9(48)			
KM_2 ($K\beta_3$)	102103.3(48)	102102.(25)†		1
KM_3 ($K\beta_1$)	102844.2(49)	102847.(25)†		1
KM_4 ($K\beta_5^{II}$)	103389.0(40)			
KM_5 ($K\beta_5^{I}$)	103539.3(40)			
KN_1	105491.2(55)			
KN_2 ($K\beta_2^{II}$)	105648.6(66)	105679.(27)†		1
KN_3 ($K\beta_2^{I}$)	105835.8(53)	105868.(27)†		1
KN_4 ($K\beta_4^{II}$)	106083.6(53)			
KN_5 ($K\beta_4^{I}$)	106119.2(53)			
K edge	106768.2(32)			
K edge (c)		106759.(19)		
L_1M_1	14845.8(33)			
L_1M_2 ($L\beta_4$)	15190.3(33)			
L_1M_3 ($L\beta_3$)	15931.1(34)	15931.5(27)†		1
L_1M_4 ($L\beta_{10}$)	16476.0(26)			
L_1M_5 ($L\beta_9$)	16626.3(25)			
L_1N_1	18578.2(40)			
L_1N_2 ($L\gamma_2$)	18735.6(51)			
L_1N_3 ($L\gamma_3$)	18922.8(38)			
L_1N_4	19170.6(38)			
L_1N_5	19206.2(38)			
L_1N_6	19530.3(32)			
L_1N_7	19537.8(29)			
L_1 edge	19855.2(17)			
L_2M_1 ($L\eta$)	14080.7(26)			
L_2M_2	14425.2(23)			
L_2M_3 ($L\beta_{17}$)	15166.0(25)			
L_2M_4 ($L\beta_1$)	15710.8(16)	15713.3(27)†		1
L_2M_5	15861.1(15)			
L_2N_1 ($L\gamma_5$)	17813.0(31)			
L_2N_2	17970.5(41)			
L_2N_3	18157.6(29)			
L_2N_4 ($L\gamma_1$)	18405.5(28)	18408.4(36)†		1
L_2N_5	18441.0(28)			
L_2N_6 (Lv)	18765.1(22)			
L_2N_7 (Lv)	18772.7(19)			
L_2 edge	19090.04(69)			
L_2 edge (c)		19083.4(38)		
L_3M_1 (Ll)	10870.1(21)			
L_3M_2 (Lt)	11214.6(21)			
L_3M_3 (Ls)	11955.4(22)			
L_3M_4 ($L\alpha_2$)	12500.2(13)	12500.99(93)		1
L_3M_5 ($L\alpha_1$)	12650.5(13)	12652.16(96)		1
L_3N_1 ($L\beta_6$)	14602.4(29)			
L_3N_2	14759.9(39)			
L_3N_3	14947.0(26)			
L_3N_4 ($L\beta_{15}$)	15194.9(26)			
L_3N_5 ($L\beta_2$)	15230.4(26)			
L_3N_6 (Lu)	15554.5(20)			
L_3N_7 (Lu)	15562.1(16)			
L_3 edge	15879.45(46)			
90	**Thorium**		**Th**	232
KL_1	89176.6(32)			
KL_2 ($K\alpha_2$)	89956.6(35)	89957.04(20)		5
KL_3 ($K\alpha_1$)	93347.9(33)	93347.38(25)		5
KM_1	104465.6(49)			
KM_2 ($K\beta_3$)	104817.2(49)	104816.53(69)		5
KM_3 ($K\beta_1$)	105601.9(51)	105601.51(53)		5
KM_4 ($K\beta_5^{II}$)	106156.4(42)	106270.(12)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	106314.9(41)	106270.(12)	$KM_{4,5}$	1
KN_1	108320.0(57)			
KN_2 ($K\beta_2^{II}$)	108481.2(67)	108509.(14)		1
KN_3 ($K\beta_2^{I}$)	108680.9(55)	108718.(13)		1
KN_4 ($K\beta_4^{II}$)	108934.2(54)	109082.(28)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)	108972.2(54)	109082.(28)	$KN_{4,5}$	1
K edge	109658.2(33)	109649.0(10)		1,67
K edge (c)		109648.0(24)		
L_1M_1	15289.0(33)			
L_1M_2 ($L\beta_4$)	15640.6(33)	15639.54(35)		75
L_1M_3 ($L\beta_3$)	16425.3(35)	16423.855(70)		75
L_1M_4 ($L\beta_{10}$)	16979.8(26)	16980.26(21)		75
L_1M_5 ($L\beta_9$)	17138.3(25)	17138.89(12)		75
L_1N_1	19143.3(41)	19146.4(22)		1
L_1N_2 ($L\gamma_2$)	19304.5(51)	19302.987(50)		75
L_1N_3 ($L\gamma_3$)	19504.3(39)	19503.445(60)		75
L_1N_4	19757.6(38)	19756.75(83)		75
L_1N_5	19795.5(38)	19793.91(50)		75
L_1N_6	20138.2(33)	20127.0(48)	$L_1N_{6,7}$	1
L_1N_7	20146.2(29)	20127.0(48)	$L_1N_{6,7}$	1
L_1 edge	20481.6(17)	20462.5(50)		1
L_1 edge (c)		20470.0(36)		
L_2M_1 ($L\eta$)	14509.0(26)	14510.327(80)		75
L_2M_2	14860.6(23)	14869.6(26)		1

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
L_2M_3 ($L\beta_{17}$)	15645.3(25)	15643.1(12)		1
L_2M_4 ($L\beta_1$)	16199.8(16)	16201.556(30)		75
L_2M_5	16358.3(15)	16358.1(10)		75
L_2N_1 ($L\gamma_5$)	18363.3(31)	18364.35(11)		75
L_2N_2	18524.5(41)			
L_2N_3	18724.2(29)	18728.4(42)		1
L_2N_4 ($L\gamma_1$)	18977.6(28)	18978.259(20)		75
L_2N_5	19015.5(28)	19012.8(43)		1
L_2N_6 (Lv)	19358.2(23)	19348.00(15)		75
L_2N_7 (Lv)	19366.2(19)			
L_2 edge	19701.59(72)	19682.9(46)		1
L_2 edge (c)		19690.5(34)		
L_3M_1 (Ll)	11117.7(21)	11118.06(18)		75
L_3M_2 (Lt)	11469.3(21)	11469.5(11)		61
L_3M_3 (Ls)	12254.0(22)	12255.98(96)		1,61
L_3M_4 ($L\alpha_2$)	12808.5(13)	12809.498(30)		75
L_3M_5 ($L\alpha_1$)	12967.0(13)	12967.937(20)		75
L_3N_1 ($L\beta_6$)	14972.0(29)	14973.424(50)		75
L_3N_2	15133.2(39)	15132.2(13)		1,61
L_3N_3	15332.9(26)	15334.0(12)		1,61
L_3N_4 ($L\beta_{15}$)	15586.3(25)	15586.910(70)		75
L_3N_5 ($L\beta_2$)	15624.2(26)	15623.960(30)		75
L_3N_6 (Lu)	15966.9(21)	15955.85(58)	$L_3N_{6,7}$	75
L_3N_7 (Lu)	15974.8(17)	15965.88(58)	$L_3N_{6,7}$	75
L_3 edge	16310.27(47)	16298.5(32)		1
L_3 edge (c)		16300.0(21)		
91	**Protactinium**		**Pa**	231
KL_1	91488.0(33)			
KL_2 ($K\alpha_2$)	92283.5(36)	92283.4(20)		10
KL_3 ($K\alpha_1$)	95864.8(34)	95866.4(20)		10
KM_1	107232.3(50)			
KM_2 ($K\beta_3$)	107591.2(51)	107585.3(20)		10
KM_3 ($K\beta_1$)	108422.3(52)	108417.3(20)		10
KM_4 ($K\beta_5^{II}$)	108986.2(43)			
KM_5 ($K\beta_5^{I}$)	109153.5(43)			
KN_1	111223.1(58)			
KN_2 ($K\beta_2^{II}$)	111387.6(69)	111405.(30)		1
KN_3 ($K\beta_2^{I}$)	111600.5(56)	111625.(30)		1
KN_4 ($K\beta_4^{II}$)	111859.4(55)			
KN_5 ($K\beta_4^{I}$)	111899.8(56)			
K edge	112601.7(35)			
K edge (c)		112598.4(23)		
L_1M_1	15744.4(33)			
L_1M_2 ($L\beta_4$)	16103.2(34)	16103.7(31)		1
L_1M_3 ($L\beta_3$)	16934.3(35)	16930.5(17)		1
L_1M_4 ($L\beta_{10}$)	17498.2(26)	17491.9(73)		1
L_1M_5 ($L\beta_9$)	17665.5(25)	17666.3(37)		1
L_1N_1	19735.1(41)			
L_1N_2 ($L\gamma_2$)	19899.6(52)	19872.1(47)		1
L_1N_3 ($L\gamma_3$)	20112.6(39)	20097.6(48)		1
L_1N_4	20371.5(38)			
L_1N_5	20411.9(38)			
L_1N_6	20751.5(34)			
L_1N_7	20760.4(29)			
L_1 edge	21113.7(17)			
L_1 edge (c)		21100.3(42)		
L_2M_1 ($L\eta$)	14948.8(26)	14946.6(27)		1
L_2M_2	15307.6(24)			
L_2M_3 ($L\beta_{17}$)	16138.8(25)			
L_2M_4 ($L\beta_1$)	16702.7(16)	16702.0(17)		1
L_2M_5	16869.9(15)			
L_2N_1 ($L\gamma_5$)	18939.6(31)	18928.6(43)		1
L_2N_2	19104.1(42)			
L_2N_3	19317.0(29)			
L_2N_4 ($L\gamma_1$)	19575.9(28)	19568.5(41)		1
L_2N_5	19616.3(29)			
L_2N_6 (Lv)	19955.9(24)			
L_2N_7 (Lv)	19964.8(20)			
L_2 edge	20318.12(73)			
L_2 edge (c)		20313.5(30)		
L_3M_1 (Ll)	11367.6(21)	11366.2(15)		1
L_3M_2 (Lt)	11726.4(21)			
L_3M_3 (Ls)	12557.6(23)			
L_3M_4 ($L\alpha_2$)	13121.5(13)	13122.3(10)		1
L_3M_5 ($L\alpha_1$)	13288.7(13)	13290.8(11)		1
L_3N_1 ($L\beta_6$)	15358.4(29)	15346.2(28)		1
L_3N_2	15522.8(39)			
L_3N_3	15735.8(26)			
L_3N_4 ($L\beta_{15}$)	15994.7(25)			
L_3N_5 ($L\beta_2$)	16035.1(26)	16024.6(31)		1
L_3N_6 (Lu)	16374.7(22)			
L_3N_7 (Lu)	16383.6(17)			
L_3 edge	16736.90(48)			
L_3 edge (c)		16732.9(22)		
92	**Uranium**		**U**	233
KL_1	93843.7(34)			
KL_2 ($K\alpha_2$)	94655.1(37)	94652.78(70)		9
KL_3 ($K\alpha_1$)	98435.6(36)	98433.75(60)		9
KM_1	110054.0(51)			
KM_2 ($K\beta_3$)	110420.2(52)			
KM_3 ($K\beta_1$)	111300.5(54)			
KM_4 ($K\beta_5^{II}$)	111873.8(45)			
KM_5 ($K\beta_5^{I}$)	112050.2(44)			
KN_1	114162.1(60)			
KN_2 ($K\beta_2^{II}$)	114331.0(71)			
KN_3 ($K\beta_2^{I}$)	114557.9(58)			
KN_4 ($K\beta_4^{II}$)	114822.4(57)			
KN_5 ($K\beta_4^{I}$)	114865.3(57)			
K edge	115609.8(36)			
L_1M_1	16210.3(32)			
L_1M_2 ($L\beta_4$)	16576.5(34)			
L_1M_3 ($L\beta_3$)	17456.8(36)			
L_1M_4 ($L\beta_{10}$)	18030.1(26)			
L_1M_5 ($L\beta_9$)	18206.5(26)			
L_1N_1	20318.4(42)			
L_1N_2 ($L\gamma_2$)	20487.3(52)			

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
L_1N_3 ($L\gamma_3$)	20714.2(39)			
L_1N_4	20978.7(38)			
L_1N_5	21021.7(39)			
L_1N_6	21369.0(35)			
L_1N_7	21378.7(30)			
L_1 edge	21766.1(18)			
L_2M_1 ($L\eta$)	15398.9(25)			
L_2M_2	15765.1(24)			
L_2M_3 ($L\beta_{17}$)	16645.4(26)			
L_2M_4 ($L\beta_1$)	17218.7(16)			
L_2M_5	17395.0(16)			
L_2N_1 ($L\gamma_5$)	19507.0(32)			
L_2N_2	19675.9(42)			
L_2N_3	19902.8(29)			
L_2N_4 ($L\gamma_1$)	20167.3(28)			
L_2N_5	20210.2(29)			
L_2N_6 (Lv)	20557.5(25)			
L_2N_7 (Lv)	20567.3(20)			
L_2 edge	20954.72(77)			
L_3M_1 (Ll)	11618.4(21)			
L_3M_2 (Lt)	11984.6(21)			
L_3M_3 (Ls)	12864.9(23)			
L_3M_4 ($L\alpha_2$)	13438.2(14)			
L_3M_5 ($L\alpha_1$)	13614.5(13)			
L_3N_1 ($L\beta_6$)	15726.5(30)			
L_3N_2	15895.4(40)			
L_3N_3	16122.3(26)			
L_3N_4 ($L\beta_{15}$)	16386.8(25)			
L_3N_5 ($L\beta_2$)	16429.7(26)			
L_3N_6 (Lu)	16777.1(23)			
L_3N_7 (Lu)	16786.8(17)			
L_3 edge	17174.23(49)			
92	**Uranium**		**U**	238
KL_1	93842.0(34)			
KL_2 ($K\alpha_2$)	94653.1(37)	94650.84(56)		5
KL_3 ($K\alpha_1$)	98433.6(36)	98431.58(28)		5
KM_1	110052.1(51)			
KM_2 ($K\beta_3$)	110418.2(52)	110415.67(65)		5
KM_3 ($K\beta_1$)	111298.5(54)	111295.08(65)		5
KM_4 ($K\beta_5^{II}$)	111871.8(45)	112009.(15)	$KM_{4,5}$	1
KM_5 ($K\beta_5^{I}$)	112048.1(44)	112009.(15)	$KM_{4,5}$	1
KN_1	114160.4(60)			
KN_2 ($K\beta_2^{II}$)	114329.2(71)	114407.(16)		1
KN_3 ($K\beta_2^{I}$)	114556.2(58)	114607.(16)		1
KN_4 ($K\beta_4^{II}$)	114820.7(57)	115011.(32)	$KN_{4,5}$	1
KN_5 ($K\beta_4^{I}$)	114863.6(57)	115011.(32)	$KN_{4,5}$	1
K edge	1157608.1(36)	115601.1(10)		1,67
K edge (c)		115596.17(68)		
L_1M_1	16210.1(32)			
L_1M_2 ($L\beta_4$)	16576.2(34)	16575.51(30)		1
L_1M_3 ($L\beta_3$)	17456.5(36)	17455.17(73)		1
L_1M_4 ($L\beta_{10}$)	18029.8(26)	18031.2(19)		1
L_1M_5 ($L\beta_9$)	18206.1(26)	18205.55(32)		1
L_1N_1	20318.3(42)			
L_1N_2 ($L\gamma_2$)	20487.2(52)	20484.92(45)		1
L_1N_3 ($L\gamma_3$)	20714.1(39)	20712.95(46)		1
L_1N_4	20978.6(38)	20979.8(26)		1
L_1N_5	21021.6(39)	21018.9(26)		1
L_1N_6	21368.9(35)			
L_1N_7	21378.7(30)			
L_1 edge	21766.1(18)	21770.4(57)		1
L_1 edge (c)		21756.0(15)		
L_2M_1 ($L\eta$)	15399.0(25)	15399.81(57)		1
L_2M_2	15765.1(24)			
L_2M_3 ($L\beta_{17}$)	16645.3(26)	16641.3(17)		1
L_2M_4 ($L\beta_1$)	17218.7(16)	17220.15(28)		1
L_2M_5	17395.0(16)			
L_2N_1 ($L\gamma_5$)	19507.2(32)	19507.27(91)		1
L_2N_2	19676.1(42)			
L_2N_3	19903.0(29)	19907.2(47)		1
L_2N_4 ($L\gamma_1$)	20167.5(28)	20167.27(44)		1
L_2N_5	20210.5(29)			
L_2N_6 (Lv)	20557.8(25)	20557.5(50)		1
L_2N_7 (Lv)	20567.5(20)			
L_2 edge	20954.95(77)	20946.5(52)		1
L_2 edge (c)		20945.7(23)		
L_3M_1 (Ll)	11618.5(21)	11618.41(32)		1
L_3M_2 (Lt)	11984.6(21)	11983.5(15)		1,62
L_3M_3 (Ls)	12864.9(23)	12865.45(81)		1,62
L_3M_4 ($L\alpha_2$)	13438.2(14)	13438.97(19)		1
L_3M_5 ($L\alpha_1$)	13614.6(13)	13614.87(20)		1
L_3N_1 ($L\beta_6$)	15726.8(30)	15726.21(59)		1
L_3N_2	15895.6(40)	15895.63(99)		1,62
L_3N_3	16122.6(26)	16123.56(90)		1,62
L_3N_4 ($L\beta_{15}$)	16387.1(25)	16385.86(29)		1
L_3N_5 ($L\beta_2$)	16430.0(26)	16428.44(29)		1
L_3N_6 (Lu)	16777.3(23)	16786.06(30)	$L_3N_{6,7}$	1
L_3N_7 (Lu)	16787.1(17)	16786.06(30)	$L_3N_{6,7}$	1
L_3 edge	17174.51(49)	17171.37(50)		1,80
L_3 edge (c)		17164.7(12)		
93	**Neptunium**		**Np**	237
KL_1	96240.6(35)	96232.(34)		64
KL_2 ($K\alpha_2$)	97067.6(39)	97068.4(30)		10
KL_3 ($K\alpha_1$)	101057.3(37)	101056.3(30)		10
KM_1	112928.1(53)			
KM_2 ($K\beta_3$)	113300.1(54)	113307.3(40)		10
KM_3 ($K\beta_1$)	114231.4(56)	114243.3(30)		10
KM_4 ($K\beta_5^{II}$)	114814.5(46)			
KM_5 ($K\beta_5^{I}$)	115000.2(46)	114989.(39)		64
KN_1	117167.4(62)			
KN_2 ($K\beta_2^{II}$)	117340.3(73)	117332.(35)		64
KN_3 ($K\beta_2^{I}$)	117581.9(59)	117569.(35)		64
KN_4 ($K\beta_4^{II}$)	117852.1(58)			
KN_5 ($K\beta_4^{I}$)	117897.6(59)			
K edge	118674.2(38)	118688.7(68)		63,64
L_1M_1	16687.5(33)	16683.(20)		64

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
L_1M_2 ($L\beta_4$)	17059.5(34)	17060.77(69)		1
L_1M_3 ($L\beta_3$)	17990.8(36)	17989.3(35)		1
L_1M_4 ($L\beta_{10}$)	18573.9(27)			
L_1M_5 ($L\beta_9$)	18759.6(26)	18757.(27)		64
L_1N_1	20926.8(42)	20922.(21)		64
L_1N_2 ($L\gamma_2$)	21099.7(53)	21104.(16)		1,64
L_1N_3 ($L\gamma_3$)	21341.2(39)	21338.(16)		1,64
L_1N_4	21611.4(39)			
L_1N_5	21657.0(39)			
L_1N_6	22012.0(36)			
L_1N_7	22022.7(31)			
L_1 edge	22433.6(18)	22437.5(95)		64,79
L_2M_1 ($L\eta$)	15860.5(26)	15864.(21)		64
L_2M_2	16232.6(24)	16242.(21)		64
L_2M_3 ($L\beta_{17}$)	17163.8(26)	17168.(21)		64
L_2M_4 ($L\beta_1$)	17746.9(16)	17750.36(34)		1
L_2M_5	17932.7(16)	17938.(28)		64
L_2N_1 ($L\gamma_5$)	20099.9(32)	20107.(19)		1,64
L_2N_2	20272.7(43)	20281.(21)		64
L_2N_3	20514.3(29)	20518.(21)		64
L_2N_4 ($L\gamma_1$)	20784.5(28)	20785.04(46)		1
L_2N_5	20830.0(29)			
L_2N_6 (Lv)	21185.0(26)			
L_2N_7 (Lv)	21195.7(20)			
L_2 edge	21606.62(79)	21615.0(99)		64,79
L_3M_1 (Ll)	11870.8(21)	11885.6(91)		1,64
L_3M_2 (Lt)	12242.9(21)	12247.(22)		64
L_3M_3 (Ls)	13174.1(23)	13173.(21)		64
L_3M_4 ($L\alpha_2$)	13757.2(14)	13759.84(20)		1
L_3M_5 ($L\alpha_1$)	13943.0(13)	13944.26(21)		1
L_3N_1 ($L\beta_6$)	16110.2(30)	16113.(18)		1,64
L_3N_2	16283.0(40)	16286.(22)		64
L_3N_3	16524.6(26)	16523.(22)		64
L_3N_4 ($L\beta_{15}$)	16794.8(26)			
L_3N_5 ($L\beta_2$)	16840.3(26)	16840.16(30)		1
L_3N_6 (Lu)	17195.3(23)			
L_3N_7 (Lu)	17206.1(17)			
L_3 edge	17616.94(50)	17608.04(50)		64,79,80
94	**Plutonium**		**Pu**	239
KL_1	98683.5(36)			
KL_2 ($K\alpha_2$)	99526.0(40)	99523.2(12)		9
KL_3 ($K\alpha_1$)	103735.4(39)	103734.05(60)		9
KM_1	115860.0(54)			
KM_2 ($K\beta_3$)	116240.8(56)	116251.8(80)		63
KM_3 ($K\beta_1$)	117226.2(58)	117243.7(80)		63
KM_4 ($K\beta_5^{II}$)	117818.8(48)			
KM_5 ($K\beta_5^{I}$)	118014.5(48)			
KN_1	120234.1(64)			
KN_2 ($K\beta_2^{II}$)	120410.8(75)			
KN_3 ($K\beta_2^{I}$)	120667.9(61)			
KN_4 ($K\beta_4^{II}$)	120943.7(60)			
KN_5 ($K\beta_4^{I}$)	120991.9(60)			
K edge	121795.4(40)	121790.17(96)		64,67,77
L_1M_1	17176.5(33)	17193.(26)		65
L_1M_2 ($L\beta_4$)	17557.3(35)	17556.23(72)		1,65
L_1M_3 ($L\beta_3$)	18542.7(37)	18540.52(81)		1,65
L_1M_4 ($L\beta_{10}$)	19135.3(27)	19127.2(44)		1
L_1M_5 ($L\beta_9$)	19331.0(26)	19323.9(45)		1
L_1N_1	21550.6(43)			
L_1N_2 ($L\gamma_2$)	21727.4(54)	21725.4(11)		1
L_1N_3 ($L\gamma_3$)	21984.4(39)	21982.64(52)		1
L_1N_4	22260.2(39)			
L_1N_5	22308.5(39)			
L_1N_6	22671.0(37)			
L_1N_7	22683.0(31)			
L_1 edge	23111.9(18)	23113.(17)		65
L_2M_1 ($L\eta$)	16334.0(25)	16332.8(32)		1
L_2M_2	16714.8(24)	16715.8(39)		65
L_2M_3 ($L\beta_{17}$)	17700.2(26)	17702.0(43)		65
L_2M_4 ($L\beta_1$)	18292.8(16)	18294.03(80)		1
L_2M_5	18488.5(16)			
L_2N_1 ($L\gamma_5$)	20708.1(33)	20705.1(51)		1
L_2N_2	20884.8(43)			
L_2N_3	21141.9(29)			
L_2N_4 ($L\gamma_1$)	21417.7(28)	21417.55(49)		1
L_2N_5	21465.9(28)			
L_2N_6 (Lv)	21828.4(26)			
L_2N_7 (Lv)	21840.5(20)			
L_2 edge	22269.42(79)	22270.(10)		65
L_3M_1 (Ll)	12124.6(21)	12124.2(18)		1
L_3M_2 (Lt)	12505.4(21)	12506.4(39)		65
L_3M_3 (Ls)	13490.8(23)	13492.5(43)		65
L_3M_4 ($L\alpha_2$)	14083.4(14)	14084.42(47)		1
L_3M_5 ($L\alpha_1$)	14279.1(13)	14278.74(49)		1
L_3N_1 ($L\beta_6$)	16498.7(30)	16498.42(65)		1
L_3N_2	16675.4(41)			
L_3N_3	16932.5(26)			
L_3N_4 ($L\beta_{15}$)	17208.3(25)	17207.8(35)		1
L_3N_5 ($L\beta_2$)	17256.6(25)	17255.48(71)		1
L_3N_6 (Lu)	17619.0(24)	17633.7(37)	$L_3N_{6,7}$	1
L_3N_7 (Lu)	17631.1(18)	17633.7(37)	$L_3N_{6,7}$	1
L_3 edge	18060.02(51)	18060.(10)		65
94	**Plutonium**		**Pu**	244
KL_1	98682.4(36)			
KL_2 ($K\alpha_2$)	99524.7(40)	99529.4(20)		10
KL_3 ($K\alpha_1$)	103734.0(39)	103740.3(20)		10
KM_1	115858.7(54)			
KM_2 ($K\beta_3$)	116239.5(56)	116241.3(20)		10
KM_3 ($K\beta_1$)	117224.8(58)	117232.2(20)		10
KM_4 ($K\beta_5^{II}$)	117817.5(48)			
KM_5 ($K\beta_5^{I}$)	118013.2(48)			
KN_1	120232.8(64)			
KN_2 ($K\beta_2$II)	120409.5(75)	120405.2(30)		10
KN_3 ($K\beta_2^{I}$)	120666.5(61)	120674.2(30)		10
KN_4 ($K\beta_4^{II}$)	120942.4(60)			

TABLE V. (*Continued*).

	Theory	Experiment		
Designation	Energy (eV)	Energy (eV)	Blend	Ref.
KN_5 ($K\beta_4^{I}$)	120990.6(60)			
K edge	121794.1(40)			
L_1M_1	17176.4(33)			
L_1M_2 ($L\beta_4$)	17557.1(35)			
L_1M_3 ($L\beta_3$)	18542.5(37)			
L_1M_4 ($L\beta_{10}$)	19135.1(27)			
L_1M_2 ($L\beta_9$)	19330.8(26)			
L_1N_1	21550.4(43)			
L_1N_2 ($L\gamma_2$)	21727.1(54)			
L_1N_3 ($L\gamma_3$)	21984.2(39)			
L_1N_4	22260.0(39)			
L_1N_5	22308.2(39)			
L_1N_6	22670.7(37)			
L_1N_7	22682.8(31)			
L_1 edge	23111.8(18)	23109.5(64)		1
L_2M_1 ($L\eta$)	16334.1(25)			
L_2M_2	16714.8(24)			
L_2M_3 ($L\beta_{17}$)	17700.2(26)			
L_2M_4 ($L\beta_1$)	18292.8(16)			
L_2M_5	18488.5(16)			
L_2N_1 ($L\gamma_5$)	20708.1(33)			
L_2N_2	20884.8(43)			
L_2N_3	21141.9(29)			
L_2N_4 ($L\gamma_1$)	21417.7(28)			
L_2N_5	21465.9(28)			
L_2N_6 (Lv)	21828.4(26)			
L_2N_7 (Lv)	21840.5(20)			
L_2 edge	22269.47(79)	22251.0(59)		1
L_3M_1 (Ll)	12124.7(21)			
L_3M_2 (Lt)	12505.4(21)			
L_3M_3 (Ls)	13490.8(23)			
L_3M_4 ($L\alpha_2$)	14083.4(14)			
L_3M_5 ($L\alpha_1$)	14279.1(13)			
L_3N_1 ($L\beta_6$)	16498.7(30)			
L_3N_2	16675.5(41)			
L_3N_3	16932.5(26)			
L_3N_4 ($L\beta_{15}$)	17208.3(25)			
L_3N_5 ($L\beta_2$)	17256.6(25)			
L_3N_6 (Lu)	17619.1(24)			
L_3N_7 (Lu)	17631.1(18)			
L_3 edge	18060.10(51)	18055.99(35)		1,80
95	**Americium**		**Am**	241
KL_1	101172.2(37)	101174.9(27)		66
KL_2 ($K\alpha_2$)	102030.7(42)	102030.3(38)		11
KL_3 ($K\alpha_1$)	106470.4(41)	106471.3(42)		11
KM_1	118849.4(55)			
KM_2 ($K\beta_3$)	119237.9(58)	119237.7(24)		66
KM_3 ($K\beta_1$)	120279.6(59)	120280.5(35)		66
KM_4 ($K\beta_5^{II}$)	120882.3(49)			
KM_5 ($K\beta_5^{I}$)	121087.9(49)			
KN_1	123361.6(66)			
KN_2 ($K\beta_2$II)	123542.7(78)	123541.5(28)		66
KN_3 ($K\beta_2^{I}$)	123815.9(63)	123817.5(29)		66
KN_4 ($K\beta_4^{II}$)	124097.7(63)			
KN_5 ($K\beta_4^{I}$)	124148.6(62)			
K edge	124984.8(42)	124986.1(45)		66,63
L_1M_1	17677.2(33)	17674.5(12)		66
L_1M_2 ($L\beta_4$)	18065.7(35)	18062.96(78)		1
L_1M_3 ($L\beta_3$)	19107.4(37)	19106.24(87)		1
L_1M_4 ($L\beta_{10}$)	19710.1(27)			
L_1M_2 ($L\beta_9$)	19915.7(27)			
L_1N_1	22189.4(44)	22187.5(20)		66
L_1N_2 ($L\gamma_2$)	22370.4(56)	22365.3(29)		1,66
L_1N_3 ($L\gamma_3$)	22643.6(40)	22642.2(31)		66
L_1N_4	22925.5(39)			
L_1N_5	22976.4(39)			
L_1N_6	23346.5(38)			
L_1N_7	23359.4(31)			
L_1 edge	23812.5(19)	23808.0(30)		66
L_2M_1 ($L\eta$)	16818.6(26)	16819.2(13)		66
L_2M_2	17207.2(24)	17206.5(21)		66
L_2M_3 ($L\beta_{17}$)	18248.9(26)	18250.0(41)		66
L_2M_4 ($L\beta_1$)	18851.6(17)	18852.18(38)		1
L_2M_5	19057.2(16)			
L_2N_1 ($L\gamma_5$)	21330.9(33)	21332.0(20)		66
L_2N_2	21511.9(45)	21510.1(30)		66
L_2N_3	21785.1(29)	21787.0(31)		66
L_2N_4 ($L\gamma_1$)	22067.0(29)	22065.39(52)		1
L_2N_5	22117.9(29)			
L_2N_6 (Lv)	22488.0(27)			
L_2N_7 (Lv)	22500.9(21)			
L_2 edge	22954.03(80)	22952.0(30)		66
L_3M_1 (Ll)	12379.0(21)	12378.2(14)		1,66
L_3M_2 (Lt)	12767.5(21)	12765.3(22)		66
L_3M_3 (Ls)	13809.2(23)	13809.2(41)		66
L_3M_4 ($L\alpha_2$)	14411.9(14)	14412.09(22)		1
L_3M_5 ($L\alpha_1$)	14617.5(14)	14617.33(23)		1
L_3N_1 ($L\beta_6$)	16891.3(30)	16887.52(65)		1,66
L_3N_2	17072.3(42)	17068.7(31)		66
L_3N_3	17345.5(26)	17346.2(32)		66
L_3N_4 ($L\beta_{15}$)	17627.4(26)	17625.90(74)		1
L_3N_5 ($L\beta_2$)	17678.2(26)	17676.66(34)		1
L_3N_6 (Lu)	18048.4(24)			
L_3N_7 (Lu)	18061.3(18)			
L_3 edge	18514.38(50)	18510.0(30)		66
95	**Americium**		**Am**	243
KL_1	101171.7(37)			
KL_2 ($K\alpha_2$)	102030.1(42)	102031.3(20)		10
KL_3 ($K\alpha_1$)	106469.8(41)	106473.3(30)		10
KM_1	118848.8(55)			
KM_2 ($K\beta_3$)	119237.3(58)	119239.2(20)		10
KM_3 ($K\beta_1$)	120279.0(59)	120279.2(20)		10
KM_4 ($K\beta_5^{II}$)	120881.7(49)			
KM_5 ($K\beta_5^{I}$)	121087.3(49)			
KN_1	123361.0(66)			
KN_2 ($K\beta_2^{II}$)	123542.0(78)	123547.2(30)		10

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
KN_3 ($K\beta_2^{I}$)	123815.2(63)	123816.2(30)		10
KN_4 ($K\beta_4^{II}$)	124097.1(63)			
KN_5 ($K\beta_4^{I}$)	124148.0(62)			
K edge	124984.1(42)			
L_1M_1	17677.1(33)			
L_1M_2 ($L\beta_4$)	18065.6(35)			
L_1M_3 ($L\beta_3$)	19107.3(37)			
L_1M_4 ($L\beta_{10}$)	19710.0(27)			
L_1M_5 ($L\beta_9$)	19915.6(27)			
L_1N_1	22189.3(44)			
L_1N_2 ($L\gamma_2$)	22370.3(56)			
L_1N_3 ($L\gamma_3$)	22643.5(40)			
L_1N_4	22925.4(39)			
L_1N_5	22976.3(39)			
L_1N_6	23346.4(38)			
L_1N_7	23359.3(31)			
L_1 edge	23812.4(19)			
L_2M_1 ($L\eta$)	16818.7(26)			
L_2M_2	17207.2(24)			
L_2M_3 ($L\beta_{17}$)	18248.9(26)			
L_2M_4 ($L\beta_1$)	18851.6(17)			
L_2M_5	19057.1(16)			
L_2N_1 ($L\gamma_5$)	21330.9(33)			
L_2N_2	21511.9(45)			
L_2N_3	21785.1(29)			
L_2N_4 ($L\gamma_1$)	22067.0(29)			
L_2N_5	22117.8(29)			
L_2N_6 (Lv)	22488.0(27)			
L_2N_7 (Lv)	22500.9(21)			
L_2 edge	22954.02(80)			
L_3M_1 (Ll)	12379.0(21)			
L_3M_2 (Lt)	12767.5(21)			
L_3M_3 (Ls)	13809.2(23)			
L_3M_4 ($L\alpha_2$)	14411.9(14)			
L_3M_5 ($L\alpha_1$)	14617.5(14)			
L_3N_1 ($L\beta_6$)	16891.3(30)			
L_3N_2	17072.3(42)			
L_3N_3	17345.5(26)			
L_{34} ($L\beta_{15}$)	17627.4(26)			
L_3N_5 ($L\beta_2$)	17678.2(26)			
L_3N_6 (Lu)	18048.4(24)			
L_3N_7 (Lu)	18061.3(18)			
L_3 edge	18514.37(50)			
96	**Curium**		**Cm**	245
KL_1	103707.4(38)			
KL_2 ($K\alpha_2$)	104581.8(43)	104589.0(50)		11
KL_3 ($K\alpha_1$)	109263.1(42)	109272.9(50)		11
KM_1	121897.0(57)			
KM_2 ($K\beta_3$)	122293.1(60)	122288.9(50)		68
KM_3 ($K\beta_1$)	123394.3(61)	123406.9(50)		68
KM_4 ($K\beta_5^{II}$)	124007.0(51)			
KM_5 ($K\beta_5^{I}$)	124223.0(51)			
KN_1	126550.9(68)			
KN_2 ($K\beta_2^{II}$)	126736.1(81)	126982.(15)	$KN_{2,3}$	68
KN_3 ($K\beta_2^{I}$)	127026.4(65)	126982.(15)	$KN_{2,3}$	68
KN_4 ($K\beta_4^{II}$)	127314.2(64)			
KN_5 ($K\beta_4^{I}$)	127367.9(63)			
K edge	128242.8(44)	128241.3(25)		67,69,77
L_1M_1	18189.6(33)			
L_1M_2 ($L\beta_4$)	18585.7(35)			
L_1M_3 ($L\beta_3$)	19686.9(38)			
L_1M_4 ($L\beta_{10}$)	20299.7(28)			
L_1M_5 ($L\beta_9$)	20515.7(28)			
L_1N_1	22843.5(45)			
L_1N_2 ($L\gamma_2$)	23028.8(57)			
L_1N_3 ($L\gamma_3$)	23319.1(40)			
L_1N_4	23606.8(41)			
L_1N_5	23660.5(40)			
L_1N_6	24038.4(38)			
L_1N_7	24052.4(32)			
L_1 edge	24535.4(19)	24515.(21)		68
L_2M_1 ($L\eta$)	17315.1(25)			
L_2M_2	17711.3(24)			
L_2M_3 ($L\beta_{17}$)	18812.5(26)			
L_2M_4 ($L\beta_1$)	19425.2(17)			
L_2M_5	19641.2(17)			
L_2N_1 ($L\gamma_5$)	21969.1(34)			
L_2N_2	22154.3(46)			
L_2N_3	22444.6(29)			
L_2N_4 ($L\gamma_1$)	22732.4(30)			
L_2N_5	22786.1(29)			
L_2N_6 (Lv)	23163.9(27)			
L_2N_7 (Lv)	23177.9(21)			
L_2 edge	23660.98(80)	23651.(11)		68
L_3M_1 (Ll)	12633.8(21)			
L_3M_2 (Lt)	13030.0(21)			
L_3M_3 (Ls)	14131.2(24)			
L_3M_4 ($L\alpha_2$)	14743.9(14)			
L_3M_5 ($L\alpha_1$)	14959.9(14)			
L_3N_1 ($L\beta_6$)	17287.8(31)			
L_3N_2	17473.0(43)			
L_3N_3	17763.3(26)			
L_3N_4 ($L\beta_{15}$)	18051.1(27)			
L_3N_5 ($L\beta_2$)	18104.8(26)			
L_3N_6 (Lu)	18482.6(24)			
L_3N_7 (Lu)	18496.6(18)			
L_3 edge	18979.68(50)	18970.(11)		68
96	**Curium**		**Cm**	248
KL_1	103706.4(38)			
KL_2 ($K\alpha_2$)	104580.7(43)	104590.3(20)		10
KL_3 ($K\alpha_1$)	109262.0(42)	109272.3(20)		10
KM_1	121895.9(57)			
KM_2 ($K\beta_3$)	122292.0(60)	122302.2(20)		10
KM_3 ($K\beta_1$)	123393.2(61)	123403.2(20)		10
KM_4 ($K\beta_5^{II}$)	124005.9(51)	124000.2(50)		10
KM_5 ($K\beta_5^{I}$)	124221.9(51)	124214.2(40)		10

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
KN_1	126549.8(68)			
KN_2 ($K\beta_2^{II}$)	126735.0(81)	126727.2(30)		10
KN_3 ($K\beta_2^{I}$)	127025.3(65)	127039.2(20)		10
KN_4 ($K\beta_4^{II}$)	127313.1(64)			
KN_5 ($K\beta_4^{I}$)	127366.8(63)			
K edge	128241.7(44)			
L_1M_1	18189.5(33)			
L_1M_2 ($L\beta_4$)	18585.5(35)			
L_1M_3 ($L\beta_3$)	19686.7(38)			
L_1M_4 ($L\beta_{10}$)	20299.5(28)			
L_1M_5 ($L\beta_9$)	20515.5(28)			
L_1N_1	22843.3(45)			
L_1N_2 ($L\gamma_2$)	23028.6(57)			
L_1N_3 ($L\gamma_3$)	23318.9(40)			
L_1N_4	23606.6(41)			
L_1N_5	23660.3(40)			
L_1N_6	24038.2(38)			
L_1N_7	24052.2(32)			
L_1 edge	24535.2(19)			
L_2M_1 ($L\eta$)	17315.2(25)			
L_2M_2	17711.3(24)			
L_2M_3 ($L\beta_{17}$)	18812.5(26)			
L_2M_4 ($L\beta_1$)	19425.2(17)			
L_2M_5	19641.2(17)			
L_2N_1 ($L\gamma_5$)	21969.1(34)			
L_2N_2	22154.3(46)			
L_2N_3	22444.6(29)			
L_2N_4 ($L\gamma_1$)	22732.4(30)			
L_2N_5	22786.1(29)			
L_2N_6 (Lv)	23163.9(27)			
L_2N_7 (Lv)	23177.9(21)			
L_2 edge	23660.96(80)			
L_3M_1 (Ll)	12633.9(21)			
L_3M_2 (Lt)	13030.0(21)			
L_3M_3 (Ls)	14131.2(24)			
L_3M_4 ($L\alpha_2$)	14743.9(14)			
L_3M_5 ($L\alpha_1$)	14959.9(14)			
L_3N_1 ($L\beta_6$)	17287.8(31)			
L_3N_2	17473.0(43)			
L_3N_3	17763.3(26)			
L_3N_4 ($L\beta_{15}$)	18051.1(27)			
L_3N_5 ($L\beta_2$)	18104.8(26)			
L_3N_6 (Lu)	18482.7(24)			
L_3N_7 (Lu)	18496.6(18)			
L_3 edge	18979.69(50)			
97	**Berkelium**		**Bk**	249
KL_1	106290.5(40)	106318.(65)		70
KL_2 ($K\alpha_2$)	107180.7(45)	107194.3(50)		10
KL_3 ($K\alpha_1$)	112115.7(44)	112127.3(50)		10
KM_1	125005.5(58)			
KM_2 ($K\beta_3$)	125409.4(61)	125414.2(70)		10
KM_3 ($K\beta_1$)	126573.1(63)	126577.2(70)		10
KM_4 ($K\beta_5^{II}$)	127196.0(53)			
KM_5 ($K\beta_5^{I}$)	127422.6(53)			
KN_1	129810.4(71)			
KN_2 ($K\beta_2^{II}$)	130000.0(83)			
KN_3 ($K\beta_2^{I}$)	130308.1(67)			
KN_4 ($K\beta_4^{II}$)	130602.1(67)			
KN_5 ($K\beta_4^{I}$)	130658.4(65)			
K edge	131561.4(45)	131555.6(47)		67,69,77
L_1M_1	18715.1(34)	18719.(40)		70
L_1M_2 ($L\beta_4$)	19118.9(36)	19128.(53)		70
L_1M_3 ($L\beta_3$)	20282.6(38)	20298.(53)		70
L_1M_4 ($L\beta_{10}$)	20905.5(28)			
L_1M_5 ($L\beta_9$)	21132.1(27)			
L_1N_1	23520.0(46)	23521.(42)		70
L_1N_2 ($L\gamma_2$)	23709.6(59)			
L_1N_3 ($L\gamma_3$)	24017.7(41)			
L_1N_4	24311.6(42)			
L_1N_5	24368.0(41)			
L_1N_6	24753.9(38)			
L_1N_7	24768.5(33)			
L_1 edge	25271.0(20)	25272.(25)		70
L_2M_1 ($L\eta$)	17824.8(25)	17829.(40)		70
L_2M_2	18228.6(25)	18238.(53)		70
L_2M_3 ($L\beta_{17}$)	19392.3(27)	19408.(53)		70
L_2M_4 ($L\beta_1$)	20015.2(17)			
L_2M_5	20241.9(16)			
L_2N_1 ($L\gamma_5$)	22629.7(35)	22631.(42)		70
L_2N_2	22819.3(48)			
L_2N_3	23127.4(30)			
L_2N_4 ($L\gamma_1$)	23421.3(30)			
L_2N_5	23477.7(29)			
L_2N_6 (Lv)	23863.7(27)			
L_2N_7 (Lv)	23878.2(21)			
L_2 edge	24380.68(90)	24382.(25)		70
L_3M_1 (Ll)	12889.9(21)	12896.(43)		70
L_3M_2 (Lt)	13293.7(21)	13305.(55)		70
L_3M_3 (Ls)	14457.4(24)	14475.(55)		70
L_3M_4 ($L\alpha_2$)	15080.3(14)			
L_3M_5 ($L\alpha_1$)	15306.9(13)			
L_3N_1 ($L\beta_6$)	17694.8(32)	17697.(45)		70
L_3N_2	17884.4(44)			
L_3N_3	18192.5(27)			
L_3N_4 ($L\beta_{15}$)	18486.4(27)			
L_3N_5 ($L\beta_2$)	18542.8(26)			
L_3N_6 (Lu)	18928.7(24)			
L_3N_7 (Lu)	18943.3(18)			
L_3 edge	19445.76(50)	19449.(30)		70
97	**Berkelium**		**Bk**	250
KL_1	106290.0(40)			
KL_2 ($K\alpha_2$)	107180.2(45)	107164.4(60)		11
KL_3 ($K\alpha_1$)	112115.1(44)	112111.4(60)		11
KM_1	125005.1(58)			
KM_2 ($K\beta_3$)	125408.8(61)	125478.(10)		69
KM_3 ($K\beta_1$)	126572.6(63)	126582.(10)		69

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
KM_4 ($K\beta_5^{II}$)	127195.5(53)			
KM_5 ($K\beta_5^{I}$)	127422.1(53)			
KN_1	129809.9(71)			
KN_2 ($K\beta_2^{II}$)	129999.5(83)			
KN_3 ($K\beta_2^{I}$)	130307.6(67)			
KN_4 ($K\beta_4^{II}$)	130601.5(67)			
KN_5 ($K\beta_4^{I}$)	130657.9(65)			
K edge	131560.9(45)			
L_1M_1	18715.0(34)			
L_1M_2 ($L\beta_4$)	19118.8(36)			
L_1M_3 ($L\beta_3$)	20282.5(38)			
L_1M_4 ($L\beta_{10}$)	20905.4(28)			
L_1M_5 ($L\beta_9$)	21132.0(27)			
L_1N_1	23519.9(46)			
L_1N_2 ($L\gamma_2$)	23709.5(59)			
L_1N_3 ($L\gamma_3$)	24017.6(41)			
L_1N_4	24311.5(42)			
L_1N_5	24367.9(41)			
L_1N_6	24753.8(38)			
L_1N_7	24768.4(33)			
L_1 edge	25270.9(20)			
L_2M_1 ($L\eta$)	17824.8(25)			
L_2M_2	18228.6(25)			
L_2M_3 ($L\beta_{17}$)	19392.3(27)			
L_2M_4 ($L\beta_1$)	20015.2(17)			
L_2M_5	20241.8(16)			
L_2N_1 ($L\gamma_5$)	22629.7(35)			
L_2N_2	22819.3(48)			
L_2N_3	23127.4(30)			
L_2N_4 ($L\gamma_1$)	23421.3(30)			
L_2N_5	23477.7(29)			
L_2N_6 (Lv)	23863.6(27)			
L_2N_7 (Lv)	23878.2(21)			
L_2 edge	24380.67(90)			
L_3M_1 (Ll)	12889.9(21)			
L_3M_2 (Lt)	13293.7(21)			
L_3M_3 (Ls)	14457.4(24)			
L_3M_4 ($L\alpha_2$)	15080.3(14)			
L_3M_5 ($L\alpha_1$)	15306.9(13)			
L_3N_1 ($L\beta_6$)	17694.8(32)			
L_3N_2	17884.4(44)			
L_3N_3	18192.5(27)			
L_3N_4 ($L\beta_{15}$)	18486.4(27)			
L_3N_5 ($L\beta_2$)	18542.8(26)			
L_3N_6 (Lu)	18928.7(24)			
L_3N_7 (Lu)	18943.3(18)			
L_3 edge	19445.76(50)			
98	**Californium**		**Cf**	249
KL_1	108923.6(41)			
KL_2 ($K\alpha_2$)	109830.1(47)			
KL_3 ($K\alpha_1$)	115031.1(46)			
KM_1	128185.5(60)			
KM_2 ($K\beta_3$)	128597.1(63)			
KM_3 ($K\beta_1$)	129826.5(65)			
KM_4 ($K\beta_5^{II}$)	130459.7(55)			
KM_5 ($K\beta_5^{I}$)	130697.3(55)			
KN_1	133141.5(74)			
KN_2 ($K\beta_2^{II}$)	133335.5(87)			
KN_3 ($K\beta_2^{I}$)	133662.5(69)			
KN_4 ($K\beta_4^{II}$)	133962.5(69)			
KN_5 ($K\beta_4^{I}$)	134021.8(67)			
K edge	134957.1(47)			
L_1M_1	19261.8(33)			
L_1M_2 ($L\beta_4$)	19673.4(36)			
L_1M_3 ($L\beta_3$)	20902.9(39)			
L_1M_4 ($L\beta_{10}$)	21536.1(29)			
L_1M_5 ($L\beta_9$)	21773.7(28)			
L_1N_1	24217.9(47)			
L_1N_2 ($L\gamma_2$)	24411.9(60)			
L_1N_3 ($L\gamma_3$)	24738.9(42)			
L_1N_4	25038.8(42)			
L_1N_5	25098.2(41)			
L_1N_6	25492.0(38)			
L_1N_7	25507.5(33)			
L_1 edge	26033.4(20)	26002.39(90)		16
L_2M_1 ($L\eta$)	18355.4(24)			
L_2M_2	18767.0(25)			
L_2M_3 ($L\beta_{17}$)	19996.5(27)			
L_2M_4 ($L\beta_1$)	20629.7(17)			
L_2M_5	20867.2(16)			
L_2N_1 ($L\gamma_5$)	23311.5(35)			
L_2N_2	23505.5(49)			
L_2N_3	23832.5(30)			
L_2N_4 ($L\gamma_1$)	24132.4(32)			
L_2N_5	24191.8(30)			
L_2N_6 (Lv)	24585.6(27)			
L_2N_7 (Lv)	24601.1(22)			
L_2 edge	25127.02(90)	25097.79(45)		16
L_3M_1 (Ll)	13154.4(21)			
L_3M_2 (Lt)	13566.0(21)			
L_3M_3 (Ls)	14795.4(24)			
L_3M_4 ($L\alpha_2$)	15428.6(14)			
L_3M_5 ($L\alpha_1$)	15666.2(13)			
L_3N_1 ($L\beta_6$)	18110.4(32)			
L_3N_2	18304.4(45)			
L_3N_3	18631.4(27)			
L_3N_4 ($L\beta_{15}$)	18931.4(28)			
L_3N_5 ($L\beta_2$)	18990.7(26)			
L_3N_6 (Lu)	19384.6(23)			
L_3N_7 (Lu)	19400.1(19)			
L_3 edge	19925.98(50)	19901.45(50)		16
98	**Californium**		**Cf**	250
KL_1	108923.6(41)	108947.(17)		71
KL_2 ($K\alpha_2$)	109830.0(47)	109837.3(80)		10
KL_3 ($K\alpha_1$)	115031.1(46)	115035.3(80)		10
KM_1	128185.3(60)			

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
KM_2 ($K\beta_3$)	128596.9(63)	128626.(11)		71
KM_3 ($K\beta_1$)	129826.3(65)	129845.(12)		71
KM_4 ($K\beta_5^{II}$)	130459.5(55)			
KM_5 ($K\beta_5^{I}$)	130697.1(55)			
KN_1	133141.4(74)			
KN_2 ($K\beta_2^{II}$)	133335.3(87)	133357.(12)		71
KN_3 ($K\beta_2^{I}$)	133662.3(69)	133675.(12)		71
KN_4 ($K\beta_4^{II}$)	133962.3(69)			
KN_5 ($K\beta_4^{I}$)	134021.7(67)			
K edge	134956.9(47)	134935.4(31)		67,69,71
L_1M_1	19261.7(33)	19257.6(86)		71
L_1M_2 ($L\beta_4$)	19673.3(36)	19676.2(63)		71
L_1M_3 ($L\beta_3$)	20902.7(39)	20892.0(94)		71
L_1M_4 ($L\beta_{10}$)	21535.9(29)			
L_1M_5 ($L\beta_9$)	21773.5(28)			
L_1N_1	24217.7(47)	24201.9(63)		71
L_1N_2 ($L\gamma_2$)	24411.7(60)	24404.8(82)		71
L_1N_3 ($L\gamma_3$)	24738.7(42)	24721.2(92)		71
L_1N_4	25038.7(42)			
L_1N_5	25098.0(41)			
L_1N_6	25491.9(38)			
L_1N_7	25507.4(33)			
L_1 edge	26033.3(20)	26016.0(50)		71
L_2M_1 ($L\eta$)	18355.3(24)	18347.1(87)		71
L_2M_2	18766.9(25)	18767.3(61)		71
L_2M_3 ($L\beta_{17}$)	19996.3(27)	19990.0(85)		71
L_2M_4 ($L\beta_1$)	20629.5(17)			
L_2M_5	20867.1(16)			
L_2N_1 ($L\gamma_5$)	23311.3(35)	23295.5(62)		71
L_2N_2	23505.3(49)	23501.1(76)		71
L_2N_3	23832.3(30)	23819.1(84)		71
L_2N_4 ($L\gamma_1$)	24132.3(32)			
L_2N_5	24191.6(30)			
L_2N_6 (Lv)	24585.5(27)			
L_2N_7 (Lv)	24600.9(22)			
L_2 edge	25126.85(90)	25108.0(50)		71
L_3M_1 (Ll)	13154.2(21)	13145.(14)		71
L_3M_2 (Lt)	13565.8(21)	13557.0(82)		71
L_3M_3 (Ls)	14795.2(24)	14785.0(85)		71
L_3M_4 ($L\alpha_2$)	15428.4(14)			
L_3M_5 ($L\alpha_1$)	15666.0(13)			
L_3N_1 ($L\beta_6$)	18110.3(32)	18090.8(85)		71
L_3N_2	18304.2(45)	18295.8(84)		71
L_3N_3	18631.2(27)	18613.9(84)		71
L_3N_4 ($L\beta_{15}$)	18931.2(28)			
L_3N_5 ($L\beta_2$)	18990.6(26)			
L_3N_6 (Lu)	19384.4(23)			
L_3N_7 (Lu)	19399.9(19)			
L_3 edge	19925.80(50)	19901.0(60)		71
98	**Californium**		**Cf**	251
KL_1	108922.8(41)			
KL_2 ($K\alpha_2$)	109829.0(47)	109860.(15)		11
KL_3 ($K\alpha_1$)	115030.0(46)	115067.(15)		11
KM_1	128184.1(60)			
KM_2 ($K\beta_3$)	128595.6(63)			
KM_3 ($K\beta_1$)	129825.1(65)			
KM_4 ($K\beta_5^{II}$)	130458.3(55)			
KM_5 ($K\beta_5^{I}$)	130695.8(55)			
KN_1	133140.1(74)			
KN_2 ($K\beta_2^{II}$)	133334.1(87)			
KN_3 ($K\beta_2^{I}$)	133661.0(69)			
KN_4 ($K\beta_4^{II}$)	133961.0(69)			
KN_5 ($K\beta_4^{I}$)	134020.4(67)			
K edge	134955.6(47)			
L_1M_1	19261.3(33)	19259.(14)		72
L_1M_2 ($L\beta_4$)	19672.9(36)	19678.(51)		72
L_1M_3 ($L\beta_3$)	20902.3(39)	20902.(58)		72
L_1M_4 ($L\beta_{10}$)	21535.5(29)	21556.(70)		72
L_1M_5 ($L\beta_9$)	21773.1(28)	21776.(70)		72
L_1N_1	24217.3(47)	24237.(61)		72
L_1N_2 ($L\gamma_2$)	24411.3(60)	24411.(72)		72
L_1N_3 ($L\gamma_3$)	24738.3(42)	24745.(72)		72
L_1N_4	25038.3(42)			
L_1N_5	25097.6(41)			
L_1N_6	25491.5(38)			
L_1N_7	25507.0(33)			
L_1 edge	26032.9(20)			
L_2M_1 ($L\eta$)	18355.1(24)	18366.(12)		72
L_2M_2	18766.6(25)	18772.(19)		72
L_2M_3 ($L\beta_{17}$)	19996.1(27)	20001.(16)		72
L_2M_4 ($L\beta_1$)	20629.3(17)	20656.(70)		72
L_2M_5	20866.8(16)	20876.(70)		72
L_2N_1 ($L\gamma_5$)	23311.1(35)	23345.(62)		72
L_2N_2	23505.1(49)	23485.(23)		72
L_2N_3	23832.1(30)	23822.(24)		72
L_2N_4 ($L\gamma_1$)	24132.0(32)			
L_2N_5	24191.4(30)			
L_2N_6 (Lv)	24585.2(27)			
L_2N_7 (Lv)	24600.7(22)			
L_2 edge	25126.63(90)			
L_3M_1 (Ll)	13154.1(21)	13141.(14)		72
L_3M_2 (Lt)	13565.6(21)	13568.(15)		72
L_3M_3 (Ls)	14795.1(24)	14797.(12)		72
L_3M_4 ($L\alpha_2$)	15428.3(14)	15434.(69)		72
L_3M_5 ($L\alpha_1$)	15665.8(13)	15654.(69)		72
L_3N_1 ($L\beta_6$)	18110.1(32)	18128.(37)		72
L_3N_2	18304.1(45)	18278.(18)		72
L_3N_3	18631.1(27)	18610.(18)		72
L_3N_4 ($L\beta_{15}$)	18931.0(28)			
L_3N_5 ($L\beta_2$)	18990.4(26)			
L_3N_6 (Lu)	19384.2(23)			
L_3N_7 (Lu)	19399.7(19)			
L_3 edge	19925.62(50)			
99	**Einsteinium**		**Es**	251
KL_1	111607.8(43)			
KL_2 ($K\alpha_2$)	112530.0(48)	112501.(10)		11

TABLE V. (*Continued*).

Designation	Theory Energy (eV)	Experiment Energy (eV)	Blend	Ref.
KL_3 ($K\alpha_1$)	118010.5(48)	118018.(10)		11
KM_1	131422.2(62)			
KM_2 ($K\beta_3$)	131841.6(64)	131848.(20)		69
KM_3 ($K\beta_1$)	133140.1(67)	133188.(20)		69
KM_4 ($K\beta_5^{II}$)	133783.7(57)			
KM_5 ($K\beta_5^{I}$)	134032.5(57)			
KN_1	136523.0(77)			
KN_2 ($K\beta_2^{II}$)	136721.4(90)			
KN_3 ($K\beta_2^{I}$)	137068.3(71)			
KN_4 ($K\beta_4^{II}$)	137374.4(71)			
KN_5 ($K\beta_4^{I}$)	137436.8(69)			
K edge	138399.9(50)	138391.5(63)		67,71
L_1M_1	19814.4(33)			
L_1M_2 ($L\beta_4$)	20233.8(37)			
L_1M_3 ($L\beta_3$)	21532.3(39)			
L_1M_4 ($L\beta_{10}$)	22175.9(30)			
L_1M_5 ($L\beta_9$)	22424.7(28)			
L_1N_1	24915.2(48)			
L_1N_2 ($L\gamma_2$)	25113.6(62)			
L_1N_3 ($L\gamma_3$)	25460.5(42)			
L_1N_4	25766.6(44)			
L_1N_5	25829.0(41)			
L_1N_6	26230.8(38)			
L_1N_7	26247.3(34)			
L_1 edge	26792.1(21)			
L_2M_1 ($L\eta$)	18892.2(24)			
L_2M_2	19311.6(25)			
L_2M_3 ($L\beta_{17}$)	20610.1(28)			
L_2M_4 ($L\beta_1$)	21253.7(18)			
L_2M_5	21502.5(17)			
L_2N_1 ($L\gamma_5$)	23993.0(36)			
L_2N_2	24191.3(50)			
L_2N_3	24538.3(30)			
L_2N_4 ($L\gamma_1$)	24844.3(32)			
L_2N_5	24906.8(29)			
L_2N_6 (Lv)	25308.5(27)			
L_2N_7 (Lv)	25325.1(23)			
L_2 edge	25869.90(90)			
L_3M_1 (Ll)	13411.7(21)			
L_3M_2 (Lt)	13831.1(21)			
L_3M_3 (Ls)	15129.6(24)			
L_3M_4 ($L\alpha_2$)	15773.2(14)			
L_3M_5 ($L\alpha_1$)	16022.0(13)			
L_3N_1 ($L\beta_6$)	18512.5(33)			
L_3N_2	18710.8(46)			
L_3N_3	19057.8(27)			
L_3N_4 ($L\beta_{15}$)	19363.8(28)			
L_3N_5 ($L\beta_2$)	19426.3(25)			
L_3N_6 (Lu)	19828.1(24)			
L_3N_7 (Lu)	19844.6(19)			
L_3 edge	20389.42(60)			
100	**Fermium**		**Fm**	254
KL_1	114343.0(44)	114390.(15)		74
KL_2 ($K\alpha_2$)	115280.9(50)	115319.(15)		11
KL_3 ($K\alpha_1$)	121054.5(50)	121095.(15)		11
KM_1	134723.3(64)			
KM_2 ($K\beta_3$)	135150.4(66)	135184.(15)		74
KM_3 ($K\beta_1$)	136521.6(69)	136555.(15)		74
KM_4 ($K\beta_5^{II}$)	137175.7(59)	137217.(17)		74
KM_5 ($K\beta_5^{I}$)	137436.3(59)	137479.(17)		74
KN_1	139980.7(79)			
KN_2 ($K\beta_2^{II}$)	140183.3(93)	140220.(16)		74
KN_3 ($K\beta_2^{I}$)	140551.4(72)	140592.(16)		74
KN_4 ($K\beta_4^{II}$)	140863.5(74)			
KN_5 ($K\beta_4^{I}$)	140929.3(72)			
K edge	141927.3(52)	141930.4(71)		67,74,78
L_1M_1	20380.3(34)	20373.(12)		74
L_1M_2 ($L\beta_4$)	20807.5(36)	20794.(11)		74
L_1M_3 ($L\beta_3$)	22178.7(40)	22165.(11)		74
L_1M_4 ($L\beta_{10}$)	22832.7(29)	22827.(14)		74
L_1M_5 ($L\beta_9$)	23093.3(29)	23089.(14)		74
L_1N_1	25637.7(50)	25633.(14)		74
L_1N_2 ($L\gamma_2$)	25840.3(62)	25830.(12)		74
L_1N_3 ($L\gamma_3$)	26208.5(43)	26202.(12)		74
L_1N_4	26520.5(45)	26514.(14)		74
L_1N_5	26586.4(41)	26584.(14)		74
L_1N_6	26996.0(39)	26934.(17)	$L_1N_{6,7}$	74
L_1N_7	27013.6(36)	26934.(17)	$L_1N_{6,7}$	74
L_1 edge	27584.4(22)	27573.0(80)		74
L_2M_1 ($L\eta$)	19442.4(24)	19444.(11)		74
L_2M_2	19869.6(25)	19865.0(99)		74
L_2M_3 ($L\beta_{17}$)	21240.8(28)	21236.0(99)		74
L_2M_4 ($L\beta_1$)	21894.8(18)	21898.(13)		74
L_2M_5	22155.4(17)	22160.(13)		74
L_2N_1 ($L\gamma_5$)	24699.8(37)	24704.(13)		74
L_2N_2	24902.4(51)	24901.(11)		74
L_2N_3	25270.6(31)	25273.(11)		74
L_2N_4 ($L\gamma_1$)	25582.6(32)	25585.(13)		74
L_2N_5	25648.5(29)	25655.(13)		74
L_2N_6 (Lv)	26058.1(27)	26005.(17)	$L_2N_{6,7}$	74
L_2N_7 (Lv)	26075.7(23)	26005.(17)	$L_2N_{6,7}$	74
L_2 edge	26646.5(10)	26644.0(70)		74
L_3M_1 (Ll)	13668.8(21)	13668.(11)		74
L_3M_2 (Lt)	14095.9(21)	14089.0(99)		74
L_3M_3 (Ls)	15467.1(24)	15460.0(99)		74
L_3M_4 ($L\alpha_2$)	16121.2(14)	16122.(13)		74
L_3M_5 ($L\alpha_1$)	16381.8(13)	16384.(13)		74
L_3N_1 ($L\beta_6$)	18926.2(34)	18928.(13)		74
L_3N_2	19128.8(48)	19125.(11)		74
L_3N_3	19496.9(27)	19497.(11)		74
L_3N_4 ($L\beta_{15}$)	19809.0(29)	19809.(13)		74
L_3N_5 ($L\beta_2$)	19874.8(26)	19879.(13)		74
L_3N_6 (Lu)	20284.4(23)	20229.(17)	$L_3N_{6,7}$	74
L_3N_7 (Lu)	20302.1(20)	20229.(17)	$L_3N_{6,7}$	74
L_3 edge	20872.81(60)	20868.0(70)		74

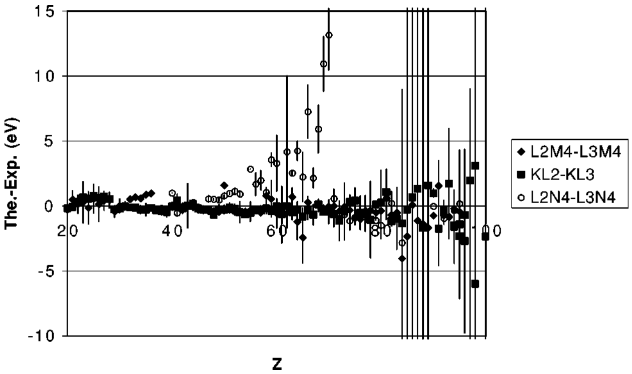

FIG. 1. Comparison between the theoretical and experimental values for the L_2L_3 fine-structure interval. The three experimental values were obtained by subtracting different transitions with a common level. The uncertainties are derived from the experimental measurements. The graph suggests that the experimental data for the L_2N_4 and L_3N_4 transitions are likely to be incorrect in the $50 \leqslant Z \leqslant 70$ region.

The second category is composed of corrections to the electron-electron interaction that cannot be accounted for by RMBPT or MCDF. These corrections start at the two-photon interaction and include three-body effects. The two-photon, nonradiative QED contribution has been calculated recently only for the ground and first excited states of two- and three-electron ions (Blundell *et al.*, 1993; Lindgren *et al.*, 1995; Mohr and Sapirstein, 2000; Andreev *et al.*, 2001; Lindgren *et al.*, 2001; Yerokhin *et al.*, 2001; Åsén *et al.*, 2002).

The radiative corrections split up into two contributions. The first contribution is composed of one-electron radiative corrections (self-energy and vacuum polarization). For the self-energy and $Z>10$ one must use all-order calculations (Mohr 1974a, 1974b, 1975, 1982, 1992; Mohr and Kim, 1992; Mohr and Soff, 1993). Vacuum polarization can be evaluated at the Uehling (Uehling, 1935) and Wichmann and Kroll (Wichmann and Kroll, 1956) level. Higher order effects are much smaller than the self-energy (Soff and Mohr, 1988) and have been neglected. The second contribution consists of radiative corrections to the electron-electron interaction, and scales as Z^3/n^3. *Ab initio* calculations have been performed only for few-electron ions (Indelicato and Mohr, 1990, 1991, 2001; Yerokhin *et al.*, 1999). Here we use the Welton approximation, which has been shown to reproduce very closely *ab initio* results in all examples that have been calculated (Indelicato *et al.*, 1987; Indelicato and Desclaux, 1990; Kim *et al.*, 1991; Blundell, 1993a, 1993b).

E. Theoretical uncertainty

The determination of the theoretical uncertainty is a very complex task. First, there are several well characterized approximations that had to be made to obtain the binding energies, e.g., QED corrections. Second, outer-shell structure had to be neglected, otherwise unmanageably large calculations would be required. Third, the calculations are for isolated atoms, not solids. We now examine in more detail the effects of those approximations.

The first group of approximations has been done because some contributions cannot be calculated at present, even in the simplest of atoms, e.g., the two-loop self-energy contribution. Only very recently were believable calculations published for hydrogenlike high-Z ions (Yerokhin and Shabaev, 2001). Yet the error resulting from such missing contributions can be estimated easily since one knows both the scaling law as a function of Z and the order of magnitude. Since this is a second-order QED diagram, the order of magnitude is α times the one-loop self-energy. This provides, however, a 40% overestimate of the error for hydrogenlike uranium where these effects have actually been calculated (Yerokhin and Shabaev, 2001). Yet we keep this overestimate to account for other uncalculated QED corrections like nonradiative corrections to two-photon exchange (Blundell *et al.*, 1993; Lindgren *et al.*, 1995; Mohr and Sapirstein, 2000; Andreev *et al.*, 2001; Lindgren *et al.*, 2001; Yerokhin *et al.*, 2001; Åsén *et al.*, 2002). Similarly the magnitude of the missing third-order correlation is described in Sec. IV.B. For the scaling we use an effective Z, equal to the real atomic number minus the number of electrons in lower shells. As described in Sec. IV.D, self-energy screening is represented by the Welton approximation to an accuracy better than 10%. Two-photon nonradiative QED corrections have been evaluated only in heliumlike and lithiumlike systems, but they are small (Blundell *et al.*, 1993; Lindgren *et al.*, 1995; Mohr and Sapirstein, 2000; Yerokhin *et al.*, 2000). It should be noted that here one should subtract errors between holes since the error for, e.g., the $K\alpha$ line should be the sum of errors for one $2p$ electron and one $1s$ electron, and not 3 times the error for $1s$ and 11 times the error for $2p$.

The reason for the second group of approximations is simply the complex structure of the outer shell in most elements. We have studied barium as an example, because it has a particularly complex structure. Neutral Ba has a $6s^2$ outer-shell structure. But the $5d^2$, $5d5s$, and $4f^2$ configurations interact very strongly. In the presence of a $4d$ hole the lower configuration becomes $4d^9 5d^2\ {}^2F_{5/2}$. In the Dirac-Fock calculation performed in this work the coupling with the outer shell has been neglected, i.e., we have calculated an average energy over all possible total angular momentum states. Moreover, we neglected closely interacting configurations. This is a potentially severe problem in the case of the Auger contributions which depend heavily on quasidegeneracy between Auger channels.

We first investigate the role of the approximation for the outer shell on the Dirac-Fock part of the calculation. Detailed information on the approximation used for K, L, and M shells can be found in Indelicato *et al.* (1998). Considering again Ba, and using the complete group of quasidegenerate configurations $5d^2$, $5d5s\ 6p^2$, and $4f^2$ as the model space, one obtains, for example, 13 135 $E1$ transitions between the $N_{4,5}$ and the $L_{2,3}$ shells. Using

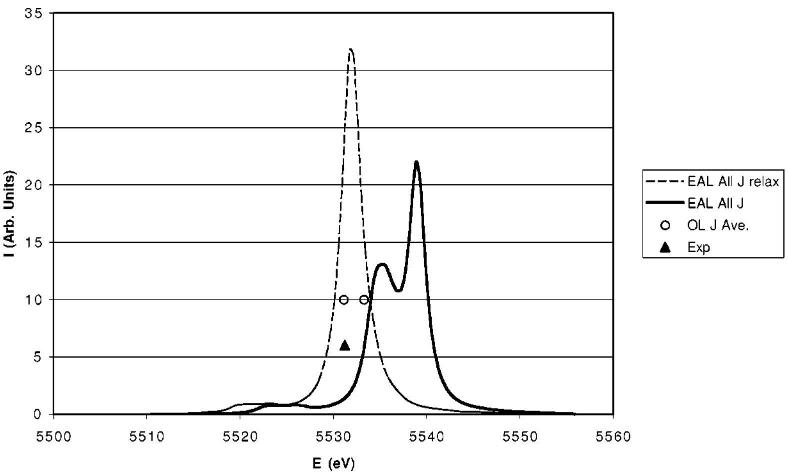

FIG. 2. Simulated spectrum of the $L_3N_{4,5}$ spectrum of barium. EAL All J relax: EAL calculation; EAL All J: EAL calculation without complete relaxation (described in Sec. IV.E); OL J Ave.: the calculation used for the x-ray table (Table V); Exp: experimental value.

the Oxford MCDF package GRASP (Dyall *et al.*, 1989), we evaluated the energies and transition rates in the extended average level mode (EAL). In this mode, a single set of radial orbitals is used for the initial and final states. They are obtained by a variational calculation over a linear combination of configuration state functions of all possible total angular momenta, with statistical weights. A Hamiltonian matrix is thus obtained and diagonalized, providing energies and mixing coefficients for all levels in the complex, taking into account exact angular recoupling. There are 138 levels in the $2p^5$ complex and 212 in the $4d^9$ one. We obtained all transition rates and level widths for the 13 135 transitions. We then made a simulated spectrum neglecting individual Auger decay channels but taking into account line width increase [the contribution of the Auger effect to the level width is obtained simultaneously with the Auger shift in the complex rotation method, from the imaginary part of the Auger resonances, the real part of which are Auger shifts (Santos *et al.*, 1999)]. We find that the extended average level method does not work very well, because the same $2p$ and $4d$ orbitals are used for the initial and final states, thus missing part of the relaxation. We then did a second calculation using different wave functions for the two active orbitals, and correcting the energy with our Auger and core-core shifts and correlation. The two simulated spectra in the vicinity of the $L_3N_{4,5}$ transitions are presented in Fig. 2. It is clear that the unrelaxed extended average level spectrum is not in agreement with experiment (having a difference of roughly 10 eV), while both the relaxed extended average level and J-average optimized levels (OL) spectrum calculations provide excellent agreement. In particular the $4d$ fine structure is reduced by relaxation, in agreement with experiment, which could not resolve the $L_3N_{4,5}$ lines. This comparison shows that it is more important to have a fully optimized and fully relaxed J-averaged calculation than to take into account the angular recoupling between the hole state and the outer shells. Moreover such a recoupling can be completely changed if the atom is in a solid matrix. From this we can safely assume that an uncertainty of ≈1 eV for the transition energy, including Auger and core-core shift, should account for the neglected angular recoupling. This represents roughly 50% of $4d$ Auger+core-core correction and 30% of the $2p_{1/2}$ Auger+core-core correction. These percentages are reasonable given that outer holes are more sensitive to outer-shell structure.

In order to check this uncertainty for barium we compare the calculation of the $4d$ shell binding energy to a recent high-resolution photoionization spectrum of atomic barium (Snell *et al.*, 2001) in Fig. 3. There is a global shift of around 2 eV between our values and the two main experimental peaks. This is to be compared with a 2.5-eV Auger and core-core shift in the $4d$ shell.

For the RMBPT calculation, however, things are more complicated. We do not know of any RMBPT code that allows recoupling of the five open shells in the intermediate state of the Auger and core-core corrections. In order to mimic the change in coupling due to that effect we did for all $n=4$ shells several calculations allowing the electron to be in an open shell like $5d^2$. Yet since a proper recoupling cannot be done, we worked with two different hypotheses: we supposed the $5d^2$ shell to be either "open," i.e., allowing electrons in intermediate states to be excited to it, or "closed," i.e., suppressing such excitations. The results of such calculations are presented in Fig. 4 in the case of the L_3N_4 transition, for which a large discrepancy between theory and experiment exists around Sm ($Z=62$). The new calcula-

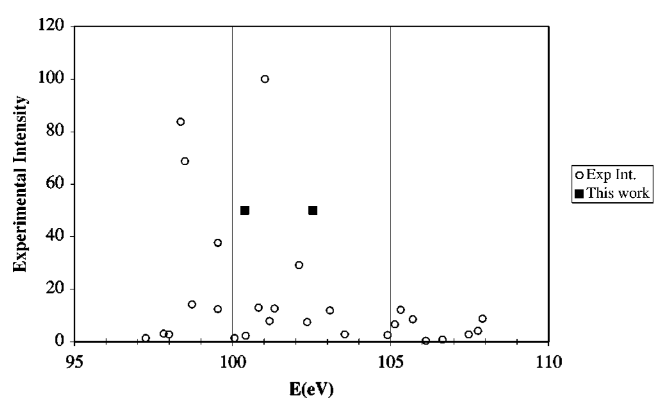

FIG. 3. Comparison between the calculated $4d_j$ binding energies in Ba (this work) with measured ionization energies (Snell *et al.*, 2001).

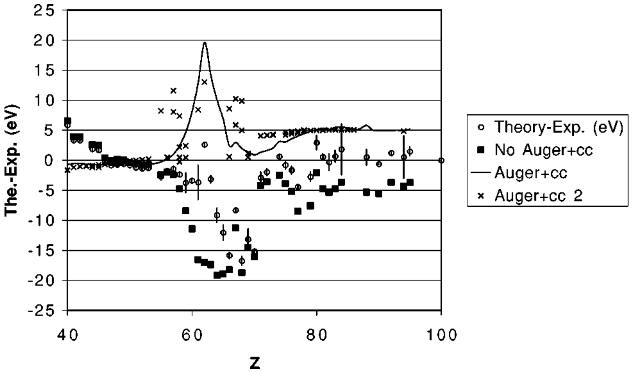

FIG. 4. Effect of the Auger and core-core contributions on the L_3N_4 transition. Results of different approximations are compared with the experimental values from Table V. Theory-Exp.: the theoretical value with all corrections included (as in Table V). No Auger+cc: Theory-experiment without the Auger and core-core correction (i.e., the "experimental" Auger +core-core value). Auger+cc: the Auger and core-core contribution from the fit to individual calculations used in the tables. Auger+cc 2: some Auger and core-core values calculated with a different hypothesis for the outer-shell structure.

tion seems to reproduce better the shape of the Auger +core-core contribution. Yet this improved agreement is misleading, as can be inferred from the L_2L_3 separation obtained from different transitions (Fig. 1). The $2p$ fine structure as obtained from the L_2N_4 and L_3N_4 transition is wrong, showing that the agreement in Fig. 4 with the calculations using different outer-shell structure is probably fortuitous.

Finally we investigate the effect of the fact that our calculations are all for isolated atoms in vacuum. First one should recognize that this is not only a problem of the calculation. After all, many measurements reported here are done for unidentified samples. If one does fluorescence on a chloride or a metal, binding energies and transition energies should be affected as well. It would be an impossible task to provide values for different chemical states or in metals. The change in the outer-shell structure as well as the change in the screening of inner electrons would affect both binding energies and transition energies. Yet it is well known that in many cases chemical shifts on transitions are negligible. Oxides, for example, have very small chemical shifts, even for the $4p$ state of Ba (Ohno and LaVilla, 1989a) and rare-earth elements (Ohno and LaVilla, 1989b). Detailed calculations of metalic Ba have been done recently (Ohno, 1999) using the Green's-function technique. In all cases, we find that our Auger and core-core shifts heavily dominate over solid-state or chemical shifts for transitions. For binding energies, inspection of Table IV (comparison of binding energies in vapors and solids) and of Fig. 9 provides an estimate of the size of these effects (see also figures in Indelicato *et al.*, 1998). Detailed experimental studies of uranium and other transuranic elements compounds have been performed that provide adequate demonstrations of the complexity of the problem, which depends on the compound [see, e.g., Keski-Rahkonen and Krause (1977) for the M shell of U metal and oxide], chemical bond length [see, e.g., Veal *et al.* (1975) for the $n=5$ shell of U and Veal *et al.* (1977) for Np, Pu, Am, Cm, Bk, and Cf], and the preparation of the sample (Park and Houston, 1973). More recently the study of the influence of the chemical environment on absorption [see Revel *et al.* (1999) for a recent example involving Cf] or extended x-ray absorption fire structure (EXAFS) spectra [see Allen *et al.* (2000) and Revel *et al.* (1999) for recent examples involving Cf, La, Ce, Nd, Eu, Yb, Y, Am, and Cm] has become a standard means to investigate the structure of heavy metal molecules. Accounting for such influences is indeed a problem far too complex for the present endeavor.

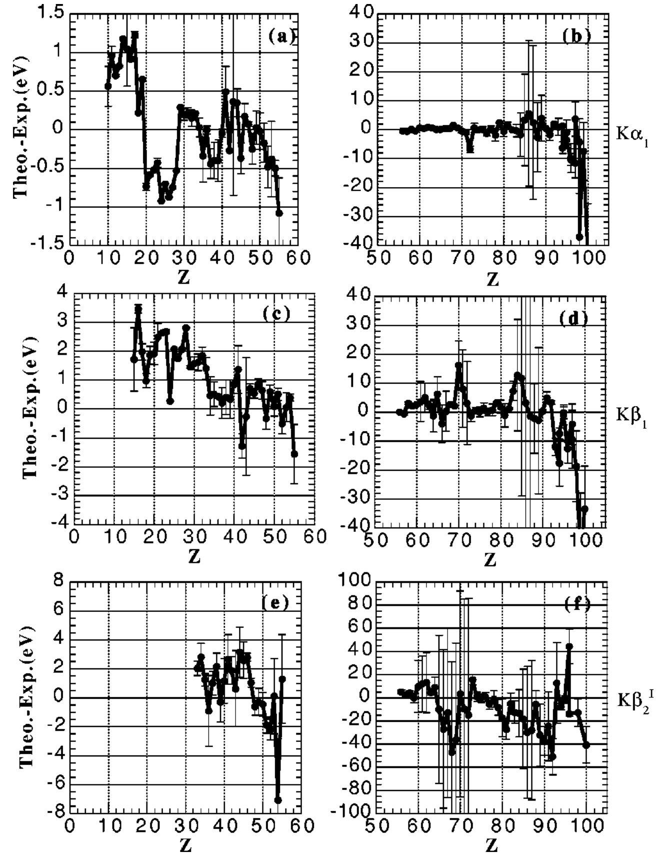

FIG. 5. The theory-experiment differences for three prominent K series transitions as a function of Z. (a) and (b) $K\alpha_1$ transition (KL_3), (c) and (d) $K\beta_1$ transition (KM_3), and (e) and (f) $K\beta_2^{\mathrm{I}}$ transition (KN_3). The low-Z [(a),(c),(e)] and high-Z [(b), (d), (f)] regions are plotted on different ordinate scales because the transition energies change by a factor of approximately 50 as a function of Z. The error bars denote the experimental uncertainties.

V. STRUCTURE AND FORMAT OF THE SUMMARY TABLES

Our goal is to provide a table of x-ray energies for the K- and L-series transitions and edges for $Z=10$–100 that contains theoretical and experimental values and is as complete as possible. To do this we begin with the

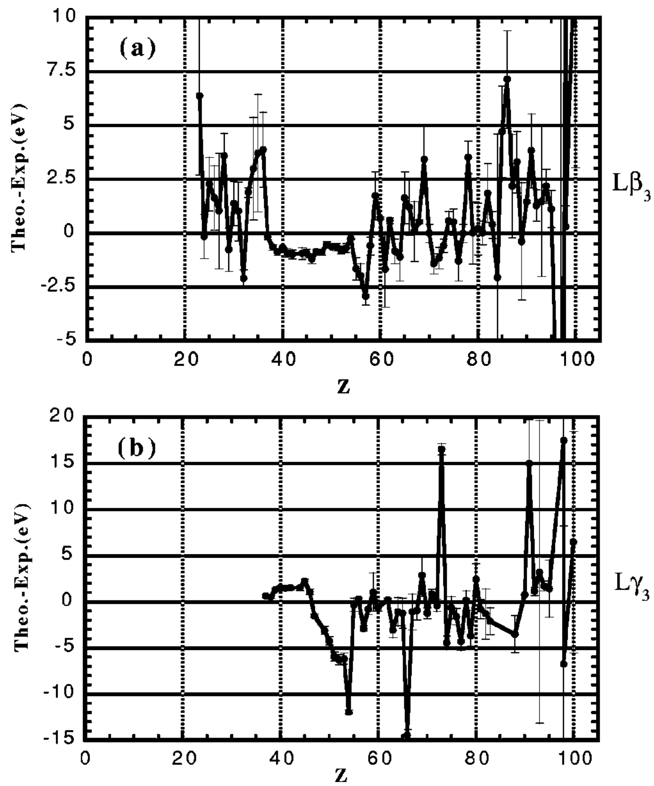

FIG. 6. The theory-experiment differences for two L_1 series transitions as a function of Z. (a) $L\beta_3$ transition (L_1M_3) and (b) $L\gamma_3$ transition (L_1N_3). The error bars denote the experimental uncertainties.

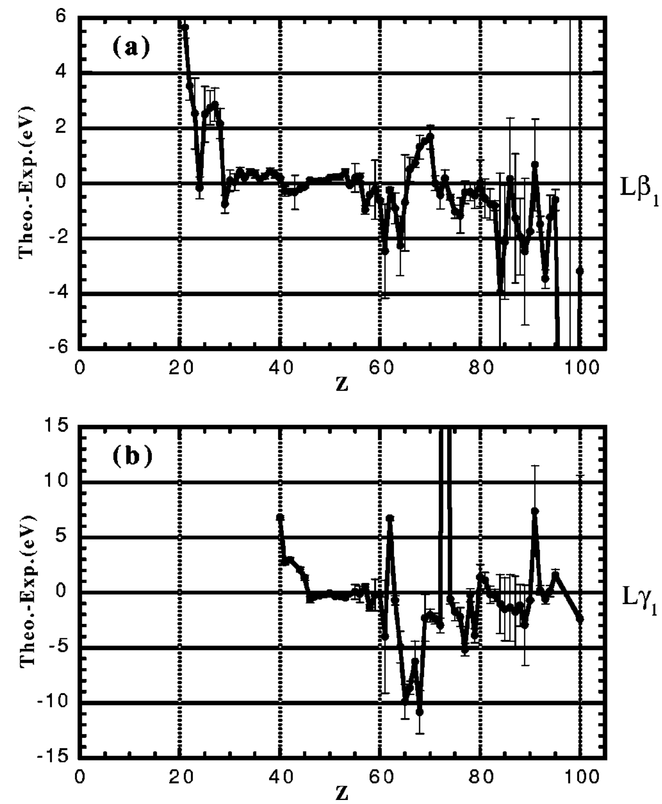

FIG. 7. The theory-experiment differences for two L_2 series transitions as a function of Z. (a) $L\beta_1$ transition (L_2M_4) and (b) $L\gamma_1$ transition (L_2N_4). The error bars denote the experimental uncertainties.

more precisely measured K-series, L-series, and absorption edge locations (see Sec. III) and expand this rather limited body of information by including experimentally measured values from the Bearden database (Bearden, 1967) corrected to an optically based scale. In addition, we have performed literature searches to find data published after the cutoff date of Bearden (1967). These data, which include many forbidden L lines in the $57 \leqslant Z \leqslant 74$ range and high-Z K and L lines, were also corrected to the optically based scale. Whenever a value was already present in Bearden (1967), or if several measurements where found, a weighted average using the published uncertainties was performed. In many instances we have increased the published uncertainty when we felt it was underestimated. For the heavy elements included in the compilation of Porter and Freedman (1978), we performed additional analyses. We did not extract transition energies from the published binding-energy values because these binding-energy values were obtained by a level fit using the available transition and electron-conversion data, while the experimental values in the present work are directly measured quantities. Since there are very few direct, sufficiently accurate, x-ray measurements for the heavy elements, we used differences between series of electron-conversion measurements to obtain experimental energies for K and L lines in the transuranic region. We also reported edge energies when they did not involve a level-fit procedure. All the references used for these new data are listed in the legend of Table V.

In addition to the experimental database, a theoretical database has been generated by using procedures outlined in Sec. IV. In general, the theoretical database is more complete than the experimental database and should aid researchers in the identification of previously undesignated features.

Numerical entries for the x-ray emission and absorption features are given as transition energies in eV. The primary measurements are, however, determinations of x-ray wavelengths. In the present work we make use of the *CODATA Recommended Values of the Fundamental Physical Constants: 1998* (Mohr and Taylor, 2000). Energy and wavelength are thus related by the conversion factor hc/e, currently evaluated as 12 398.418 57(49) eV Å (Mohr and Taylor, 2000). Since the uncertainty in this quantity is much smaller than the uncertainties associated with the x-ray wavelengths, the two representations (energy and wavelength) can be treated as metrologically equivalent, although some numerical care has to be exercised to avoid ill effects from repeated conversions and round off. In the version of this tabulation that was prepared for the new edition of International Tables for Crystallography (Deslattes *et al.*, 1998b) the transitions are given as wavelength values, and make use of the 1986 fundamental constants tabulation (Cohen and Taylor, 1987).

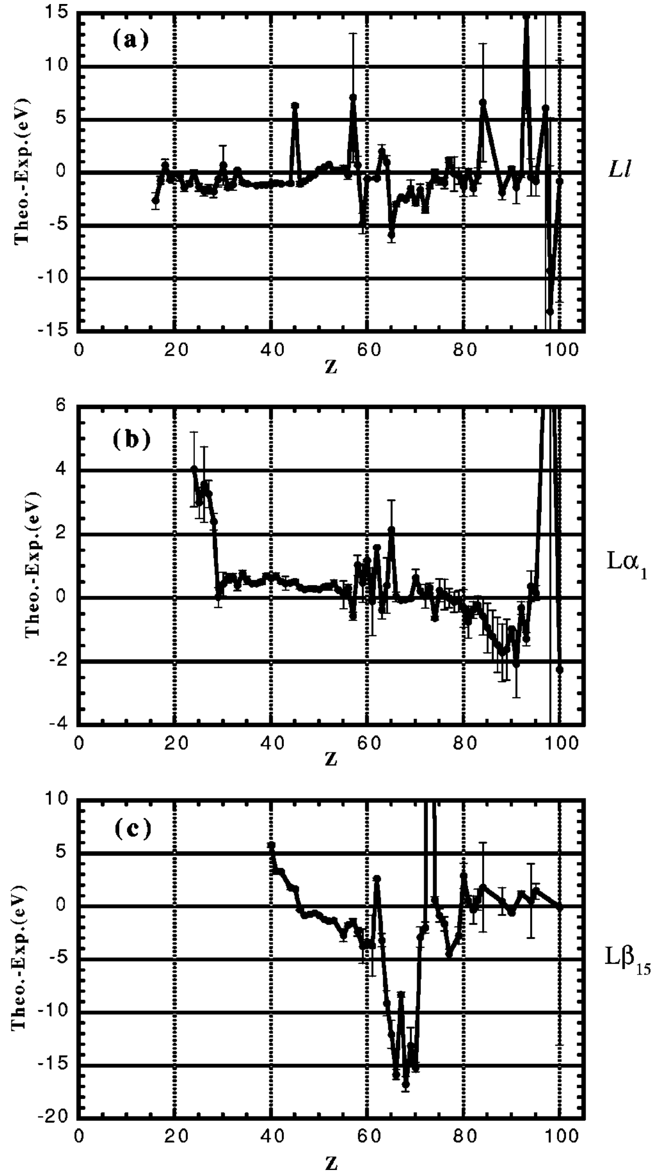

FIG. 8. The theory-experiment differences for three prominent L_3 series transitions as a function of Z. (a) Ll transition (L_3M_1), (b) $L\alpha_1$ transition (L_3M_5), and (c) $L\beta_{15}$ transition (L_3N_4). The error bars denote the experimental uncertainties.

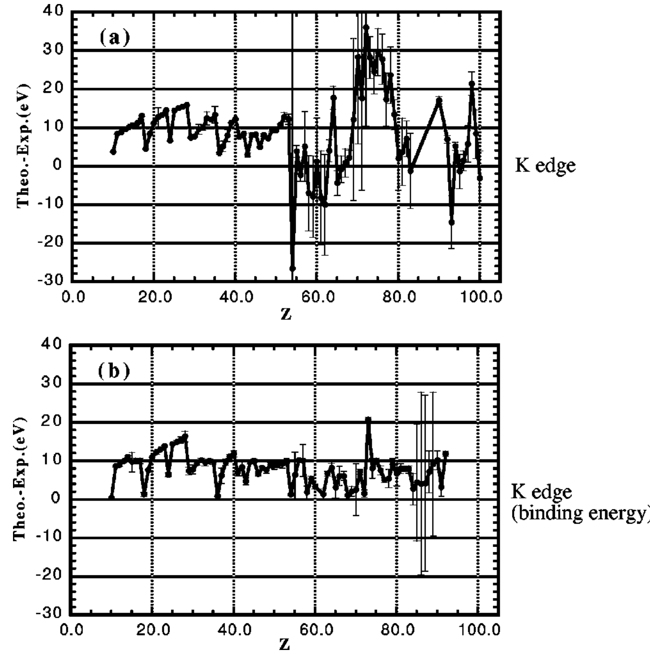

FIG. 9. The theory-experiment differences for the K absorption edge as a function of Z. (a) Directly measured absorption edges, and (b) absorption edges obtained by combining transition energies and electron binding energies. The error bars denote the experimental uncertainties.

A. *K*- and *L*-series transitions and absorption edges

The data compilation program described in this paper is an on-going effort on both the theoretical and experimental sides. We intend to make the numerical values available on the NIST Physics Laboratory Physical Reference Data web site, which can be more easily updated and sorted in a number of ways (i.e., by element, by transition, by energy, and by wavelength). However, in this publication we provide in Table V the results for the K and L series transitions and edges that were available to us as of February 2002. The table is sorted by element and the transitions are designated by the initial and final levels and the Siegbahn notation in parentheses (Jenkins *et al.*, 1991). Theoretical and experimental energies are given. For the absorption edges, there are potentially four entries; the theoretical value, the directly measured experimental value (i.e., designation K edge), the value obtained by combining emission lines and photoelectron spectroscopy [i.e., designation K edge (c)], and a metallic vapor value [i.e., designation K edge (v)]. Experimental entries which are blends of two or more transitions have an entry in the "Blend" column, which indicates all the levels involved in the blend. The "Ref." column provides the reader with the origin of each experimental entry. No references are provided in the table for the edges obtained by combining emission lines with outer-shell binding energies because each entry is the average of several emission-binding energy combinations. However, the collection of references that were used to obtain these entries are included in Sec. III.C. Numerical values for the theoretical energies are given to a number of significant figures commensurate with the uncertainties obtained as discussed in Sec. IV.E. The uncertainties are given in parentheses. A few entries are marked with the symbol # indicating that the level structure is too complicated to obtain a proper assignment of that transition energy (see Sec. IV.C.). The numerical values for the experimental energies are given to a number of significant figures commensurate with their estimated uncertainties; these are shown in parentheses following each experimental value. Some of the experimental entries are followed by a dagger (†) to caution the reader that this entry was obtained by interpolation using a Moseley-type diagram. Those readers who need a value obtained by interpolation should consider using the theoretical value corrected by the average theory-experiment difference from a few neighboring elements with an uncertainty equal to the average uncertainty of the neighboring elements.

TABLE VI. Energies, wavelengths, and conversion factors. Numbers in parentheses are one standard deviation uncertainties of the quoted value referred to the last figures of the quoted value.

	Cu $K\alpha_1$	Mo $K\alpha_1$	W $K\alpha_1$
E (eV)	8047.8227(26)	17479.372(10)	59318.847(50)
λ (Å)	1.54059290(50)	0.70931715(41)	0.20901314(18)
λ (Å*)			0.2090100
λ (kxu)	1.537400	0.707831	
eV×λ (Å)	12398.41857(49)	12398.41857(49)	12398.41857(49)
eV×λ (Å*)			12398.232(11)
eV×λ (kxu)	12372.7227(40)	12372.4415(71)	

Some guidance concerning the confidence that the user should place in a "less well-measured" experimental datum can be obtained by comparing the theoretical and experimental values in nearby elements for the transition in question. The comparisons are most instructive when they include "good" experimental values in elements not far removed from the element of interest. To illustrate this situation, Figs. 5–8 show plots of the difference between the theoretical and experimental values in eV as functions of Z for some of the most prominent K, L_1, L_2, and L_3 series lines. These plots show a general trend which is most evident in transitions for which there are "good" experimental values over the full range of Z. [See, for example, Figs. 5(a)–(d), 6(a), 7(a), and 8(b)]. This trend is characterized by generally good agreement in the central range of Z and less satisfactory agreement in the high-Z and low-Z regions. The problems in these two regions are rather different but have the common effect of limiting the confidence that the user can place in these values. In the high-Z region, experimental data have rather large uncertainties and are largely absent above $Z=92$. At the low Z end of the table, the particular calculational approach used is not optimal, and the experimental data are surprisingly weak. Aside from this general trend, these plots reveal two other important items. First there are a few isolated points with unusually large theory-experiment differences, which are likely caused by poor experimental measurements [i.e., Figs. 6(b) and 8(a)]. Second, there are regions in which the theory-experiment differences are quite large, such as in the $Z=60-70$ region of Figs. 7(b) and 8(c). In this region the source of the theory-experiment differences is more difficult to identify because the theoretical Auger shift correction is hard to calculate and the experimental entries are dominated by a few early references whose accuracy is difficult to assess. All experimental entries that, in our opinion, the reader should use with caution are marked with a double dagger (‡). Similar to the above suggestion concerning interpolated values, we encourage the reader who needs a value that is marked with a ‡ to consider using the theoretical value corrected by the average theory-experiment difference from a few neighboring elements with an uncertainty equal to the average uncertainty of the neighboring elements.

In Fig. 9 the differences between the theoretical and experimental values for the K absorption edge are plotted. Figure 9(a) uses the directly measured experimental values, while Fig. 9(b) uses the experimental values obtained by combining transition energies and electron binding energies. For $Z<55$ there is an approximate 10-eV offset between theory and experiment due to the assumption of free atoms in the theoretical calculations while the experimental values primarily come from solid targets. For $Z>55$ the combined experimental values are more accurate and complete than the direct experimental values and the theory-combined experiment differences show a smoother variation than the theory-direct experiment differences.

VI. CONCLUSIONS AND OUTLOOK

A. Summary of the present situation

The combined theoretical and experimental study presented here may be considered from several perspectives. First of all it represents a wide-ranging comparison between theoretical and experimental results covering all prominent K and L x-ray transitions for nearly all elements. The results of this extended comparison point toward certain areas where new investigations may help to understand the theory-experiment descrepancies that exist in those regions. At the same time it is not only the areas of disagreement that merit attention but also there is a real need to understand why the theoretical work has been as successful as it has proved to be. Clearly there were many important simplifications needed, and it is likely that each of these that has worked carries a message that it will take time to understand.

In addition, the result of our work has been to generate a database unlike any of its predecessors in several respects. Two aspects in particular seem to invite further development. For most of the Periodic Table and for the more prominent transitions, the distribution of residual differences seems intuitively to offer some kind of a measure of the uncertainties that should be assigned. The question of how to arrive at estimates of "best" value remains to be answered, as does the question of how to make a proper assignment of an overall uncertainty.

B. Connection with scales used in previous literature

In order to compare historical data for x-ray spectra with the results in the present tabulation, certain conversion factors are needed. As discussed in the Introduction, the principal units found in the literature are the xu and the Å* unit. There is the additional complication that there were several different definitions in use at various times and at the same time in different laboratories. For the convenience of the reader we summarize in Table VI the main conversion factors needed.

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