

# X-Ray Wavelengths

J. A. BEARDEN

*The Johns Hopkins University, Baltimore, Maryland*

Inconsistencies in accepted values (in x units) of x-ray reference lines have recently been demonstrated, although all are supposedly based on "good" calcite crystals. Factors supporting the selection of the W  $K\alpha_1$  line as *the X-Ray Wavelength Standard* are critically discussed. A review is given of the experimental measurements which are used to establish the wavelength of this line on an absolute angstrom basis. Its value is  $\lambda W K\alpha_1 = (0.2090100 \pm 5 \text{ ppm}) \text{ \AA}$ . This may be used to define a new unit, denoted by  $\text{\AA}^*$ , such that the W  $K\alpha_1$  wavelength is exactly  $0.2090100 \text{ \AA}^*$ ; hence  $1 \text{ \AA}^* = 1 \text{ \AA} \pm 5 \text{ ppm}$ . The wavelengths of the Ag  $K\alpha_1$ , Mo  $K\alpha_1$ , Cu  $K\alpha_1$ , and the Cr  $K\alpha_2$  have been established as secondary standards with probable error of approximately one part per million. Sixty-one additional x-ray lines have been used as reference values in a comprehensive review and reevaluation of more than 2700 emission and absorption wavelengths. The recommended wavelength values are listed in  $\text{\AA}^*$  units together with probable errors; corresponding energies are given in keV. A second table lists the wavelengths in numerical order, and likewise includes their energies in keV.

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## INTRODUCTION

The higher energy emission and absorption x-ray wavelengths provide energy reference standards for nuclear  $\beta$ - and  $\gamma$ -ray spectroscopy. Crystallographic dimensions are usually measured with the Mo  $K\alpha_1$ , Cu  $K\alpha_1$ , and other longer x-ray wavelengths. Accurate relative values of the occupied atomic energy levels have been calculated<sup>1</sup> by the use of all the emission x-ray wavelengths of an element, and the absolute scale can be derived from the wavelength of the absorption edge, or more accurately from x-ray emission wavelengths, and electron energy measurements from photoionization experiments.<sup>2</sup>

Wavelength values for more than twenty-seven hundred x-ray emission lines and absorption edges have been measured and remeasured over the last fifty years. Reviewers have published many critical surveys, listing recommended values for x-ray wave-

lengths. The best known reviews are those of Siegbahn,<sup>3</sup> Cauchois and Hulubei,<sup>4</sup> and Sandström.<sup>5</sup>

A very serious discrepancy exists in each of these tabulations (and all others): The shorter and longer wavelengths are not on the same relative energy scale. In general wavelengths less than  $1.0 \text{ \AA}$  are consistent with a Mo  $K\alpha_1 = 707.831 \text{ xu}$  scale, and those of longer wavelength with a Cu  $K\alpha_1 = 1537.400 \text{ xu}$  scale. Recent higher precision measurements<sup>6</sup> of the Mo  $K\alpha_1$  and Cu  $K\alpha_1$  wavelengths, with carefully selected diffraction crystals of various materials shows that the above values are in disagreement by almost 20 parts per million (ppm) or approximately twenty times the previous estimates<sup>7</sup> of the probable error. If we assume the xu defined by the first-order grating constant of calcite ( $d_1 = 3029.04 \text{ xu}$ ) the new measurements are consistent with a Cu  $K\alpha_1$  value of  $1537.400 \text{ xu}$ . The cause of the apparent errors in the Mo  $K\alpha_1$  and other short wavelengths is still unknown.

In addition to the above discrepancy in the relative values of the wavelengths, the xu,<sup>8</sup> which was intended to be  $10^{-3} \text{ \AA}$ , differs from this absolute scale by more than 200 ppm. Early measurements of x-ray wavelengths were made with NaCl crystals whose grating constant  $d = 2.814 \text{ \AA}$  was calculated<sup>9</sup> from the crystal geometry, molecular weight, density, and Avogadro's number. The latter was evaluated from the Faraday and the oil-drop value of the electronic charge which was in error by more than 600 ppm. Siegbahn<sup>8</sup> noted the superiority of calcite crystals to NaCl for spectro-

<sup>3</sup> M. Siegbahn, *Spektroskopie der Röntgenstrahlen* (Julius Springer-Verlag, Berlin, 1931), 2nd ed.

<sup>4</sup> Y. Cauchois and H. Hulubei, *Longueurs d'onde des Emissions X et des Discontinuités d'Absorption X* (Hermann et Cie., Paris, 1947).

<sup>5</sup> A. E. Sandström, *Handbuch der Physik*, S. Flügge, Ed. (Springer-Verlag, Berlin, 1957), Vol. 30, p. 164.

<sup>6</sup> J. A. Bearden, A. Henins, J. G. Marzolf, W. C. Sauder, and J. S. Thomsen, *Phys. Rev.* **135**, 899 (1964).

<sup>7</sup> See Ref. 5, p. 161.

<sup>8</sup> M. Siegbahn and A. Leide, *Phil. Mag.* **38**, 647 (1919); M. Siegbahn, *Arkiv Mat. Astron. Fys.* **14**, Nr. 9 (1920).

<sup>9</sup> H. G. S. Moseley, *Phil. Mag.* **26**, 1024 (1913).

<sup>1</sup> J. A. Bearden and A. F. Burr, *Rev. Mod. Phys.* **39**, 125 (1967), following article.

<sup>2</sup> S. Hagström, C. Nordling, and K. Siegbahn, *Alpha-, Beta-, Gamma-ray Spectroscopy*, Kai Siegbahn, Ed. (North-Holland Publishing Co., Amsterdam, 1965), Vol. 1, p. 845.

scopic measurements, and therefore determined the ratio of their grating constants. He assumed  $d_1 = 2814.00$  xu for NaCl and obtained for calcite  $d_1 = 3029.04$  xu, which has been the accepted definition<sup>10</sup> of the xu. Thus the wavelength values in all previous tables are neither self-consistent nor are on an absolute Å scale.

In practice most x-ray wavelengths have been measured relative to convenient lines whose values had been established on an x-unit scale by other experimenters. Beginning in 1960, work in the x-ray laboratory of The Johns Hopkins University was undertaken on a precise remeasurement of the most used reference lines relative to a selected primary standard<sup>11</sup> wavelength, and also on new measurements to establish the selected primary x-ray wavelength standard on an absolute Angstrom scale. A further part of the work was to make a critical review of all x-ray wavelength papers and recalculate the published values on a single absolute scale with explicitly estimated probable errors for all adopted wavelength values. In the complete report<sup>12</sup> on that work, original published values are listed, changes due to reevaluation of reference lines, and weighting with respect to other values is indicated and recommended wavelength values obtained. Since most of the review and analysis on the shorter wavelengths had been completed on a Mo  $K\alpha_1 = 707.831$  xu reference scale before the discrepancy between the Mo  $K\alpha_1$  and Cu  $K\alpha_1$  wavelengths was realized, the working data in the appendices of the above report<sup>12</sup> was continued on a Mo  $K\alpha_1 = 707.83$  or its equivalent W  $K\alpha_1 = 208.5770$  xu scale. The final recommended wavelength values of that report were readjusted to a W  $K\alpha_1 = 0.2090100$  Å\* scale. These are the values (except for minor corrected errors and a few new wavelengths) listed in the present review.

## A PRIMARY X-RAY WAVELENGTH STANDARD

### Inadequacy of the Calcite xu Standard

The x unit of length introduced by Siegbahn<sup>8</sup> contains one serious flaw: it assumes that every good calcite crystal has the same grating constant. This was recognized as a possible limitation by Siegbahn<sup>8</sup> in 1919 and has been under intermittent criticism ever since. Double-crystal<sup>13</sup> spectrometer measurements in 1930 indicated a variation of 6 ppm between different samples of the best crystals then available. A more recent investigation<sup>14</sup> on a wider selection of clear so-called "perfect" calcites gave a variation of approximately 20 ppm. A good calcite used by Merrill and

DuMond<sup>15</sup> gave a value of the Mo  $K\alpha_1$  25 ppm greater than the accepted value of 707.831 xu reported by Sandström.<sup>7</sup>

This flaw has been particularly criticized by DuMond,<sup>16</sup> who suggested that an emission line or lines would form a much better basis for defining a unit of length than a species of crystal. He suggested the use of the Mo  $K\alpha_1$  line or, alternatively, an average of five x-ray wavelengths. Bergvall<sup>17</sup> also voiced a similar opinion and stated that the Mo  $K\alpha_1$  line had indeed become the working standard at Upsala. However, recent measurements<sup>8</sup> have shown that their adopted value for the Mo  $K\alpha_1 = 707.831$  xu is in serious disagreement with the calcite  $d_1 = 3029.04$  xu definition and also as noted above with the xu value of Cu  $K\alpha_1 = 1537.400$ . Thus we have two xu standards and a third, the Angstrom used in crystallography. Any attempt to redefine the xu for use as a primary standard would certainly lead to further confusion in the x-ray wavelength and crystallographic literature.

## CONSIDERATIONS IN THE SELECTION OF A WAVELENGTH STANDARD

In principle any x-ray line could be chosen and assigned an arbitrary value; for example, Cu  $K\alpha_1 = 1.000000$  Cu unit. Then in every calculation of the properties of matter involving knowledge of atomic dimensions, a conversion factor would be required. Since the vast majority of such calculations do not attain an accuracy better than 10 ppm, this procedure appears to be unnecessary, provided, however, an absolute wavelength standard can be defined whose wavelength in centimeters or Angstroms is known within a few ppm. Of course, for the most precise calculations, e.g., atomic constants, a conversion factor differing from unity by a few ppm will be required, and this factor will change slightly as the accuracy of absolute x-ray wavelength measurements is increased.

### Wavelength Defined by Peak Intensity of Line

X-ray spectra are recorded by photographic, counter, and ionization techniques. It would appear that the asymmetry of a line would influence the measurement of its wavelengths by these different techniques. However, this was not observed in the measurements<sup>18</sup> made on the K-series elements from titanium to germanium. Increased precision in the measuring techniques may make such effects observable, and hence only highly symmetrical lines have been considered for a wavelength standard.

<sup>10</sup> M. Siegbahn, *Nature* **151**, 502 (1943), and Ref. 2, pp. 42-47.

<sup>11</sup> J. A. Bearden, *Phys. Rev.* **137**, 455 (1965).

<sup>12</sup> J. A. Bearden, *X-Ray Wavelengths*, NYO-10586 (Fed. Sci. and Tech. Inf., U.S. Dept. of Commerce, Springfield, Va., 1964).

<sup>13</sup> J. A. Bearden, *Phys. Rev.* **38**, 2089 (1931).

<sup>14</sup> J. A. Bearden, *Phys. Rev.* **137**, 181 (1964).

<sup>15</sup> J. J. Merrill and J. W. M. DuMond, *Phys. Rev.* **110**, 84 (1958).

<sup>16</sup> J. W. M. DuMond, *Proc. Natl. Acad. Sci. (U.S.)* **45**, 1052 (1959).

<sup>17</sup> P. Bergvall, O. Hörnfeldt, and C. Nordling, *Arkiv Fysik* **17**, 113 (1960).

<sup>18</sup> J. A. Bearden and C. H. Shaw, *Phys. Rev.* **48**, 18 (1935).

For a symmetrical line, it is immaterial whether the wavelength is defined by the peak (obtained by division of chords<sup>19</sup>) or the mean, i.e., centroid. In general the peak position has been accepted as the wavelength criterion for both symmetrical and asymmetrical lines, and has been so employed in all measurements in the Johns Hopkins x-ray laboratory. In the designation of a wavelength standard the peak of the line has been recommended as the most precise indicator of its wavelength. It should be noted that the use of a symmetrical line as a standard does not eliminate all problems involving different methods of measurement; a great many lines are themselves asymmetric or have been measured in terms of asymmetric lines.

### Selection of a Wavelength Region

In selecting the wavelength to be used as a standard, primary consideration should be given to the researches which require the highest precision and are most affected by errors arising in making the relative measurements. The energy scale for the highly important  $\beta$ - and  $\gamma$ -ray spectrum is very dependent<sup>20</sup> on the use of short x-ray wavelengths. The most precise  $\gamma$ -ray measurements have been those of Knowles,<sup>21</sup> who has measured the ratio of the third-order positron annihilation radiation to the first order of a  $\gamma$  ray of Ta<sup>182</sup>, and then compared the third order of this radiation relative to the  $W K\alpha_1$  line. In this work the angles were measured to the order of 0.01 sec, indicating the precision that can be attained in the measurement of narrow, symmetrical lines where the diffraction angle is only of the order of a few degrees. Another recent problem<sup>22</sup> which required high accuracy in the short-wavelength region was the location of the lead absorption edge for use in the  $\mu$ -meson mass determination. In x-ray spectroscopy, shorter wavelengths have frequently been used as reference wavelengths<sup>23</sup> for the measurement of weak spectral lines.

It should be emphasized that the designation of a particular wavelength as *the x-ray standard* does not imply that all crystals and spectrometers must be calibrated by direct comparison to this wavelength. Convenient *secondary standards*<sup>6</sup> with probable errors of the order of 1 ppm are available which are adequate for general use. The designated primary wavelength will be of most value in the highly precise researches whose objective is the establishment of new or better secondary standards.

<sup>19</sup> J. A. Bearden, Phys. Rev. **43**, 94 (1933).

<sup>20</sup> J. W. M. DuMond, Ann. Phys. (N.Y.) **2**, 283 (1957); E. L. Chupp, A. F. Clark, J. W. M. DuMond, F. J. Gordon, and H. Mark, Phys. Rev. **107**, 745 (1957).

<sup>21</sup> J. W. Knowles, Can. J. Phys. **40**, 237 (1962). International Conference on Nuclear Physics with Reactor Neutrons (AEC) ANL-6797, F. E. Throw, Ed., p. 165.

<sup>22</sup> A. J. Bearden, Phys. Rev. Letters **4**, 240 (1960).

<sup>23</sup> E. Ingelstam, Nova Acta Reg. Soc. Sci., Upsala **10**, Nr. 5 (1937).

### Width and Symmetry Effects

The width of a line ( $E/\Delta E$ ) is of prime importance in the precision with which its wavelength can be measured. Gamma-ray sources, with narrow symmetrical lines ( $10^{-6}$ – $10^{-10}$  eV), would make ideal standards if they could be produced at an intrinsic intensity comparable to that available from x-ray tubes. The width of an x-ray line (in wavelength units) is approximately proportional to its wavelength. In recent  $\gamma$ -ray<sup>21</sup> and x-ray<sup>6</sup> measurements, the centers of the observed symmetrical line profiles were located to within 0.001 of the observed width (not, of course the natural width of the  $\gamma$ -ray line). Thus in principle the peak of a narrow [e.g.,  $W K\alpha_1$  in (2, +5) is 30 sec] short-wavelength line can be located with a higher precision than its angular position can be read on the divided circle. The error in the reading of the divided circle (approximately 0.1 sec) is constant and hence its error in ppm decreases with increased Bragg angle (the precision of the interferometer angle measuring method<sup>24</sup> is 1 ppm for angles from 3° to 30°). Disregarding other considerations, this would suggest that the long-wavelength symmetrical lines (e.g.,  $Cr K\alpha_2$ ) would be measured more accurately with a divided circle than the short wavelengths. However, this advantage is offset by errors in large corrections due to index of refraction and anomalous dispersion,<sup>25</sup> the effect of surface treatment on the index of refraction correction,<sup>26</sup> single-crystal diffraction pattern asymmetry,<sup>27</sup> geometrical imperfection of crystals,<sup>28</sup> and the very important shift in wavelength due to the chemical state of the x-ray tube anode. These conclusions are completely substantiated<sup>6</sup> in the precision evaluation of the wavelength ratio of five x-ray lines,  $W K\alpha_1$ ,  $Ag K\alpha_1$ ,  $Mo K\alpha_1$ ,  $Cu K\alpha_1$ , and  $Cr K\alpha_2$ , with five selected crystals. A least-squares analysis of the measurements showed that each of the wavelengths had been measured with a probable error of approximately 1 ppm.

### Source Requirements

The x-ray wavelength should be independent of chemical and isotope effects in the source. The  $K\alpha_1$  lines of the elements of high atomic number are much less affected by chemical combination than those of low  $Z$ . Rogosa and Schwarz<sup>29</sup> were unable to observe any shift in the wavelength peak of the  $Mo K\alpha_1$  for separated isotopes of  $Mo^{92}$ ,  $Mo^{96}$ , and  $Mo^{100}$  greater than 10 ppm. Shortly afterwards Wertheim and Igo<sup>30</sup>

<sup>24</sup> J. G. Marzolf, Rev. Sci. Instr. **35**, 1212 (1964).

<sup>25</sup> See Ref. 5, p. 143.

<sup>26</sup> J. A. Bearden, Bull. Am. Phys. Soc. **7**, 339 (1962).

<sup>27</sup> M. Renninger, Acta Cryst. **13**, 1067 (1960); J. G. Marzolf, S. J., Bull. Am. Phys. Soc. **8**, 313 (1963); also thesis, Dept. of Physics, The Johns Hopkins University, 1963.

<sup>28</sup> J. A. Bearden and A. Henins, Rev. Sci. Instr. **36**, 334 (1965).

<sup>29</sup> G. L. Rogosa and G. Schwarz, Phys. Rev. **92**, 1434 (1953).

<sup>30</sup> M. S. Wertheim and G. Igo, Phys. Rev. **98**, 1 (1955).

TABLE I. Fe<sup>57</sup> Mössbauer wavelength in Å\* and keV units measured with calcite and quartz crystals.

Date	Crystals	Order	$d$ (Å* 25°C)	Wavelength Å*	keV
12/26/63	Calcite <i>A, B</i>	(1, ±1)	3.035528	0.860239	10.66533
2/24/64	Calcite <i>A, B</i>	(2, ±2)	3.035835	0.860241	10.66535
2/26/64	Calcite <i>A, B</i>	(2, ±2)	3.035835	0.860238	10.66532
8/7/64	Quartz $V_a, V_{14}$	(1, ±1)	3.336009	0.860223	10.66513
8/11/64	Quartz $V_a, V_{14}$	(2, ±2)	3.336412	0.860227	10.66518
			Average	0.860234	10.66526

studied the problem and showed from theory that the expected shift for Mo  $K\alpha_1$  was of the order of 5 ppm, about half the minimum value detectible by Rogosa and Schwarz. The shift for W  $K\alpha_1$  should be substantially greater. However, as long as "natural abundances" of the W or Mo isotopes remain constant within 1%, either line should furnish a satisfactory standard.

A high-activity concentrated  $\gamma$ -ray source of dimensions comparable to an x-ray focal spot yields intensities of the order of  $10^4$  smaller than that emitted by an x-ray tube. The use of a 200-mCi Fe<sup>57</sup> Mössbauer source as a wavelength standard has been evaluated<sup>31</sup> by measurement of the wavelength of the 14.4-keV Fe<sup>57</sup>  $\gamma$  ray with calcite and quartz crystals in the (1, ±1) and (2, ±2) orders. The area of the source was approximately 10 mm × 10 mm, positioned such that its projected area was approximately 2 mm × 10 mm. The adjustment of the spectrometer on the low-intensity  $\gamma$ -ray line was much more difficult than in the case of an intense x-ray line. The recorded intensities at peaks ranged from approximately 0.1 counts sec<sup>-1</sup> to approximately 0.6 counts sec<sup>-1</sup>, requiring the utmost precaution to reduce the background to less than 0.01 counts sec<sup>-1</sup>. Two independent alignments of the spectrometer crystals and  $\gamma$ -ray source were made. The results in the (1, ±1) and (2, ±2) with each crystal were in excellent agreement, but the results with the two crystals differed by approximately 20 ppm. Between the two sets of measurements, which were several months apart, the spectrometer, crystals, and source were completely realigned. The results are listed in Table I. Because of the large difference in the two sets of measurements, no probable errors are calculated.

From the experience with these measurements, it could be seen that the source strength would have to be increased by at least a factor of ten or one hundred to make a  $\gamma$ -ray standard experimentally feasible. Imperfections present in most crystals would also require that the source dimensions be even smaller than those used. These experimental considerations

eliminate, at least for the present, the use of a  $\gamma$ -ray wavelength standard.

#### Crystal Considerations

The index of refraction correction for all crystals used in the first diffraction order (most used in previous wavelength measurements) is of the order of 160 ppm. Very few refraction measurements have been made which are of sufficient accuracy to be the basis for precise correction of wavelengths in low orders. Theories<sup>32</sup> are available for calculating the index of refraction, but each leads to a significantly different value. Anomalous dispersion effects<sup>33</sup> may introduce errors of the order of 20 to 30 ppm in the regions of crystal absorption edges. In establishing a primary standard or relating secondary standards to it, refraction effects seriously limit the use of crystals of high atomic number and also wavelengths greater than one or two angstroms.

The index of refraction correction is reduced by the square of the order of diffraction.<sup>33</sup> W  $K\alpha_1$  can be easily recorded in the 5th to 7th orders with calcite or silicon crystals; the refraction correction is thus reduced to 3 to 6 ppm. An error of 10% in the measured value of the index then introduces an error in the wavelength of less than one ppm. The short wavelength of the W  $K\alpha_1$  permits its use in transmission, and by proper cutting of the crystal with respect to the atomic plane such that the incident and diffracted beams make equal angles with the crystal surfaces, the index of refraction effect is zero.

Asymmetry in the Darwin-Prins<sup>27</sup> single-crystal rocking curve affects the measured x-ray wavelength to a much smaller degree than the index of refraction. Its effect is wavelength-dependent and can be neglected for low atomic weight crystals used at the shorter (e.g., W  $K\alpha_1$ ) wavelengths.

A more serious limitation to the accuracy of x-ray wavelength measurements is due to the large scale

<sup>32</sup> H. Kallmann and H. Mark, *Ann. Physik* **82**, 585 (1927); J. A. Prins, *Z. Physik* **47**, 479 (1928); H. Honl, *Z. Physik* **84**, 1 (1933); J. A. Wheeler and J. A. Bearden, *Phys. Rev.* **46**, 755 (1934).

<sup>33</sup> Reference 5, p. 138.

<sup>31</sup> J. A. Bearden, *Bull. Am. Phys. Soc.* **9**, 387 (1964).

imperfection<sup>28</sup> of all natural and most synthetic crystals. Large single crystals approaching geometrical perfection are exceedingly rare and, even in the best examples, sharply bounded volumes occur whose planes differ from the average orientation by as much as a second of arc. Since all wavelength measurements, except those made in transmission, require a rotation of the crystal by  $(180^\circ \pm 2\theta)$ , failure of the x-ray beam to be diffracted from exactly the same crystal volume in both positions may introduce an appreciable error in the wavelength measurement. Grinding and etching a crystal surface parallel to the atomic planes, precise alignment of the crystal parallel to and on the rotation axis of the spectrometer, and the use of a narrowly defined x-ray beam minimize this error. The present availability of good synthetic crystals of silicon alleviates many of these difficulties.

### THE W $K\alpha_1$ WAVELENGTH STANDARD

A wavelength standard should possess characteristics which permit its ready redetermination in other laboratories by different techniques. Considering all of the factors involved in the selection of a wavelength standard, the W  $K\alpha_1$  line is superior to any other x-ray or  $\gamma$ -ray wavelength. Its advantages as the x-ray wavelength standard are:

(1) In diffraction measurements with W  $K\alpha_1$  in transmission, the correction for index of refraction  $\mu$  is negligible (0 for equal incident and emergent angles). The anomalous dispersion correction is negligible (less than 1 ppm) at this wavelength for either reflection or transmission in crystals of low atomic number.

(2) The W  $K\alpha_1$  line is highly symmetrical, and any wavelength dependence on chemical effects or variations in the natural isotopic abundance of tungsten is well below present experimental errors.

(3) The measurement of the diffraction angle for the W  $K\alpha_1$  line in transmission is affected by crystal imperfections and asymmetries in the single-crystal diffraction patterns considerably less than for lines of longer wavelengths.

(4) The interferometer method<sup>24</sup> of measuring angles is ideally suited to the transmission method; the requirement of a high-precision divided circle is unnecessary.

(5) The short wavelength of the W  $K\alpha_1$  can be used directly to calibrate  $\gamma$ -ray lines if the latter are taken in high orders. Hence nuclear energy level systems can be calibrated.

(6) By secondary standards<sup>6</sup> (already determined) x-ray wavelengths and parameters of individual crystal samples can be placed on a precise scale relative to the W  $K\alpha_1$  with probable errors of approximately 1 ppm.

### The W $K\alpha_1$ Wavelength

In order to complete the discussion of the W  $K\alpha_1$  wavelength standard, use will be made of the result

obtained in a following section on the ratio of the absolute wavelength of the Cu  $K\alpha_1\alpha_2$  (and to some extent the Cr and Al  $K\alpha_1\alpha_2$ ) lines to their xu value or  $\Lambda = \lambda_g/\lambda_s = 1.002056 \times 10^{-3}$ . In the section on the inadequacy of the calcite xu standard, it was pointed out that a value of Cu  $K\alpha_1 = 1537.400$  xu was consistent with the calcite definition  $d_1 = 3029.04$  xu. Hence the absolute wavelength of the Cu  $K\alpha_1$  is

$$\text{Cu } K\alpha_1 = 1.540562 \text{ \AA} \pm 5 \text{ ppm.}$$

The precision (five crystals) measurement<sup>6</sup> of the ratio of the Cu  $K\alpha_1$  wavelength to the W  $K\alpha_1$  gave  $7.370757 \pm 1.2$  ppm. Dividing the Cu  $K\alpha_1$  wavelength by this factor yields the wavelength in angstroms of the W  $K\alpha_1$  line or

$$\lambda \text{ W } K\alpha_1 = 0.2090100 \text{ \AA} \pm 5 \text{ ppm.}$$

This numerical value of the wavelength of the W  $K\alpha_1$  line is used to define the *x-ray wavelength standard* by the relation

$$\lambda(\text{W } K\alpha_1) = 0.2090100 \text{ \AA}^*.$$

This is a new unit of length which may differ from the angstrom by  $\pm 5$  ppm (probable error), *but as a wavelength standard it has no error*. In order to clearly indicate that this unit is not exactly an angstrom, it has been designated  $\text{\AA}^*$ <sup>11</sup> and has been used for all wavelength values appearing in this review. When higher accuracy is attained in the absolute measurement of the W  $K\alpha_1$  line, a conversion factor slightly different from unity will then be required for the extremely precise calculations, for example in atomic constants.

### SECONDARY STANDARDS

Secondary standards of wavelength are desirable to provide suitable reference lines for various portions of the x-ray spectrum. The recent study by Bearden *et al.*<sup>6</sup> was designed to establish a group of such standards to the highest precision presently attainable. This investigation consisted of a long series of high precision measurements using a spectrometer with a graduated circle calibrated by means of an angular interferometer.<sup>24</sup> The lines studied were: Cr  $K\alpha_2$ , Cu  $K\alpha_1$ , Mo  $K\alpha_1$ , Ag  $K\alpha_1$ , and W  $K\alpha_1$ . Five different crystals (one calcite, two quartz, two silicon) were used, some in all wavelength measurements, giving a

TABLE II. Secondary standards.

Primary standard $\lambda$ W $K\alpha_1 = 0.2090100 \text{ \AA}^*$
$\lambda$ Ag $K\alpha_1 = (0.5594075 \pm 1.1 \text{ or } 5.2 \text{ ppm}) \text{ \AA}^*$
$\lambda$ Mo $K\alpha_1 = (0.709300 \pm 1.3 \text{ or } 5.2 \text{ ppm}) \text{ \AA}^*$
$\lambda$ Cu $K\alpha_1 = (1.540562 \pm 1.3 \text{ or } 5.2 \text{ ppm}) \text{ \AA}^*$
$\lambda$ Cr $K\alpha_2 = (2.293606 \pm 1.3 \text{ or } 5.2 \text{ ppm}) \text{ \AA}^*$

TABLE III. New experimental values of emission lines in Å\* units. The probable error is that of the last digit. The  $\alpha_1$  of 47 Ag is a secondary standard.

	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb
$\alpha_2$ $KL_{II}$	0.647404±4	0.617630±4	0.589820±4	0.563799±3	0.539422±3	0.516544±4	0.495052±3	0.474827±3
$\alpha_1$ $KL_{III}$	0.643083±4	0.613278±4	0.585449±4	0.5594075	0.535001±3	0.512112±4	0.490599±3	0.470358±3
$\beta_3$ $KM_{II}$	0.573067±4	0.546200±4	0.521123±4	0.497685±4	0.574728±7	0.455185±4	0.435871±5	0.417737±4
$\beta_1$ $KM_{III}$	0.572482±4	0.545605±4	0.520520±4	0.497069±4	0.574106±7	0.454550±4	0.435231±5	0.417086±3
$\beta_5$ $KM_{IV,V}$				0.49306±2				
$\beta_2$ $KN_{II,III}$		0.53503±2	0.510228±4	0.487032±4	0.465319±7			
$\beta_1$ $L_{II}M_{IV}$	4.62058±3	4.37414±4	4.14622±5	3.93473±3	3.73823±4	3.55530±4		3.22567±4
$\gamma_1$ $L_{II}N_{IV}$				3.52260±4		3.16213±4		2.85159±3
$\alpha_1$ $L_{III}M_{V}$	4.84575±3		4.36767±5	4.15443±3	3.95635±4	3.77192±4	3.59994±3	3.43940±4
$\beta_{2,15}$ $L_{III}N_{IV,V}$			3.90887±4	3.70335±3	3.51408±4	3.33838±3	3.17505±3	3.02335±3

total of twenty different combinations, each one yielding a value of  $\lambda/d$ . There then resulted twenty equations for nine unknown quantities (four wavelengths and five grating constants). This system of overdetermined linear equations was solved by a least-squares adjustment on an IBM 7094 computer.

The resulting wavelength values are given in Table II. Two probable errors in ppm are given; the first is relative to the  $W K\alpha_1$  as the *primary standard*, and the second takes into account the probable error of  $\pm 5$  ppm in the conversion factor  $\Lambda$  and hence is the probable error of the wavelength in absolute angstroms. These probable errors are borne out by the internal consistency of the data in a  $\chi^2$  test.

#### Additional Reference Standards

It was pointed out in the Introduction that most x-ray wavelengths have been measured relative to a few conveniently located lines whose values had been determined directly. About sixty of these lines have been remeasured in order to be able to reevaluate the published values on a consistent wavelength scale. These new values are the basis on which many wavelengths have been recomputed and hence are listed for convenience in Table III.

The instrumentation and method of measurement were basically the same as in the determination of reference wavelengths.<sup>6</sup> Naturally less time and effort were devoted to each individual wavelength. In most cases only one crystal was used for each line and only one or two "runs" were taken. Each run consisted of about six curves taken alternately in the  $(m+n)$  and  $(m-n)$  positions of the double-crystal spectrometer.

The  $K$ -series measurements were carried out with the same calcite crystal used in the previous study<sup>6</sup>; its grating constant was known to about 1 ppm from the least-squares computation. In the  $L$ -series work a helium atmosphere was used to minimize absorption; physical limitations of the apparatus then dictated the use of two smaller calcite crystals. These were cali-

brated against reference wavelengths and grating constants of standard crystals determined in the least-squares evaluation. The resulting grating constants for the small calcite crystals involved probable errors of about 5 ppm.

Probable errors of the measurements in the  $K$  series were determined by the statistical fluctuation of the data and by the average systematic error associated with a single series of runs; the latter was estimated as about 4 ppm. In most cases the resulting wavelength errors ranged from 6 to 8 ppm. Errors in the  $L$ -series determinations were slightly greater, due to higher statistical fluctuations and less accurately known grating constants. For the most part probable errors ranged from 8 to 10 ppm.

In many instances, these values were considered sufficiently superior to all previous measurements to be adopted without change. However, there were also numerous instances in which these results were averaged with other high-precision data to obtain a "recommended" value.

#### X-RAY WAVELENGTH CONVERSION FACTOR

$$\Lambda(\lambda_g/\lambda_s)$$

Two methods have been used for determining the x-ray wavelength conversion factor: (a) the absolute wavelengths of x-ray lines have been measured with a ruled grating and divided by their known value in x units; and (b) it has also been determined by computing the absolute grating constant of crystals from their density, molecular weight, and Avogadro's number.

Two ruled-grating measurements have been made with an accuracy sufficient to be used in a precision evaluation of the conversion factor: the early measurements<sup>34</sup> on the  $\alpha$  and  $\beta$  lines of Cu and Cr, and the remeasurement of the Al  $K\alpha$  plates of Tyren by Edlen and Svensson.<sup>35</sup> The value of the Al  $K\alpha$  line in xu was

<sup>34</sup> J. A. Bearden, Phys. Rev. **37**, 1210 (1931).

<sup>35</sup> B. Edlen and L. A. Svensson, Arkiv Fysik **28**, 427 (1965).

taken from the work of Nordfors,<sup>36</sup> who used the  $L$  lines of Ag as references. The Ag  $L$  series was, in turn measured by Haglund<sup>37</sup> with respect to the Cu  $K\alpha_1$ . The resulting values of  $\Lambda$  are shown in Table III.

Unless there is a serious error (greater than 50 ppm) in Avogadro's number as listed in a recent analysis of atomic constants,<sup>38</sup> the measurement of crystal properties affords the most accurate method of evaluating the conversion factor. There is some question as to the constancy of isotopic abundances in nature<sup>39</sup> which needs further study. Precision density and x-ray measurements<sup>40</sup> have been made on eighteen high-purity silicon crystals obtained from various sources. The results were highly consistent, and a careful analysis of the errors in atomic weight, isotopic abundance, density, and Avogadro's number gave a final probable error of less than 5 ppm. In another experiment<sup>41</sup> nine selected calcite crystals were used and corrections made for the known chemical impurities in each crystal. The results were in excellent agreement with the silicon values, giving some indication that the isotopic abundance question may not be serious. Smakula *et al.*<sup>42</sup> have measured the density of seven crystals, Al, CaF<sub>2</sub>, CsI, Ge, TiCl, TlBr, and Si. Powdered samples of these were then used to measure the diffraction angles for Cu  $K\alpha_1$  x rays and hence to determine  $\Lambda$ . Several older and less accurate measurements<sup>43</sup> have been made with Mo  $K\alpha_1$  radiation and are included with the other values in Table IV.

The high-frequency limit of the continuous x-ray spectrum  $Ve = h\nu$  may be rewritten

$$\Lambda = (h/e)c^2/V\lambda_s \text{ \AA-kxu}^{-1},$$

where  $\Lambda$  is the conversion factor,  $h/e$  the ratio of Planck's constant to the electronic charge,  $c$  the velocity of light,  $V$  the x-ray tube voltage, and  $\lambda_s$  the wavelength of the limit in xu.  $V\lambda_s$  has been measured<sup>44</sup> using a mercury gas target x-ray tube in order to avoid solid state fine structure at the high-frequency limit. The resulting value of  $\Lambda$  is lower than any of the others in Table IV but there is no reason for rejecting this value or increasing its probable error.

The final recommended value from Table IV (based

<sup>36</sup> B. Nordfors, *Arkiv Fysik* **10**, 279 (1956).

<sup>37</sup> Ph. Haglund, *Z. Physik* **94**, 369 (1935).

<sup>38</sup> E. R. Cohen and J. W. M. DuMond, *Rev. Mod. Phys.* **37**, 590 (1965).

<sup>39</sup> R. J. Allenby, *Geochim. Cosmochim. Acta* **5**, 40 (1954); K. Rankama, *Isotope Geology* (McGraw-Hill Book Co., Inc., New York, 1954), p. 272.

<sup>40</sup> I. Henins and J. A. Bearden, *Phys. Rev.* **135**, 890 (1964); and I. Henins, *J. Res. Natl. Bur. Std. (U.S.)* **68**, 529 (1964).

<sup>41</sup> J. A. Bearden, *Phys. Rev.* **137**, 181 (1965).

<sup>42</sup> A. Smakula and J. Kalnajs, *Nuovo Cimento Suppl.* **6**, 214 (1957). *Phys. Rev.* **99**, 1737 (1955); A. Smakula and V. Sils, *Phys. Rev.* **99**, 1744 (1955); A. Smakula, J. Kalnajs, and V. Sils, *Phys. Rev.* **99**, 1747 (1955).

<sup>43</sup> See Ref. 40, p. 897.

<sup>44</sup> J. J. Spijkerman and J. A. Bearden, *Phys. Rev.* **134**, 871 (1964).

on Cu  $K\alpha_1 = 1537.400$  xu) is

$$\Lambda = (1.002056 \pm 0.000005) \text{ \AA-kxu}^{-1}.$$

## RECOMPUTATION OF X-RAY WAVELENGTHS

### Literature Data

In addition to the comparatively few measurements described above, a vast amount of other x-ray wavelength data covering a period of over forty years has been reconsidered. Most of the measurements have employed one of five experimental methods<sup>45</sup>—the single-crystal spectrometer, the tube spectrometer, the double-crystal spectrometer, the curved-crystal spectrometer, and the ruled grating (primarily in the soft x-ray region). In general, the double-crystal and tube-spectrometer results are considered more accurate, along with a few of the curved-crystal measurements.

If one measurement seemed clearly superior to all others by a significant margin, it was adopted without change. When two or more values of comparable accuracy were available, an average was taken. Such an average can be computed on a rigorous basis in comparatively few cases. This really requires a thorough

TABLE IV. Values of  $\Lambda$  based on Cu  $K\alpha_1 = 1.537400$  kxu. The mean value was calculated with statistical weighting and the p.e. 4 is by internal consistency.

Experiment	$\Lambda$	p.e. (ppm)
Crystal constants		
Henins <sup>a</sup> (Si)	1.002057	5
Bearden <sup>b</sup> (CaCO <sub>3</sub> )	1.002055	9
Smakula <sup>c</sup> (Al, Si, Ge, CaF <sub>2</sub> , CsI, TiCl, and TlBr)	1.00207	15
Various <sup>a</sup> Mo $K\alpha_1\lambda$		
(CaCO <sub>3</sub> , Qz, C)	1.00205	20
Ruled grating		
Bearden <sup>d</sup> —plain	1.00203	30
Edlen <sup>e</sup> —Tyren—concave	1.002060	20
“ $h/e$ exptl.”		
Spijkerman <sup>f</sup>	1.00201	26
Mean	1.002056	4

Note: Atomic constants needed in calculation of the above values of  $\Lambda$  are taken from E. R. Cohen and J. W. M. DuMond, *Rev. Mod. Phys.* **37**, 537 (1965).

<sup>a</sup> I. Henins and J. A. Bearden, *Phys. Rev.* **135**, 890 (1964).

<sup>b</sup> J. A. Bearden, *Phys. Rev.* **137**, 181 (1965).

<sup>c</sup> A. Smakula and J. Kalnajs, *Nuovo Cimento Suppl.* **6**, 214 (1957); *Phys. Rev.* **99**, 1737 (1955); A. Smakula and V. Sils, *Phys. Rev.* **99**, 1744 (1955); A. Smakula, J. Kalnajs, and V. Sils, *Phys. Rev.* **99**, 1747 (1955); see also Ref. a.

<sup>d</sup> J. A. Bearden, *Phys. Rev.* **37**, 1210 (1931).

<sup>e</sup> B. Edlen and L. A. Svensson, *Arkiv Fysik* **28**, 427 (1965).

<sup>f</sup> J. J. Spijkerman and J. A. Bearden, *Phys. Rev.* **134**, A871 (1964).

<sup>45</sup> See Ref. 5, pp. 94 to 129.

discussion of both systematic and statistical errors (the latter preferably supported by detailed data on individual runs) by each of the workers involved. In addition, it is desirable to have several measurements, say four or more, so that the external consistency of the data is subject to a meaningful check; it is particularly helpful if the workers involved have all measured a whole series of lines rather than an isolated one. In such instances, one can form a weighted average with reasonable confidence. In the case of spin doublets, a check of the consistency of the doublet wavelength separation was helpful in estimating the accuracy of the measurements.

However, for the majority of measurements, the available information is less than complete. There are often just two precision measurements, both with inadequate error discussion or with error estimates which are clearly overly optimistic. In such cases one has to combine intelligent guesswork and indirect evidence. The latter may include error estimates obtained from comparison with other lines measured by a given worker in the same report, or simply from those errors normally encountered with the same general design of instrument.

Two other types of indirect evidence have been used in many instances. One is energy-level data, which give a measure of the same energy difference by an indirect series of transitions between the two levels involved. This procedure rests on a rigorous basis, although the indirect values are often less precise than the direct ones. The second method is based on the familiar Moseley diagram. Reasonably adequate data are usually available to use this approach profitably.

In a few instances directly measured values have been rejected entirely, and interpolated values, based on the same line for neighboring elements, have been adopted. Interpolated values are also given for some cases where no direct measurements have been reported.

### Conventions

Wavelengths tabulated normally refer to the pure element in its solid form. However, there are many instances in which such data are not available. For example, rare gases are of necessity almost always used in the gaseous form, while the rare-earth elements were customarily used in the form of salts. In many instances the data are sufficiently crude or the particular lines are so insensitive to chemical effects that the distinction becomes of no practical importance.

In high precision work there is some ambiguity as to exactly what feature of a line profile should be taken to be the "true wavelength." In double-crystal work the line peak is usually employed. In crystallography the centroid is widely used; in photographic work with visual observation of the plates, there is involved some subjective criterion of the observer which it is difficult to define precisely. In this survey the peak of

the line profile has been adopted as the standard criterion. This is one reason for giving preference to double-crystal values in most cases. Of course for the majority of lines the data are not sufficiently precise and well-defined to make the distinction between the various criteria at all meaningful.

The above criterion has been followed as consistently as possible even in the case of rather broad emission bands. In cases where the peak value could not be established with any degree of certainty, a value near the center of the band has been chosen and assigned a rather large probable error. In such cases the peak is usually not the best-defined feature of the band. The short-wavelength limit is often much sharper and more reproducible. In such cases the original experimental paper should be consulted to obtain a better-detailed picture of the band structure.

### Errors

Previously published x-ray wavelength tables have usually not included any error estimates, except as these were implied by the number of significant figures stated. However, in order to give the maximum information on any experimentally determined quantity, it should be accompanied by a statement of estimated error. Hence it has been decided to list a probable error with each emission line in the accompanying tables.

The error criterion used is that of *probable error*. This term must emphatically not be misinterpreted as a limit of error. It is merely a rather crude estimate such that, in the judgment of the author, roughly half the true wavelength values lie within the assigned errors. In most cases there is no implication of a Gaussian error distribution. In particular, the probability of large deviations may be substantially greater than implied by Gaussian distributions; for example, it is likely that the chance of a discrepancy exceeding five probable errors is substantially greater than one in a thousand. As mentioned in the preceding section, there are a few instances in which experimental errors are fully discussed in the papers involved and in which there are a sufficient number of measurements by different workers to obtain a good check by external consistency. In such cases a probable error can be assigned on a reasonably rigorous basis. The greater majority of cases fall short of this ideal. However, it was considered more desirable to estimate probable errors and risk some serious mistakes in judgment than to omit this important information entirely.

### WAVELENGTH TABLES V AND VI

In Table V all the emission lines of an element are listed under the element heading. The line and level designation are shown in the first column. The wavelengths in the second column are in Å\* units (i.e., relative to the primary x-ray wavelength standard



TABLE V. X-ray wavelengths in Å\* units and in keV. The probable error (p.e.) is the error in the last digit of wavelength. Designation indicates both conventional Siegbahn notation (if applicable) and transition, e.g.,  $\beta_1 L_{II}M_{IV}$  denotes a transition between the  $L_{II}$  and  $M_{IV}$  levels, which is the  $L\beta_1$  line in Siegbahn notation.

Designation	Å*	p.e.	keV	Å*	p.e.	keV	Designation	Å*	p.e.	keV	Å*	p.e.	keV		
<b>3 Lithium</b>				<b>4 Beryllium</b>				<b>19 Potassium (Cont.)</b>				<b>20 Calcium (Cont.)</b>			
$\alpha KL$	228.	1	0.0543	114.	1	0.1085	$\eta L_{II}M_I$	47.24	2	0.2625	40.46	2	0.3064		
<b>5 Boron</b>				<b>6 Carbon</b>				$\beta_1$			35.94	2	0.3449		
$\alpha KL$	67.6	3	0.1833	44.7	3	0.277	$l L_{III}M_I$	47.74	1	0.25971	40.96	2	0.3027		
<b>7 Nitrogen</b>				<b>8 Oxygen</b>				$\alpha_{1,2} L_{III}M_{IV,V}$			36.33	2	0.3413		
$\alpha KL$	31.6	4	0.3924	23.62	3	0.5249	$M_{II,III}N_I$	692	9	0.0179	525.	9	0.0236		
<b>9 Fluorine</b>				<b>10 Neon</b>				<b>21 Scandium</b>				<b>22 Titanium</b>			
$\alpha_{1,2} KL_{II,III}$	18.32	2	0.6768	14.610	3	0.8486	$\alpha_2 KL_{II}$	3.0342	1	4.0861	2.75216	2	4.50486		
$\beta KM$				14.452	5	0.8579	$\alpha_1 KL_{III}$	3.0309†	1	4.0906	2.74851	2	4.51084		
<b>11 Sodium</b>				<b>12 Magnesium</b>				$\beta_{1,3} KM_{II,III}$	2.7796	2	4.4605	2.51391	2	4.93181	
$\alpha_{1,2} KL_{II,III}$	11.9101	9	1.0410	9.8900	2	1.25360	$\beta_5 KM_{IV,V}$	2.7634	3	4.4865	2.4985	2	4.9623		
$\beta KM$	11.575	2	1.0711	9.521	2	1.3022	$\eta L_{II}M_I$	35.13	2	0.3529	30.89	3	0.4013		
$L_{II,III}M$	407.1	5	0.03045	251.5	5	0.0493	$\beta_1 L_{II}M_{IV}$	31.02	2	0.3996	27.05	2	0.4584		
$L_I L_{II,III}$	376	1	0.0330	317	1	0.0392	$l L_{III}M_I$	35.59	3	0.3483	31.36	2	0.3953		
<b>13 Aluminum</b>				<b>14 Silicon</b>				$\alpha_{1,2} L_{III}M_{IV,V}$	31.35	3	0.3954	27.42	2	0.4522	
$\alpha_2 KL_{II}$	8.34173	9	1.48627	7.12791	9	1.73938	<b>23 Vanadium</b>				<b>24 Chromium</b>				
$\alpha_1 KL_{III}$	8.33934	9	1.48670	7.12542	9	1.73998	$\alpha_2 KL_{II}$	2.50738	2	4.94464	2.293606	3	5.40551		
$\beta KM$	7.960	2	1.5574	6.753	1	1.8359	$\alpha_1 KL_{III}$	2.50356	2	4.95220	2.28970	2	5.41472		
$L_{II,III}$	171.4	5	0.0724	135.5	4	0.0915	$\beta_{1,3} KM_{II,III}$	2.28440	2	5.42729	2.08487	2	5.94671		
$L_I L_{II,III}$	290.	1	0.0428				$\beta_5 KM_{IV,V}$	2.26951	6	5.4629	2.07087	6	5.9869		
<b>15 Phosphorus</b>				<b>16 Sulfur</b>				$\beta_{3,4} L_I M_{II,III}$	21.19†	9	0.585	18.96	2	0.654	
$\alpha_2 KL_{II}$	6.160†	1	2.0127	5.37496	8	2.30664	$\eta L_{II}M_I$	27.34	3	0.4535	24.30	3	0.5102		
$\alpha_1 KL_{III}$	6.157†	1	2.0137	5.37216	7	2.30784	$\beta_1 L_{II}M_{IV}$	23.88	4	0.5192	21.27	1	0.5828		
$\beta KM$	5.796	2	2.1390				$l L_{III}M_I$	27.77	1	0.4465	24.78	1	0.5003		
$\beta_1 KM$				5.0316	2	2.4640	$\alpha_{1,2} L_{III}M_{IV,V}$	24.25	3	0.5113	21.64	3	0.5728		
$\beta_2 KM$				5.0233	3	2.4681	$M_{II,III}M_{IV,V}$	337.	9	0.037	309.	9	0.040		
$L_{II,III}M$	103.8	4	0.1194				<b>25 Manganese</b>				<b>26 Iron</b>				
$l, \eta L_{II,III}M_I$				83.4	3	0.1487	$\alpha_2 KL_{II}$	2.10578	2	5.88765	1.939980	9	6.39084		
<b>17 Chlorine</b>				<b>18 Argon</b>				$\alpha_1 KL_{III}$	2.101820	9	5.89875	1.936042	9	6.40384	
$\alpha_2 KL_{II}$	4.7307	1	2.62078	4.19474	5	2.95563	$\beta_{1,3} KM_{II,III}$	1.91021	2	6.49045	1.75661	2	7.05798		
$\alpha_1 KL_{III}$	4.7278	1	2.62239	4.19180	5	2.95770	$\beta_5 KM_{IV,V}$	1.8971	1	6.5352	1.7442	1	7.1081		
$\beta KM$	4.4034	3	2.8156				$\beta_{3,4} L_I M_{II,III}$	17.19	2	0.721	15.65	2	0.792		
$\beta_{1,3} KM_{II,III}$				3.8860	2	3.1905	$\eta L_{II}M_I$	21.85	2	0.5675	19.75	4	0.628		
$\eta L_{II}M_I$	67.33	9	0.1841	55.9†	1	0.2217	$\beta_1 L_{II}M_{IV}$	19.11	2	0.6488	17.26	1	0.7185		
$l L_{III}M_I$	67.90	9	0.1826	56.3†	1	0.2201	$l L_{III}M_I$	22.29	1	0.5563	20.15	1	0.6152		
<b>19 Potassium</b>				<b>20 Calcium</b>				$\alpha_{1,2} L_{III}M_{IV,V}$	19.45	1	0.6374	17.59	2	0.7050	
$\alpha_2 KL_{II}$	3.7445	2	3.3111	3.36166	3	3.68809	$M_{II,III}M_{IV,V}$	273.	6	0.045	243.	5	0.051		
$\alpha_1 KL_{III}$	3.7414	2	3.3138	3.35839	3	3.69168	<b>27 Cobalt</b>				<b>28 Nickel</b>				
$\beta_{1,3} KM_{II,III}$	3.4539	2	3.5896	3.0897	2	4.0127	$\alpha_2 KL_{II}$	1.792850	9	6.91530	1.661747	8	7.46089		
$\beta_5 KM_{IV,V}$	3.4413	4	3.6027	3.0746	3	4.0325	$\alpha_1 KL_{III}$	1.788965	9	6.93032	1.657910	8	7.47815		
							$\beta_{1,3} KM_{II,III}$	1.62079	2	7.64943	1.500135	8	8.26466		
							$\beta_5 KM_{IV,V}$	1.60891	3	7.7059	1.48862	4	8.3286		
							$\beta_{3,4} L_I M_{II,III}$	14.31	3	0.870	13.18	1	0.941		
							$\eta L_{II}M_I$	17.87	3	0.694	16.27	3	0.762		
							$\beta_1 L_{II}M_{IV}$	15.666	8	0.7914	14.271	6	0.8688		
							$l L_{III}M_I$	18.292	8	0.6778	16.693	9	0.7427		
							$\alpha_{1,2} L_{III}M_{IV,V}$	15.972	6	0.7762	14.561	3	0.8515		
							$M_{II,III}M_{IV,V}$	214.	6	0.058	190.	2	0.0651		



TABLE V (Continued)

Designation	Å*	p.e.	keV	Å*	p.e.	keV	Designation	Å*	p.e.	keV	Å*	p.e.	keV										
39 Yttrium (Cont.)						40 Zirconium (Cont.)						43 Technetium						44 Ruthenium					
$\beta_4 KN_{IV,V}$	0.72776	5	17.036	0.68901	5	17.994	$\alpha_2 KL_{II}$	0.67932 <sup>†</sup>	3	18.2508	0.647408	5	19.1504										
$\beta_4 LI_{M_{II}}$	6.0186	3	2.0600	5.6681	3	2.1873	$\alpha_1 KL_{III}$	0.67502 <sup>†</sup>	3	18.3671	0.643083	4	19.2792										
$\beta_3 LI_{M_{III}}$	5.9832	3	2.0722	5.6330	3	2.2010	$\beta_3 KM_{II}^{\dagger}$	0.60188 <sup>†</sup>	4	20.599	0.573067	4	21.6346										
$\gamma_{2,3} LI_{N_{II,III}}$	5.2830	3	2.3468	4.9536	3	2.5029	$\beta_1 KM_{III}$	0.60130 <sup>†</sup>	4	20.619	0.572482	4	21.6568										
$\eta LI_{M_I}$	7.0406	3	1.76095	6.6069	3	1.87654	$\beta_2 KN_{II,III}$	0.59024 <sup>†</sup>	5	21.005	0.56166	3	22.074										
$\beta_1 LI_{M_{IV}}$	6.2120	3	1.99584	5.8360	3	2.1244	$\beta_5^{II} KM_{IV}$				0.5680	2	21.829										
$\gamma_6 LI_{N_I}$	5.8754	3	2.1102	5.4977	3	2.2551	$\beta_5^I KM_V$				0.56785	9	21.834										
$\gamma_1 LI_{N_{IV}}$				5.3843	3	2.3027	$\beta_4$				0.56089	9	22.104										
$l LI_{M_I}$	7.3563	3	1.68536	6.9185	3	1.79201	$\beta_4 LI_{M_{IV}}$				4.5230	2	2.7411										
$\alpha_2 LI_{M_{IV}}$	6.4558	3	1.92047	6.0778	3	2.0399	$\beta_3 LI_{M_{III}}$				4.4866	3	2.7634										
$\alpha_1 LI_{M_V}$	6.4488	2	1.92256	6.0705	2	2.04236	$\gamma_{2,3} LI_{N_{II,III}}$				3.8977	2	3.1809										
$\beta_6 LI_{N_I}$	6.0942	3	2.0344	5.7101	3	2.1712	$\eta LI_{M_I}$				5.2050	2	2.38197										
$\beta_{2,15}$				5.5863	3	2.2194	$\beta_1 LI_{M_{IV}}$	4.8873 <sup>†</sup>	8	2.5368	4.62058	3	2.68323										
$M_{II}M_{IV}$	81.5	2	0.1522	76.7	2	0.1617	$\gamma_6 LI_{N_I}$				4.2873	2	2.8918										
$M_{II}N_I$	46.48	9	0.267				$\gamma_1 LI_{N_{IV}}$				4.1822	2	2.9645										
$M_{III}M_V$				80.9	3	0.1533	$l LI_{M_I}$				5.5035	3	2.2528										
$M_{III}N_I$	48.5	2	0.256				$\alpha_2 LI_{M_{IV}}$				4.85381	7	2.55431										
$M_{III}M_{IV,V}$	86.5	2	0.1434				$\alpha_1 LI_{M_V}$	5.1148 <sup>†</sup>	3	2.4240	4.84575	5	2.55855										
$\zeta M_{IV,V}N_{II,III}$	93.4	2	0.1328	82.1	2	0.1511	$\beta_6 LI_{N_I}$				4.4866	3	2.7634										
$M_{IV,V}O_{II,III}$				70.0	4	0.177	$\beta_{2,15} LI_{N_{IV,V}}$				4.3718	2	2.8360										
41 Niobium						42 Molybdenum						45 Rhodium						46 Palladium					
$\alpha_2 KL_{II}$	0.75044	1	16.5210	0.713590	6	17.3743	$M_{II}M_{IV}$				62.2	1	0.1992										
$\alpha_1 KL_{III}$	0.74620	1	16.6151	0.709300	1	17.47934	$M_{II}N_I$				32.3	2	0.384										
$\beta_3 KM_{II}$	0.66634	3	18.6063	0.632872	9	19.5903	$M_{II}N_{IV}$				25.50	9	0.486										
$\beta_1 KM_{III}$	0.66576	2	18.6225	0.632288	9	19.6083	$M_{III}M_V$				68.3	1	0.1814										
$\beta_2^{II}$				0.62107	5	19.963	$\gamma M_{III}N_{IV,V}$				26.9	1	0.462										
$\beta_2 KN_{II,III}$	0.65416	4	18.953	0.62099	2	19.9652	$\zeta M_{IV,V}N_{II,III}$				52.34	7	0.2369										
$\beta_4 KN_{IV,V}$	0.65318	5	18.981				$M_{IV,V}O_{II,III}$				44.8	1	0.2768										
$\beta_5^{II} KM_{IV}$				0.62708	5	19.771	45 Rhodium						46 Palladium										
$\beta_5^I KM_V$				0.62692	5	19.776	$\alpha_2 KL_{II}$	0.617630	4	20.0737	0.589821	3	21.0201										
$\beta_4 KN_{IV,V}$				0.62001	9	19.996	$\alpha_1 KL_{III}$	0.613279	4	20.2161	0.585448	3	21.1771										
$\beta_4 LI_{M_{II}}$	5.3455	3	2.3194	5.0488	3	2.4557	$\beta_3 KM_{II}$	0.546200	4	22.6989	0.521123	4	23.7911										
$\beta_3 LI_{M_{III}}$	5.3102	3	2.3348	5.0133	3	2.4730	$\beta_1 KM_{III}$	0.545605	4	22.7236	0.520520	4	23.8187										
$\gamma_{2,3} LI_{N_{II,III}}$	4.6542	2	2.6638	4.3800	2	2.8306	$\beta_2^{II} KN_{II}$	0.53513	5	23.168													
$\eta LI_{M_I}$	6.2109	3	1.99620	5.8475	3	2.1202	$\beta_2 KN_{II,III}$	0.53503	2	23.1728	0.510228	4	24.2991										
$\beta_1 LI_{M_{IV}}$	5.4923	3	2.2574	5.17708	8	2.39481	$\beta_5^{II} KM_{IV}$	0.54118	9	22.909													
$\gamma_5 LI_{N_I}$	5.1517	3	2.4066	4.8369	2	2.5632	$\beta_5^I KM_V$	0.54101	9	22.917													
$\gamma_1 LI_{N_{IV}}$	5.0361	3	2.4618	4.7258	2	2.6235	$\beta_4 KN_{IV,V}$	0.53401	9	23.217	0.5093	2	24.346										
$l LI_{M_I}$	6.5176	3	1.90225	6.1508	3	2.01568	$\beta_3 KM_{IV,V}$				0.51670	9	23.995										
$\alpha_2 LI_{M_{IV}}$	5.7319	3	2.1630	5.41437	8	2.28985	$\beta_4 LI_{M_{II}}$	4.2888	2	2.8908	4.0711	2	3.0454										
$\alpha_1 LI_{M_V}$	5.7243	2	2.16589	5.40655	8	2.29316	$\beta_3 LI_{M_{III}}$	4.2522	2	2.9157	4.0346	2	3.0730										
$\beta_6 LI_{N_I}$	5.3613	3	2.3125	5.0488	5	2.4557	$\gamma_{2,3} LI_{N_{II,III}}$	3.6855	2	3.3640	3.4892	2	3.5533										
$\beta_{2,15} LI_{N_{IV,V}}$	5.2379	3	2.3670	4.9232	2	2.5183	$\eta LI_{M_I}$	4.9217	2	2.5191	4.6605	2	2.6603										
$M_{II}M_{IV}$	72.1	3	0.1718	68.9	2	0.1798	$\beta_1 LI_{M_{IV}}$	4.37414	4	2.83441	4.14622	5	2.99022										
$M_{II}N_I$	38.4	3	0.323	35.3	3	0.351	$\gamma_6 LI_{N_I}$	4.0451	2	3.0650	3.8222	2	3.2437										
$M_{II}N_{IV}$	33.1	2	0.375				$\gamma_1 LI_{N_{IV}}$	3.9437	2	3.1438	3.7246	2	3.3287										
$M_{III}M_V$	78.4	2	0.1582	74.9	1	0.1656	$l LI_{M_I}$	5.2169	3	2.3765	4.9525	3	2.5034										
$M_{III}N_I$	40.7	2	0.305	37.5	2	0.331	$\alpha_2 LI_{M_{IV}}$	4.60545	9	2.69205	4.37588	7	2.83329										
$\gamma M_{III}N_{IV,V}$	34.9	2	0.356				$\alpha_1 LI_{M_V}$	4.59743	9	2.69674	4.36767	5	2.83861										
$\zeta M_{IV,V}N_{II,III}$	72.19	9	0.1717	64.38	7	0.1926	$\beta_6 LI_{N_I}$	4.2417	2	2.9229	4.0162	2	3.0870										
$M_{IV,V}O_{II,III}$	61.9	2	0.2002	54.8	2	0.2262	$\beta_{2,15} LI_{N_{IV,V}}$	4.1310	2	3.0013	3.90887	4	3.17179										
							$\beta_{10} LI_{M_{IV}}$				3.7988	2	3.2637										

TABLE V (Continued)

Designation	Å*	p.e.	keV	Å*	p.e.	keV	Designation	Å*	p.e.	keV	Å*	p.e.	keV						
<b>45 Rhodium (Cont.)</b>						<b>46 Palladium (Cont.)</b>						<b>49 Indium (Cont.)</b>				<b>50 Tin (Cont.)</b>			
$\beta_9 L_I M_V$				3.7920	2	3.2696	$\beta_1 K M_{III}$	0.454545	4	27.2759	0.435236	5	28.4860						
$M_I N_{II,III}$				20.1	2	0.616	$\beta_2 K N_{II,III}$	0.44500	1	27.8608	0.425915	8	29.1093						
$M_{II} M_{IV}$	59.3	1	0.2090	56.5	1	0.2194	$K O_{II,III}$	0.44374	3	27.940	0.42467	3	29.195						
$M_{II} N_I$	28.1	2	0.442	26.2	2	0.474	$\beta_5^{II} K M_{IV}$	0.45098	2	27.491	0.43184	3	28.710						
$M_I N_{IV}$				22.1	1	0.560	$\beta_5^I K M_V$	0.45086	2	27.499	0.43175	3	28.716						
$M_{III} M_V$	65.5	1	0.1892	62.9	1	0.1970	$\beta_4 K N_{IV,V}$	0.44393	4	27.928	0.42495	3	29.175						
$M_{III} N_I$	29.8	1	0.417	27.9	1	0.445	$\beta_4 L_I M_{II}$	3.50697	9	3.5353	3.34335	9	3.7083						
$\gamma M_{III} N_{IV,V}$	25.01	9	0.496	23.3 <sup>†</sup>	1	0.531	$\beta_4 L_I M_{III}$	3.46984	9	3.5731	3.30585	3	3.7500						
$\zeta M_{IV,V} N_{II,III}$	47.67	9	0.2601	43.6	1	0.2844	$\gamma_{2,3} L_I N_{II,III}$	2.9800	2	4.1605	2.8327	2	4.3768						
$M_{IV,V} O_{II,III}$	40.9	2	0.303	37.4	2	0.332	$\gamma_4 L_I O_{II,III}$	2.9264	2	4.2367	2.7775	2	4.4638						
<b>47 Silver</b>						<b>48 Cadmium</b>						$\eta L_{II} M_I$				$\beta_1 L_{II} M_{IV}$			
$\alpha_2 K L_{II}$	0.563798	4	21.9903	0.539422	3	22.9841	$\gamma_5 L_{II} N_I$	3.24907	9	3.8159	3.08475	9	4.0192						
$\alpha_1 K L_{III}$	0.5594075	6	22.16292	0.535010	3	23.1736	$\gamma_1 L_{II} N_{IV}$	3.16213	4	3.92081	3.00115	3	4.13112						
$\beta_3 K M_{II}$	0.497685	4	24.9115	0.475730	5	26.0612	$l L_{III} M_I$	4.26873	9	2.90440	4.07165	9	3.04499						
$\beta_1 K M_{III}$	0.497069	4	24.9424	0.475105	6	26.0955	$\alpha_2 L_{III} M_{IV}$	3.78073	6	3.27929	3.60891	4	3.43542						
$\beta_2 K N_{II,III}$	0.487032	4	25.4564	0.465328	7	26.6438	$\alpha_1 L_{III} M_V$	3.77192	4	3.28694	3.59994	3	3.44398						
$\beta_5 K M_{IV,V}$	0.49306	2	25.145				$\beta_6 L_{III} N_I$	3.43606	9	3.60823	3.26901	9	3.7926						
$\beta_4 K N_{IV,V}$	0.48598	3	25.512				$\beta_{2,15} L_{III} N_{IV,V}$	3.33838	3	3.71381	3.17505	3	3.90486						
$\beta_4 L_I M_{II}$	3.87023	5	3.20346	3.68203	9	3.36719	$\beta_7 L_{III} O_I$	3.324	4	3.730	3.1564	3	3.9279						
$\beta_3 L_I M_{III}$	3.83313	9	3.23446	3.64495	9	3.40145	$\beta_{10} L_I M_{IV}$	3.27404	9	3.7868	3.12170	9	3.9716						
$\gamma_2 L_I N_{II}$	3.31216	9	3.7432	3.1377	2	3.9513	$\beta_9 L_I M_V$	3.26763	9	3.7942	3.11513	9	3.9800						
$\gamma_3 L_I N_{III}$	3.30635	9	3.7498				$M_{II} M_{IV}$				47.3	1	0.2621						
$\eta L_{II} M_I$	4.4183	2	2.8061	4.19315	9	2.95675	$M_{II} N_I$				20.0	1	0.619						
$\beta_1 L_{II} M_{IV}$	3.93473	3	3.15094	3.73823	4	3.31657	$M_{II} N_{IV}$				16.93	5	0.733						
$\gamma_5 L_{II} N_I$	3.61638	9	3.42832	3.42551	9	3.61935	$M_{III} M_V$				54.2	1	0.2287						
$\gamma_1 L_{III} N_{IV}$	3.52260	4	3.51959	3.33564	6	3.71686	$M_{III} N_I$				21.5	1	0.575						
$l L_{III} M_I$	4.7076	2	2.6337	4.48014	9	2.76735	$\gamma M_{III} N_{IV,V}$				17.94	5	0.691						
$\alpha_2 L_{III} M_{IV}$	4.16294	5	2.97821	3.96496	6	3.12691	$M_{IV} O_{II,III}$				25.3	1	0.491						
$\alpha_1 L_{III} M_V$	4.15443	3	2.98431	3.95635	4	3.13373	$\zeta M_{IV,V} N_{II,III}$				31.24	9	0.397						
$\beta_5 L_{III} N_I$	3.80774	9	3.25603	3.61467	9	3.42994	$M_V O_{III}$				25.7	1	0.483						
$\beta_{2,15} L_{III} N_{IV,V}$	3.70335	3	3.34781	3.51408	4	3.52812	<b>51 Antimony</b>				<b>52 Tellurium</b>								
$\beta_{10} L_I M_{IV}$	3.61158	9	3.43287	3.4367	2	3.6075	$\alpha_2 K L_{II}$	0.474827	3	26.1108	0.455784	3	27.2017						
$\beta_9 L_I M_V$	3.60497	9	3.43917	3.43015	9	3.61445	$\alpha_1 K L_{III}$	0.470354	3	26.3591	0.451295	3	27.4723						
$M_I N_{II,III}$	18.8	2	0.658				$\beta_3 K M_{II}$	0.417737	4	29.6792	0.400659	4	30.9443						
$M_{II} M_{IV}$	54.0	1	0.2295	52.0	2	0.2384	$\beta_1 K M_{III}$	0.417085	3	29.7256	0.399995	5	30.9957						
$M_{II} N_I$				22.9	2	0.540	$\beta_2 K N_{II,III}$	0.407973	5	30.3895	0.391102	6	31.7004						
$M_{II} N_{IV}$	20.66	7	0.600	19.40	7	0.639	$K O_{II,III}$	0.40666	1	30.4875	0.38974	1	31.8114						
$M_{III} M_V$	60.5	1	0.2048	58.7	2	0.2111	$\beta_5^{II} K M_{IV}$	0.41388	1	29.9560									
$M_{III} N_I$	26.0	1	0.478	24.5	1	0.507	$\beta_5^I K M_V$	0.41378	1	29.9632									
$\gamma M_{III} N_{IV,V}$	21.82	7	0.568	20.47	7	0.606	$\beta_4 K N_{IV,V}$	0.40702	1	30.4604									
$M_{IV} O_{II,III}$				30.4	1	0.408	$\beta_4 L_I M_{II}$	3.19014	9	3.8864	3.04661	9	4.0695						
$\zeta M_{IV,V} N_{II,III}$	39.77	7	0.3117	36.8	1	0.3371	$\beta_3 L_I M_{III}$	3.15258	9	3.9327	3.00893	9	4.1204						
$M_V N_I$	24.4	2	0.509				$\gamma_{2,3} L_I N_{II,III}$	2.6953	2	4.5999	2.5674	2	4.8290						
$M_V O_{III}$				30.8	1	0.403	$\gamma_4 L_I O_{II,III}$	2.6398	2	4.6967	2.5113	2	4.9369						
$M_{IV,V} O_{II,III}$	33.5	3	0.370				$\eta L_{II} M_I$	3.60765	9	3.43661	3.43832	9	3.60586						
<b>49 Indium</b>						<b>50 Tin</b>						$\beta_1 L_{II} M_{IV}$				$\gamma_5 L_{II} N_I$			
$\alpha_2 K L_{II}$	0.516544	3	24.0020	0.495053	3	25.0440	$\gamma_6 L_{II} N_{IV}$	2.93187	9	4.2287	2.79007	9	4.4437						
$\alpha_1 K L_{III}$	0.512113	3	24.2097	0.490599	3	25.2713	$\gamma_1 L_{III} N_I$	2.85159	3	4.34779	2.71241	6	4.5709						
$\beta_3 K M_{II}$	0.455181	4	27.2377	0.435877	5	28.4440	$l L_{III} M_I$	3.88826	9	3.18860	3.71696	9	3.33555						
							$\alpha_2 L_{III} M_{IV}$	3.44840	6	3.59532	3.29846	9	3.7588						

TABLE V (Continued)

Designation	Å*	p.e.	keV	Å*	p.e.	keV	Designation	Å*	p.e.	keV	Å*	p.e.	keV										
<b>51 Antimony (Cont.)</b>						<b>52 Tellurium (Cont.)</b>						<b>55 Cesium (Cont.)</b>						<b>56 Tellurium (Cont.)</b>					
$\alpha_1 L_{III}M_V$	3.43941	4	3.60472	3.28920	6	3.76933	$\gamma_4 L_{I}O_{II,III}$	2.1741	2	5.7026	2.0756	3	5.9733										
$\beta_6 L_{III}N_I$	3.11513	9	3.9800	2.97088	9	4.1732	$\eta L_{II}M_I$	2.9932	2	4.1421	2.8627	3	4.3309										
$\beta_{2,15} L_{III}N_{IV,V}$	3.02335	3	4.10078	2.88217	8	4.3017	$\beta_1 L_{II}M_{IV}$	2.6837	2	4.6198	2.56821	5	4.82753										
$\beta_7 L_{III}O_I$	3.0052	3	4.1255	2.8634	3	4.3298	$\gamma_5 L_{II}N_I$	2.4174	2	5.1287	2.3085	3	5.3707										
$\beta_{10} L_{II}M_{IV}$	2.97917	9	4.1616	2.84679	9	4.3551	$\gamma_1 L_{II}N_{IV}$	2.3480	2	5.2804	2.2415	2	5.5311										
$\beta_9 L_{II}M_V$	2.97261	9	4.1708	2.83897	9	4.3671	$l L_{III}M_I$	3.2670	2	3.7950	3.1355	2	3.9541										
$M_{II}M_{IV}$	45.2	1	0.2743				$\alpha_2 L_{III}M_{IV}$	2.9020	2	4.2722	2.78553	5	4.45090										
$M_{II}N_I$	18.8	1	0.658	17.6	1	0.703	$\alpha_1 L_{III}M_V$	2.8924	2	4.2865	2.77595	5	4.46626										
$M_{II}N_{IV}$	15.98	5	0.776				$\beta_6 L_{III}N_I$	2.5932	2	4.7811	2.4826	2	4.9939										
$M_{III}M_V$	52.2	1	0.2375	50.3	1	0.2465	$\beta_{2,15} L_{III}N_{IV,V}$	2.5118	2	4.9359	2.40435	6	5.1565										
$M_{III}N_I$	20.2	1	0.612	19.1	1	0.648	$\beta_7 L_{III}O_I$	2.4849	2	4.9893	2.3806	2	5.2079										
$\gamma M_{III}N_{IV,V}$	16.92	4	0.733	15.93	4	0.778	$\beta_{10} L_{II}M_{IV}$	2.4920	2	4.9752	2.3869	2	5.1941										
$M_{IV}O_{II,III}$				21.34	5	0.581	$\beta_9 L_{II}M_V$	2.4783	2	5.0026	2.3764	2	5.2171										
$\zeta M_{IV,V}N_{II,III}$	28.88	8	0.429	26.72	9	0.464	$\gamma M_{III}N_{IV,V}$				12.75	3	0.973										
$M_V O_{III}$				21.78	5	0.569	$M_{IV}O_{II}$				15.91	5	0.779										
							$M_{IV}O_{III}$				15.72	9	0.789										
<b>53 Iodine</b>						<b>54 Xenon</b>						<b>57 Lanthanum</b>						<b>58 Cerium</b>					
$\alpha_2 K L_{II}$	0.437829	7	28.3172	0.42087 <sup>†</sup>	2	29.458	$\zeta M_V N_{III}$				20.64	4	0.601										
$\alpha_1 K L_{III}$	0.433318	5	28.6120	0.41634 <sup>†</sup>	2	29.779	$M_V O_{III}$				16.20	5	0.765										
$\beta_3 K M_{II}$	0.384564	4	32.2394	0.36941 <sup>†</sup>	2	33.562	$N_{IV}O_{II}$	188.6	1	0.06574	163.3	2	0.07590										
$\beta_1 K M_{III}$	0.383905	4	32.2947	0.36872 <sup>†</sup>	2	33.624	$N_{IV}O_{III}$	183.8	1	0.06746	159.0	2	0.07796										
$\beta_2 K N_{II,III}$	0.37523 <sup>†</sup>	2	33.042	0.36026 <sup>†</sup>	3	34.415	$N_V O_{III}$	190.3	1	0.06515	164.6	2	0.07530										
$\beta_4 L_I M_{II}$	2.91207	9	4.2575																				
$\beta_3 L_I M_{III}$	2.87429	9	4.3134																				
$\gamma_{2,3} L_I N_{II,III}$	2.4475	2	5.0657																				
$\gamma_4 L_I O_{II,III}$	2.3913	2	5.1848																				
$\eta L_{II}M_I$	3.27979	9	3.7801																				
$\beta_1 L_{II}M_{IV}$	2.93744	6	4.22072																				
$\gamma_5 L_{II}N_I$	2.65710	9	4.6660																				
$\gamma_1 L_{II}N_{IV}$	2.58244	8	4.8009																				
$l L_{III}M_I$	3.55754	9	3.48502																				
$\alpha_2 L_{III}M_{IV}$	3.15791	6	3.92604																				
$\alpha_1 L_{III}M_V$	3.14860	6	3.93765	3.0166 <sup>†</sup>	2	4.1099																	
$\beta_6 L_{III}N_I$	2.83672	9	4.3706																				
$\beta_{2,15} L_{III}N_{IV,V}$	2.75053	8	4.5075																				
$\beta_7 L_{III}O_I$	2.7288	3	4.5435																				
$\beta_{10} L_{II}M_{IV}$	2.72104	9	4.5564																				
$\beta_9 L_{II}M_V$	2.71352	9	4.5690																				
<b>55 Cesium</b>						<b>56 Barium</b>						$\alpha_2 K L_{II}$						$0.375313$					
$\alpha_2 K L_{II}$	0.404835	4	30.6251	0.389668	5	31.8171	$\alpha_1 K L_{III}$	0.370737	2	33.4418	0.361683	2	34.2789										
$\alpha_1 K L_{III}$	0.400290	4	30.9728	0.385111	4	32.1936	$\beta_3 K M_{II}$	0.328686	4	37.7202	0.357092	2	34.7197										
$\beta_3 K M_{II}$	0.355050	4	34.9194	0.341507	4	36.3040	$\beta_1 K M_{III}$	0.327983	3	37.8010	0.316520	4	39.1701										
$\beta_1 K M_{III}$	0.354364	7	34.9869	0.340811	3	36.3782	$\beta_2 K N_{II,III}$	0.320117	7	38.7299	0.30816	1	40.233										
$\beta_2 K N_{II,III}$	0.34611	2	35.822	0.33277	1	37.257	$K O_{II,III}$	0.31864	2	38.909	0.30668	2	40.427										
$K O_{II,III}$				0.33127	2	37.426	$\beta_5^{II} K M_{IV}$	0.32563	2	38.074	0.31357	2	39.539										
$\beta_5^{II} K M_{IV}$				0.33835	2	36.643	$\beta_3^{I} K M_V$	0.32546	2	38.094	0.31342	2	39.558										
$\beta_3^{I} K M_V$				0.33814	2	36.666	$\beta_4 K N_{IV,V}$	0.31931	2	38.828	0.30737	2	40.337										
$\beta_4 K N_{IV,V}$				0.33229	2	37.311	$\beta_4 L_I M_{II}$	2.4493	3	5.0620	2.3497	4	5.2765										
$\beta_4 L_I M_{II}$	2.6666	2	4.6494	2.5553	2	4.8519	$\beta_3 L_I M_{III}$	2.4105	3	5.1434	2.3109	3	5.3651										
$\beta_3 L_I M_{III}$	2.6285	2	4.7167	2.5164	2	4.9269	$\gamma_2 L_I N_{II}$	2.0460	4	6.060	1.9602	3	6.3250										
$\gamma_2 L_I N_{II}$	2.2371	2	5.5420	2.1387	2	5.7969	$\gamma_3 L_I N_{III}$	2.0410	4	6.074	1.9553	3	6.3409										
$\gamma_3 L_I N_{III}$	2.2328	2	5.5527	2.1342	2	5.8092	$\gamma_4 L_I O_{II,III}$	1.9830	4	6.252	1.8991	4	6.528										
							$\eta L_{II}M_I$	2.740	3	4.525	2.6203	4	4.7315										
							$\beta_1 L_{II}M_{IV}$	2.45891	5	5.0421	2.3561	3	5.2622										
							$\gamma_5 L_{II}N_I$	2.2056	4	5.621	2.1103	3	5.8751										
							$\gamma_1 L_{II}N_{IV}$	2.1418	3	5.7885	2.0487	4	6.052										
							$\gamma_8 L_{II}O_I$				2.0237	4	6.126										
							$l L_{III}M_I$	3.006	3	4.124	2.8917	4	4.2875										
							$\alpha_2 L_{III}M_{IV}$	2.67533	5	4.63423	2.5706	3	4.8230										
							$\alpha_1 L_{III}M_V$	2.66570	5	4.65097	2.5615	2	4.8402										
							$\beta_6 L_{III}N_I$	2.3790	4	5.2114	2.2818	3	5.4334										
							$\beta_{2,15} L_{III}N_{IV,V}$	2.3030	3	5.3835	2.2087	2	5.6134										
							$\beta_7 L_{III}O_I$	2.275	3	5.450	2.1701	2	5.7132										
							$\beta_{10} L_{II}M_{IV}$	2.290	3	5.415	2.1958	5	5.646										
							$\beta_9 L_{II}M_V$	2.282	3	5.434	2.1885	3	5.6650										
							$\gamma M_{III}N_{IV,V}$	12.08	4	1.027	11.53	1	1.0749										
							$\beta M_{IV}N_{VI}$	14.51	5	0.854	13.75	4	0.902										
							$\zeta M_V N_{III}$	19.44	5	0.638	18.35	4	0.676										
							$\alpha M_V N_{VI,VII}$	14.88	5	0.833	14.04	2	0.883										

TABLE V (Continued)

Designation	Å*	p.e.	keV	Å*	p.e.	keV	Designation	Å*	p.e.	keV	Å*	p.e.	keV		
<b>57 Lanthanum (Cont.)</b>				<b>58 Cerium (Cont.)</b>				<b>61 Promethium (Cont.)</b>				<b>62 Samarium (Cont.)</b>			
$M_V O_{II,III}$				14.39	5	0.862	$\alpha_2 L_{III} M_{IV}$	2.2926	4	5.4078	2.21062	3	5.6084		
$N_{IV,V} O_{II,III}$	152.6	6	0.0812	144.4	6	0.0859	$\alpha_1 L_{III} M_V$	2.2822	3	5.4325	2.1998	2	5.6361		
<b>59 Praseodymium</b>				<b>60 Neodymium</b>				$\beta_6 L_{III} N_I$				1.94643	3	6.3697	
$\alpha_2 K L_{II}$	0.348749	2	35.5502	0.336472	2	36.8474	$\beta_{2,15} L_{III} N_{IV,V}$	1.9559	6	6.339	1.88221	3	6.5870		
$\alpha_1 K L_{III}$	0.344140	2	36.0263	0.331846	2	37.3610	$\beta_7 L_{III} O_I$				1.85626	3	6.6791		
$\beta_3 K M_{II}$	0.304975	5	40.6529	0.294027	3	42.1665	$\beta_5 L_{III} O_{IV,V}$				1.84700	9	6.7126		
$\beta_1 K M_{III}$	0.304261	4	40.7482	0.293299	2	42.2713	$\beta_{10} L_I M_{IV}$				1.86990	3	6.6304		
$\beta_2 K N_{II,III}$	0.29679	2	41.773	0.2861 <sup>†</sup>	1	43.33	$\beta_3 L_I M_V$				1.86166	3	6.6597		
$\beta_4 L_I M_{II}$	2.2550	4	5.4981	2.1669	3	5.7216	$\gamma M_{III} N_{IV,V}$				9.600	9	1.291		
$\beta_3 L_I M_{III}$	2.2172	3	5.5918	2.1268	2	5.8294	$\beta M_{IV} N_{VI}$				11.27	1	1.0998		
$\gamma_2 L_I N_{II}$	1.8791	4	6.598	1.8013	4	6.883	$\zeta M_V N_{III}$				14.91	4	0.831		
$\gamma_3 L_I N_{III}$	1.8740	4	6.616	1.7964	4	6.902	$\alpha M_V N_{VI,VII}$				11.47	3	1.081		
$\gamma_4 L_I O_{II,III}$	1.8193	4	6.815	1.7445	4	7.107	$N_{IV,V} N_{VI,VII}$				98.	1	0.126		
$\eta L_{II} M_I$	2.512	3	4.935	2.4094	4	5.1457	$N_{IV,V} O_{II,III}$				117.4	4	0.1056		
$\beta_1 L_{II} M_{IV}$	2.2588	3	5.4889	2.1669	2	5.7216	<b>63 Europium</b>				<b>64 Gadolinium</b>				
$\gamma_6 L_{II} N_I$	2.0205	4	6.136	1.9355	4	6.406	$\alpha_2 K L_{II}$	0.303118	2	40.9019	0.293038	2	42.3089		
$\gamma_7 L_{II} N_{IV}$	1.9611	3	6.3221	1.8779	2	6.6021	$\alpha_1 K L_{III}$	0.298446	2	41.5422	0.288353	2	42.9962		
$\gamma_8 L_{II} O_I$	1.9362	4	6.403	1.8552	5	6.683	$\beta_3 K M_{II}$	0.264332	5	46.9036	0.25534	2	48.555		
$l L_{III} M_I$	2.7841	4	4.4532	2.6760	4	4.6330	$\beta_1 K M_{III}$	0.263577	5	47.0379	0.25460	2	48.697		
$\alpha_2 L_{III} M_{IV}$	2.4729	3	5.0135	2.3807	3	5.2077	$\beta_2 K N_{II,III}$	0.256923	8	48.256	0.24816	3	49.959		
$\alpha_1 L_{III} M_V$	2.4630	2	5.0337	2.3704	2	5.2304	$K O_{II,III}$	0.255645	7	48.497	0.24687	3	50.221		
$\beta_6 L_{III} N_I$	2.1906	4	5.660	2.1039	3	5.8930	$\beta_5 K M_{IV,V}$				0.25275	3	49.052		
$\beta_{2,15} L_{III} N_{IV,V}$	2.1194	4	5.850	2.0360	3	6.0894	$\beta_4 L_I M_{II}$	1.9255	2	6.4389	1.8540	2	6.6871		
$\beta_7 L_{III} O_I$	2.0919	4	5.927	2.0092	3	6.1708	$\beta_3 L_I M_{III}$	1.8867	2	6.5713	1.8150	2	6.8311		
$\beta_{10} L_I M_{IV}$	2.1071	4	5.884	2.0237	3	6.1265	$\gamma_2 L_I N_{II}$	1.5961	2	7.7677	1.5331	2	8.087		
$\beta_9 L_I M_V$	2.1004	4	5.903	2.0165	3	6.1484	$\gamma_3 L_I N_{III}$	1.5903	2	7.7961	1.5297	2	8.105		
$\gamma M_{III} N_{IV,V}$	10.998	9	1.1273	10.505	9	1.180	$\gamma_4 L_I O_{II,III}$	1.5439	1	8.0304	1.4839	2	8.355		
$\beta M_{IV} N_{VI}$	13.06	2	0.950	12.44	2	0.997	$\gamma L_{II} M_I$	2.1315	2	5.8166	2.0494	1	6.0495		
$\zeta M_V N_{III}$	17.38	4	0.714	16.46	4	0.753	$\beta_1 L_{II} M_{IV}$	1.9203	2	6.4564	1.8468	2	6.7132		
$\alpha M_V N_{VI,VII}$	13.343	5	0.9292	12.68	2	0.978	$\gamma_5 L_{II} N_I$	1.7085	2	7.2566	1.6412	2	7.5543		
$N_{IV,V} N_{VI,VII}$	113.	1	0.1095	107.	1	0.116	$\gamma_1 L_{II} N_{IV}$	1.6574	2	7.4803	1.5924	2	7.7858		
$N_{IV,V} O_{II,III}$	136.5	4	0.0908	128.9	7	0.0962	$\gamma_8 L_{II} O_I$	1.6346	2	7.5849	1.5707	2	7.894		
<b>61 Promethium</b>				<b>62 Samarium</b>				$\gamma_6 L_{II} O_{IV}$	1.6282	2	7.6147	1.5644	2	7.925	
$\alpha_2 K L_{II}$	0.324803	4	38.1712	0.313698	2	39.5224	$l L_{III} M_I$	2.3948	2	5.1772	2.3122	2	5.3621		
$\alpha_1 K L_{III}$	0.320160	4	38.7247	0.309040	2	40.1181	$\alpha_2 L_{III} M_{IV}$	2.1315	2	5.8166	2.0578	2	6.0250		
$\beta_3 K M_{II}$	0.28363 <sup>†</sup>	4	43.713	0.27376	2	45.289	$\alpha_1 L_{III} M_V$	2.1209	2	5.8457	2.0468	2	6.0572		
$\beta_1 K M_{III}$	0.28290 <sup>†</sup>	3	43.826	0.27301	2	45.413	$\beta_6 L_{III} N_I$	1.8737	2	6.6170	1.8054	2	6.8671		
$\beta_2 K N_{II,III}$	0.2759 <sup>†</sup>	1	44.94	0.2662	1	46.58	$\beta_{2,15} L_{III} N_{IV,V}$	1.8118	2	6.8432	1.7455	2	7.1028		
$K O_{II,III}$				0.26491	3	46.801	$\beta_7 L_{III} O_I$	1.7851	2	6.9453	1.7203	2	7.2071		
$\beta_5 K M_{IV,V}$				0.27111	3	45.731	$\beta_8 L_{III} O_{IV,V}$	1.7772	2	6.9763	1.7130	2	7.2374		
$\beta_4 L_I M_{II}$				2.00095	6	6.1963	$\beta_{10} L_I M_{IV}$	1.7993	3	6.890	1.7315	3	7.160		
$\beta_3 L_I M_{III}$	2.0421	4	6.071	1.96241	3	6.3180	$\beta_9 L_I M_V$	1.7916	3	6.920	1.7240	3	7.192		
$\gamma_2 L_I N_{II}$				1.66044	6	7.4668	$L_I O_{IV,V}$				1.4807	3	8.373		
$\gamma_3 L_I N_{III}$				1.65601	3	7.4867	$\gamma M_{III} N_{IV,V}$	9.211	9	1.346	8.844	9	1.402		
$\gamma_4 L_I O_{II,III}$				1.60728	3	7.7137	$\beta M_{IV} N_{VI}$	10.750	7	1.1533	10.254	6	1.2091		
$\eta L_{II} M_I$				2.21824	3	5.5892	$\zeta M_V N_{III}$	14.22	2	0.872	13.57	2	0.914		
$\beta_1 L_{II} M_{IV}$	2.0797	4	5.961	1.99806	3	6.2051	$\alpha M_V N_{VI,VII}$	10.96	3	1.131	10.46	3	1.185		
$\gamma_5 L_{II} N_I$				1.77934	3	6.9678	$N_{IV,V} O_{II,III}$	112.0	6	0.1107	<b>65 Terbium</b>				
$\gamma_1 L_{II} N_{IV}$	1.7989	9	6.892	1.72724	3	7.1780	$\alpha_2 K L_{II}$	0.283423	2	43.7441	0.274247	2	45.2078		
$\gamma_6 L_{II} O_{IV}$				1.6966	9	7.3076	$\alpha_1 K L_{III}$	0.278724	2	44.4816	0.269533	2	45.9984		
$l L_{III} M_I$				2.4823	4	4.9945	$\beta K M_{II}$	0.24683	2	50.229	0.23862	2	51.957		
<b>61 Promethium</b>				<b>62 Samarium</b>				<b>65 Terbium</b>				<b>66 Dysprosium</b>			

TABLE V (Continued)

Designation	Å*	p.e.	keV	Å*	p.e.	keV	Designation	Å*	p.e.	keV	Å*	p.e.	keV						
<b>65 Terbium (Cont.)</b>						<b>66 Dysprosium (Cont.)</b>						<b>67 Holmium (Cont.)</b>				<b>68 Erbium (Cont.)</b>			
$\beta_1 KM_{III}$	0.24608	2	50.382	0.23788	2	52.119	$\beta_{10} L_{IV}M_{IV}$	1.5486	3	8.006	1.4941	3	8.298						
$\beta_2 KN_{II,III}$	0.2397 <sup>†</sup>	2	51.72	0.2317 <sup>†</sup>	2	53.51	$L_{IV}O_{IV,V}$	1.3208	3	9.387									
$KO_{II,III}$	0.23858	3	51.965	0.23056	3	53.774	$\beta_9 L_{IV}M_{IV}$				1.4855	5	8.346						
$\beta_6 KM_{IV,V}$				0.23618	3	52.494	$M_{II}N_{IV}$				7.60	1	1.632						
$\beta_4 L_{IV}M_{II}$	1.7864	2	6.9403	1.72103	7	7.2039	$\gamma M_{III}N_{IV,V}$	7.865	9	1.576									
$\beta_3 L_{IV}M_{III}$	1.7472	2	7.0959	1.6822	2	7.3702	$\gamma M_{III} v$				7.546	8	1.643						
$\gamma_2 L_{IV}N_{II}$	1.4764	2	8.398	1.42278	7	8.7140	$\beta M_{IV}N_{VI}$	8.965	4	1.3830	8.592	3	1.4430						
$\gamma_3 L_{IV}N_{III}$	1.4718	2	8.423	1.41640	7	8.7532	$\zeta M_{IV}N_{III}$	11.86	1	1.0450	11.37	1	1.0901						
$\gamma_4 L_{IV}O_{II,III}$	1.4276	2	8.685	1.37459	7	9.0195	$\alpha M_{IV}N_{VI,VII}$	9.20	2	1.348	8.82	1	1.406						
$\eta L_{II}M_{I}$	1.9730	2	6.2839	1.89743	7	6.5342	$N_{IV}N_{VI}$				72.7	9	0.171						
$\beta_1 L_{II}M_{IV}$	1.7768	3	6.978	1.71062	7	7.2477	$N_{IV}N_{VI,VII}$				76.3	7	0.163						
$\gamma_6 L_{II}N_{I}$	1.5787	2	7.8535	1.51824	7	8.1661													
$\gamma_1 L_{II}N_{IV}$	1.5303	2	8.102	1.47266	7	8.4188													
$\gamma_8 L_{II}O_{I}$	1.5097	2	8.212				<b>69 Thulium</b>				<b>70 Ytterbium</b>								
$\gamma_6 L_{II}O_{IV}$	1.5035	2	8.246	1.44579	7	8.5753	$\alpha_2 KL_{II}$	0.249095	2	49.7726	0.241424	2	51.3540						
$l L_{III}M_{I}$	2.2352	2	5.5467	2.15877	7	5.7431	$\alpha_1 KL_{III}$	0.244338	2	50.7416	0.236655	2	52.3889						
$\alpha_2 L_{III}M_{IV}$	1.9875	2	6.2380	1.91991	3	6.4577	$\beta_3 KM_{II}$	0.21636	2	57.304	0.2096 <sup>†</sup>	1	59.14						
$\alpha_1 L_{III}M_{V}$	1.9765	2	6.2728	1.90881	3	6.4952	$\beta_1 KM_{III}$	0.21556	2	57.517	0.20884	8	59.37						
$\beta_6 L_{III}N_{I}$	1.7422	2	7.1163	1.68213	7	7.3705	$\beta_2 KN_{II,III}$	0.2098 <sup>†</sup>	2	59.09	0.2033 <sup>†</sup>	2	60.98						
$\beta_{2,15} L_{III}N_{IV,V}$	1.6830	2	7.3667	1.62369	7	7.6357	$KO_{II,III}$	0.20891	2	59.346	0.20226	2	61.298						
$\beta_7 L_{III}O_{I}$	1.6585	2	7.4753	1.60447	7	7.7272	$\beta_5 KM_{IV,V}$	0.21404	2	57.923	0.20739	2	59.782						
$\beta_5 L_{III}O_{IV,V}$	1.6510	2	7.5094	1.58837	7	7.8055	$\beta_4 L_{IV}M_{II}$	1.5448	2	8.026	1.49138	3	8.3132						
$\beta_{10} L_{IV}M_{IV}$	1.6673	3	7.436	1.60743	9	7.7130	$\beta_3 L_{IV}M_{III}$	1.5063	2	8.231	1.45233	5	8.5367						
$\beta_9 L_{IV}M_{V}$				1.59973	9	7.7501	$\gamma_2 L_{IV}N_{II}$	1.2742	2	9.730	1.22879	7	10.0897						
$L_{IV}O_{IV,V}$	1.4228	3	8.714				$\gamma_3 L_{IV}N_{III}$	1.2678	2	9.779	1.22232	5	10.1431						
$\gamma M_{III}N_{IV,V}$	8.486	9	1.461	8.144	9	1.522	$\gamma_4 L_{IV}O_{II,III}$	1.2294	2	10.084	1.1853	1	10.4603						
$\beta M_{IV}N_{VI}$	9.792	6	1.2661	9.357	6	1.3250	$\eta L_{II}M_{I}$	1.6963	2	7.3088	1.63560	5	7.5802						
$\zeta M_{IV}N_{III}$	12.98	2	0.955	12.43	2	0.998	$\beta_1 L_{II}M_{IV}$	1.5304	2	8.101	1.47565	5	8.4018						
$\alpha M_{IV}N_{VI,VII}$	10.00	2	1.240	9.59	2	1.293	$\gamma_5 L_{II}N_{I}$	1.3558	2	9.144	1.3063	1	9.4910						
$N_{IV,V}N_{VI,VII}$	86.	1	0.144	83.	1	0.149	$\gamma_1 L_{II}N_{IV}$	1.3153	2	9.426	1.26769	5	9.8701						
$N_{IV,V}O_{II,III}$	102.2	4	0.1213	97.2	8	0.128	$\gamma_8 L_{II}O_{I}$				1.24923	5	9.9246						
							$\gamma_6 L_{II}O_{IV}$	1.2905	2	9.607	1.24271	3	9.9766						
							$l L_{III}M_{I}$	1.9550	2	6.3419	1.89415	5	6.5455						
							$\alpha_2 L_{III}M_{IV}$	1.7381	2	7.1331	1.68285	5	7.3673						
							$\alpha_1 L_{III}M_{V}$	1.7268 <sup>†</sup>	2	7.1799	1.67189	4	7.4156						
							$\beta_6 L_{III}N_{I}$	1.5162	2	8.177	1.4661	1	8.4563						
							$\beta_{2,15} L_{III}N_{IV,V}$	1.4640	2	8.468	1.41550	5	8.7588						
							$\beta_7 L_{III}O_{I}$				1.3948	1	8.8889						
							$\beta_5 L_{III}O_{IV,V}$	1.4349	2	8.641	1.38696	7	8.9390						
							$\beta_{10} L_{IV}M_{IV}$	1.4410	3	8.604	1.3915	1	8.9100						
							$\beta_9 L_{IV}M_{V}$	1.4336	3	8.648	1.3838	1	8.9597						
							$L_{IV}O_{I}$				1.1886	1	10.4312						
							$L_{IV}O_{IV,V}$	1.2263	3	10.110	1.1827	1	10.4833						
							$L_{II}M_{II}$				1.58844	9	7.8052						
							$L_{II}O_{II,III}$				1.2453	1	9.9561						
							$l L_{III}M_{II}$				1.83091	9	6.7715						
							$L_{III}O_{II,III}$				1.3898	1	8.9209						
							$M_{III}N_{I}$				8.470	9	1.464						
							$\gamma M_{III}N_{V}$				7.024	8	1.765						
							$\beta M_{IV}N_{VI}$	8.249	7	1.503	7.909	2	1.5675						
							$\zeta M_{IV}N_{III}$				10.48	1	1.183						
							$\alpha M_{IV}N_{VI,VII}$	8.48	1	1.462	8.149	5	1.5214						
							$N_{IV}N_{VI}$				65.1	7	0.190						
							$N_{IV}N_{VI,VII}$				69.3	5	0.179						
							<b>71 Lutetium</b>				<b>72 Hafnium</b>								
							$\alpha_2 KL_{II}$	0.234081	2	52.9650	0.227024	3	54.6114						
							$\alpha_1 KL_{III}$	0.229298	2	54.0698	0.222227	3	55.7902						
							$\beta_2 KM_{II}$	0.20309 <sup>†</sup>	4	61.05	0.19686 <sup>†</sup>	4	62.98						







TABLE V (Continued)

Designation	Å*	p.e.	keV	Å*	p.e.	keV	Designation	Å*	p.e.	keV	Å*	p.e.	keV										
<b>77 Iridium (Cont.)</b>						<b>78 Platinum (Cont.)</b>						<b>79 Gold (Cont.)</b>						<b>80 Mercury (Cont.)</b>					
$\beta_5 L_{III}O_{IV,V}$	1.10585	3	11.2114	1.0724	2	11.561	$\gamma_2 L_{II}N_{II}$	0.90434	3	13.7095	0.87544	7	14.162										
$L_I M_I$	1.2102	2	10.245	1.16962	9	10.6001	$\gamma_3 L_I N_{III}$	0.89783	5	13.8090	0.86915	7	14.265										
$\beta_{10} L_I M_{IV}$	1.09702	4	11.3016	1.06183	7	11.6762	$\gamma'_4 L_I O_{II}$	0.86816	4	14.2809	0.84013	7	14.757										
$\beta_9 L_I M_V$	1.08975	5	11.3770	1.05446	5	11.7577	$\gamma_4 L_I O_{III}$	0.86703	4	14.2996	0.83894	7	14.778										
$L_I N_I$	0.9766	2	12.695	0.9455	2	13.113	$\eta L_{II} M_I$	1.20273	3	10.3083	1.1640	1	10.6512										
$L_I N_{IV}$	0.9459	2	13.108				$\beta_1 L_{III} M_{IV}$	1.08353	3	11.4423	1.04868	5	11.8226										
$\gamma_{II} L_I N_V$	0.9446	2	13.126	0.9143	2	13.560	$\gamma_5 L_{II} N_I$	0.95559	3	12.9743	0.92453	7	13.410										
$L_I O_{IV,V}$	0.9243	3	13.413				$\gamma_1 L_{II} N_{IV}$	0.92650	3	13.3817	0.89646	5	13.8301										
$L_I O_I$				0.8995	2	13.784	$\gamma_8 L_{II} O_I$	0.90989	5	13.6260	0.87995	7	14.090										
$L_I O_{IV}$				0.8943	1	13.864	$\gamma_6 L_{II} O_{IV}$	0.90297	3	13.7304	0.87319	7	14.199										
$L_I O_V$				0.8934	1	13.878	$l L_{III} M_I$	1.45964	9	8.4939	1.4216	1	8.7210										
$L_{II} M_{II}$	1.2502	3	9.917	1.213	1	10.225	$\alpha_2 L_{III} M_{IV}$	1.28772	3	9.6280	1.25264	7	9.8976										
$\beta_{17} L_{II} M_{III}$	1.2069	2	10.273	1.1667	1	10.6265	$\alpha_1 L_{III} M_V$	1.27640	3	9.7133	1.24120	5	9.9888										
$L_{II} M_V$	1.1489	2	10.791	1.1129	2	11.140	$\beta_6 L_{III} N_I$	1.11092	3	11.1602	1.07975	7	11.4824										
$L_{II} N_{II}$	1.0120	2	12.251	0.9792	2	12.661	$\beta_{15} L_{III} N_{IV}$	1.07188	5	11.5667	1.04151	7	11.9040										
$L_{II} N_{III}$	1.0054	3	12.332	0.97173	4	12.7588	$\beta_2 L_{III} N_V$	1.07022	3	11.5847	1.03975	7	11.9241										
$v L_{II} N_{VI}$	0.97161	6	12.7603	0.93931	5	13.1992	$\beta_7 L_{III} O_I$	1.04974	8	11.8106	1.01937	7	12.1625										
$L_{II} O_{III}$	0.96979	5	12.7843				$\beta_5 L_{III} O_{IV,V}$	1.04044	3	11.9163	1.00987	7	12.2769										
$t L_{III} M_{II}$	1.4930	3	8.304	1.4530	2	8.533	$L_I M_I$	1.13525	5	10.9210	1.0999	2	11.272										
$s L_{III} M_{III}$	1.4318	2	8.659	1.3895	2	8.923	$\beta_{10} L_I M_{IV}$	1.02789	7	12.0617	0.9962	2	12.446										
$L_{III} N_{II}$	1.16545	5	10.6380	1.1310	2	10.962	$\beta_9 L_I M_V$	1.02063	7	12.1474	0.9871	2	12.560										
$L_{III} N_{III}$	1.1560	3	10.725	1.1226	2	11.044	$L_I N_I$	0.9131	1	13.578	0.8827	2	14.045										
$u L_{III} N_{VI,VII}$	1.11145	4	11.1549	1.07896	5	11.4908	$L_I N_{IV}$	0.88563	7	13.999													
$L_{III} O_{II,III}$	1.10923	6	11.1772	1.0761	3	11.521	$\gamma_{II} L_I N_V$	0.88433	7	14.020	0.85657	7	14.474										
$M_{II} N_{III}$	4.631 <sup>†</sup>	9	2.677	4.460	9	2.780	$L_I O_I$	0.87074	5	14.2385	0.8452	2	14.670										
$M_{II} N_{IV}$	4.780	4	2.594	4.601	4	2.695	$L_I O_{IV,V}$	0.86400	5	14.3497	0.8350	2	14.847										
$M_{III} N_I$	6.669	9	1.859	6.455	9	1.921	$L_{II} M_{II}$	1.1708	1	10.5892	1.1387	5	10.888										
$M_{III} N_{IV}$	5.540	5	2.238	5.357	5	2.314	$\beta_{17} L_{II} M_{III}$	1.12798	5	10.9915	1.0916	5	11.358										
$\gamma M_I N_V$	5.500	4	2.254	5.319	4	2.331	$L_{II} M_V$	1.0756	2	11.526													
$M_{III} O_I$				4.876	9	2.543	$L_{II} N_{III}$	0.9402	2	13.186	0.90894	7	13.640										
$M_{III} O_{IV,V}$	4.869	9	2.546	4.694	8	2.641	$v L_{II} N_{VI}$	0.90837	5	13.6487	0.87885	7	14.107										
$\zeta_2 M_{IV} N_{II}$	8.065	5	1.5373	7.790	5	1.592	$L_{II} O_{II}$	0.90746	7	13.662	0.8784	1	14.114										
$M_{IV} N_{III}$	7.645	8	1.622	7.371	8	1.682	$L_{II} O_{III}$	0.90638	7	13.679	0.8758	1	14.156										
$\beta M_{IV} N_{VI}$	6.038	1	2.0535	5.828	1	2.1273	$t L_{III} M_{II}$	1.41366	7	8.7702	1.3746	2	9.019										
$\zeta_1 M_V N_{III}$	8.021	4	1.5458	7.738	4	1.6022	$s L_{III} M_{III}$	1.35131	7	9.1749	1.3112	2	9.455										
$\alpha_2 M_V N_{VI}$	6.275	3	1.9758	6.058	3	2.047	$L_{III} N_{II}$	1.09968	7	11.2743	1.0649	2	11.642										
$\alpha_1 M_V N_{VII}$	6.262	1	1.9799	6.047	1	2.0505	$L_{III} N_{III}$	1.09026	7	11.3717	1.0585	1	11.713										
$M_V O_{III}$				5.987	9	2.071	$u L_{III} N_{VI,VII}$	1.04752	5	11.8357													
$N_{IV} N_{VI}$	50.2	1	0.2470	48.1	2	0.258	$u' L_{III} N_{VI}$				1.01769	7	12.1826										
$N_V N_{VI,VII}$	52.8	1	0.2348	50.9	1	0.2436	$u L_{III} N_{VII}$				1.01674	7	12.1940										
<b>79 Gold</b>						<b>80 Mercury</b>																	
$\alpha_2 K L_{II}$	0.185075	2	66.9895	0.179958	3	68.895	$L_{III} O_{II,III}$	1.0450	2	11.865													
$\alpha_1 K L_{III}$	0.180195	2	68.8037	0.175068	3	70.819	$L_{III} O_{II}$				1.01558	7	12.2079										
$\beta_3 K M_{II}$	0.159810	2	77.580	0.155321	3	79.822	$L_{III} O_{III}$				1.01404	7	12.2264										
$\beta_1 K M_{III}$	0.158982	3	77.984	0.154487	3	80.253	$L_{III} P_{II,III}$	1.03876	7	11.9355													
$\beta_2^{II} K N_{II}$	0.15483	2	80.08	0.15040	2	82.43	$M_I N_{III}$	4.300	9	2.883													
$\beta_2^I K N_{III}$	0.154618	9	80.185	0.15020	2	82.54	$M_{II} N_{IV}$	4.432	4	2.797													
$K O_{II,III}$	0.153694	7	80.667	0.14931	2	83.04	$M_{III} N_I$	6.259	9	1.981	6.09	2	2.036										
$K L_I$	0.18672	4	66.40				$M_{III} N_{IV}$	5.186	5	2.391													
$\beta_5^{II} K M_{IV}$	0.158062	7	78.438				$\gamma M_{III} N_V$	5.145	4	2.410	4.984 <sup>†</sup>	2	2.4875										
$\beta_5^I K M_V$	0.157880	5	78.529				$M_{III} O_I$	4.703	9	2.636													
$\beta_5 K M_{IV,V}$				0.15353	2	80.75	$M_{III} O_{IV,V}$	4.522	6	2.742													
$\beta_4 K N_{IV,V}$	0.154224	5	80.391	0.14978	2	82.78	$\zeta_2 M_{IV} N_{II}$	7.523	5	1.648													
$\beta_4 L_I M_{II}$	1.10651	3	11.2047	1.07222	7	11.5630	$M_{IV} N_{III}$	7.101	8	1.746	6.87	2	1.805										
$\beta_3 L_I M_{III}$	1.06785	9	11.6103	1.03358	7	11.9953	$\beta M_{IV} N_{VI}$	5.624	1	2.2046	5.4318 <sup>†</sup>	9	2.2825										
							$\zeta_1 M_V N_{III}$	7.466	4	1.6605													
							$\alpha_2 M_V N_{VI}$	5.854	3	2.118													

TABLE V (Continued)

Designation	Å*	p.e.	keV	Å*	p.e.	keV	Designation	Å*	p.e.	keV	Å*	p.e.	keV					
79 Gold (Cont.)						80 Mercury (Cont.)						81 Thallium (Cont.)						
$\alpha_1 M_V N_{VII}$	5.840	1	2.1229	5.6476 <sup>†</sup>	9	2.1953	$L_{II} N_{III}$	0.87996	5	14.0893	$L_{II} N_{III}$	0.85192	7	14.553				
$M_V O_{III}$	5.767	9	2.150				$L_{II} N_V$				$L_{II} N_V$	0.8382	2	14.791				
$N_{IV} N_{VI}$	46.8	2	0.265	45.2 <sup>†</sup>	3	0.274	$v L_{II} N_{VI}$	0.85048	5	14.5777	$v L_{II} N_{VI}$	0.82327	7	15.060				
$N_V N_{VI, VII}$	49.4	1	0.2510	47.9 <sup>†</sup>	3	0.259	$L_{II} O_{II}$	0.8490	1	14.604	$L_{II} O_{II}$							
81 Thallium						82 Lead						82 Lead (Cont.)						
$\alpha_2 K L_{II}$	0.175036	2	70.8319	0.170294	2	72.8042	$L_{II} O_{III}$				$L_{II} O_{III}$	0.8200	1	15.120				
$\alpha_1 K L_{III}$	0.170136	2	72.8715	0.165376	2	74.9694	$t L_{III} M_{II}$	1.34154	5	9.2417	$t L_{III} M_{II}$	1.30767	7	9.4811				
$\beta_3 K M_{II}$	0.150980	6	82.118	0.146810	4	84.450	$s L_{III} M_{III}$	1.27807	5	9.7007	$s L_{III} M_{III}$	1.24385	7	9.9675				
$\beta_1 K M_{III}$	0.150142	5	82.576	0.145970	6	84.936	$L_{III} N_{II}$				$L_{III} N_{II}$	1.01040	7	12.2705				
$\beta_2^{II} K N_{II}$	0.14614	1	84.836	0.14212	2	87.23	$L_{III} N_{III}$	1.0286	1	12.053	$L_{III} N_{III}$	1.0005	1	12.392				
$\beta_2^I K N_{III}$	0.14595	1	84.946	0.14191	1	87.364	$u L_{III} N_{VI, VII}$	0.9888	1	12.538	$u L_{III} N_{VI, VII}$	0.96133	7	12.8968				
$K O_{II, III}$	0.14509	1	85.451	0.141012	8	87.922	$L_{III} O_{II}$	0.98738	5	12.5566	$L_{III} O_{II}$	0.9586	1	12.934				
$K P$				0.1408	1	88.06	$L_{III} O_{III}$	0.98538	5	12.5820	$L_{III} O_{III}$	0.9578	1	12.945				
$\beta_5 K M_{IV, V}$	0.14917	1	83.114				$L_{III} P_{II, III}$	0.97926	5	12.6607	$L_{III} P_{II, III}$	0.95118	7	13.0344				
$\beta_5^{II} K M_{IV}$				0.14512	2	85.43	$M_I N_{III}$	4.013	9	3.089	$M_I N_{III}$	3.872	9	3.202				
$\beta_5^I K M_V$				0.14495	3	85.53	$M_{II} N_I$				$M_{II} N_I$	4.655	8	2.664				
$\beta_4 K N_{IV, V}$	0.14553	2	85.19	0.14155	3	87.59	$M_{II} N_{IV}$	4.116	4	3.013	$M_{II} N_{IV}$	3.968	5	3.124				
$\beta_4 L_I M_{II}$	1.03918	3	11.9306	1.0075	1	12.306	$M_{III} N_I$	5.884	8	2.107	$M_{III} N_I$	5.704	8	2.174				
$\beta_3 L_I M_{III}$	1.00062	3	12.3904	0.96911	7	12.7933	$M_{III} N_{IV}$	4.865	5	2.548	$M_{III} N_{IV}$	4.715	3	2.630				
$\gamma_2 L_I N_{II}$	0.84773	5	14.6251	0.8210	2	15.101	$\gamma M_{III} N_V$	4.823	4	2.571	$\gamma M_{III} N_V$	4.674	1	2.6527				
$\gamma_3 L_I N_{III}$	0.84130	4	14.7368	0.8147	1	15.218	$M_{III} O_I$				$M_{III} O_I$	4.244	9	2.921				
$\gamma_4 L_I O_{II}$	0.81308	5	15.2482	0.78706	7	15.752	$M_{II} O_{IV, V}$	4.216	6	2.941	$M_{II} O_{IV, V}$	4.069	6	3.047				
$\gamma_4 L_I O_{III}$	0.81184	5	15.2716	0.7858	1	15.777	$\zeta_2 M_{IV} N_{II}$	7.032	5	1.763	$\zeta_2 M_{IV} N_{II}$	6.802	5	1.823				
$\eta L_{II} M_I$	1.12769	3	10.9943	1.09241	7	11.3493	$M_{IV} N_{III}$				$M_{IV} N_{III}$	6.384	7	1.942				
$L_{II} M_{IV}$	1.01513	4	12.2133	0.98291	3	12.6137	$M_{IV} N_{VI}$	5.249	1	2.3621	$M_{IV} N_{VI}$	5.076	1	2.4427				
$\gamma_5 L_{II} N_I$	0.89500	4	13.8526	0.86655	5	14.3075	$M_{IV} O_{II}$	5.196	9	2.386	$M_{IV} O_{II}$	5.004	9	2.477				
$\gamma_1 L_{II} N_{IV}$	0.86752	3	14.2915	0.83973	3	14.7644	$\zeta_1 M_V N_{III}$	6.974	4	1.778	$\zeta_1 M_V N_{III}$	6.740	3	1.8395				
$\gamma_3 L_{II} O_I$	0.8513	2	14.564	0.82365	5	15.0527	$\alpha_2 M_V N_{VI}$	5.472	2	2.2656	$\alpha_2 M_V N_{VI}$	5.299	2	2.3397				
$\gamma_6 L_{II} O_{IV}$	0.8442	2	14.685	0.81683	5	15.1783	$\alpha_1 M_V N_{VII}$	5.460	1	2.2706	$\alpha_1 M_V N_{VII}$	5.286	1	2.3455				
$L_{II} P_I$				0.81583	5	15.1969	$M_V O_{III}$				$M_V O_{III}$	5.168	9	2.399				
$i L_{III} M_I$	1.38477	3	8.9532	1.34990	7	9.1845	$N_{IV} N_{VI}$				$N_{IV} N_{VI}$	42.3	2	0.293				
$\alpha_2 L_{III} M_{IV}$	1.21875	3	10.1728	1.18648	5	10.4495	$N_V N_{VI, VII}$	46.5	2	0.267	$N_V N_{VI, VII}$	45.0	1	0.2756				
$\alpha_1 L_{III} M_V$	1.20739	4	10.2685	1.17501	2	10.5515	$N_{VI} O_{IV}$	115.3	2	0.1075	$N_{VI} O_{IV}$	102.4	1	0.1211				
$\beta_6 L_{III} N_I$	1.04963	5	11.8118	1.0210	1	12.143	$N_{VI} O_V$	113.0	1	0.10968	$N_{VI} O_V$	100.2	2	0.1237				
$\beta_{15} L_{III} N_{IV}$	1.01201	3	12.2510	0.98389	7	12.6011	$N_{VII} O_V$	117.7	1	0.10530	$N_{VII} O_V$	104.3	1	0.1189				
$\beta_2 L_{III} N_V$	1.01031	3	12.2715	0.98221	7	12.6226	83 Bismuth						84 Polonium					
$\beta_7 L_{III} O_I$	0.99017	5	12.5212	0.9620	1	12.888	$\alpha_2 K L_{II}$	0.165717	2	74.8148	$\alpha_2 K L_{II}$	0.16130 <sup>†</sup>	1	76.862				
$\beta_5 L_{III} O_{IV, V}$	0.98058	3	12.6436	0.9526	1	13.015	$\alpha_1 K L_{III}$	0.160789	2	77.1079	$\alpha_1 K L_{III}$	0.15636 <sup>†</sup>	1	79.290				
$L_I M_I$	1.0644	2	11.648	1.0323	2	12.010	$\beta_3 K M_{II}$	0.142779	7	86.834	$\beta_3 K M_{II}$	0.13892 <sup>†</sup>	2	89.25				
$\beta_{10} L_I M_{IV}$	0.96389	7	12.8626	0.9339	2	13.275	$\beta_1 K M_{III}$	0.141948	3	87.343	$\beta_1 K M_{III}$	0.13807 <sup>†</sup>	2	89.80				
$\beta_9 L_I M_V$	0.95675	7	12.9585	0.9268	1	13.377	$\beta_2^{II} K N_{II}$	0.13817	1	89.733	$\beta_2^{II} K N_{II}$	0.13438 <sup>†</sup>	2	92.26				
$L_I N_I$	0.8549	1	14.503	0.82859	7	14.963	$\beta_2^I K N_{III}$	0.13797	1	89.864	$\beta_2^I K N_{III}$	0.13418 <sup>†</sup>	2	92.40				
$L_I N_{IV}$	0.83001	7	14.937	0.80364	7	15.427	$K O_{II, III}$	0.13709	1	90.435	$K O_{II, III}$							
$\gamma_{11} L_I N_V$	0.82879	5	14.9593	0.80233	9	15.453	$\beta_5 K M_{IV, V}$	0.14111	1	87.860	$\beta_5 K M_{IV, V}$	0.14111	1	87.860				
$L_I N_{VI, VII}$				0.7884	1	15.725	$\beta_4 K N_{IV, V}$	0.13759	2	90.11	$\beta_4 K N_{IV, V}$	0.13759	2	90.11				
$L_I O_I$	0.8158	1	15.198	0.7897	1	15.699	$\beta_4 L_I M_{II}$	0.97690	4	12.6912	$\beta_4 L_I M_{II}$	0.9475	3	13.086				
$L_I O_{IV, V}$	0.80861	5	15.3327	0.78257	7	15.843	$\beta_3 L_I M_{III}$	0.93855	3	13.2098	$\beta_3 L_I M_{III}$	0.9091	3	13.638				
$L_{II} M_{II}$	1.0997	1	11.274	1.0644	2	11.648	$\gamma_2 L_I N_{II}$	0.79565	3	15.5824	$\gamma_2 L_I N_{II}$	0.772	1	16.07				
$\beta_{17} L_{II} M_{III}$	1.05609	7	11.7397	1.0223	1	12.127	$\gamma_3 L_I N_{III}$	0.78917	5	15.7102	$\gamma_3 L_I N_{III}$							
$L_{II} M_V$	1.00722	5	12.3093	0.9747	1	12.720	$\gamma_4 L_I O_{II}$	0.76198	3	16.2709	$\gamma_4 L_I O_{II}$							
$L_{II} N_{II}$	0.882	2	14.057	0.8585	3	14.442	$\gamma_4 L_I O_{III}$	0.76087	3	16.2947	$\gamma_4 L_I O_{III}$							
							$\gamma_{13} L_I P_{II, III}$	0.75690	3	16.3802	$\gamma_{13} L_I P_{II, III}$							
							$\eta L_{II} M_I$	1.05856	3	11.7122	$\eta L_{II} M_I$							
							$\beta_1 L_{II} M_{IV}$	0.951978	9	13.0235	$\beta_1 L_{II} M_{IV}$	0.9220	2	13.447				
							$\gamma_5 L_{II} N_I$	0.83923	5	14.7732	$\gamma_5 L_{II} N_I$							





TABLE V (Continued)

Designation	Å*	p.e.	keV	Å*	p.e.	keV	Designation	Å*	p.e.	keV	Å*	p.e.	keV		
<b>91 Protactinium (Cont.)</b>				<b>92 Uranium (Cont.)</b>				<b>91 Protactinium (Cont.)</b>				<b>92 Uranium (Cont.)</b>			
$\gamma_2 L_{II}N_{II}$	0.6239	1	19.872	0.605237	9	20.4847	$M_{IV}O_{II}$	3.691	2	3.359	3.576	1	3.4666		
$\gamma_3 L_{II}N_{III}$	0.6169	1	20.098	0.598574	9	20.7127	$\xi_1 M_{V}N_{III}$	5.092	2	2.4350	4.946	2	2.507		
$\gamma'_4 L_{II}O_{II}$				0.576700	9	21.4984	$\alpha_2 M_{V}N_{VI}$	4.035	3	3.072	3.924	1	3.1595		
$\gamma_4 L_{II}O_{II,III}$	0.5937	1	20.882	0.57499	9	21.562	$\alpha_1 M_{V}N_{VII}$	4.022	1	3.0823	3.910	1	3.1708		
$\gamma_{13}$				0.5706	1	21.729	$N_{I}O_{III}$				10.09	7	1.229		
$\eta L_{II}M_{I}$	0.8295	1	14.946	0.80509	2	15.3997	$N_{I}P_{II}$				8.81	7	1.41		
$\beta_1 L_{II}M_{IV}$	0.74232	5	16.702	0.719984	8	17.2200	$N_{I}P_{III}$				8.76	7	1.42		
$\gamma_5 L_{II}N_{I}$	0.6550	1	18.930	0.63557	2	19.5072	$N_{II}P_{I}$				10.40	7	1.192		
$\gamma_1 L_{II}N_{IV}$	0.63358 <sup>†</sup>	9	19.568	0.614770	9	20.1671	$N_{III}O_{V}$				12.90	9	0.961		
$\gamma_8 L_{II}O_{I}$				0.60125	5	20.621	$N_{IV}N_{VI}$				31.8	1	0.390		
$\gamma_6 L_{II}O_{IV}$	0.6133	1	20.216	0.594845	9	20.8426	$N_{V}N_{VI,VII}$				34.8	1	0.357		
$L_{II}P_{IV}$				0.59203	5	20.942	$N_{IV}O_{IV}$				43.3	2	0.286		
$l L_{III}M_{I}$	1.0908	1	11.366	1.06712	2	11.6183	$N_{VI}O_{V}$				42.1	2	0.295		
$\alpha_2 L_{III}M_{IV}$	0.94482 <sup>†</sup>	5	13.1222	0.922558	9	13.4388	$N_{I}P_{IV,V}$				8.60	7	1.44		
$\alpha_1 L_{III}M_{V}$	0.93284	5	13.2907	0.910639	9	13.6147									
$\beta_6 L_{III}N_{I}$	0.8079	1	15.347	0.78838	2	15.7260	<b>93 Neptunium</b>				<b>94 Plutonium</b>				
$\beta_{15} L_{III}N_{IV}$				0.756642	9	16.3857	$\beta_4 L_{II}M_{II}$	0.72671	2	17.0607	0.70620	2	17.5560		
$\beta_2 L_{III}N_{V}$	0.7737	1	16.024	0.754681	9	16.4283	$\beta_3 L_{II}M_{III}$	0.68920 <sup>†</sup>	9	17.989	0.66871	2	18.5405		
$\beta_7 L_{III}O_{I}$	0.7546	2	16.431	0.73602	6	16.845	$\gamma_2 L_{II}N_{II}$	0.5873	5	21.11	0.57068	2	21.7251		
$\beta_5 L_{III}O_{IV,V}$	0.7452	2	16.636	0.726305	9	17.0701	$\gamma_3 L_{II}N_{III}$	0.5810	5	21.34	0.564001	9	21.9824		
$L_{III}P_{I}$				0.72521	5	17.096	$\gamma'_4 L_{II}O_{II}$				0.5432	1	22.823		
$L_{III}P_{IV,V}$				0.72240	5	17.162	$\gamma_4 L_{II}O_{II,III}$	0.5585	5	22.20	0.5416	1	22.891		
$\beta_{10} L_{II}M_{V}$	0.7088	2	17.492	0.68760	5	18.031	$\eta L_{II}M_{I}$	0.7809	2	15.876	0.7591	1	16.333		
$\beta_9 L_{II}M_{V}$	0.7018	1	17.667	0.681014	8	18.2054	$\beta_1 L_{II}M_{IV}$	0.698478	9	17.7502	0.67772	2	18.2937		
$L_{II}N_{IV}$				0.59096	5	20.979	$\gamma_5 L_{II}N_{I}$	0.616	1	20.12	0.5988	1	20.704		
$\gamma_{11} L_{II}N_{V}$				0.58986	5	21.019	$\gamma_1 L_{II}N_{IV}$	0.596498	9	20.7848	0.578882	9	21.4173		
$L_{II}O_{IV,V}$				0.5725	1	21.657	$\gamma_8$				0.5658	1	21.914		
$\beta_{17} L_{II}M_{III}$				0.74503	5	16.641	$\gamma_6 L_{II}O_{IV}$	0.57699	5	21.488	0.55973	2	22.1502		
$L_{II}N_{III}$				0.6228	1	19.907	$l L_{III}M_{I}$	1.0428	6	11.890	1.0226	1	12.124		
$v L_{II}N_{VI}$				0.6031	1	20.556	$\alpha_2 L_{III}M_{IV}$	0.901045	9	13.7597	0.88028	2	14.0842		
$L_{III}O_{III}$				0.59728	5	20.758	$\alpha_1 L_{III}M_{V}$	0.889128	9	13.9441	0.86830	2	14.2786		
$L_{II}P_{II,III}$				0.5930	2	20.906	$\beta_6 L_{III}N_{I}$	0.769	1	16.13	0.75148	2	16.4983		
$l L_{III}M_{II}$				1.0347	1	11.982	$\beta_{15} L_{III}N_{IV}$				0.7205	1	17.208		
$s L_{III}M_{III}$				0.9636	1	12.866	$\beta_2 L_{III}N_{V}$	0.736230	9	16.8400	0.71851	2	17.2553		
$L_{III}N_{II}$				0.78017	9	15.892	$\beta_7 L_{III}O_{I}$				0.7003	1	17.705		
$L_{III}N_{III}$				0.7691	1	16.120	$\beta_5 L_{III}O_{IV,V}$	0.70814	2	17.5081	0.69068	2	17.9506		
$u L_{III}N_{VI,VII}$				0.738603	9	16.7859	$\beta_{10} L_{II}M_{IV}$				0.6482	1	19.126		
$L_{III}O_{II}$				0.7333	1	16.907	$\beta_9 L_{II}M_{V}$				0.6416	1	19.323		
$L_{III}O_{III}$				0.7309	1	16.962	$u L_{III}N_{VI,VII}$				0.7031	1	17.635		
$L_{III}P_{II,III}$				0.72426	5	17.118	<b>95 Americium</b>								
$M_{I}N_{II}$				2.92	2	4.25	$\beta_4 L_{II}M_{II}$	0.68639	2	18.0627					
$M_{I}N_{III}$				2.753	8	4.50	$\beta_3 L_{II}M_{III}$	0.64891	2	19.1059					
$M_{I}O_{III}$				2.304	7	5.38	$\gamma_2 L_{II}N_{II}$	0.5544	2	22.361					
$M_{I}P_{III}$				2.253	6	5.50	$\beta_1 L_{II}M_{IV}$	0.657655	9	18.8520					
$M_{II}N_{I}$	3.441	5	3.603	3.329	4	3.724	$\gamma_1 L_{II}N_{IV}$	0.561886	9	22.0652					
$M_{II}N_{IV}$	2.910	2	4.260	2.817	2	4.401	$\gamma_6 L_{II}O_{IV}$	0.54311	2	22.8282					
$M_{II}O_{IV}$	2.527	4	4.906	2.443	4	5.075	$l L_{III}M_{I}$	1.0012	6	12.384					
$M_{III}N_{I}$	4.450	4	2.786	4.330	2	2.863	$\alpha_2 L_{III}M_{IV}$	0.860266	9	14.4119					
$M_{III}N_{IV}$	3.614	2	3.430	3.521	2	3.521	$\alpha_1 L_{III}M_{V}$	0.848187	9	14.6172					
$\gamma M_{III}N_{V}$	3.577	1	3.4657	3.479	1	3.563	$\beta_6 L_{III}N_{I}$	0.73418	2	16.8870					
$M_{III}O_{I}$	3.245	9	3.82	3.115	7	3.980	$\beta_{15} L_{III}N_{IV}$	0.70341	2	17.6258					
$M_{III}O_{IV,V}$	3.038	2	4.081	2.948	2	4.205	$\beta_2 L_{III}N_{V}$	0.701390	9	17.6765					
$\xi_2 M_{IV}N_{II}$	5.193	2	2.3876	5.050	2	2.4548	$\beta_5 L_{III}O_{IV,V}$	0.67383	2	18.3996					
$M_{IV}N_{III}$				4.625	5	2.681									
$\beta M_{IV}N_{VI}$	3.827	1	3.2397	3.716	1	3.3367									

TABLE VI. Wavelengths in numerical order of the emission lines and absorption edges.

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV		
0.10723	1 92 U	<i>K</i>	Abs. Edge	115.62	0.1408	1 82 Pb	<i>KP</i>	88.06	
0.10744	1 92 U		<i>KO<sub>II,III</sub></i>	115.39	0.140880	5 82 Pb	<i>K</i>	Abs. Edge	88.005
0.10780	2 92 U	<i>Kβ<sub>4</sub></i>	<i>KN<sub>IV,V</sub></i>	115.01	0.141012	8 82 Pb		<i>KO<sub>II,III</sub></i>	87.922
0.10818	1 92 U	<i>Kβ<sub>2</sub><sup>I</sup></i>	<i>KN<sub>III</sub></i>	114.60	0.14111	1 83 Bi	<i>Kβ<sub>5</sub></i>	<i>KM<sub>IV,V</sub></i>	87.860
0.10837	1 92 U	<i>Kβ<sub>2</sub><sup>II</sup></i>	<i>KN<sub>II</sub></i>	114.40	0.14141	2 89 Ac	<i>Kα<sub>2</sub></i>	<i>KL<sub>II</sub></i>	87.67
0.11069	1 92 U	<i>Kβ<sub>5</sub></i>	<i>KM<sub>IV,V</sub></i>	112.01	0.14155	3 82 Pb	<i>Kβ<sub>4</sub></i>	<i>KN<sub>IV,V</sub></i>	87.59
0.11107	2 91 Pa	<i>Kβ<sub>2</sub><sup>I</sup></i>	<i>KN<sub>III</sub></i>	111.62	0.14191	1 82 Pb	<i>Kβ<sub>2</sub><sup>I</sup></i>	<i>KN<sub>III</sub></i>	87.364
0.11129	2 91 Pa	<i>Kβ<sub>2</sub><sup>II</sup></i>	<i>KN<sub>II</sub></i>	111.40	0.141948	3 83 Bi	<i>Kβ<sub>1</sub></i>	<i>KM<sub>III</sub></i>	87.343
0.111394	5 92 U	<i>Kβ<sub>1</sub></i>	<i>KM<sub>III</sub></i>	111.300	0.14212	2 82 Pb	<i>Kβ<sub>2</sub><sup>II</sup></i>	<i>KN<sub>II</sub></i>	87.23
0.112296	4 92 U	<i>Kβ<sub>3</sub></i>	<i>KM<sub>II</sub></i>	110.406	0.142779	7 83 Bi	<i>Kβ<sub>3</sub></i>	<i>KM<sub>II</sub></i>	86.834
0.11307	1 90 Th	<i>K</i>	Abs. Edge	109.646	0.14399	3 87 Fr	<i>Kα<sub>1</sub></i>	<i>KL<sub>III</sub></i>	86.10
0.11322	1 90 Th		<i>KO<sub>II,III</sub></i>	109.500	0.14495	1 81 Tl	<i>K</i>	Abs. Edge	85.533
0.11366	2 90 Th	<i>Kβ<sub>4</sub></i>	<i>KN<sub>IV,V</sub></i>	109.08	0.14495	3 82 Pb	<i>Kβ<sub>5</sub><sup>I</sup></i>	<i>KM<sub>V</sub></i>	85.53
0.114040	9 90 Th	<i>Kβ<sub>2</sub><sup>I</sup></i>	<i>KN<sub>III</sub></i>	108.717	0.14509	1 81 Tl		<i>KO<sub>II,III</sub></i>	85.451
0.11426	1 90 Th	<i>Kβ<sub>2</sub><sup>II</sup></i>	<i>KN<sub>II</sub></i>	108.511	0.14512	2 82 Pb	<i>Kβ<sub>5</sub><sup>II</sup></i>	<i>KM<sub>IV</sub></i>	85.43
0.114345	8 91 Pa	<i>Kβ<sub>1</sub></i>	<i>KM<sub>III</sub></i>	108.427	0.14512	2 88 Ra	<i>Kα<sub>2</sub></i>	<i>KL<sub>II</sub></i>	85.43
0.11523	2 91 Pa	<i>Kβ<sub>3</sub></i>	<i>KM<sub>II</sub></i>	107.60	0.14553	2 81 Tl	<i>Kβ<sub>4</sub></i>	<i>KN<sub>IV,V</sub></i>	85.19
0.116667	9 90 Th	<i>Kβ<sub>5</sub></i>	<i>KM<sub>IV,V</sub></i>	106.269	0.14595	1 81 Tl	<i>Kβ<sub>2</sub><sup>I</sup></i>	<i>KN<sub>III</sub></i>	84.946
0.11711	2 89 Ac	<i>Kβ<sub>2</sub><sup>I</sup></i>	<i>KN<sub>III</sub></i>	105.86	0.145970	6 82 Pb	<i>Kβ<sub>1</sub></i>	<i>KM<sub>III</sub></i>	84.936
0.11732	2 89 Ac	<i>Kβ<sub>2</sub><sup>II</sup></i>	<i>KN<sub>II</sub></i>	105.67	0.14614	1 81 Tl	<i>Kβ<sub>2</sub><sup>II</sup></i>	<i>KN<sub>II</sub></i>	84.836
0.117396	9 90 Th	<i>Kβ<sub>1</sub></i>	<i>KM<sub>III</sub></i>	105.609	0.146810	4 82 Pb	<i>Kβ<sub>3</sub></i>	<i>KM<sub>II</sub></i>	84.450
0.118268	3 90 Th	<i>Kβ<sub>3</sub></i>	<i>KM<sub>II</sub></i>	104.831	0.14798	3 86 Rn	<i>Kα<sub>1</sub></i>	<i>KL<sub>III</sub></i>	83.78
0.12029	3 88 Ra	<i>Kβ<sub>2</sub><sup>I</sup></i>	<i>KN<sub>III</sub></i>	103.07	0.14896	3 87 Fr	<i>Kα<sub>2</sub></i>	<i>KL<sub>II</sub></i>	83.23
0.12050	3 88 Ra	<i>Kβ<sub>2</sub><sup>II</sup></i>	<i>KN<sub>II</sub></i>	102.89	0.14917	1 81 Tl	<i>Kβ<sub>5</sub></i>	<i>KM<sub>IV,V</sub></i>	83.114
0.12055	2 89 Ac	<i>Kβ<sub>1</sub></i>	<i>KM<sub>III</sub></i>	102.85	0.14918	1 80 Hg	<i>K</i>	Abs. Edge	83.109
0.12143	2 89 Ac	<i>Kβ<sub>3</sub></i>	<i>KM<sub>II</sub></i>	102.10	0.14931	2 80 Hg		<i>KO<sub>II,III</sub></i>	83.04
0.12358	5 87 Fr	<i>Kβ<sub>2</sub><sup>I</sup></i>	<i>KN<sub>III</sub></i>	100.33	0.14978	2 80 Hg	<i>Kβ<sub>4</sub></i>	<i>KN<sub>IV,V</sub></i>	82.78
0.12379	5 87 Fr	<i>Kβ<sub>2</sub><sup>II</sup></i>	<i>KN<sub>II</sub></i>	100.16	0.150142	5 81 Tl	<i>Kβ<sub>1</sub></i>	<i>KM<sub>III</sub></i>	82.576
0.12382	3 88 Ra	<i>Kβ<sub>1</sub></i>	<i>KM<sub>III</sub></i>	100.13	0.15020	2 80 Hg	<i>Kβ<sub>2</sub><sup>I</sup></i>	<i>KN<sub>III</sub></i>	82.54
0.12469	3 88 Ra	<i>Kβ<sub>3</sub></i>	<i>KM<sub>II</sub></i>	99.43	0.15040	2 80 Hg	<i>Kβ<sub>2</sub><sup>II</sup></i>	<i>KN<sub>II</sub></i>	82.43
0.125947	3 92 U	<i>Kα<sub>1</sub></i>	<i>KL<sub>III</sub></i>	98.439	0.150980	6 81 Tl	<i>KL<sub>3</sub></i>	<i>KM<sub>II</sub></i>	82.118
0.12698	5 86 Rn	<i>Kβ<sub>2</sub><sup>I</sup></i>	<i>KN<sub>III</sub></i>	97.64	0.15210	2 85 At	<i>Kα<sub>1</sub></i>	<i>KL<sub>III</sub></i>	81.52
0.12719	5 86 Rn	<i>Kβ<sub>2</sub><sup>II</sup></i>	<i>KN<sub>II</sub></i>	97.47	0.15294	3 86 Rn	<i>Kα<sub>2</sub></i>	<i>KL<sub>II</sub></i>	81.07
0.12719	5 87 Fr	<i>Kβ<sub>1</sub></i>	<i>KM<sub>III</sub></i>	97.47	0.15353	2 80 Hg	<i>Kβ<sub>5</sub></i>	<i>KM<sub>IV,V</sub></i>	80.75
0.12807	5 87 Fr	<i>Kβ<sub>3</sub></i>	<i>KM<sub>II</sub></i>	96.81	0.153593	5 79 Au	<i>K</i>	Abs. Edge	80.720
0.129325	3 91 Pa	<i>Kα<sub>1</sub></i>	<i>KL<sub>III</sub></i>	95.868	0.153694	7 79 Au		<i>KO<sub>II,III</sub></i>	80.667
0.13052	4 85 At	<i>Kβ<sub>2</sub><sup>I</sup></i>	<i>KN<sub>III</sub></i>	94.99	0.154224	5 79 Au	<i>Kβ<sub>4</sub></i>	<i>KN<sub>IV,V</sub></i>	80.391
0.13069	5 86 Rn	<i>Kβ<sub>1</sub></i>	<i>KM<sub>III</sub></i>	94.87	0.154487	3 80 Hg	<i>Kβ<sub>1</sub></i>	<i>KM<sub>III</sub></i>	80.253
0.13072	4 85 At	<i>Kβ<sub>2</sub><sup>II</sup></i>	<i>KN<sub>II</sub></i>	94.84	0.154618	9 79 Au	<i>Kβ<sub>2</sub><sup>I</sup></i>	<i>KN<sub>III</sub></i>	80.185
0.130968	4 92 U	<i>Kα<sub>2</sub></i>	<i>KL<sub>II</sub></i>	94.665	0.15483	2 79 Au	<i>Kβ<sub>2</sub><sup>II</sup></i>	<i>KN<sub>II</sub></i>	80.08
0.13155	5 86 Rn	<i>Kβ<sub>3</sub></i>	<i>KM<sub>II</sub></i>	94.24	0.155321	3 80 Hg	<i>Kβ<sub>3</sub></i>	<i>KM<sub>II</sub></i>	79.822
0.132813	2 90 Th	<i>Kα<sub>1</sub></i>	<i>KL<sub>III</sub></i>	93.350	0.15636	1 84 Po	<i>Kα<sub>1</sub></i>	<i>KL<sub>III</sub></i>	79.290
0.13418	2 84 Po	<i>Kβ<sub>2</sub><sup>I</sup></i>	<i>KN<sub>III</sub></i>	92.40	0.15705	2 85 At	<i>Kα<sub>2</sub></i>	<i>KL<sub>II</sub></i>	78.95
0.13432	4 85 At	<i>Kβ<sub>1</sub></i>	<i>KM<sub>III</sub></i>	92.30	0.157880	5 79 Au	<i>Kβ<sub>5</sub><sup>I</sup></i>	<i>KM<sub>V</sub></i>	78.529
0.134343	9 91 Pa	<i>Kα<sub>2</sub></i>	<i>KL<sub>II</sub></i>	92.287	0.158062	7 79 Au	<i>Kβ<sub>5</sub><sup>II</sup></i>	<i>KM<sub>IV</sub></i>	78.438
0.13438	2 84 Po	<i>Kβ<sub>2</sub><sup>II</sup></i>	<i>KN<sub>II</sub></i>	92.26	0.15818	1 78 Pt	<i>K</i>	Abs. Edge	78.381
0.13517	4 85 At	<i>Kβ<sub>3</sub></i>	<i>KM<sub>II</sub></i>	91.72	0.15826	1 78 Pt		<i>KO<sub>II,III</sub></i>	78.341
0.136417	8 89 Ac	<i>Kα<sub>1</sub></i>	<i>KL<sub>III</sub></i>	90.884	0.15881	2 78 Pt	<i>Kβ<sub>4</sub></i>	<i>KN<sub>IV,V</sub></i>	78.069
0.13694	1 83 Bi	<i>K</i>	Abs. Edge	90.534	0.158982	3 79 Au	<i>Kβ<sub>1</sub></i>	<i>KM<sub>III</sub></i>	77.984
0.13709	1 83 Bi		<i>KO<sub>II,III</sub></i>	90.435	0.15920	1 78 Pt	<i>Kβ<sub>2</sub><sup>I</sup></i>	<i>KN<sub>III</sub></i>	77.878
0.13759	2 83 Bi	<i>Kβ<sub>4</sub></i>	<i>KN<sub>IV,V</sub></i>	90.11	0.15939	1 78 Pt	<i>Kβ<sub>2</sub><sup>II</sup></i>	<i>KN<sub>II</sub></i>	77.785
0.137829	2 90 Th	<i>Kα<sub>2</sub></i>	<i>KL<sub>II</sub></i>	89.953	0.159810	2 79 Au	<i>Kβ<sub>3</sub></i>	<i>KM<sub>II</sub></i>	77.580
0.13797	1 83 Bi	<i>Kβ<sub>2</sub><sup>I</sup></i>	<i>KN<sub>III</sub></i>	89.864	0.160789	2 83 Bi	<i>Kα<sub>1</sub></i>	<i>KL<sub>III</sub></i>	77.1079
0.13807	2 84 Po	<i>Kβ<sub>1</sub></i>	<i>KM<sub>III</sub></i>	89.80	0.16130	1 84 Po	<i>Kα<sub>2</sub></i>	<i>KL<sub>II</sub></i>	76.862
0.13817	1 83 Bi	<i>Kβ<sub>2</sub><sup>II</sup></i>	<i>KN<sub>II</sub></i>	89.733	0.16255	3 78 Pt	<i>Kβ<sub>5</sub><sup>I</sup></i>	<i>KM<sub>V</sub></i>	76.27
0.13892	2 84 Po	<i>Kβ<sub>3</sub></i>	<i>KM<sub>II</sub></i>	89.25	0.16271	2 78 Pt	<i>Kβ<sub>5</sub><sup>II</sup></i>	<i>KM<sub>IV</sub></i>	76.199
0.14014	2 88 Ra	<i>Kα<sub>1</sub></i>	<i>KL<sub>III</sub></i>	88.47	0.16292	1 77 Ir	<i>K</i>	Abs. Edge	76.101

TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV
0.163019	5 77 Ir	$KO_{II,III}$	76.053	0.190381	4 78 Pt	$K\alpha_2$	65.122
0.16352	2 77 Ir	$K\beta_4$	75.821	0.1908	2 72 Hf	$K\beta_2$	64.98
0.163675	3 78 Pt	$K\beta_1$	75.748	0.190890	2 73 Ta	$K\beta_3$	64.9488
0.163956	7 77 Ir	$K\beta_2^I$	75.619	0.191047	2 77 Ir	$K\alpha_1$	64.8956
0.16415	1 77 Ir	$K\beta_2^{II}$	75.529	0.19585	5 71 Lu	$K$	63.31
0.164501	3 78 Pt	$K\beta_3$	75.368	0.19589	2 71 Lu	$KO_{II,III}$	63.293
0.165376	2 82 Pb	$K\alpha_1$	74.9694	0.195904	2 77 Ir	$K\alpha_2$	63.2867
0.165717	2 83 Bi	$K\alpha_2$	74.8148	0.19607	3 72 Hf	$K\beta_1$	63.234
0.167373	9 77 Ir	$K\beta_5^I$	74.075	0.196794	2 76 Os	$K\alpha_1$	63.0005
0.16759	2 77 Ir	$K\beta_5^{II}$	73.980	0.19686	4 72 Hf	$K\beta_3$	62.98
0.16787	1 76 Os	$K$	73.856	0.1969	2 71 Lu	$K\beta_2$	62.97
0.16798	1 76 Os	$KO_{II,III}$	73.808	0.20084	2 71 Lu	$K\beta_5$	61.732
0.16842	2 76 Os	$K\beta_4$	73.615	0.201639	2 76 Os	$K\alpha_2$	61.4867
0.168542	2 77 Ir	$K\beta_1$	73.5608	0.20224	5 70 Yb	$K$	61.30
0.168906	6 76 Os	$K\beta_2^I$	73.402	0.20226	2 70 Yb	$KO_{II,III}$	61.298
0.16910	1 76 Os	$K\beta_2^{II}$	73.318	0.20231	3 71 Lu	$K\beta_1$	61.283
0.169367	2 77 Ir	$K\beta_3$	73.2027	0.202781	2 75 Re	$K\alpha_1$	61.1403
0.170136	2 81 Tl	$K\alpha_1$	72.8715	0.20309	4 71 Lu	$K\beta_3$	61.05
0.170294	2 82 Pb	$K\alpha_2$	72.8042	0.2033	2 70 Yb	$K\beta_2$	60.89
0.17245	1 76 Os	$K\beta_5^I$	71.895	0.20739	2 70 Yb	$K\beta_5$	59.782
0.17262	1 76 Os	$K\beta_5^{II}$	71.824	0.207611	1 75 Re	$K\alpha_2$	59.7179
0.17302	1 75 Re	$K$	71.658	0.20880	5 69 Tm	$K$	59.38
0.17308	1 75 Re	$KO_{II,III}$	71.633	0.20884	8 70 Yb	$K\beta_1$	59.37
0.173611	3 76 Os	$K\beta_1$	71.413	0.20891	2 69 Tm	$KO_{II,III}$	59.346
0.17362	2 75 Re	$K\beta_4$	71.410	0.2090100	Std. 74 W	$K\alpha_1$	59.31824
0.174054	6 75 Re	$K\beta_2^I$	71.232	0.2096	1 70 Yb	$K\beta_3$	59.14
0.17425	1 75 Re	$K\beta_2^{II}$	71.151	0.2098	2 69 Tm	$K\beta_2$	59.09
0.174431	3 76 Os	$K\beta_3$	71.077	0.213828	2 74 W	$K\alpha_2$	57.9817
0.175036	2 81 Tl	$K\alpha_2$	70.8319	0.21404	2 69 Tm	$K\beta_5$	57.923
0.175068	3 80 Hg	$K\alpha_1$	70.819	0.215497	4 73 Ta	$K\alpha_1$	57.532
0.17766	1 75 Re	$K\beta_5^I$	69.786	0.21556	2 69 Tm	$K\beta_1$	57.517
0.17783	1 75 Re	$K\beta_5^{II}$	69.719	0.21567	1 68 Er	$K$	57.487
0.17837	1 74 W	$K$	69.508	0.21581	3 68 Er	$KO_{II,III}$	57.450
0.178444	5 74 W	$KO_{II,III}$	69.479	0.21592	4 74 W	$KL_I$	57.42
0.178880	3 75 Re	$K\beta_1$	69.310	0.21636	2 69 Tm	$K\beta_3$	57.304
0.17892	2 74 W	$K\beta_4$	69.294	0.2167	2 68 Er	$K\beta_2$	57.21
0.179421	7 74 W	$K\beta_2^I$	69.101	0.220305	8 73 Ta	$K\alpha_2$	56.277
0.17960	1 74 W	$K\beta_2^{II}$	69.031	0.22124	3 68 Er	$K\beta_5$	56.040
0.179697	3 75 Re	$K\beta_3$	68.994	0.222227	3 72 Hf	$K\alpha_1$	55.7902
0.179958	3 80 Hg	$K\alpha_2$	68.895	0.22266	2 68 Er	$K\beta_1$	55.681
0.180195	2 79 Au	$K\alpha_1$	68.8037	0.22291	1 67 Ho	$K$	55.619
0.183092	7 74 W	$K\beta_5^I$	67.715	0.22305	3 67 Ho	$KO_{II,III}$	55.584
0.183264	5 74 W	$K\beta_5^{II}$	67.652	0.22341	2 68 Er	$K\beta_3$	55.494
0.18394	1 73 Ta	$K$	67.403	0.2241	2 67 Ho	$K\beta_2$	55.32
0.184031	7 73 Ta	$KO_{II,III}$	67.370	0.227024	3 72 Hf	$K\alpha_2$	54.6114
0.184374	2 74 W	$K\beta_1$	67.2443	0.22855	3 67 Ho	$K\beta_5$	54.246
0.18451	1 73 Ta	$K\beta_4$	67.194	0.229298	2 71 Lu	$K\alpha_1$	54.0698
0.185011	8 73 Ta	$K\beta_2^I$	67.013	0.23012	2 67 Ho	$K\beta_1$	53.877
0.185075	2 79 Au	$K\alpha_2$	66.9895	0.23048	1 66 Dy	$K$	53.793
0.185181	2 74 W	$K\beta_3$	66.9514	0.23056	3 66 Dy	$KO_{II,III}$	53.774
0.185188	9 73 Ta	$K\beta_2^{II}$	66.949	0.23083	2 67 Ho	$K\beta_3$	53.711
0.185511	4 78 Pt	$K\alpha_1$	66.832	0.2317	2 66 Dy	$K\beta_2$	53.47
0.18672	4 79 Au	$KL_I$	66.40	0.234081	2 71 Lu	$K\alpha_2$	52.9650
0.188757	6 73 Ta	$K\beta_5^I$	65.683	0.23618	3 66 Dy	$K\beta_5$	52.494
0.188920	6 73 Ta	$K\beta_5^{II}$	65.626	0.236655	2 70 Yb	$K\alpha_1$	52.3889
0.18982	5 72 Hf	$K$	65.31	0.23788	2 66 Dy	$K\beta_1$	52.119
0.190089	4 73 Ta	$K\beta_1$	65.223	0.23841	1 65 Tb	$K$	52.002



TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV
0.23858	3 65 Tb	$KO_{II,III}$	51.965	0.315816	2 58 Ce	$K\beta_1$ $KM_{III}$	39.2573
0.23862	2 66 Dy	$K\beta_3$ $KM_{II}$	51.957	0.316520	4 58 Ce	$K\beta_3$ $KM_{II}$	39.1701
0.2397	2 65 Tb	$K\beta_2$ $KN_{II,III}$	51.68	0.31844	5 57 La	$K$ Abs. Edge	38.934
0.241424	2 70 Yb	$K\alpha_2$ $KL_{II}$	51.3540	0.31864	2 57 La	$K$ $KO_{II,III}$	38.909
0.244338	2 69 Tm	$K\alpha_1$ $KL_{III}$	50.7416	0.31931	2 57 La	$K\beta_5^I$ $KN_{IV,V}$	38.828
0.24608	2 65 Tb	$K\beta_1$ $KM_{III}$	50.382	0.320117	7 57 La	$K\beta_2$ $KN_{II,III}$	38.7299
0.24681	1 64 Gd	$K$ Abs. Edge	50.233	0.320160	4 61 Pm	$K\alpha_1$ $KL_{III}$	38.7247
0.24683	2 65 Tb	$K\beta_3$ $KM_{II}$	50.229	0.324803	4 61 Pm	$K\alpha_2$ $KL_{II}$	38.1712
0.24687	3 64 Gd	$K$ $KO_{II,III}$	50.221	0.32546	2 57 La	$K\beta_5^I$ $KM_V$	38.094
0.24816	3 64 Gd	$K\beta_2$ $KN_{II,III}$	49.959	0.32563	2 57 La	$K\beta_5^{II}$ $KM_{IV}$	38.074
0.249095	2 69 Tm	$K\alpha_2$ $KL_{II}$	49.7726	0.327983	3 57 La	$K\beta_1$ $KM_{III}$	37.8010
0.252365	2 68 Er	$K\alpha_1$ $KL_{III}$	49.1277	0.328686	4 57 La	$K\beta_3$ $KM_{II}$	37.7202
0.25275	3 64 Gd	$K\beta_5$ $KM_{IV,V}$	49.052	0.33104	1 56 Ba	$K$ Abs. Edge	37.452
0.25460	2 64 Gd	$K\beta_1$ $KM_{III}$	48.697	0.33127	2 56 Ba	$K$ $KO_{II,III}$	37.426
0.25534	2 64 Gd	$K\beta_3$ $KM_{II}$	48.555	0.331846	2 60 Nd	$K\alpha_1$ $KL_{III}$	37.3610
0.25553	1 63 Eu	$K$ Abs. Edge	48.519	0.33229	2 56 Ba	$K\beta_4^{II}$ $KN_{IV}$	37.311
0.255645	7 63 Eu	$KO_{II,III}$	48.497	0.33277	1 56 Ba	$K\beta_2$ $KN_{II,III}$	37.257
0.256923	8 63 Eu	$K\beta_2^I$ $KN_{II,III}$	48.256	0.336472	2 60 Nd	$K\alpha_2$ $KL_{II}$	36.8474
0.257110	2 68 Er	$K\alpha_2$ $KL_{II}$	48.2211	0.33814	2 56 Ba	$K\beta_5^I$ $KM_V$	36.666
0.260756	2 67 Ho	$K\alpha_1$ $KL_{III}$	47.5467	0.33835	2 56 Ba	$K\beta_5^{II}$ $KM_{IV}$	36.643
0.263577	5 63 Eu	$K\beta_1$ $KM_{III}$	47.0379	0.340811	3 56 Ba	$K\beta_1$ $KM_{III}$	36.3782
0.264332	5 63 Eu	$K\beta_3$ $KM_{II}$	46.9036	0.341507	4 56 Ba	$K\beta_3$ $KM_{II}$	36.3040
0.26464	5 62 Sm	$K$ Abs. Edge	46.849	0.344140	2 59 Pr	$K\alpha_1$ $KL_{III}$	36.0263
0.26491	3 62 Sm	$KO_{II,III}$	46.801	0.34451	1 55 Cs	$K$ Abs. Edge	35.987
0.265486	2 67 Ho	$K\alpha_2$ $KL_{II}$	46.6997	0.34611	2 55 Cs	$K\beta_2$ $KN_{II,III}$	35.822
0.2662	1 62 Sm	$K\beta_2$ $KN_{II,III}$	46.57	0.348749	2 59 Pr	$K\alpha_2$ $KL_{II}$	35.5502
0.269533	2 66 Dy	$K\alpha_1$ $KL_{III}$	45.9984	0.354364	7 55 Cs	$K\beta_1$ $KM_{III}$	34.9869
0.27111	3 62 Sm	$K\beta_5$ $KM_{IV,V}$	45.731	0.355050	4 55 Cs	$K\beta_3$ $KM_{II}$	34.9194
0.27301	2 62 Sm	$K\beta_1$ $KM_{III}$	45.413	0.357092	2 58 Ce	$K\alpha_1$ $KL_{III}$	34.7197
0.27376	2 62 Sm	$K\beta_3$ $KM_{II}$	45.289	0.3584	5 54 Xe	$K$ Abs. Edge	34.59
0.274247	2 66 Dy	$K\alpha_2$ $KL_{II}$	45.2078	0.36026	3 54 Xe	$K\beta_2$ $KN_{II,III}$	34.415
0.27431	5 61 Pm	$K$ Abs. Edge	45.198	0.361683	2 58 Ce	$K\alpha_2$ $KL_{II}$	34.2789
0.2759	1 61 Pm	$K\beta_2$ $KN_{II,III}$	44.93	0.36872	2 54 Xe	$K\beta_1$ $KM_{III}$	33.624
0.278724	2 65 Tb	$K\alpha_1$ $KL_{III}$	44.4816	0.36941	2 54 Xe	$K\beta_3$ $KM_{II}$	33.562
0.28290	3 61 Pm	$K\beta_1$ $KM_{III}$	43.826	0.370737	2 57 La	$K\alpha_1$ $KL_{III}$	33.4418
0.283423	2 65 Tb	$K\alpha_2$ $KL_{II}$	43.7441	0.37381	1 53 I	$K$ Abs. Edge	33.1665
0.28363	4 61 Pm	$K\beta_3$ $KM_{II}$	43.713	0.37523	2 53 I	$K\beta_2$ $KN_{II,III}$	33.042
0.28453	5 60 Nd	$K$ Abs. Edge	43.574	0.375313	2 57 La	$K\alpha_2$ $KL_{II}$	33.0341
0.2861	1 60 Nd	$K\beta_2$ $KN_{II,III}$	43.32	0.383905	4 53 I	$K\beta_1$ $KM_{III}$	32.2947
0.288353	2 64 Gd	$K\alpha_1$ $KL_{III}$	42.9962	0.384564	4 53 I	$K\beta_3$ $KM_{II}$	32.2394
0.293038	2 64 Gd	$K\alpha_2$ $KL_{II}$	42.3089	0.385111	4 56 Ba	$K\alpha_1$ $KL_{III}$	32.1936
0.293299	2 60 Nd	$K\beta_1$ $KM_{III}$	42.2713	0.389668	5 56 Ba	$K\alpha_2$ $KL_{II}$	31.8171
0.294027	3 60 Nd	$K\beta_3$ $KM_{II}$	42.1665	0.38974	1 52 Te	$KO_{II,III}$	31.8114
0.29518	5 59 Pr	$K$ Abs. Edge	42.002	0.38974	1 52 Te	$K$ Abs. Edge	31.8114
0.29679	2 59 Pr	$K\beta_2$ $KN_{II,III}$	41.773	0.391102	6 52 Te	$K\beta_2$ $KN_{II,III}$	31.7004
0.298446	2 63 Eu	$K\alpha_1$ $KL_{III}$	41.5422	0.399995	5 52 Te	$K\beta_1$ $KM_{III}$	30.9957
0.303118	2 63 Eu	$K\alpha_2$ $KL_{II}$	40.9019	0.400290	4 55 Cs	$K\alpha_1$ $KL_{III}$	30.9728
0.304261	4 59 Pr	$K\beta_1$ $KM_{III}$	40.7482	0.400659	4 52 Te	$K\beta_3$ $KM_{II}$	30.9443
0.304975	5 59 Pr	$K\beta_3$ $KM_{II}$	40.6529	0.404835	4 55 Cs	$K\alpha_2$ $KL_{II}$	30.6251
0.30648	5 58 Ce	$K$ Abs. Edge	40.453	0.40666	1 51 Sb	$KO_{II,III}$	30.4875
0.30668	2 58 Ce	$KO_{II,III}$	40.427	0.40668	1 51 Sb	$K$ Abs. Edge	30.4860
0.30737	2 58 Ce	$K\beta_4^I$ $KN_{IV,V}$	40.337	0.40702	1 51 Sb	$K\beta_4^I$ $KN_{IV,V}$	30.4604
0.30816	1 58 Ce	$K\beta_2$ $KN_{II,III}$	40.233	0.407973	5 51 Sb	$K\beta_2$ $KN_{II,III}$	30.3895
0.309040	2 62 Sm	$K\alpha_1$ $KL_{III}$	40.1181	0.41378	1 51 Sb	$K\beta_5^I$ $KM_V$	29.9632
0.31342	2 58 Ce	$K\beta_5^I$ $KM_V$	39.558	0.41388	1 51 Sb	$K\beta_5^{II}$ $KM_{IV}$	29.9560
0.31357	2 58 Ce	$K\beta_5^{II}$ $KM_{IV}$	39.539	0.41634	2 54 Xe	$K\alpha_1$ $KL_{III}$	29.779
0.313698	2 62 Sm	$K\alpha_2$ $KL_{II}$	39.5224	0.417085	3 51 Sb	$K\beta_1$ $KM_{III}$	29.7256

TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV		
0.417737	4 51 Sb	$K\beta_3$	$KM_{II}$	29.6792	0.546200	4 45 Rh	$K\beta_3$	$KM_{II}$	22.6989
0.42087	2 54 Xe	$K\alpha_2$	$KL_{II}$	29.458	0.5544	2 95 Am	$L\gamma_2$	$L_{I}N_{II}$	22.361
0.42467	3 50 Sn		$KO_{II,III}$	29.195	0.5572	1 94 Pu	$L_{II}$	Abs. Edge	22.253
0.42467	1 50 Sn	$K$	Abs. Edge	29.1947	0.5585	5 93 Np	$L\gamma_4$	$L_{I}O_{II,III}$	22.20
0.42495	3 50 Sn	$K\beta_3^I$	$KN_{IV,V}$	29.175	0.5594075	6 47 Ag	$K\alpha_1$	$KL_{III}$	22.16292
0.425915	8 50 Sn	$K\beta_2$	$KN_{II,III}$	29.1093	0.55973	2 94 Pu	$L\gamma_6$	$L_{II}O_{IV}$	22.1502
0.43175	3 50 Sn	$K\beta_3^I$	$KM_V$	28.716	0.56051	1 44 Ru	$K$	Abs. Edge	22.1193
0.43184	3 50 Sn	$K\beta_3^{II}$	$KM_{IV}$	28.710	0.56089	9 44 Ru	$K\beta_4$	$KN_{IV,V}$	22.104
0.433318	5 53 I	$K\alpha_1$	$KL_{III}$	28.6120	0.56166	3 44 Ru	$K\beta_2$	$KN_{II,III}$	22.074
0.435236	5 50 Sn	$K\beta_1$	$KM_{III}$	28.4860	0.561886	9 95 Am	$L\gamma_1$	$L_{II}N_{IV}$	22.0652
0.435877	5 50 Sn	$K\beta_3$	$KM_{II}$	28.4440	0.563798	4 47 Ag	$K\alpha_2$	$KL_{II}$	21.9903
0.437829	7 53 I	$K\alpha_2$	$KL_{II}$	28.3172	0.564001	9 94 Pu	$L\gamma_3$	$L_{I}N_{III}$	21.9824
0.44371	1 49 In	$K$	Abs. Edge	27.9420	0.5658	1 94 Pu	$L\gamma_3$	$L_{II}O_{I}$	21.914
0.44374	3 49 In		$KO_{II,III}$	27.940	0.56785	9 44 Ru	$K\beta_5^I$	$KM_V$	21.834
0.44393	4 49 In	$K\beta_3^I$	$KN_{IV,V}$	27.928	0.5680	2 44 Ru	$K\beta_5^{II}$	$KM_{IV}$	21.829
0.44500	1 49 In	$K\beta_2$	$KN_{II,III}$	27.8608	0.5695	1 92 U	$L_{I}$	Abs. Edge	21.771
0.45086	2 49 In	$K\beta_5^I$	$KM_V$	27.499	0.5706	1 92 U	$L\gamma_{13}$	$L_{I}P_{II,III}$	21.729
0.45098	2 49 In	$K\beta_5^{II}$	$KM_{IV}$	27.491	0.57068	2 94 Pu	$L\gamma_2$	$L_{I}N_{II}$	21.1251
0.451295	3 52 Te	$K\alpha_1$	$KL_{III}$	27.4723	0.572482	4 44 Ru	$K\beta_1$	$KM_{III}$	21.6568
0.454545	4 49 In	$K\beta_1$	$KM_{III}$	27.2759	0.5725	1 92 U		$L_{I}O_{IV,V}$	21.657
0.455181	4 49 In	$K\beta_3$	$KM_{II}$	27.2377	0.573067	4 44 Ru	$K\beta_3$	$KM_{II}$	21.6346
0.455784	3 52 Te	$K\alpha_2$	$KL_{II}$	27.2017	0.57499	9 92 U	$L\gamma_4$	$L_{I}O_{III}$	21.562
0.46407	1 48 Cd	$K$	Abs. Edge	26.7159	0.576700	9 92 U	$L\gamma_4'$	$L_{I}O_{II}$	21.4984
0.465328	7 48 Cd	$K\beta_2$	$KN_{II,III}$	26.6438	0.57699	5 93 Np	$L\gamma_6$	$L_{II}O_{IV}$	21.488
0.470354	3 51 Sb	$K\alpha_1$	$KL_{III}$	26.3591	0.578882	9 94 Pu	$L\gamma_1$	$L_{II}N_{IV}$	21.4173
0.474827	3 51 Sb	$K\alpha_2$	$KL_{II}$	26.1108	0.5810	5 93 Np	$L\gamma_3$	$L_{I}N_{III}$	21.34
0.475105	6 48 Cd	$K\beta_1$	$KM_{III}$	26.0955	0.585448	3 46 Pd	$K\alpha_1$	$KL_{III}$	21.1771
0.475730	5 48 Cd	$K\beta_3$	$KM_{II}$	26.0612	0.5873	5 93 Np	$L\gamma_2$	$L_{I}N_{II}$	21.11
0.48589	1 47 Ag	$K$	Abs. Edge	25.5165	0.58906	1 43 Te	$K$	Abs. Edge	21.0473
0.4859	9 47 Ag	$K\beta_4$	$KN_{IV,V}$	25.512	0.589821	3 46 Pd	$K\alpha_2$	$KL_{II}$	21.0201
0.487032	4 47 Ag	$K\beta_2$	$KN_{II,III}$	25.4564	0.58986	5 92 U	$L\gamma_{11}$	$L_{II}N_V$	21.019
0.490599	3 50 Sn	$K\alpha_1$	$KL_{III}$	25.2713	0.59024	5 43 Tc	$K\beta_2$	$KN_{II,III}$	21.005
0.49306	2 47 Ag	$K\beta_5$	$KM_{IV,V}$	25.145	0.59096	5 92 U		$L_{I}N_{IV}$	20.979
0.495053	3 50 Sn	$K\alpha_2$	$KL_{II}$	25.0440	0.5919	1 92 U	$L_{II}$	Abs. Edge	20.945
0.497069	4 47 Ag	$K\beta_1$	$KM_{III}$	24.9424	0.59203	5 92 U		$L_{II}P_{IV}$	20.942
0.497685	4 47 Ag	$K\beta_3$	$KM_{II}$	24.9115	0.5930	2 92 U		$L_{II}P_{II,III}$	20.906
0.5092	1 46 Pd	$K$	Abs. Edge	24.348	0.5937	1 91 Pa	$L\gamma_4$	$L_{I}O_{II,III}$	20.882
0.5093	2 46 Pd	$K\beta_4$	$KN_{IV,V}$	24.346	0.594845	9 92 U	$L\gamma_6$	$L_{II}O_{IV}$	20.8426
0.510228	4 46 Pd	$K\beta_2$	$KN_{II,III}$	24.2991	0.596498	9 93 Np	$L\gamma_1$	$L_{II}N_{IV}$	20.7848
0.512113	3 49 In	$K\alpha_1$	$KL_{III}$	24.2097	0.59728	5 92 U		$L_{II}O_{III}$	20.758
0.516544	3 49 In	$K\alpha_2$	$KL_{II}$	24.0020	0.598574	9 92 U	$L\gamma_3$	$L_{I}N_{III}$	20.7127
0.51670	9 46 Pd	$K\beta_5$	$KM_{IV,V}$	23.995	0.5988	1 94 Pu	$L\gamma_5$	$L_{II}N_{I}$	20.704
0.520520	4 46 Pd	$K\beta_1$	$KM_{III}$	23.8187	0.60125	5 92 U	$L\gamma_8$	$L_{II}O_{I}$	20.621
0.521123	4 46 Pd	$K\beta_3$	$KM_{II}$	23.7911	0.60130	4 43 Tc	$K\beta_1$	$KM_{III}$	20.619
0.53395	1 45 Rh	$K$	Abs. Edge	23.2198	0.60188	4 43 Tc	$K\beta_3$	$KM_{II}$	20.599
0.53401	9 45 Rh	$K\beta_4^I$	$KN_{IV,V}$	23.217	0.6031	1 92 U	$L_V$	$L_{II}N_{VI}$	20.556
0.535010	3 48 Cd	$K\alpha_1$	$KL_{III}$	23.1736	0.605237	9 92 U	$L\gamma_2$	$L_{I}N_{II}$	20.4847
0.53503	2 45 Rh	$K\beta_2$	$KN_{II,III}$	23.1728	0.6059	1 90 Th	$L_{I}$	Abs. Edge	20.464
0.53513	5 45 Rh	$K\beta_2^{II}$	$KN_{II}$	23.168	0.60705	8 90 Th	$L\gamma_{13}$	$L_{I}P_{II,III}$	20.424
0.5365	1 94 Pu	$L_{I}$	Abs. Edge	23.109	0.6083	1 90 Th		$L_{I}O_{IV,V}$	20.383
0.539422	3 48 Cd	$K\alpha_2$	$KL_{II}$	22.9841	0.61098	4 90 Th	$L\gamma_4$	$L_{I}O_{III}$	20.292
0.54101	9 45 Rh	$K\beta_3^I$	$KM_V$	22.917	0.61251	4 90 Th	$L\gamma_4'$	$L_{I}O_{II}$	20.242
0.54118	9 45 Rh	$K\beta_3^{II}$	$KM_{IV}$	22.909	0.6133	1 91 Pa	$L\gamma_6$	$L_{II}O_{IV}$	20.216
0.5416	1 94 Pu	$L\gamma_4$	$L_{I}O_{III}$	22.891	0.613279	4 45 Rh	$K\alpha_1$	$KL_{III}$	20.2161
0.54311	2 95 Am	$L\gamma_6$	$L_{II}O_{IV}$	22.8282	0.6146	1 90 Th		$L_{I}O_{I}$	20.174
0.5432	1 94 Pu	$L\gamma_4'$	$L_{I}O_{II}$	22.823	0.614770	9 92 U	$L\gamma_1$	$L_{II}N_{IV}$	20.1671
0.545605	4 45 Rh	$K\beta_1$	$KM_{III}$	22.7236	0.6160	1 90 Th		$L_{I}N_{VI,VII}$	20.128

TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV		
0.616	1 93 Np	$L\gamma_5$	$L_{II}N_I$	20.12	0.67383	2 95 Am	$L\beta_6$	$L_{III}O_{IV,V}$	18.3996
0.6169	1 91 Pa	$L\gamma_3$	$L_I N_{III}$	20.098	0.67491	4 90 Th	$L\gamma_6$	$L_{II}N_I$	18.370
0.617630	4 45 Rh	$K\alpha_2$	$KL_{II}$	20.0737	0.67502	3 43 Tc	$K\alpha_1$	$KL_{III}$	18.3671
0.61978	1 42 Mo	$K$	Abs. Edge	20.0039	0.67538	5 88 Ra	$L\gamma_3$	$L_I N_{III}$	18.357
0.62001	9 42 Mo	$K\beta_4^I$	$KN_{IV,V}$	19.996	0.6764	1 88 Ra		$L_{II}O_{III}$	18.330
0.62099	2 42 Mo	$K\beta_2$	$KN_{II,III}$	19.9652	0.67772	2 94 Pu	$L\beta_1$	$L_{II}M_{IV}$	18.2937
0.62107	5 42 Mo	$K\beta_2^{II}$	$KN_{II}$	19.963	0.6780	1 88 Ra		$L_{II}O_{II}$	18.286
0.6228	1 92 U		$L_{II}N_{III}$	19.907	0.67932	3 43 Tc	$K\alpha_2$	$KL_{II}$	18.2508
0.6239	1 91 Pa	$L\gamma_2$	$L_I N_{II}$	19.872	0.6801	1 88 Ra	$L\gamma_3$	$L_{II}O_I$	18.230
0.62636	9 90 Th	$L\gamma_{11}$	$L_I N_V$	19.794	0.681014	8 92 U	$L\beta_9$	$L_I M_V$	18.2054
0.62692	5 42 No	$K\beta_5^I$	$KM_V$	19.776	0.68199	5 88 Ra	$L\gamma_2$	$L_I N_{II}$	18.179
0.62708	5 42 Mo	$K\beta_5^{II}$	$KM_{IV}$	19.771	0.68639	2 95 Am	$L\beta_4$	$L_I M_{II}$	18.0627
0.6276	1 90 Th		$L_I N_{IV}$	19.755	0.6867	1 94 Pu	$L_{III}$	Abs. Edge	18.054
0.6299	1 90 Th	$L_{II}$	Abs. Edge	19.683	0.6874	1 88 Ra		$L_I N_I$	18.036
0.62991	9 90 Th		$L_{II}P_{IV}$	19.682	0.68760	5 92 U	$L\beta_{10}$	$L_I M_{IV}$	18.031
0.6312	1 90 Th		$L_{II}P_{II,III}$	19.642	0.68883	1 40 Zr	$K$	Abs. Edge	17.9989
0.6316	1 90 Th		$L_{II}P_I$	19.629	0.68901	5 40 Zr	$K\beta_4$	$KN_{IV,V}$	17.994
0.632288	9 42 Mo	$K\beta_1$	$KM_{III}$	19.6083	0.68920	9 93 Np	$L\beta_3$	$L_I M_{III}$	17.989
0.63258	4 90 Th	$L\gamma_6$	$L_{II}O_{IV}$	19.599	0.68993	4 40 Zr	$K\beta_2$	$KN_{II,III}$	17.970
0.632872	2 42 Mo	$K\beta_3$	$KM_{II}$	19.5903	0.69068	2 94 Pu	$L\beta_5$	$L_{III}O_{IV,V}$	17.9506
0.63358	9 91 Pa	$L\gamma_1$	$L_{II}N_{IV}$	19.568	0.6932	1 88 Ra		$L_{II}N_V$	17.884
0.63557	2 92 U	$L\gamma_5$	$L_{II}N_I$	19.5072	0.69463	5 88 Ra	$L\gamma_1$	$L_{II}N_{IV}$	17.849
0.63559	4 90 Th	$L\gamma_3$	$L_I N_{III}$	19.507	0.6959	1 40 Zr	$K\beta_5$	$KM_{IV,V}$	17.815
0.6356	1 90 Th		$L_{II}O_{III}$	19.506	0.698478	9 93 Np	$L\beta_1$	$L_{II}M_{IV}$	17.7502
0.6369	1 90 Th		$L_{II}O_{II}$	19.466	0.7003	1 94 Pu	$L\beta_7$	$L_{III}O_I$	17.705
0.63898	5 90 Th	$L\gamma_8$	$L_{II}O_I$	19.403	0.701390	9 95 Am	$L\beta_2$	$L_{III}N_V$	17.6765
0.64064	9 90 Th	$L\nu$	$L_{II}N_{VI}$	19.353	0.70173	3 40 Zr	$K\beta_1$	$KM_{III}$	17.6678
0.6416	1 94 Pu	$L\beta_9$	$L_I M_V$	19.323	0.7018	1 91 Pa	$L\beta_9$	$L_I M_V$	17.667
0.64221	4 90 Th	$L\gamma_2$	$L_I N_{II}$	19.305	0.70228	4 40 Zr	$K\beta_3$	$KM_{II}$	17.654
0.643083	4 44 Ru	$K\alpha_1$	$KL_{III}$	19.2792	0.7031	1 94 Pu	$L\nu$	$L_{III}N_{VI,VII}$	17.635
0.6445	1 88 Ra	$L_I$	Abs. Edge	19.236	0.70341	2 95 Am	$L\beta_{15}$	$L_{III}N_{IV}$	17.6258
0.64513	5 88 Ra	$L\gamma_{13}$	$L_I P_{II,III}$	19.218	0.7043	1 88 Ra		$L_{II}N_{III}$	17.604
0.6468	1 88 Ra		$L_I O_{IV,V}$	19.167	0.70620	2 94 Pu	$L\beta_4$	$L_I M_{II}$	17.5560
0.647408	5 44 Ru	$K\alpha_2$	$KL_{II}$	19.1504	0.70814	2 93 Np	$L\beta_5$	$L_{III}O_{IV,V}$	17.5081
0.64755	5 90 Th		$L_I N_I$	19.146	0.7088	2 91 Pa	$L\beta_{10}$	$L_I M_{IV}$	17.492
0.6482	1 94 Pu	$L\beta_{10}$	$L_I M_{IV}$	19.126	0.709300	1 42 Mo	$K\alpha_1$	$KL_{III}$	17.47934
0.64891	2 95 Am	$L\beta_3$	$L_I M_{III}$	19.1059	0.71029	2 92 U	$L\beta_3$	$L_I M_{III}$	17.4550
0.64965	5 88 Ra	$L\gamma_4$	$L_I O_{III}$	19.084	0.713590	6 42 Mo	$K\alpha_2$	$KL_{II}$	17.3743
0.65131	5 88 Ra	$L\gamma_4'$	$L_I O_{II}$	19.036	0.71652	9 87 Fr	$L\gamma_1$	$L_{II}N_{IV}$	17.303
0.6521	1 90 Th		$L_{II}N_V$	19.014	0.71774	5 88 Ra	$L\gamma_5$	$L_{II}N_I$	17.274
0.65298	1 41 Nb	$K$	Abs. Edge	18.9869	0.71851	2 94 Pu	$L\beta_2$	$L_{III}N_V$	17.2553
0.65313	3 90 Th	$L\gamma_1$	$L_{II}N_{IV}$	18.9825	0.719984	8 92 U	$L\beta_1$	$L_{II}M_{IV}$	17.2200
0.65318	5 41 Nb	$K\beta_4$	$KN_{IV,V}$	18.981	0.7205	1 94 Pu	$L\beta_{15}$	$L_{III}N_{IV}$	17.208
0.65416	4 41 Nb	$K\beta_2$	$KN_{II,III}$	18.953	0.7223	1 92 U	$L_{III}$	Abs. Edge	17.165
0.6550	1 91 Pa	$L\gamma_5$	$L_{II}N_I$	18.930	0.72240	5 92 U		$L_{III}P_{IV,V}$	17.162
0.657655	9 95 Am	$L\beta_1$	$L_{II}M_{IV}$	18.8520	0.7234	1 90 Th	$L\beta_9$	$L_I M_V$	17.139
0.6620	1 90 Th		$L_{II}N_{III}$	18.729	0.72426	5 92 U		$L_{III}P_{II,III}$	17.118
0.6654	1 88 Ra	$L\gamma_{11}$	$L_I N_V$	18.633	0.72521	5 92 U		$L_{III}P_I$	17.096
0.66576	2 41 Nb	$K\beta_1$	$KM_{III}$	18.6225	0.726305	9 92 U	$L\beta_5$	$L_{III}O_{IV,V}$	17.0701
0.66634	3 41 Nb	$K\beta_3$	$KM_{II}$	18.6063	0.72671	2 93 Np	$L\beta_4$	$L_I M_{II}$	17.0607
0.6666	1 88 Ra		$L_I N_{IV}$	18.600	0.72766	5 39 Y	$K$	Abs. Edge	17.038
0.66871	2 94 Pu	$L\beta_3$	$L_I M_{III}$	18.5405	0.72776	5 39 Y	$K\beta_4$	$KN_{IV,V}$	17.036
0.6707	1 88 Ra	$L_{II}$	Abs. Edge	18.486	0.72864	4 39 Y	$K\beta_2$	$KN_{II,III}$	17.0154
0.6714	1 88 Ra		$L_{II}P_{II,III}$	18.466	0.7301	1 90 Th	$L\beta_{10}$	$L_I M_{IV}$	16.981
0.6724	1 88 Ra		$L_{II}P_I$	18.439	0.7309	1 92 U		$L_{III}O_{III}$	16.962
0.67328	5 88 Ra	$L\gamma_6$	$L_{II}O_{IV}$	18.414	0.73230	5 91 Pa	$L\beta_3$	$L_I M_{III}$	16.930
0.67351	9 89 Ac	$L\gamma_1$	$L_{II}N_{IV}$	18.408	0.7333	1 92 U		$L_{III}O_{II}$	16.907

TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV		
0.73418	2 95 Am	$L\beta_6$	$L_{III}N_I$	16.8870	0.78292	2 38 Sr	$K\beta_1$	$KM_{III}$	15.8357
0.7345	1 39 Y	$K\beta_5$	$KM_{IV,V}$	16.879	0.78345	3 38 Sr	$K\beta_3$	$KM_{II}$	15.8249
0.73602	6 92 U	$L\beta_7$	$L_{III}O_I$	16.845	0.7858	1 82 Pb	$L\gamma_4$	$L_I O_{III}$	15.777
0.736230	9 93 Np	$L\beta_2$	$L_{III}N_V$	16.8400	0.78593	1 40 Zr	$K\alpha_1$	$KL_{III}$	15.7751
0.738603	9 92 U	$Lu$	$L_{III}N_{VI,VII}$	16.7859	0.78706	7 82 Pb	$L\gamma_4'$	$L_I O_{II}$	15.752
0.73928	9 86 Rn	$L\gamma_1$	$L_{II}N_{IV}$	16.770	0.78748	9 84 Po	$L\gamma_1$	$L_{II}N_{IV}$	15.744
0.74072	2 39 Y	$K\beta_1$	$KM_{III}$	16.7378	0.78838	2 92 U	$L\beta_8$	$L_{III}N_I$	15.7260
0.74126	3 39 Y	$K\beta_3$	$KM_{II}$	16.7258	0.7884	1 82 Pb		$L_I N_{VI,VII}$	15.725
0.74232	5 91 Pa	$L\beta_1$	$L_{II}M_{IV}$	16.702	0.7887	1 83 Bi	$L_{II}$	Abs. Edge	15.719
0.74503	5 92 U	$L\beta_{17}$	$L_{II}M_{III}$	16.641	0.78903	9 89 Ac	$L\beta_1$	$L_{II}M_{IV}$	15.713
0.7452	2 91 Pa	$L\beta_5$	$L_{III}O_{IV,V}$	16.636	0.78917	5 83 Bi	$L\gamma_3$	$L_I N_{III}$	15.7102
0.74620	1 41 Nb	$K\alpha_1$	$KL_{III}$	16.6151	0.7897	1 82 Pb		$L_I O_I$	15.699
0.747985	9 92 U	$L\beta_4$	$L_I M_{II}$	16.5753	0.79015	1 40 Zr	$K\alpha_2$	$KL_{II}$	15.6909
0.75044	1 41 Nb	$K\alpha_2$	$KL_{II}$	16.5210	0.79043	3 83 Bi	$L\gamma_6$	$L_{II}O_{IV}$	15.6853
0.75148	2 94 Pu	$L\beta_6$	$L_{III}N_I$	16.4983	0.79257	4 90 Th	$L\beta_4$	$L_I M_{II}$	15.6429
0.7546	2 91 Pa	$L\beta_7$	$L_{III}O_I$	16.431	0.79257	4 90 Th	$L\beta_{17}$	$L_{II}M_{III}$	15.6429
0.754681	9 92 U	$L\beta_2$	$L_{III}N_V$	16.4283	0.79354	3 90 Th	$L\beta_2$	$L_{III}M_V$	15.6237
0.75479	3 90 Th	$L\beta_3$	$L_I M_{III}$	16.4258	0.79384	5 83 Bi		$L_{II}O_{III}$	15.6178
0.756642	9 92 U	$L\beta_{15}$	$L_{III}N_{IV}$	16.3857	0.79539	5 90 Th	$L\beta_{15}$	$L_{III}N_{IV}$	15.5875
0.75690	3 83 Bi	$L\gamma_{18}$	$L_I P_{II,III}$	16.3802	0.79565	3 83 Bi	$L\gamma_2$	$L_I N_{II}$	15.5824
0.7571	1 83 Bi	$L_I$	Abs. Edge	16.376	0.79721	9 83 Bi	$L\nu$	$L_{II}N_{VI}$	15.552
0.7579	1 90 Th		$L_{II}M_V$	16.359	0.7973	1 83 Bi	$L\gamma_8$	$L_{II}O_I$	15.551
0.75791	5 83 Bi		$L_I O_{IV,V}$	16.358	0.8022	1 83 Bi		$L_I N_I$	15.456
0.7591	1 94 Pu	$L\eta$	$L_{II}M_I$	16.333	0.80233	9 82 Pb	$L\gamma_{11}$	$L_I N_V$	15.453
0.7607	1 90 Th	$L_{III}$	Abs. Edge	16.299	0.80273	5 88 Ra	$L\beta_3$	$L_I M_{III}$	15.4449
0.76087	9 90 Th		$L_{III}P_{IV,V}$	16.295	0.8028	1 88 Ra	$L_{III}$	Abs. Edge	15.444
0.76087	3 83 Bi	$L\gamma_4$	$L_I O_{III}$	16.2947	0.80364	7 82 Pb		$L_I N_{IV}$	15.427
0.76198	3 83 Bi	$L\gamma_4'$	$L_I O_{II}$	16.2709	0.8038	1 88 Ra		$L_{III}P_{II,III}$	15.425
0.7625	2 90 Th		$L_{III}P_{II,III}$	16.260	0.8050	1 88 Ra		$L_{III}P_I$	15.402
0.76289	9 85 At	$L\gamma_1$	$L_{II}N_{IV}$	16.251	0.80509	2 92 U	$L\eta$	$L_{II}M_I$	15.3997
0.76338	5 90 Th		$L_{II}P_I$	16.241	0.80627	5 88 Ra	$L\beta_5$	$L_{III}O_{IV,V}$	15.3771
0.7641	5 83 Bi		$L_I N_{VI,VII}$	16.23	0.8079	1 91 Pa	$L\beta_6$	$L_{III}N_I$	15.347
0.7645	2 84 Po	$L\gamma_6$	$L_{II}O_{IV}$	16.218	0.8081	1 81 Tl	$L_I$	Abs. Edge	15.343
0.76468	5 90 Th	$L\beta_5$	$L_{III}O_{IV,V}$	16.213	0.8082	1 90 Th		$L_{II}N_{III}$	15.341
0.765210	9 90 Th	$L\beta_1$	$L_{II}M_{IV}$	16.2022	0.80861	5 81 Tl		$L_I O_{IV,V}$	15.3327
0.76857	5 88 Ra	$L\beta_9$	$L_I M_V$	16.131	0.81163	9 90 Th		$L_I M_I$	15.276
0.769	1 93 Np	$L\beta_8$	$L_{III}N_I$	16.13	0.81184	5 81 Tl	$L\gamma_4$	$L_I O_{III}$	15.2716
0.7690	1 90 Th		$L_{III}O_{III}$	16.123	0.81308	5 81 Tl	$L\gamma_4'$	$L_I O_{II}$	15.2482
0.7691	1 92 U		$L_{III}N_{III}$	16.120	0.81311	2 83 Bi	$L\gamma_1$	$L_{II}N_{IV}$	15.2477
0.76973	5 38 Sr	$K$	Abs. Edge	16.107	0.81375	5 88 Ra	$L\beta_1$	$L_{II}M_{IV}$	15.2358
0.7699	1 91 Pa	$L\beta_4$	$L_I M_{II}$	16.104	0.8147	1 82 Pb	$L\gamma_3$	$L_I N_{III}$	15.218
0.76989	5 38 Sr	$K\beta_4$	$KN_{IV,V}$	16.104	0.81538	5 82 Pb	$L_{II}$	Abs. Edge	15.2053
0.77081	3 38 Sr	$K\beta_2$	$KN_{II,III}$	16.0846	0.8154	2 37 Rb	$K\beta_4$	$KN_{IV,V}$	15.205
0.7713	1 90 Th		$L_{III}O_{II}$	16.074	0.81554	5 37 Rb	$K$	Abs. Edge	15.2023
0.772	1 84 Po	$L\gamma_2$	$L_I N_{II}$	16.07	0.8158	1 81 Tl		$L_I O_I$	15.198
0.7737	1 91 Pa	$L\beta_2$	$L_{III}N_V$	16.024	0.81583	5 82 Pb		$L_{II}P_I$	15.1969
0.77437	4 90 Th	$L\beta_7$	$L_{III}O_I$	16.0105	0.8162	1 88 Ra	$L\beta_7$	$L_{III}O_I$	15.190
0.77546	5 88 Ra	$L\beta_{10}$	$L_I M_{IV}$	15.988	0.81645	3 37 Rb	$K\beta_2$	$KN_{II,III}$	15.1854
0.7764	1 38 Sr	$K\beta_5$	$KM_{IV,V}$	15.969	0.81683	5 82 Pb	$L\gamma_6$	$L_{II}O_{IV}$	15.1783
0.77661	5 90 Th	$Lu$	$L_{III}N_{VI,VII}$	15.964	0.8186	1 88 Ra	$Lu$	$L_{III}N_{VI,VII}$	15.146
0.77728	5 83 Bi	$L\gamma_{11}$	$L_I N_V$	15.951	0.8190	2 90 Th		$L_{III}N_{II}$	15.138
0.77822	9 89 Ac	$L\beta_3$	$L_I M_{III}$	15.931	0.8200	1 82 Pb		$L_{II}O_{III}$	15.120
0.77954	5 83 Bi		$L_I N_{IV}$	15.904	0.8210	2 82 Pb	$L\gamma_2$	$L_I N_{II}$	15.101
0.78017	9 92 U		$L_{III}N_{II}$	15.892	0.8219	1 37 Rb	$K\beta_5$	$KM_{IV,V}$	15.085
0.7809	2 93 Np	$L\eta$	$L_{II}M_I$	15.876	0.82327	7 82 Pb	$L\nu$	$L_I N_{VI}$	15.060
0.78196	5 82 Pb	$L_I$	Abs. Edge	15.855	0.82365	5 82 Pb	$L\gamma_8$	$L_{II}O_I$	15.0527
0.78257	7 82 Pb		$L_I O_{IV,V}$	15.843	0.8248	1 83 Bi		$L_{II}N_{III}$	15.031

TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV		
0.82789	9 87 Fr	$L\beta_3$	$L_{II}M_{III}$	14.976	0.87088	5 88 Ra	$L\beta_3$	$L_{III}N_I$	14.2362
0.82790	8 90 Th	$L\beta_6$	$L_{III}N_I$	14.975	0.8722	1 80 Hg	$L_{II}$	Abs. Edge	14.215
0.82859	7 82 Pb		$L_I N_I$	14.963	0.87319	7 80 Hg	$L\gamma_6$	$L_{II}O_{IV}$	14.199
0.82868	2 37 Rb	$K\beta_1$	$KM_{III}$	14.9613	0.87526	1 38 Sr	$K\alpha_1$	$KL_{III}$	14.1650
0.82879	5 81 Tl	$L\gamma_{11}$	$L_I N_V$	14.9593	0.87544	7 80 Hg	$L\gamma_2$	$L_I N_{II}$	14.162
0.82884	1 39 Y	$K\alpha_1$	$KL_{III}$	14.9584	0.8758	1 80 Hg		$L_{II}O_{III}$	14.156
0.82921	3 37 Rb	$K\beta_3$	$KM_{II}$	14.9517	0.8784	1 80 Hg		$L_I O_{II}$	14.114
0.8295	1 91 Pa	$L\eta$	$L_{II}M_I$	14.946	0.8785	1 36 Kr	$K\beta_1$	$KM_{III}$	14.112
0.83001	7 81 Tl		$L_I N_{IV}$	14.937	0.87885	7 80 Hg	$L\nu$	$L_{II}N_{VI}$	14.107
0.83305	1 39 Y	$K\alpha_2$	$KL_{II}$	14.8829	0.8790	1 36 Kr	$K\beta_3$	$KM_{II}$	14.104
0.8338	1 90 Th		$L_{II}M_{II}$	14.869	0.87943	1 38 Sr	$K\alpha_2$	$KL_{II}$	14.0979
0.8344	9 83 Bi		$L_{II}N_{II}$	14.86	0.87995	7 80 Hg	$L\gamma_8$	$L_{II}O_I$	14.090
0.8350	2 80 Hg		$L_I O_{IV,V}$	14.847	0.87996	5 81 Tl		$L_{II}N_{III}$	14.0893
0.8353	1 80 Hg	$L_I$	Abs. Edge	14.842	0.88028	2 94 Pu	$L\alpha_2$	$L_{III}M_{IV}$	14.0842
0.83537	5 88 Ra	$L\beta_2$	$L_{II}N_V$	14.8414	0.88135	9 85 At	$L\beta_3$	$L_I M_{III}$	14.067
0.83722	5 88 Ra	$L\beta_{15}$	$L_{III}N_{IV}$	14.8086	0.8827	2 80 Hg		$L_I N_I$	14.045
0.8382	2 82 Pb		$L_{II}N_V$	14.791	0.88433	7 79 Au	$L\gamma_{11}$	$L_I N_V$	14.020
0.83894	7 80 Hg	$L\gamma_4$	$L_I O_{III}$	14.778	0.88563	7 79 Au		$L_I N_{IV}$	13.999
0.83923	5 83 Bi	$L\gamma_5$	$L_{II}N_I$	14.7732	0.8882	2 81 Tl		$L_{II}M_{II}$	13.959
0.83940	9 87 Fr	$L\beta_1$	$L_{II}M_{IV}$	14.770	0.889128	9 93 Np	$L\alpha_1$	$L_{III}M_V$	13.9441
0.83973	3 82 Pb	$L\gamma_1$	$L_{II}N_{IV}$	14.7644	0.8931	1 78 Pt	$L_I$	Abs. Edge	13.883
0.84013	7 80 Hg	$L\gamma_4'$	$L_I O_{II}$	14.757	0.8934	1 78 Pt		$L_I O_V$	13.878
0.84071	5 88 Ra	$L\beta_4$	$L_I M_{II}$	14.7472	0.89349	9 85 At	$L\beta_1$	$L_{II}M_{IV}$	13.876
0.84130	4 81 Tl	$L\gamma_3$	$L_I N_{III}$	14.7368	0.8943	1 78 Pt		$L_I O_{IV}$	13.864
0.8434	1 81 Tl	$L_{II}$	Abs. Edge	14.699	0.89500	4 81 Tl	$L\gamma_5$	$L_{II}N_I$	13.8526
0.8438	1 88 Ra	$L\beta_{17}$	$L_{II}M_{III}$	14.692	0.89646	5 80 Hg	$L\gamma_{11}$	$L_{II}N_{IV}$	13.8301
0.8442	2 81 Tl	$L\gamma_6$	$L_{II}O_{IV}$	14.685	0.89659	4 78 Pt	$L\gamma_4$	$L_I O_{III}$	13.8281
0.8452	2 80 Hg		$L_I O_I$	14.670	0.89747	4 78 Pt	$L\gamma_4'$	$L_I O_{II}$	13.8145
0.84773	5 81 Tl	$L\gamma_2$	$L_I N_{II}$	14.6251	0.89783	5 79 Au	$L\gamma_8$	$L_I N_{III}$	13.8090
0.848187	9 95 Am	$L\alpha_1$	$L_{III}M_V$	14.6172	0.89791	3 83 Bi	$L\beta_3$	$L_I M_V$	13.8077
0.8490	1 81 Tl		$L_{II}O_{II}$	14.604	0.8995	2 78 Pt		$L_I O_I$	13.784
0.85048	5 81 Tl	$L\nu$	$L_{II}N_{VI}$	14.5777	0.8996	2 84 Po	$L\beta_5$	$L_{III}O_{IV,V}$	13.782
0.8512	1 88 Ra		$L_{III}N_{III}$	14.566	0.901045	9 93 Np	$L\alpha_2$	$L_{III}M_{IV}$	13.7597
0.8513	2 81 Tl	$L\gamma_8$	$L_{II}O_I$	14.564	0.90259	5 79 Au	$L_{II}$	Abs. Edge	13.7361
0.85192	7 82 Pb		$L_{II}N_{III}$	14.553	0.90297	3 79 Au	$L\gamma_6$	$L_{II}O_{IV}$	13.7304
0.85436	9 86 Rn	$L\beta_3$	$L_I M_{III}$	14.512	0.90434	3 79 Au	$L\gamma_2$	$L_I N_{II}$	13.7095
0.85446	4 90 Th	$L\eta$	$L_{II}M_I$	14.5099	0.90495	4 83 Bi	$L\beta_{10}$	$L_I M_{IV}$	13.7002
0.8549	1 81 Tl		$L_I N_I$	14.503	0.90638	7 79 Au		$L_{II}O_{III}$	13.679
0.85657	7 80 Hg	$L\gamma_{11}$	$L_I N_V$	14.474	0.90742	5 88 Ra	$L\eta$	$L_{II}M_I$	13.6630
0.858	2 87 Fr	$L\beta_2$	$L_{III}N_V$	14.45	0.90746	7 79 Au		$L_{II}O_{II}$	13.662
0.8585	3 82 Pb		$L_{II}N_{II}$	14.442	0.90837	5 79 Au	$L\nu$	$L_{II}N_{VI}$	13.6487
0.860266	9 95 Am	$L\alpha_2$	$L_{III}M_{IV}$	14.4119	0.90894	7 80 Hg		$L_{II}N_{III}$	13.640
0.8618	1 88 Ra		$L_{III}N_{II}$	14.387	0.9091	3 84 Po	$L\beta_3$	$L_I M_{III}$	13.638
0.86376	5 79 Au	$L_I$	Abs. Edge	14.3537	0.90989	5 79 Au	$L\gamma_8$	$L_{II}O_I$	13.6260
0.86400	5 79 Au		$L_I O_{IV,V}$	14.3497	0.910639	9 92 U	$L\alpha_1$	$L_{III}M_V$	13.6147
0.8653	2 36 Kr	$K\beta_4$	$KN_{IV,V}$	14.328	0.9131	1 79 Au		$L_I N_I$	13.578
0.86552	1 36 Kr	$K$	Abs. Edge	14.3244	0.9143	2 78 Pt	$L\gamma_{11}$	$L_I N_V$	13.560
0.86605	9 86 Rn	$L\beta_1$	$L_{II}M_{IV}$	14.316	0.9204	1 35 Br	$K$	Abs. Edge	13.470
0.8661	1 36 Kr	$K\beta_2$	$KN_{II,III}$	14.315	0.92046	2 35 Br	$K\beta_2$	$KN_{II,III}$	13.4695
0.86655	5 82 Pb	$L\gamma_5$	$L_{II}N_I$	14.3075	0.9220	2 84 Po	$L\beta_1$	$L_{II}M_{IV}$	13.447
0.86703	4 79 Au	$L\gamma_4$	$L_I O_{III}$	14.2996	0.922558	9 92 U	$L\alpha_2$	$L_{III}M_{IV}$	13.4388
0.86752	3 81 Tl	$L\gamma_1$	$L_{II}N_{IV}$	14.2915	0.9234	1 83 Bi	$L_{III}$	Abs. Edge	13.426
0.86816	4 79 Au	$L\gamma_4'$	$L_I O_{II}$	14.2809	0.9236	1 77 Ir	$L_I$	Abs. Edge	13.423
0.86830	2 94 Pu	$L\alpha_1$	$L_{III}M_V$	14.2786	0.92413	4 83 Bi		$L_{III}P_{II,III}$	13.4159
0.86915	7 80 Hg	$L\gamma_3$	$L_I N_{III}$	14.265	0.9243	3 77 Ir		$L_I O_{IV,V}$	13.413
0.87074	5 79 Au		$L_I O_I$	14.2385	0.92453	7 80 Hg	$L\gamma_5$	$L_{II}N_I$	13.410
0.8708	2 36 Kr	$K\beta_5$	$KM_{IV,V}$	14.238	0.9255	1 35 Br	$K\beta_5$	$KM_{IV,V}$	13.396

TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV		
0.925553	9 37 Rb	$K\alpha_1$	$KL_{III}$	13.3953	0.96788	2 90 Th	$L\alpha_2$	$L_{III}M_{IV}$	12.8096
0.92556	3 83 Bi	$L\beta_5$	$L_{III}O_{IV,V}$	13.3953	0.96911	7 82 Pb	$L\beta_3$	$L_{II}M_{III}$	12.7933
0.92650	3 79 Au	$L\gamma_1$	$L_{II}N_{IV}$	13.3817	0.96979	5 77 Ir		$L_{II}O_{III}$	12.7843
0.9268	1 82 Pb	$L\beta_9$	$L_{II}M_{V}$	13.377	0.97161	6 77 Ir	$L\nu$	$L_{II}N_{VI}$	12.7603
0.92744	3 77 Ir	$L\gamma_4$	$L_{II}O_{III}$	13.3681	0.97173	4 78 Pt		$L_{II}N_{III}$	12.7588
0.92791	5 78 Pt	$L\gamma_3$	$L_{II}N_{III}$	13.3613	0.97321	5 83 Bi		$L_{III}N_{III}$	12.7394
0.92831	3 77 Ir	$L\gamma_4'$	$L_{II}O_{II}$	13.3555	0.97409	3 77 Ir	$L\gamma_8$	$L_{II}O_{I}$	12.7279
0.92937	5 84 Po	$L\beta_2$	$L_{III}N_{V}$	13.3404	0.9747	1 82 Pb		$L_{II}M_{V}$	12.720
0.92969	1 37 Rb	$K\alpha_2$	$KL_{II}$	13.3358	0.9765	3 76 Os	$L\gamma_{11}$	$L_{II}N_{V}$	12.696
0.9302	2 83 Bi		$L_{III}O_{III}$	13.328	0.9766	2 77 Ir		$L_{II}N_{I}$	12.695
0.9312	2 84 Po	$L\beta_{15}$	$L_{III}N_{IV}$	13.314	0.97690	4 83 Bi	$L\beta_4$	$L_{II}M_{II}$	12.6912
0.9323	2 83 Bi		$L_{III}O_{II}$	13.298	0.9772	3 76 Os		$L_{II}N_{IV}$	12.687
0.93279	2 35 Br	$K\beta_1$	$KM_{III}$	13.2914	0.9792	2 78 Pt		$L_{II}N_{II}$	12.661
0.93284	5 91 Pa	$L\alpha_1$	$L_{III}M_{V}$	13.2907	0.97926	5 81 Tl		$L_{III}P_{II,III}$	12.6607
0.93327	5 35 Br	$K\beta_3$	$KM_{II}$	13.2845	0.9793	1 81 Tl	$L_{III}$	Abs. Edge	12.660
0.9339	2 82 Pb	$L\beta_{10}$	$L_{II}M_{IV}$	13.275	0.97974	1 34 Se	$K$	Abs. Edge	12.6545
0.93414	5 78 Pt	$L_{II}$	Abs. Edge	13.2723	0.97992	5 34 Se	$K\beta_2$	$KN_{II,III}$	12.6522
0.9342	2 78 Pt	$L\gamma_6$	$L_{II}O_{IV}$	13.271	0.97993	5 89 Ac	$L\alpha_1$	$L_{III}M_{V}$	12.6520
0.93427	5 78 Pt	$L\gamma_2$	$L_{II}N_{II}$	13.2704	0.9801	1 36 Kr	$K\alpha_1$	$KL_{III}$	12.649
0.93505	5 83 Bi	$L\beta_7$	$L_{III}O_{I}$	13.2593	0.98058	3 81 Tl	$L\beta_5$	$L_{III}O_{IV,V}$	12.6436
0.93505	5 83 Bi	$L\nu$	$L_{III}N_{VI,VII}$	13.2593	0.98221	7 82 Pb	$L\beta_2$	$L_{III}N_{V}$	12.6226
0.93855	3 83 Bi	$L\beta_3$	$L_{II}M_{III}$	13.2098	0.98280	5 83 Bi		$L_{III}N_{II}$	12.6151
0.93931	5 78 Pt	$L\nu$	$L_{II}N_{VI}$	13.1992	0.98291	3 82 Pb	$L\beta_1$	$L_{II}M_{IV}$	12.6137
0.9402	2 79 Au		$L_{II}N_{III}$	13.186	0.98389	7 82 Pb	$L\beta_{15}$	$L_{III}N_{IV}$	12.6011
0.9411	1 78 Pt	$L\gamma_8$	$L_{II}O_{I}$	13.173	0.9841	1 36 Kr	$K\alpha_2$	$KL_{II}$	12.598
0.94419	5 83 Bi		$L_{II}M_{V}$	13.1310	0.9843	1 34 Se	$K\beta_5$	$KM_{IV,V}$	12.595
0.9446	2 77 Ir	$L\gamma_{11}$	$L_{II}N_{V}$	13.126	0.98538	5 81 Tl		$L_{III}O_{III}$	12.5820
0.94482	5 91 Pa	$L\alpha_2$	$L_{III}M_{IV}$	13.1222	0.9871	2 80 Hg	$L\beta_9$	$L_{II}M_{V}$	12.560
0.9455	2 78 Pt		$L_{II}N_{I}$	13.113	0.98738	5 81 Tl		$L_{III}O_{II}$	12.5566
0.9459	2 77 Ir		$L_{II}N_{IV}$	13.108	0.9877	2 78 Pt	$L\gamma_6$	$L_{II}N_{I}$	12.552
0.9475	3 84 Po	$L\beta_4$	$L_{II}M_{II}$	13.086	0.9888	1 81 Tl	$L\nu$	$L_{III}N_{VI,VII}$	12.538
0.95073	5 82 Pb	$L_{III}$	Abs. Edge	13.0406	0.98913	5 83 Bi	$L\beta_{17}$	$L_{II}M_{III}$	12.5344
0.95118	7 82 Pb		$L_{III}P_{II,III}$	13.0344	0.9894	1 75 Re	$L_{II}$	Abs. Edge	12.530
0.951978	9 83 Bi	$L\beta_1$	$L_{II}M_{IV}$	13.0235	0.9900	1 75 Re		$L_{II}O_{IV,V}$	12.524
0.9526	1 82 Pb	$L\beta_5$	$L_{III}O_{IV,V}$	13.015	0.99017	5 81 Tl	$L\beta_7$	$L_{III}O_{I}$	12.5212
0.95518	4 83 Bi	$L\beta_2$	$L_{III}N_{V}$	12.9799	0.99085	3 77 Ir	$L\gamma_1$	$L_{II}N_{IV}$	12.5126
0.95559	3 79 Au	$L\gamma_5$	$L_{II}N_{I}$	12.9743	0.99178	5 89 Ac	$L\alpha_2$	$L_{III}M_{IV}$	12.5008
0.9558	1 76 Os	$L_{II}$	Abs. Edge	12.972	0.99186	5 76 Os	$L\gamma_3$	$L_{II}N_{III}$	12.4998
0.95600	3 90 Th	$L\alpha_1$	$L_{III}M_{V}$	12.9687	0.99218	3 34 Se	$K\beta_1$	$KM_{III}$	12.4959
0.95603	5 76 Os		$L_{II}O_{IV,V}$	12.9683	0.99249	5 75 Re	$L\gamma_4$	$L_{II}O_{III}$	12.4920
0.95675	7 81 Tl	$L\beta_9$	$L_{II}M_{V}$	12.9585	0.99268	5 34 Se	$K\beta_3$	$KM_{II}$	12.4896
0.95702	5 83 Bi	$L\beta_{15}$	$L_{III}N_{IV}$	12.9549	0.99331	3 83 Bi	$L\beta_5$	$L_{II}N_{I}$	12.4816
0.9578	1 82 Pb		$L_{III}O_{III}$	12.945	0.99334	5 75 Re	$L\gamma_4'$	$L_{II}O_{II}$	12.4813
0.95797	3 78 Pt	$L\gamma_1$	$L_{II}N_{IV}$	12.9420	0.9962	2 80 Hg	$L\beta_{10}$	$L_{II}M_{IV}$	12.446
0.9586	1 82 Pb		$L_{III}O_{II}$	12.934	0.9965	1 75 Re		$L_{II}O_{I}$	12.442
0.95931	5 77 Ir	$L\gamma_3$	$L_{II}N_{III}$	12.9240	0.99805	5 76 Os	$L\gamma_2$	$L_{II}N_{II}$	12.4224
0.95938	8 76 Os	$L\gamma_4$	$L_{II}O_{III}$	12.923	1.0005	1 82 Pb		$L_{III}N_{III}$	12.392
0.96033	8 76 Os	$L\gamma_4'$	$L_{II}O_{II}$	12.910	1.0005	9 83 Bi		$L_{II}M_{I}$	12.39
0.96133	7 82 Pb	$L\nu$	$L_{III}N_{VI,VII}$	12.8968	1.00062	3 81 Tl	$L\beta_3$	$L_{II}M_{III}$	12.3904
0.9620	1 82 Pb	$L\beta_7$	$L_{III}O_{I}$	12.888	1.00107	5 76 Os	$L\gamma_6$	$L_{II}O_{IV}$	12.3848
0.96318	7 76 Os		$L_{II}O_{I}$	12.8721	1.0012	6 95 Am	$L_{II}$	$L_{III}M_{I}$	12.384
0.9636	1 92 U	$L\delta$	$L_{III}M_{III}$	12.866	1.0014	1 76 Os	$L_{II}$	Abs. Edge	12.381
0.96389	7 81 Tl	$L\beta_{10}$	$L_{II}M_{IV}$	12.8626	1.0047	2 76 Os		$L_{II}O_{III}$	12.340
0.96545	3 77 Ir	$L\gamma_2$	$L_{II}N_{II}$	12.8418	1.00473	5 88 Ra	$L\alpha_1$	$L_{III}M_{V}$	12.3397
0.96708	4 77 Ir	$L\gamma_6$	$L_{II}O_{IV}$	12.8201	1.0050	2 76 Os	$L\nu$	$L_{II}N_{VI}$	12.337
0.9671	1 77 Ir	$L_{II}$	Abs. Edge	12.820	1.0054	3 77 Ir		$L_{II}N_{III}$	12.332
0.9672	2 84 Po	$L\beta_6$	$L_{III}N_{I}$	12.819	1.00722	5 81 Tl		$L_{II}M_{V}$	12.3093

TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV		
1.0075	1 82 Pb	$L\beta_4$	$L_{II}M_{II}$	12.306	1.04500	3 33 As	$K\beta_2$	$KN_{II,III}$	11.8642
1.00788	5 76 Os	$L\gamma_8$	$L_{II}O_I$	12.3012	1.0458	1 74 W	$L\gamma_{11}$	$L_{II}N_V$	11.856
1.0091	1 80 Hg	$L_{II}$	Abs. Edge	12.286	1.0468	2 74 W		$L_{II}N_{IV}$	11.844
1.00987	7 80 Hg	$L\beta_5$	$L_{III}O_{IV,V}$	12.2769	1.04752	5 79 Au	$Lu$	$L_{III}N_{VI,VII}$	11.8357
1.01031	3 81 Tl	$L\beta_2$	$L_{III}N_V$	12.2715	1.04868	5 80 Hg	$L\beta_1$	$L_{II}M_{IV}$	11.8226
1.01040	7 82 Pb		$L_{III}N_{II}$	12.2705	1.0488	1 33 As	$K\beta_5$	$KM_{IV,V}$	11.822
1.0108	1 75 Re	$L\gamma_{11}$	$L_{II}N_V$	12.266	1.04963	5 81 Tl	$L\beta_6$	$L_{III}N_I$	11.8118
1.0112	1 90 Th	$L_s$	$L_{III}M_{III}$	12.261	1.04974	8 79 Au	$L\beta_7$	$L_{II}O_I$	11.8106
1.0119	1 75 Re		$L_{II}N_{IV}$	12.252	1.05446	5 78 Pt	$L\beta_9$	$L_I M_V$	11.7577
1.0120	2 77 Ir		$L_{II}N_{II}$	12.251	1.05609	7 81 Tl	$L\beta_{17}$	$L_{II}M_{III}$	11.7397
1.01201	3 81 Tl	$L\beta_{15}$	$L_{III}N_{IV}$	12.2510	1.05693	5 76 Os	$L\gamma_5$	$L_{II}N_I$	11.7303
1.01404	7 80 Hg		$L_{III}O_{III}$	12.2264	1.05723	5 86 Rn	$L\alpha_1$	$L_{III}M_V$	11.7270
1.01513	4 81 Tl	$L\beta_1$	$L_{II}M_{IV}$	12.2133	1.05730	2 33 As	$K\beta_1$	$KM_{III}$	11.7262
1.01558	7 80 Hg		$L_{III}O_{II}$	12.2079	1.05783	5 33 As	$K\beta_3$	$KM_{II}$	11.7203
1.01656	5 88 Ra	$L\alpha_2$	$L_{III}M_{IV}$	12.1962	1.0585	1 80 Hg		$L_{III}N_{III}$	11.713
1.01674	7 80 Hg	$Lu$	$L_{III}N_{VII}$	12.1940	1.05856	3 83 Bi	$L\eta$	$L_{II}M_I$	11.7122
1.01769	7 80 Hg	$Lu'$	$L_{III}N_{VI}$	12.1826	1.06099	5 75 Re	$L\gamma_1$	$L_{II}N_{IV}$	11.6854
1.01937	7 80 Hg	$L\beta_7$	$L_{III}O_I$	12.1625	1.0613	1 73 Ta	$L_I$	Abs. Edge	11.682
1.02063	7 79 Au	$L\beta_9$	$L_I M_V$	12.1474	1.06183	7 78 Pt	$L\beta_{10}$	$L_I M_{IV}$	11.6762
1.0210	1 82 Pb	$L\beta_6$	$L_{III}N_I$	12.143	1.06192	9 73 Ta		$L_I O_{IV,V}$	11.6752
1.02175	5 77 Ir	$L\gamma_5$	$L_{II}N_I$	12.1342	1.06200	6 74 W	$L\gamma_3$	$L_I N_{III}$	11.6743
1.0223	1 82 Pb	$L\beta_{17}$	$L_{II}M_{III}$	12.127	1.06357	9 73 Ta		$L_I N_{VI,VII}$	11.6570
1.0226	1 94 Pu	$Ll$	$L_{III}M_I$	12.124	1.0644	2 82 Pb		$L_{II}M_{II}$	11.648
1.02467	5 74 W	$L_I$	Abs. Edge	12.0996	1.0644	2 81 Tl		$L_I M_I$	11.648
1.0250	2 74 W		$L_I O_{IV,V}$	12.095	1.06467	3 73 Ta	$L\gamma_4$	$L_I O_{III}$	11.6451
1.02503	5 76 Os	$L\gamma_1$	$L_{II}N_{IV}$	12.0953	1.0649	2 80 Hg		$L_{II}N_{II}$	11.642
1.02613	7 75 Re	$L\gamma_3$	$L_I N_{III}$	12.0824	1.06544	3 73 Ta	$L\gamma_4'$	$L_I O_{II}$	11.6366
1.02775	3 74 W	$L\gamma_4$	$L_I O_{III}$	12.0634	1.06712	2 92 U	$Ll$	$L_{III}M_I$	11.6183
1.02789	7 79 Au	$L\beta_{10}$	$L_I M_{IV}$	12.0617	1.06771	9 73 Ta		$L_I O_I$	11.6118
1.0286	1 81 Tl		$L_{III}N_{III}$	12.053	1.06785	9 79 Au	$L\beta_3$	$L_I M_{III}$	11.6103
1.02863	3 74 W	$L\gamma_4'$	$L_I O_{II}$	12.0530	1.06806	3 74 W	$L\gamma_2$	$L_I N_{II}$	11.6080
1.03049	5 87 Fr	$L\alpha_1$	$L_{III}M_V$	12.0313	1.06899	5 86 Rn	$L\alpha_2$	$L_{III}M_{IV}$	11.5979
1.0317	3 74 W		$L_I O_I$	12.017	1.07022	3 79 Au	$L\beta_2$	$L_{III}N_V$	11.5847
1.03233	5 75 Re	$L\gamma_2$	$L_I N_{II}$	12.0098	1.07188	5 79 Au	$L\beta_{15}$	$L_{III}N_{IV}$	11.5667
1.0323	2 82 Pb		$L_I M_I$	12.010	1.07222	7 80 Hg	$L\beta_4$	$L_I M_{II}$	11.5630
1.03358	7 80 Hg	$L\beta_3$	$L_I M_{III}$	11.9953	1.0723	1 78 Pt	$L_{II}$	Abs. Edge	11.562
1.0346	9 83 Bi		$L_I M_{II}$	11.98	1.0724	2 78 Pt	$L\beta_5$	$L_{III}O_{IV,V}$	11.561
1.0347	1 92 U	$Ll$	$L_{III}M_{II}$	11.982	1.07448	5 74 W	$L\gamma_6$	$L_{II}O_{IV}$	11.5387
1.03699	9 75 Re	$L\gamma_6$	$L_{II}O_{IV}$	11.956	1.0745	1 74 W	$L_{II}$	Abs. Edge	11.538
1.0371	1 75 Re	$L_{II}$	Abs. Edge	11.954	1.0756	2 79 Au		$L_{II}M_V$	11.526
1.03876	7 79 Au		$L_{III}P_{II,III}$	11.9355	1.0761	3 78 Pt		$L_{III}O_{II,III}$	11.521
1.03918	3 81 Tl	$L\beta_4$	$L_{II}M_{II}$	11.9306	1.0767	1 75 Re		$L_{II}N_{III}$	11.515
1.0397	1 75 Re		$L_{II}O_{III}$	11.925	1.0771	1 74 W	$L\nu$	$L_{II}N_{VI}$	11.510
1.03973	5 76 Os		$L_{II}N_{III}$	11.9243	1.07896	5 78 Pt	$Lu$	$L_{III}N_{VI,VII}$	11.4908
1.03974	2 35 Br	$K\alpha_1$	$KL_{III}$	11.9242	1.0792	2 74 W		$L_{II}O_{III}$	11.488
1.03975	7 80 Hg	$L\beta_2$	$L_{III}N_V$	11.9241	1.07975	7 80 Hg	$L\beta_5$	$L_{III}N_I$	11.4824
1.04000	5 79 Au	$L_{III}$	Abs. Edge	11.9212	1.08009	9 90 Th	$Ll$	$L_{III}M_{II}$	11.4788
1.0404	1 75 Re	$L\nu$	$L_{II}N_{VI}$	11.917	1.08113	4 74 W	$L\gamma_8$	$L_{II}O_I$	11.4677
1.04044	3 79 Au	$L\beta_5$	$L_{III}O_{IV,V}$	11.9163	1.08168	3 78 Pt	$L\beta_7$	$L_{III}O_I$	11.4619
1.04151	7 80 Hg	$L\beta_{15}$	$L_{III}N_{IV}$	11.9040	1.08205	7 73 Ta	$L\gamma_{11}$	$L_I N_V$	11.4580
1.0420	1 75 Re		$L_I N_I$	11.899	1.08353	3 79 Au	$L\beta_1$	$L_{II}M_{IV}$	11.4423
1.04230	5 87 Fr	$L\alpha_2$	$L_{III}M_{IV}$	11.8950	1.08377	7 73 Ta		$L_I N_{IV}$	11.4398
1.0428	6 93 Np	$Ll$	$L_{III}M_I$	11.890	1.0839	1 75 Re		$L_{II}N_{II}$	11.438
1.04382	2 35 Br	$K\alpha_2$	$KL_{II}$	11.8776	1.08500	5 85 At	$L\alpha_1$	$L_{II}M_V$	11.4268
1.04398	5 75 Re	$L\gamma_8$	$L_{II}O_I$	11.8758	1.08975	5 77 Ir	$L\beta_3$	$L_I M_V$	11.3770
1.0450	2 79 Au		$L_{III}O_{II,III}$	11.865	1.09026	7 79 Au		$L_{III}N_{III}$	11.3717
1.0450	1 33 As	$K$	Abs. Edge	11.865	1.0908	1 91 Pa	$Ll$	$L_{III}M_I$	11.366

TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV		
1.0916	5 80 Hg	$L\beta_{17}$	$L_{II}M_{III}$	11.358	1.13687	9 73 Ta	$L_{II}N_V$	10.9055	
1.09241	7 82 Pb	$L\eta$	$L_{II}M_I$	11.3493	1.13707	3 77 Ir	$L\beta_{15}$	$L_{III}N_{IV}$	10.9036
1.09388	5 75 Re	$L\gamma_5$	$L_{II}N_I$	11.3341	1.13794	3 73 Ta	$L\gamma_1$	$L_{II}N_{IV}$	10.8952
1.09671	5 85 At	$L\alpha_2$	$L_{III}M_{IV}$	11.3048	1.13841	5 72 Hf	$L\gamma_3$	$L_I N_{III}$	10.8907
1.09702	4 77 Ir	$L\beta_{10}$	$L_I M_{IV}$	11.3016	1.1387	5 80 Hg		$L_{II}M_{II}$	10.888
1.09855	3 74 W	$L\gamma_1$	$L_{II}N_{IV}$	11.2859	1.1402	1 71 Lu	$L_I$	Abs. Edge	10.8740
1.09936	4 73 Ta	$L\gamma_3$	$L_I N_{III}$	11.2776	1.1405	1 76 Os	$L\beta_5$	$L_{III}O_{IV,V}$	10.8711
1.0997	1 81 Tl		$L_{II}M_{II}$	11.274	1.1408	1 76 Os	$L_{III}$	Abs. Edge	10.8683
1.0997	1 72 Hf	$L_I$	Abs. Edge	11.274	1.14085	3 77 Ir	$L\beta_3$	$L_I M_{III}$	10.8674
1.09968	7 79 Au		$L_{III}N_{II}$	11.2743	1.14223	5 78 Pt	$L\beta_4$	$L_I M_{II}$	10.8543
1.0999	2 80 Hg		$L_I M_I$	11.272	1.1435	1 71 Lu	$L\gamma_4$	$L_I O_{II,III}$	10.8425
1.10086	9 72 Hf		$L_I O_{IV}$	11.2622	1.14355	5 78 Pt	$L\beta_6$	$L_{III}N_I$	10.8418
1.10200	3 78 Pt	$L\beta_2$	$L_{III}N_V$	11.2505	1.14386	2 83 Bi	$L\alpha_1$	$L_{III}M_V$	10.8388
1.10303	5 72 Hf	$L\gamma_4$	$L_I O_{III}$	11.2401	1.14442	5 72 Hf	$L\gamma_2$	$L_I N_{II}$	10.8335
1.10376	5 72 Hf	$L\gamma_4'$	$L_I O_{II}$	11.2326	1.14537	7 76 Os	$L\mu$	$L_{III}N_{VI,VII}$	10.8245
1.10394	5 78 Pt	$L\beta_3$	$L_I M_{III}$	11.2308	1.1489	2 77 Ir		$L_{II}M_V$	10.791
1.10477	2 34 Se	$K\alpha_1$	$KL_{III}$	11.2224	1.14933	8 76 Os	$L\beta_7$	$L_{III}O_I$	10.7872
1.1053	1 73 Ta	$L\gamma_2$	$L_I N_{II}$	11.217	1.1548	1 72 Hf	$L_{II}$	Abs. Edge	10.7362
1.1058	1 77 Ir	$L_{III}$	Abs. Edge	11.212	1.15519	5 72 Hf	$L\gamma_6$	$L_{II}O_{IV}$	10.7325
1.10585	3 77 Ir	$L\beta_5$	$L_{III}O_{IV,V}$	11.2114	1.1553	1 73 Ta		$L_{II}N_{III}$	10.7316
1.10651	3 79 Au	$L\beta_4$	$L_I M_{II}$	11.2047	1.15536	1 83 Bi	$L\alpha_2$	$L_{III}M_{IV}$	10.73091
1.10664	9 72 Hf		$L_I O_I$	11.2034	1.1560	3 77 Ir		$L_{III}N_{III}$	10.725
1.10882	2 34 Se	$K\alpha_2$	$KL_{II}$	11.1814	1.15781	3 77 Ir	$L\beta_1$	$L_I M_{IV}$	10.7083
1.10923	6 77 Ir		$L_{III}O_{II,III}$	11.1772	1.15830	9 72 Hf	$L\nu$	$L_{II}N_{VI}$	10.7037
1.11092	3 79 Au	$L\beta_6$	$L_{III}N_I$	11.1602	1.1600	2 73 Ta		$L_{II}N_{II}$	10.688
1.11145	4 77 Ir	$L\mu$	$L_{III}N_{VI,VII}$	11.1549	1.16107	9 71 Lu	$L\gamma_{11}$	$L_I N_V$	10.6782
1.1129	2 78 Pt		$L_{II}M_V$	11.140	1.16138	5 72 Hf	$L\gamma_8$	$L_{II}O_I$	10.6754
1.1137	1 73 Ta	$L_{II}$	Abs. Edge	11.132	1.16227	9 71 Lu		$L_I N_{IV}$	10.6672
1.11386	4 84 Po	$L\alpha_1$	$L_{III}M_V$	11.1308	1.1640	1 80 Hg	$L\eta$	$L_{II}M_I$	10.6512
1.11388	3 73 Ta	$L\gamma_6$	$L_{II}O_{IV}$	11.1306	1.16487	4 75 Re	$L\beta_9$	$L_I M_V$	10.6433
1.11489	3 77 Ir	$L\beta_7$	$L_{III}O_I$	11.1205	1.16545	5 77 Ir		$L_{II}N_{II}$	10.6380
1.1149	2 74 W		$L_{II}N_{III}$	11.120	1.1667	1 78 Pt	$L\beta_{17}$	$L_{II}M_{III}$	10.6265
1.11508	4 90 Th	$Ll$	$L_{III}M_I$	11.1186	1.16719	5 88 Ra	$Ll$	$L_{III}M_I$	10.6222
1.11521	9 73 Ta		$L_I N_I$	11.1173	1.16962	9 78 Pt		$L_I M_I$	10.6001
1.1158	1 73 Ta	$L\nu$	$L_{II}N_{VI}$	11.1113	1.16979	8 76 Os	$L\beta_2$	$L_{II}N_V$	10.5985
1.11658	5 32 Ge	$K$	Abs. Edge	11.1036	1.1708	1 79 Au		$L_{II}M_{II}$	10.5892
1.11686	2 32 Ge	$K\beta_2$	$KN_{II,III}$	11.1008	1.17167	5 76 Os	$L\beta_{15}$	$L_{III}N_{IV}$	10.5816
1.11693	9 73 Ta		$L_{II}O_{III}$	11.1001	1.17218	5 75 Re	$L\beta_{10}$	$L_I M_{IV}$	10.5770
1.11789	9 73 Ta		$L_{II}O_{II}$	11.0907	1.1729	1 73 Ta	$L\gamma_5$	$L_I N_I$	10.5702
1.1195	1 32 Ge	$K\beta_5$	$KM_{IV,V}$	11.0745	1.17501	2 82 Pb	$L\alpha_1$	$L_{III}M_V$	10.5515
1.11990	2 78 Pt	$L\beta_1$	$L_{II}M_{IV}$	11.0707	1.17588	1 33 As	$K\alpha_1$	$KL_{III}$	10.54372
1.1205	1 73 Ta	$L\gamma_8$	$L_{II}O_I$	11.0646	1.17721	5 75 Re	$L\beta_5$	$L_{III}O_{IV,V}$	10.5318
1.12146	9 72 Hf	$L\gamma_{11}$	$L_I N_V$	11.0553	1.1773	1 75 Re	$L_{III}$	Abs. Edge	10.5306
1.1218	3 74 W		$L_{II}N_{II}$	11.052	1.17788	9 72 Hf		$L_{II}N_V$	10.5258
1.12250	9 72 Hf		$L_I N_{IV}$	11.0451	1.17796	3 77 Ir	$L\beta_6$	$L_{III}N_I$	10.5251
1.1226	2 78 Pt		$L_{III}N_{III}$	11.044	1.17900	5 72 Hf	$L\gamma_1$	$L_{II}N_{IV}$	10.5158
1.12548	5 84 Po	$L\alpha_2$	$L_{III}M_{IV}$	11.0158	1.17953	4 71 Lu	$L\gamma_3$	$L_I N_{III}$	10.5110
1.12637	6 76 Os	$L\beta_9$	$L_I M_V$	11.0071	1.17955	7 76 Os	$L\beta_3$	$L_I M_{III}$	10.5108
1.12769	3 81 Tl	$L\eta$	$L_{II}M_I$	10.9943	1.17958	3 77 Ir	$L\beta_4$	$L_I M_{II}$	10.5106
1.12798	5 79 Au	$L\beta_{17}$	$L_{II}M_{III}$	10.9915	1.17987	1 33 As	$K\alpha_2$	$KL_{II}$	10.50799
1.12894	2 32 Ge	$K\beta_1$	$KM_{III}$	10.9821	1.1815	1 75 Re	$L\mu$	$L_{III}N_{VI,VII}$	10.4931
1.12936	9 32 Ge	$K\beta_3$	$KM_{II}$	10.9780	1.1818	1 70 Yb	$L_I$	Abs. Edge	10.4904
1.1310	2 78 Pt		$L_{III}N_{II}$	10.962	1.1827	1 70 Yb		$L_I O_{IV,V}$	10.4833
1.13235	3 74 W	$L\gamma_6$	$L_{II}N_I$	10.9490	1.1853	1 70 Yb	$L\gamma_4$	$L_I O_{II,III}$	10.4603
1.13353	5 76 Os	$L\beta_{10}$	$L_I M_{IV}$	10.9376	1.1853	2 71 Lu	$L\gamma_2$	$L_I N_{II}$	10.460
1.13525	5 79 Au		$L_I M_I$	10.9210	1.18610	5 75 Re	$L\beta_7$	$L_{III}O_I$	10.4529
1.13532	3 77 Ir	$L\beta_2$	$L_{III}N_V$	10.9203	1.18648	5 82 Pb	$L\alpha_2$	$L_{II}M_{IV}$	10.4495



TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV		
1.1886	1 70 Yb	$L_{II}O_I$	10.4312	1.254054	9 32 Ge	$K\alpha_1$	$KL_{III}$	9.88642	
1.18977	7 76 Os	$L_{II}M_V$	10.4205	1.2553	1 73 Ta	$L_{III}$	Abs. Edge	9.8766	
1.1958	1 31 Ga	$K$	Abs. Edge	10.3682	1.2555	1 73 Ta	$L\beta_6$	$L_{III}O_{IV,V}$	9.8750
1.19600	2 31 Ga	$K\beta_2$	10.3663	1.25778	4 73 Ta	$Lu$	$L_{III}N_{VI,VII}$	9.8572	
1.19727	7 76 Os	$L\beta_1$	$L_{II}M_{IV}$	10.3553	1.258011	9 32 Ge	$K\alpha_2$	$KL_{II}$	9.85532
1.1981	2 31 Ga	$K\beta_5$	$KM_{IV,V}$	10.348	1.25917	5 75 Re	$L\beta_4$	$L_I M_{II}$	9.8463
1.1985	1 71 Lu	$L_{II}$	Abs. Edge	10.3448	1.2596	1 71 Lu	$L\gamma_6$	$L_{II}N_I$	9.8428
1.1987	1 71 Lu	$L\gamma_6$	$L_{II}O_{IV}$	10.3431	1.2601	3 73 Ta		$L_{III}O_{II,III}$	9.839
1.20086	7 76 Os		$L_{III}N_{II}$	10.3244	1.26269	5 74 W	$L\beta_3$	$L_I M_{III}$	9.8188
1.2014	1 71 Lu		$L_{II}O_{II,III}$	10.3198	1.26385	5 73 Ta	$L\beta_7$	$L_{III}O_I$	9.8098
1.20273	3 79 Au	$L\eta$	$L_{II}M_I$	10.3083	1.2672	2 74 W		$L_{III}N_{III}$	9.784
1.2047	1 71 Lu	$L\gamma_8$	$L_{II}O_I$	10.2915	1.26769	5 70 Yb	$L\gamma_1$	$L_{II}N_{IV}$	9.7801
1.20479	7 74 W	$L\beta_9$	$L_I M_V$	10.2907	1.2678	2 69 Tm	$L\gamma_3$	$L_I N_{III}$	9.779
1.20660	4 75 Re	$L\beta_2$	$L_{III}N_V$	10.2752	1.2706	1 68 Er	$L_I$	Abs. Edge	9.7574
1.2069	2 77 Ir	$L\beta_{17}$	$L_{II}M_{III}$	10.273	1.2728	2 74 W		$L_{II}M_V$	9.741
1.20739	4 81 Tl	$L\alpha_1$	$L_{III}M_V$	10.2685	1.2742	2 69 Tm	$L\gamma_2$	$L_I N_{II}$	9.730
1.20789	2 31 Ga	$K\beta_1$	$KM_{III}$	10.2642	1.2748	1 83 Bi	$Lt$	$L_{III}M_{II}$	9.7252
1.20819	5 75 Re	$L\beta_{15}$	$L_{III}N_{IV}$	10.2617	1.2752	2 68 Er	$L\gamma_4$	$L_I O_{II,III}$	9.722
1.20835	5 31 Ga	$K\beta_3$	$KM_{II}$	10.2603	1.27640	3 79 Au	$L\alpha_1$	$L_{III}M_V$	9.7133
1.2102	2 77 Ir		$L_I M_I$	10.245	1.2765	2 74 W		$L_{III}N_{II}$	9.712
1.2105	1 83 Bi	$Ls$	$L_{III}M_{III}$	10.2421	1.27807	5 81 Tl	$Ls$	$L_{III}M_{III}$	9.7007
1.21218	3 74 W	$L\beta_{10}$	$L_I M_{IV}$	10.2279	1.281809	9 74 W	$L\beta_1$	$L_{II}M_{IV}$	9.67235
1.213	1 78 Pt		$L_{II}M_{II}$	10.225	1.2829	5 84 Po	$Ll$	$L_{III}M_I$	9.664
1.21349	5 76 Os	$L\beta_6$	$L_{III}N_I$	10.2169	1.2834	1 30 Zn	$K$	Abs. Edge	9.6607
1.21537	5 72 Hf	$L\gamma_5$	$L_{II}N_I$	10.2011	1.28372	2 30 Zn	$K\beta_2$	$KN_{II,III}$	9.6580
1.21545	3 74 W	$L\beta_5$	$L_{III}O_{IV,V}$	10.2004	1.28448	3 77 Ir	$L\eta$	$L_{II}M_I$	9.6522
1.2155	1 74 W	$L_{III}$	Abs. Edge	10.1999	1.28454	2 73 Ta	$L\beta_2$	$L_{III}N_V$	9.6518
1.21844	5 76 Os	$L\beta_4$	$L_I M_{II}$	10.1754	1.2848	1 30 Zn	$K\beta_5$	$KM_{IV,V}$	9.6501
1.21868	5 74 W	$Lu$	$L_{III}N_{VI,VII}$	10.1733	1.28619	5 73 Ta	$L\beta_{15}$	$L_{III}N_{IV}$	9.6394
1.21875	3 81 Tl	$L\alpha_2$	$L_{III}M_{IV}$	10.1728	1.28772	3 79 Au	$L\alpha_2$	$L_{III}M_{IV}$	9.6280
1.22031	5 75 Re	$L\beta_3$	$L_I M_{III}$	10.1598	1.2892	1 69 Tm	$L_{II}$	Abs. Edge	9.6171
1.2211	2 74 W		$L_{III}O_{II,III}$	10.153	1.28989	7 74 W	$L\beta_8$	$L_{III}N_I$	9.6117
1.22228	4 71 Lu	$L\gamma_1$	$L_{II}N_{IV}$	10.1434	1.29025	9 72 Hf	$L\beta_9$	$L_I M_V$	9.6090
1.22232	5 70 Yb	$L\gamma_3$	$L_I N_{III}$	10.1431	1.2905	2 69 Tm	$L\gamma_6$	$L_{II}O_{IV}$	9.607
1.22400	4 74 W	$L\beta_7$	$L_{III}O_I$	10.1292	1.2927	1 75 Re	$L\beta_{17}$	$L_{II}M_{III}$	9.5910
1.2250	1 69 Tm	$L_I$	Abs. Edge	10.1206	1.2934	2 76 Os		$L_{II}M_{II}$	9.586
1.2263	3 69 Tm		$L_I O_{IV,V}$	10.110	1.29525	2 30 Zn	$K\beta_{1,3}$	$KM_{II,III}$	9.5720
1.2283	1 75 Re		$L_{III}N_{III}$	10.0933	1.2972	1 72 Hf	$L_{III}$	Abs. Edge	9.5577
1.22879	7 70 Yb	$L\gamma_2$	$L_I N_{II}$	10.0897	1.29761	5 72 Hf	$L\beta_6$	$L_{III}O_{IV,V}$	9.5546
1.2294	2 69 Tm	$L\gamma_4$	$L_I O_{II,III}$	10.084	1.29819	9 72 Hf	$L\beta_{10}$	$L_I M_{IV}$	9.5503
1.2305	1 75 Re		$L_{II}M_V$	10.0753	1.30162	5 74 W	$L\beta_4$	$L_I M_{II}$	9.5252
1.23858	2 75 Re	$L\beta_1$	$L_{II}M_{IV}$	10.0100	1.30165	9 72 Hf	$Lu$	$L_{III}N_{VI,VII}$	9.5249
1.24120	5 80 Hg	$L\alpha_1$	$L_{III}M_V$	9.9888	1.30564	5 72 Hf	$L\beta_7$	$L_{III}O_I$	9.4958
1.24271	3 70 Yb	$L\gamma_6$	$L_{II}O_{IV}$	9.9766	1.3063	1 70 Yb	$L\gamma_6$	$L_{II}N_I$	9.4910
1.2428	1 70 Yb	$L_{II}$	Abs. Edge	9.9761	1.30678	3 73 Ta	$L\beta_3$	$L_I M_{III}$	9.4875
1.2429	2 78 Pt	$L\eta$	$L_{II}M_I$	9.975	1.30767	7 82 Pb	$Lt$	$L_{III}M_{II}$	9.4811
1.24385	7 82 Pb	$Ls$	$L_{III}M_{III}$	9.9675	1.3086	1 73 Ta		$L_{III}N_{III}$	9.4742
1.24460	3 74 W	$L\beta_2$	$L_{III}N_V$	9.9615	1.3112	2 80 Hg	$Ls$	$L_{III}M_{III}$	9.455
1.2453	1 70 Yb		$L_{II}O_{II,III}$	9.9561	1.31304	3 78 Pt	$L\alpha_1$	$L_{III}M_V$	9.4423
1.24631	3 74 W	$L\beta_{15}$	$L_{III}N_{IV}$	9.9478	1.3146	1 68 Er	$L\gamma_3$	$L_I N_{III}$	9.4309
1.2466	2 73 Ta	$L\beta_9$	$L_I M_V$	9.946	1.3153	2 69 Tm	$L\gamma_1$	$L_{II}N_{IV}$	9.426
1.2480	2 76 Os	$L\beta_{17}$	$L_{II}M_{III}$	9.934	1.31610	7 83 Bi	$Ll$	$L_{III}M_I$	9.4204
1.24923	5 70 Yb	$L\gamma_8$	$L_{II}O_I$	9.9246	1.3167	1 73 Ta		$L_{III}N_{II}$	9.4158
1.2502	3 77 Ir		$L_{II}M_{II}$	9.917	1.31897	9 73 Ta		$L_{II}M_V$	9.3998
1.25100	5 75 Re	$L\beta_6$	$L_{III}N_I$	9.9105	1.3190	1 67 Ho	$L_I$	Abs. Edge	9.3994
1.25264	7 80 Hg	$L\alpha_2$	$L_{III}M_{IV}$	9.8976	1.3208	3 67 Ho		$L_I O_{IV,V}$	9.387
1.2537	2 73 Ta	$L\beta_{10}$	$L_I M_{IV}$	9.889	1.3210	2 68 Er	$L\gamma_2$	$L_I N_{II}$	9.385

TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV		
1.3225	2 67 Ho	$L\gamma_4$	$L_{II}O_{II,III}$	9.374	1.3948	1 70 Yb	$L\beta_7$	$L_{III}O_I$	8.8889
1.32432	2 78 Pt	$L\alpha_2$	$L_{III}M_{IV}$	9.3618	1.3983	2 67 Ho	$L\gamma_8$	$L_{II}O_I$	8.867
1.32639	5 72 Hf	$L\beta_3$	$L_{III}N_V$	9.3473	1.40140	5 71 Lu	$L\beta_3$	$L_I M_{III}$	8.8469
1.32698	3 73 Ta	$L\beta_1$	$L_{II}M_{IV}$	9.3431	1.40234	5 76 Os	$L\alpha_2$	$L_{II}M_{IV}$	8.8410
1.32783	5 72 Hf	$L\beta_{15}$	$L_{III}N_{IV}$	9.3371	1.4067	3 68 Er	$L\gamma_5$	$L_{II}N_I$	8.814
1.32785	7 76 Os	$L\eta$	$L_{II}M_I$	9.3370	1.41366	7 79 Au	$L\iota$	$L_{II}M_{II}$	8.7702
1.33094	8 73 Ta	$L\beta_6$	$L_{III}N_I$	9.3153	1.41550	5 70 Yb	$L\beta_{2,15}$	$L_{III}N_{IV,V}$	8.7588
1.3358	1 71 Lu	$L\beta_9$	$L_I M_V$	9.2816	1.41640	7 66 Dy	$L\gamma_3$	$L_I N_{III}$	8.7532
1.3365	3 74 W		$L_I M_I$	9.277	1.4174	2 67 Ho	$L\gamma_1$	$L_{II}N_{IV}$	8.747
1.3366	1 75 Re		$L_{II}M_{II}$	9.2761	1.4189	1 71 Lu	$L\beta_6$	$L_{III}N_I$	8.7376
1.3386	1 68 Er	$L_{II}$	Abs. Edge	9.2622	1.42110	3 74 W	$L\eta$	$L_{II}M_I$	8.7243
1.3387	2 74 W	$L\beta_{17}$	$L_{II}M_{III}$	9.261	1.4216	1 80 Hg	$L\iota$	$L_{II}M_I$	8.7210
1.3397	3 68 Er	$L\gamma_6$	$L_{II}O_{IV}$	9.255	1.4223	1 65 Tb	$L_I$	Abs. Edge	8.7167
1.340083	9 31 Ga	$K\alpha_1$	$KL_{III}$	9.25174	1.42278	7 66 Dy	$L\gamma_2$	$L_I N_{II}$	8.7140
1.3405	1 71 Lu	$L_{III}$	Abs. Edge	9.2490	1.4228	3 65 Tb		$L_I O_{IV,V}$	8.714
1.34154	5 81 Tl	$L\iota$	$L_{III}M_{II}$	9.2417	1.42359	3 71 Lu	$L\beta_1$	$L_{II}M_{IV}$	8.7090
1.34183	7 71 Lu	$L\beta_5$	$L_{III}O_{IV,V}$	9.2397	1.4276	2 65 Tb	$L\gamma_4$	$L_I O_{II,III}$	8.685
1.3430	2 71 Lu	$L\beta_{10}$	$L_I M_{IV}$	9.232	1.43025	9 72 Hf		$L_I M_I$	8.6685
1.34399	1 31 Ga	$K\alpha_2$	$KL_{II}$	9.22482	1.43048	9 73 Ta		$L_{II}M_{II}$	8.6671
1.34524	9 71 Lu		$L_{III}O_{II,III}$	9.2163	1.4318	2 77 Ir	$L\varsigma$	$L_{III}M_{III}$	8.659
1.34581	3 73 Ta	$L\beta_4$	$L_I M_{II}$	9.2124	1.43290	4 75 Re	$L\alpha_1$	$L_{III}M_V$	8.6525
1.34949	5 71 Lu	$L\beta_7$	$L_{III}O_I$	9.1873	1.4334	1 69 Tm	$L_{III}$	Abs. Edge	8.6496
1.34990	7 82 Pb	$L\iota$	$L_{III}M_I$	9.1845	1.4336	3 69 Tm	$L\beta_9$	$L_I M_V$	8.648
1.35053	9 72 Hf		$L_{III}N_{III}$	9.1802	1.4349	2 69 Tm	$L\beta_5$	$L_{III}O_{IV,V}$	8.641
1.35128	3 77 Ir	$L\alpha_1$	$L_{III}M_V$	9.1751	1.435155	7 30 Zn	$K\alpha_1$	$KL_{III}$	8.63886
1.35131	7 79 Au	$L\varsigma$	$L_{III}M_{III}$	9.1749	1.43643	9 72 Hf	$L\beta_{17}$	$L_{II}M_{III}$	8.6312
1.35300	5 72 Hf	$L\beta_8$	$L_I M_{III}$	9.1634	1.439000	8 30 Zn	$K\alpha_2$	$KL_{II}$	8.61578
1.3558	2 69 Tm	$L\gamma_5$	$L_{II}N_I$	9.144	1.44056	5 71 Lu	$L\beta_4$	$L_I M_{II}$	8.6064
1.35887	9 72 Hf		$L_{III}N_{II}$	9.1239	1.4410	3 69 Tm	$L\beta_{10}$	$L_I M_{IV}$	8.604
1.36250	5 77 Ir	$L\alpha_2$	$L_{III}M_{IV}$	9.0995	1.44396	5 75 Re	$L\alpha_2$	$L_{II}M_{IV}$	8.5862
1.3641	2 68 Er	$L\gamma_1$	$L_{II}N_{IV}$	9.089	1.4445	1 66 Dy	$L_{II}$	Abs. Edge	8.5830
1.3643	2 67 Ho	$L\gamma_3$	$L_I N_{III}$	9.087	1.44579	7 66 Dy	$L\gamma_6$	$L_{II}O_{IV}$	8.5753
1.3692	1 66 Dy	$L_I$	Abs. Edge	9.0548	1.45233	5 70 Yb	$L\beta_8$	$L_I M_{III}$	8.5367
1.3698	2 67 Ho	$L\gamma_2$	$L_I N_{II}$	9.051	1.4530	2 78 Pt	$L\iota$	$L_{III}M_{II}$	8.533
1.37012	3 71 Lu	$L\beta_2$	$L_{III}N_V$	9.0489	1.45964	9 79 Au	$L\iota$	$L_{III}M_I$	8.4939
1.3715	1 71 Lu	$L\beta_{15}$	$L_{III}N_{IV}$	9.0395	1.4618	2 67 Ho	$L\gamma_5$	$L_{II}N_I$	8.481
1.37342	5 75 Re	$L\eta$	$L_{II}M_I$	9.0272	1.4640	2 69 Tm	$L\beta_{2,15}$	$L_{III}N_{IV,V}$	8.468
1.37410	5 72 Hf	$L\beta_1$	$L_{II}M_{IV}$	9.0227	1.4661	1 70 Yb	$L\beta_6$	$L_{III}N_I$	8.4563
1.37410	5 72 Hf	$L\beta_6$	$L_{III}N_I$	9.0227	1.47106	5 73 Ta	$L\eta$	$L_{II}M_I$	8.4280
1.37459	7 66 Dy	$L\gamma_4$	$L_I O_{II,III}$	9.0195	1.4718	2 65 Tb	$L\gamma_3$	$L_I N_{III}$	8.423
1.3746	2 80 Hg	$L\iota$	$L_{III}M_{II}$	9.019	1.47266	7 66 Dy	$L\gamma_1$	$L_{II}N_{IV}$	8.4188
1.38059	5 29 Cu	$K$	Abs. Edge	8.9803	1.4735	2 76 Os	$L\varsigma$	$L_{III}M_{III}$	8.414
1.38109	3 29 Cu	$K\beta_2$	$KM_{IV,V}$	8.9770	1.47565	5 70 Yb	$L\beta_1$	$L_{II}M_{IV}$	8.4018
1.3838	1 70 Yb	$L\beta_9$	$L_I M_V$	8.9597	1.4764	2 65 Tb	$L\gamma_2$	$L_I N_{II}$	8.398
1.38477	3 81 Tl	$L\iota$	$L_{III}M_I$	8.9532	1.47639	2 74 W	$L\alpha_1$	$L_{III}M_V$	8.3976
1.3862	1 70 Yb	$L_{III}$	Abs. Edge	8.9441	1.4784	1 64 Gd	$L_I$	Abs. Edge	8.3864
1.3864	1 73 Ta	$L\beta_{17}$	$L_{II}M_{III}$	8.9428	1.48064	9 72 Hf		$L_{II}M_{II}$	8.3735
1.38696	7 70 Yb	$L\beta_5$	$L_{III}O_{IV,V}$	8.9390	1.4807	3 64 Gd		$L_I O_{IV,V}$	8.373
1.3895	2 78 Pt	$L\varsigma$	$L_{III}M_{III}$	8.923	1.4835	1 68 Er	$L_{III}$	Abs. Edge	8.3575
1.3898	1 70 Yb		$L_{III}O_{II,III}$	8.9209	1.4839	2 64 Gd	$L\gamma_4$	$L_I O_{II,III}$	8.355
1.3905	1 67 Ho	$L_{II}$	Abs. Edge	8.9164	1.4848	3 68 Er	$L\beta_5$	$L_{III}O_{IV,V}$	8.350
1.39121	5 76 Os	$L\alpha_1$	$L_{III}M_V$	8.9117	1.4855	5 68 Er	$L\beta_9$	$L_I M_V$	8.346
1.3915	1 70 Yb	$L\beta_{10}$	$L_I M_{IV}$	8.9100	1.48743	2 74 W	$L\alpha_2$	$L_{III}M_{IV}$	8.3352
1.39220	5 72 Hf	$L\beta_4$	$L_I M_{II}$	8.9054	1.48807	1 28 Ni	$K$	Abs. Edge	8.33165
1.392218	9 29 Cu	$K\beta_{1,3}$	$KM_{II,III}$	8.90529	1.48862	4 28 Ni	$K\beta_5$	$KM_{IV,V}$	8.3286
1.3923	2 67 Ho	$L\gamma_6$	$L_{II}O_{IV}$	8.905	1.49138	3 70 Yb	$L\beta_4$	$L_I M_{II}$	8.3132
1.3926	1 29 Cu	$K\beta_3$	$KM_{II}$	8.9029	1.4930	3 77 Ir	$L\iota$	$L_{III}M_{II}$	8.304

TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV		
1.4941	3 68 Er	$L\beta_7$	$L_{III}O_I$	8.298	1.60891	3 27 Co	$K\beta_5$	$KM_{IV,V}$	7.7059
1.4941	3 68 Er	$L\beta_{10}$	$L_{II}M_{IV}$	8.298	1.61264	9 73 Ta	$L_S$	$L_{III}M_{III}$	7.6881
1.4995	2 78 Pt	$L_I$	$L_{III}M_I$	8.268	1.61951	3 71 Lu	$L\alpha_1$	$L_{III}M_V$	7.6555
1.500135	8 28 Ni	$K\beta_{1,3}$	$KM_{II,III}$	8.26466	1.6203	2 67 Ho	$L\beta_3$	$L_{II}M_{III}$	7.6519
1.5023	1 65 Tb	$L_{II}$	Abs. Edge	8.2527	1.62079	2 27 Co	$K\beta_{1,3}$	$KM_{II,III}$	7.64943
1.5035	2 65 Tb	$L\gamma_6$	$L_{II}O_{IV}$	8.246	1.6237	2 67 Ho	$L\beta_6$	$L_{III}N_I$	7.6359
1.5063	2 69 Tm	$L\beta_3$	$L_{II}M_{III}$	8.231	1.62369	7 66 Dy	$L\beta_{2,15}$	$L_{III}N_{IV,V}$	7.6357
1.5097	2 65 Tb	$L\gamma_8$	$L_{II}O_I$	8.212	1.6244	3 74 W	$L_I$	$L_{III}M_{II}$	7.6324
1.51399	9 68 Er	$L\beta_{2,15}$	$L_{III}N_{IV,V}$	8.1890	1.6271	1 63 Eu	$L_{II}$	Abs. Edge	7.6199
1.5162	2 69 Tm	$L\beta_6$	$L_{III}N_I$	8.177	1.6282	2 63 Eu	$L\gamma_6$	$L_{II}O_{IV}$	7.6147
1.5178	1 75 Re	$L_S$	$L_{III}M_{III}$	8.1682	1.63029	5 71 Lu	$L\alpha_2$	$L_{III}M_{IV}$	7.6049
1.51824	7 66 Dy	$L\gamma_6$	$L_{II}N_I$	8.1661	1.63056	5 75 Re	$L_I$	$L_{III}M_I$	7.6036
1.52197	2 73 Ta	$L\alpha_1$	$L_{III}M_V$	8.1461	1.6346	2 63 Eu	$L\gamma_8$	$L_{II}O_I$	7.5849
1.52325	5 72 Hf	$L_\eta$	$L_{II}M_I$	8.1393	1.63560	5 70 Yb	$L_\eta$	$L_{II}M_I$	7.5802
1.5297	2 64 Gd	$L\gamma_3$	$L_{II}N_{III}$	8.105	1.6412	2 64 Gd	$L\gamma_6$	$L_{II}N_I$	7.5543
1.5303	2 65 Tb	$L\gamma_1$	$L_{II}N_{IV}$	8.102	1.6475	2 67 Ho	$L\beta_1$	$L_{II}M_{IV}$	7.5253
1.5304	2 69 Tm	$L\beta_1$	$L_{II}M_{IV}$	8.101	1.6497	1 65 Tb	$L_{III}$	Abs. Edge	7.5153
1.53293	2 73 Ta	$L\alpha_2$	$L_{III}M_{IV}$	8.0879	1.6510	2 65 Tb	$L\beta_5$	$L_{III}O_{IV,V}$	7.5094
1.5331	2 64 Gd	$L\gamma_2$	$L_{II}N_{II}$	8.087	1.65601	3 62 Sm	$L\gamma_3$	$L_{II}N_{III}$	7.487
1.53333	9 71 Lu		$L_{II}M_{II}$	8.0858	1.6574	2 63 Eu	$L\gamma_1$	$L_{II}N_{IV}$	7.4803
1.5347	2 76 Os	$L_I$	$L_{III}M_{II}$	8.079	1.657910	8 28 Ni	$K\alpha_1$	$KL_{III}$	7.47815
1.5368	1 67 Ho	$L_{III}$	Abs. Edge	8.0676	1.6585	2 65 Tb	$L\beta_7$	$L_{III}O_I$	7.4753
1.5378	2 67 Ho	$L\beta_5$	$L_{III}O_{IV,V}$	8.062	1.6595	2 67 Ho	$L\beta_4$	$L_{II}M_{II}$	7.4708
1.5381	1 63 Eu	$L_I$	Abs. Edge	8.0607	1.66044	6 62 Sm	$L\gamma_2$	$L_{II}N_{II}$	7.467
1.540562	2 29 Cu	$K\alpha_1$	$KL_{III}$	8.04778	1.661747	8 28 Ni	$K\alpha_2$	$KL_{II}$	7.46089
1.54094	3 77 Ir	$L_I$	$L_{III}M_I$	8.0458	1.66346	9 72 Hf	$L_S$	$L_{III}M_{III}$	7.4532
1.5439	1 63 Eu	$L\gamma_4$	$L_{IO_{II,III}}$	8.0304	1.6673	3 65 Tb	$L\beta_{10}$	$L_{II}M_{IV}$	7.436
1.544390	9 29 Cu	$K\alpha_2$	$KL_{II}$	8.02783	1.6674	5 61 Pm	$L_I$	Abs. Edge	7.436
1.5448	2 69 Tm	$L\beta_4$	$L_{II}M_{II}$	8.026	1.67189	4 70 Yb	$L\alpha_1$	$L_{III}M_V$	7.4156
1.5486	3 67 Ho	$L\beta_{10}$	$L_{II}M_{IV}$	8.006	1.67265	9 73 Ta	$L_I$	$L_{III}M_{II}$	7.4123
1.5616	1 68 Er	$L\beta_3$	$L_{II}M_{III}$	7.9392	1.6782	1 74 W	$L_I$	$L_{III}M_I$	7.3878
1.5632	1 64 Gd	$L_{II}$	Abs. Edge	7.9310	1.68213	7 66 Dy	$L\beta_6$	$L_{III}N_I$	7.3705
1.5642	3 74 W	$L_S$	$L_{III}M_{III}$	7.926	1.6822	2 66 Dy	$L\beta_3$	$L_{II}M_{III}$	7.3702
1.5644	2 64 Gd	$L\gamma_6$	$L_{II}O_{IV}$	7.925	1.68285	5 70 Yb	$L\alpha_2$	$L_{III}M_{IV}$	7.3673
1.5671	2 67 Ho	$L\beta_{2,15}$	$L_{III}N_{IV,V}$	7.911	1.6830	2 65 Tb	$L\beta_{2,15}$	$L_{III}N_{IV,V}$	7.3667
1.5675	2 68 Er	$L\beta_6$	$L_{III}N_I$	7.909	1.6953	1 62 Sm	$L_{II}$	Abs. Edge	7.3132
1.56958	5 72 Hf	$L\alpha_1$	$L_{III}M_V$	7.8990	1.6963	2 69 Tm	$L_\eta$	$L_{II}M_I$	7.3088
1.5707	2 64 Gd	$L\gamma_8$	$L_{II}O_I$	7.894	1.6966	9 62 Sm	$L\gamma_6$	$L_{II}O_{IV}$	7.308
1.5779	1 71 Lu	$L_\eta$	$L_{II}M_I$	7.8575	1.7085	2 63 Eu	$L\gamma_5$	$L_{II}N_I$	7.2566
1.5787	2 65 Tb	$L\gamma_6$	$L_{II}N_I$	7.8535	1.71062	7 66 Dy	$L\beta_1$	$L_{II}M_{IV}$	7.2477
1.5789	1 75 Re	$L_I$	$L_{III}M_{II}$	7.8525	1.7117	1 64 Gd	$L_{III}$	Abs. Edge	7.2430
1.58046	5 72 Hf	$L\alpha_2$	$L_{III}M_{IV}$	7.8446	1.7130	2 64 Gd	$L\beta_5$	$L_{III}O_{IV,V}$	7.2374
1.58498	7 76 Os	$L_I$	$L_{III}M_I$	7.8222	1.7203	2 64 Gd	$L\beta_7$	$L_{III}O_I$	7.2071
1.5873	1 68 Er	$L\beta_1$	$L_{II}M_{IV}$	7.8109	1.72103	7 66 Dy	$L\beta_4$	$L_{II}M_{II}$	7.2039
1.58837	7 66 Dy	$L\beta_5$	$L_{III}O_{IV,V}$	7.8055	1.72305	9 72 Hf	$L_I$	$L_{III}M_{II}$	7.1954
1.58844	9 70 Yb		$L_{II}M_{II}$	7.8052	1.7240	3 64 Gd	$L\beta_9$	$L_{II}M_V$	7.192
1.5903	2 63 Eu	$L\gamma_3$	$L_{II}N_{III}$	7.7961	1.72724	3 62 Sm	$L\gamma_1$	$L_{III}N_{IV}$	7.178
1.5916	1 66 Dy	$L_{III}$	Abs. Edge	7.7897	1.7268	2 69 Tm	$L\alpha_1$	$L_{III}M_V$	7.1799
1.5924	2 64 Gd	$L\gamma_1$	$L_{II}N_{IV}$	7.7858	1.72841	5 73 Ta	$L_I$	$L_{III}M_I$	7.1731
1.5961	2 63 Eu	$L\gamma_2$	$L_{II}N_{II}$	7.7677	1.7315	3 64 Gd	$L\beta_{10}$	$L_{II}M_{IV}$	7.160
1.59973	9 66 Dy	$L\beta_9$	$L_{II}M_V$	7.7501	1.7381	2 69 Tm	$L\alpha_2$	$L_{III}M_{IV}$	7.1331
1.6002	1 62 Sm	$L_I$	Abs. Edge	7.7478	1.7390	1 60 Nd	$L_I$	Abs. Edge	7.1294
1.6007	1 68 Er	$L\beta_4$	$L_{II}M_{II}$	7.7453	1.7422	2 65 Tb	$L\beta_5$	$L_{III}N_I$	7.1163
1.60447	7 66 Dy	$L\beta_7$	$L_{III}O_I$	7.7272	1.74346	1 26 Fe	$K$	Abs. Edge	7.11120
1.60728	3 62 Sm	$L\gamma_4$	$L_{IO_{II,III}}$	7.714	1.7442	1 26 Fe	$K\beta_5$	$KM_{IV,V}$	7.1081
1.60743	9 66 Dy	$L\beta_{10}$	$L_{II}M_{IV}$	7.7130	1.7445	4 60 Nd	$L\gamma_4$	$L_{IO_{II,III}}$	7.107
1.60815	1 27 Co	$K$	Abs. Edge	7.70954	1.7455	2 64 Gd	$L\beta_{2,15}$	$L_{III}N_{IV,V}$	7.1028

TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV		
1.7472	2 65 Tb	$L\beta_3$	$L_I M_{III}$	7.0959	1.9255	2 63 Eu	$L\beta_4$	$L_I M_{II}$	6.4389
1.75661	2 26 Fe	$K\beta_{1,3}$	$K M_{II,III}$	7.05798	1.9255	5 59 Pr	$L_{II}$	Abs. Edge	6.439
1.7566	1 68 Er	$L\eta$	$L_{II} M_I$	7.0579	1.9355	4 60 Nd	$L\gamma_5$	$L_{II} N_I$	6.406
1.7676	5 61 Pm	$L_{II}$	Abs. Edge	7.014	1.936042	9 26 Fe	$K\alpha_1$	$K L_{III}$	6.40384
1.7760	1 71 Lu	$L_I$	$L_{III} M_{II}$	6.9810	1.9362	4 59 Pr	$L\gamma_8$	$L_{II} O_I$	6.403
1.7761	1 63 Eu	$L_{III}$	Abs. Edge	6.9806	1.939980	9 26 Fe	$K\alpha_2$	$K L_{II}$	6.39084
1.7768	3 65 Tb	$L\beta_1$	$L_{II} M_{IV}$	6.978	1.94643	3 62 Sm	$L\beta_6$	$L_{III} N_I$	6.3693
1.7772	2 63 Eu	$L\beta_3$	$L_{III} O_{IV,V}$	6.9763	1.9550	2 69 Tm	$L_I$	$L_{III} M_I$	6.3419
1.77934	3 62 Sm	$L\gamma_5$	$L_{II} N_I$	6.968	1.9553	3 58 Ce	$L\gamma_3$	$L_I N_{III}$	6.3409
1.78145	5 72 Hf	$L_I$	$L_{III} M_I$	6.9596	1.9559	6 61 Pm	$L\beta_{2,15}$	$L_{III} N_{IV,V}$	6.339
1.78425	9 68 Er	$L\alpha_1$	$L_{III} M_V$	6.9487	1.9602	3 58 Ce	$L\gamma_2$	$L_I N_{II}$	6.3250
1.7851	2 63 Eu	$L\beta_7$	$L_{III} O_I$	6.9453	1.9611	3 59 Pr	$L\gamma_1$	$L_{II} N_{IV}$	6.3221
1.7864	2 65 Tb	$L\beta_4$	$L_I M_{II}$	6.9403	1.96241	3 62 Sm	$L\beta_8$	$L_I M_{III}$	6.318
1.788965	9 27 Co	$K\alpha_1$	$K L_{III}$	6.93032	1.9730	2 65 Tb	$L\eta$	$L_{II} M_I$	6.2839
1.7916	3 63 Eu	$L\beta_9$	$L_I M_V$	6.920	1.9765	2 65 Tb	$L\alpha_1$	$L_{III} M_V$	6.2728
1.792850	9 27 Co	$K\alpha_2$	$K L_{II}$	6.91530	1.9780	5 57 La	$L_I$	Abs. Edge	6.268
1.7955	2 68 Er	$L\alpha_2$	$L_{III} M_{IV}$	6.9050	1.9830	4 57 La	$L\gamma_4$	$L_I O_{II,III}$	6.252
1.7964	4 60 Nd	$L\gamma_3$	$L_I N_{III}$	6.902	1.9875	2 65 Tb	$L\alpha_2$	$L_{III} M_{IV}$	6.2380
1.7989	9 61 Pm	$L\gamma_1$	$L_{II} N_{IV}$	6.892	1.9967	1 60 Nd	$L_{III}$	Abs. Edge	6.2092
1.7993	3 63 Eu	$L\beta_{10}$	$L_I M_{IV}$	6.890	1.99806	3 62 Sm	$L\beta_1$	$L_{II} M_{IV}$	6.2051
1.8013	4 60 Nd	$L\gamma_2$	$L_I N_{II}$	6.883	2.00095	6 62 Sm	$L\beta_4$	$L_I M_{II}$	6.196
1.8054	2 64 Gd	$L\beta_8$	$L_{III} N_I$	6.8671	2.0092	3 60 Nd	$L\beta_7$	$L_{III} O_I$	6.1708
1.8118	2 63 Eu	$L\beta_{2,15}$	$L_{III} N_{IV,V}$	6.8432	2.0124	5 58 Ce	$L_{II}$	Abs. Edge	6.161
1.8141	5 59 Pr	$L_I$	Abs. Edge	6.834	2.015	1 68 Er	$L_I$	$L_{III} M_I$	6.152
1.8150	2 64 Gd	$L\beta_3$	$L_I M_{III}$	6.8311	2.0165	3 60 Nd	$L\beta_9$	$L_I M_V$	6.1484
1.8193	4 59 Pr	$L\gamma_4$	$L_I O_{II,III}$	6.815	2.0205	4 59 Pr	$L\gamma_5$	$L_{II} N_I$	6.136
1.8264	2 67 Ho	$L\eta$	$L_{II} M_I$	6.7883	2.0237	4 58 Ce	$L\gamma_8$	$L_{II} O_I$	6.126
1.83091	9 70 Yb	$L_I$	$L_{III} M_{II}$	6.7715	2.0237	3 60 Nd	$L\beta_{10}$	$L_I M_{IV}$	6.1265
1.8360	1 71 Lu	$L_I$	$L_{III} M_I$	6.7528	2.0360	3 60 Nd	$L\beta_{2,15}$	$L_{III} N_{IV,V}$	6.0894
1.8440	1 60 Nd	$L_{II}$	Abs. Edge	6.7234	2.0410	4 57 La	$L\gamma_8$	$L_I N_{III}$	6.074
1.8450	2 67 Ho	$L\alpha_1$	$L_{III} M_V$	6.7198	2.0421	4 61 Pm	$L\beta_8$	$L_I M_{III}$	6.071
1.8457	1 62 Sm	$L_{III}$	Abs. Edge	6.7172	2.0460	4 57 La	$L\gamma_2$	$L_I N_{II}$	6.060
1.8468	2 64 Gd	$L\beta_1$	$L_{II} M_{IV}$	6.7132	2.0468	2 64 Gd	$L\alpha_1$	$L_{III} M_V$	6.0572
1.84700	9 62 Sm	$L\beta_6$	$L_{III} O_{IV,V}$	6.7126	2.0487	4 58 Ce	$L\gamma_1$	$L_{II} N_{IV}$	6.052
1.8540	2 64 Gd	$L\beta_4$	$L_I M_{II}$	6.6871	2.0494	1 64 Gd	$L\eta$	$L_{II} M_I$	6.0495
1.8552	5 60 Nd	$L\gamma_8$	$L_{II} O_I$	6.683	2.0578	2 64 Gd	$L\alpha_2$	$L_{III} M_{IV}$	6.0250
1.8561	2 67 Ho	$L\alpha_2$	$L_{III} M_{IV}$	6.6795	2.0678	5 56 Ba	$L_I$	Abs. Edge	5.996
1.85626	3 62 Sm	$L\beta_7$	$L_{III} O_I$	6.679	2.07020	5 24 Cr	$K$	Abs. Edge	5.9888
1.86166	3 62 Sm	$L\beta_9$	$L_I M_V$	6.660	2.07087	6 24 Cr	$K\beta_5$	$K M_{IV,V}$	5.9869
1.86990	3 62 Sm	$L\beta_{10}$	$L_I M_{IV}$	6.634	2.0756	3 56 Ba	$L\gamma_4$	$L_I O_{II,III}$	5.9733
1.8737	2 63 Eu	$L\beta_5$	$L_{III} N_I$	6.6170	2.0791	5 59 Pr	$L_{III}$	Abs. Edge	5.963
1.8740	4 59 Pr	$L\gamma_3$	$L_I N_{III}$	6.616	2.0797	4 61 Pm	$L\beta_1$	$L_{II} M_{IV}$	5.961
1.8779	2 60 Nd	$L\gamma_1$	$L_{II} N_{IV}$	6.6021	2.08487	2 24 Cr	$K\beta_{1,3}$	$K M_{II,III}$	5.94671
1.8791	4 59 Pr	$L\gamma_2$	$L_I N_{II}$	6.598	2.0860	2 67 Ho	$L_I$	$L_{III} M_I$	5.9434
1.8821	3 62 Sm	$L\beta_{2,15}$	$L_{III} N_{IV,V}$	6.586	2.0919	4 59 Pr	$L\beta_7$	$L_{III} O_I$	5.927
1.8867	2 63 Eu	$L\beta_3$	$L_I M_{III}$	6.5713	2.1004	4 59 Pr	$L\beta_9$	$L_I M_V$	5.903
1.8934	5 58 Ce	$L_I$	Abs. Edge	6.548	2.101820	9 25 Mn	$K\alpha_1$	$K L_{III}$	5.89875
1.89415	5 70 Yb	$L_I$	$L_{III} M_I$	6.5455	2.1039	3 60 Nd	$L\beta_6$	$L_{III} N_I$	5.8930
1.89643	5 25 Mn	$K$	Abs. Edge	6.5376	2.1053	5 57 La	$L_{II}$	Abs. Edge	5.889
1.8971	1 25 Mn	$K\beta_5$	$K M_{IV,V}$	6.5352	2.10578	2 25 Mn	$K\alpha_2$	$K L_{II}$	5.88765
1.89743	7 66 Dy	$L\eta$	$L_{II} M_I$	6.5342	2.1071	4 59 Pr	$L\beta_{10}$	$L_I M_{IV}$	5.884
1.8991	4 58 Ce	$L\gamma_4$	$L_I O_{II,III}$	6.528	2.1103	3 58 Ce	$L\gamma_5$	$L_{II} N_I$	5.8751
1.90881	3 66 Dy	$L\alpha_1$	$L_{III} M_V$	6.4952	2.1194	4 59 Pr	$L\beta_{2,15}$	$L_{III} N_{IV,V}$	5.850
1.91021	2 25 Mn	$K\beta_{1,3}$	$K M_{II,III}$	6.49045	2.1209	2 63 Eu	$L\alpha_1$	$L_{II} M_V$	5.8457
1.9191	1 61 Pm	$L_{III}$	Abs. Edge	6.4605	2.1268	2 60 Nd	$L\beta_3$	$L_I M_{III}$	5.8294
1.91991	3 66 Dy	$L\alpha_2$	$L_{III} M_{IV}$	6.4577	2.1315	2 63 Eu	$L\eta$	$L_{II} M_I$	5.8166
1.9203	2 63 Eu	$L\beta_1$	$L_{II} M_{IV}$	6.4564	2.1315	2 63 Eu	$L\alpha_2$	$L_{III} M_{IV}$	5.8166

TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV		
2.1342	2 56 Ba	$L\gamma_3$	$L_{II}N_{III}$	5.8092	2.3913	2 53 I	$L\gamma_4$	$L_{IO_{II,III}}$	5.1848
2.1387	2 56 Ba	$L\gamma_2$	$L_{II}N_{II}$	5.7969	2.3948	2 63 Eu	$Ll$	$L_{III}M_I$	5.1772
2.1418	3 57 La	$L\gamma_1$	$L_{III}N_{IV}$	5.7885	2.40435	6 56 Ba	$L\beta_{2,15}$	$L_{III}N_{IV,V}$	5.1565
2.15877	7 66 Dy	$Ll$	$L_{III}M_I$	5.7431	2.4094	4 60 Nd	$L\eta$	$L_{II}M_I$	5.1457
2.166	1 58 Ce	$L_{III}$	Abs. Edge	5.723	2.4105	3 57 La	$L\beta_3$	$L_I M_{III}$	5.1434
2.1669	3 60 Nd	$L\beta_4$	$L_I M_{II}$	5.7216	2.4174	2 55 Cs	$L\gamma_5$	$L_{II}N_I$	5.1287
2.1669	2 60 Nd	$L\beta_1$	$L_{II}M_{IV}$	5.7216	2.4292	1 54 Xe	$L_{II}$	Abs. Edge	5.1037
2.1673	5 55 Cs	$L_I$	Abs. Edge	5.721	2.442	9 90 Th		$M_{IO_{III}}$	5.08
2.1701	2 58 Ce	$L\beta_7$	$L_{III}O_I$	5.7132	2.443	4 92 U		$M_{II}O_{IV}$	5.075
2.1741	2 55 Cs	$L\gamma_4$	$L_{IO_{II,III}}$	5.7026	2.4475	2 53 I	$L\gamma_{2,3}$	$L_{II}N_{II,III}$	5.0657
2.1885	3 58 Ce	$L\beta_9$	$L_I M_V$	5.6650	2.4493	3 57 La	$L\beta_4$	$L_{II}M_{II}$	5.0620
2.1906	4 59 Pr	$L\beta_6$	$L_{III}N_I$	5.660	2.45891	5 57 La	$L\beta_1$	$L_{II}M_{IV}$	5.0421
2.1958	5 58 Ce	$L\beta_{10}$	$L_I M_{IV}$	5.646	2.4630	2 59 Pr	$L\alpha_1$	$L_{III}M_V$	5.0337
2.1998	2 62 Sm	$L\alpha_1$	$L_{III}M_V$	5.6361	2.4729	3 59 Pr	$L\alpha_2$	$L_{III}M_{IV}$	5.0135
2.2048	1 56 Ba	$L_{II}$	Abs. Edge	5.6233	2.4740	1 55 Cs	$L_{III}$	Abs. Edge	5.0113
2.2056	4 57 La	$L\gamma_5$	$L_{II}N_I$	5.621	2.4783	2 55 Cs	$L\beta_9$	$L_I M_V$	5.0026
2.2087	2 58 Ce	$L\beta_{2,15}$	$L_{III}N_{IV,V}$	5.6134	2.4823	4 62 Sm	$Ll$	$L_{III}M_I$	4.9945
2.21062	3 62 Sm	$L\alpha_2$	$L_{III}M_{IV}$	5.6090	2.4826	2 56 Ba	$L\beta_6$	$L_{II}N_I$	4.9939
2.2172	3 59 Pr	$L\beta_3$	$L_I M_{III}$	5.5918	2.4849	2 55 Cs	$L\beta_7$	$L_{III}O_I$	4.9893
2.21824	3 62 Sm	$L\eta$	$L_{II}M_I$	5.589	2.4920	2 55 Cs	$L\beta_{10}$	$L_I M_{IV}$	4.9752
2.2328	2 55 Cs	$L\gamma_3$	$L_{II}N_{III}$	5.5527	2.49734	5 22 Ti	$K$	Abs. Edge	4.96452
2.2352	2 65 Tb	$Ll$	$L_{III}M_I$	5.5467	2.4985	2 22 Ti	$K\beta_5$	$KM_{IV,V}$	4.9623
2.2371	2 55 Cs	$L\gamma_2$	$L_{II}N_{II}$	5.5420	2.50356	2 23 V	$K\alpha_1$	$KL_{III}$	4.95220
2.2415	2 56 Ba	$L\gamma_1$	$L_{II}N_{IV}$	5.5311	2.50738	2 23 V	$K\alpha_2$	$KL_{II}$	4.94464
2.253	6 92 U		$M_{IP_{III}}$	5.50	2.5099	1 52 Te	$L_I$	Abs. Edge	4.9397
2.2550	4 59 Pr	$L\beta_4$	$L_I M_{II}$	5.4981	2.5113	2 52 Te	$L\gamma_4$	$L_{IO_{II,III}}$	4.9369
2.2588	3 59 Pr	$L\beta_1$	$L_{II}M_{IV}$	5.4889	2.5118	2 55 Cs	$L\beta_{2,15}$	$L_{III}N_{IV,V}$	4.9359
2.261	1 57 La	$L_{III}$	Abs. Edge	5.484	2.512	3 59 Pr	$L\eta$	$L_{II}M_I$	4.935
2.2691	1 23 V	$K$	Abs. Edge	5.4639	2.51391	2 22 Ti	$K\beta_{1,3}$	$KM_{II,III}$	4.93181
2.26951	6 23 V	$K\beta_5$	$KM_{IV,V}$	5.4629	2.5164	2 56 Ba	$L\beta_3$	$L_I M_{III}$	4.9269
2.2737	1 54 Xe	$L_I$	Abs. Edge	5.4528	2.527	4 91 Pa		$M_{II}O_{IV}$	4.906
2.275	3 57 La	$L\beta_7$	$L_{III}O_I$	5.450	2.5542	5 53 I	$L_{II}$	Abs. Edge	4.8540
2.282	3 57 La	$L\beta_9$	$L_I M_V$	5.434	2.5553	2 56 Ba	$L\beta_4$	$L_I M_{II}$	4.8519
2.2818	3 58 Ce	$L\beta_6$	$L_{III}N_I$	5.4334	2.5615	2 58 Ce	$L\alpha_1$	$L_{III}M_V$	4.8402
2.2822	3 61 Pm	$L\alpha_1$	$L_{III}M_V$	5.4325	2.5674	2 52 Te	$L\gamma_{2,3}$	$L_{II}N_{II,III}$	4.8290
2.28440	2 23 V	$K\beta_{1,3}$	$KM_{II,III}$	5.42729	2.56821	5 56 Ba	$L\beta_1$	$L_{II}M_{IV}$	4.82753
2.28970	2 24 Cr	$K\alpha_1$	$KL_{III}$	5.41472	2.5706	3 58 Ce	$L\alpha_2$	$L_{III}M_{IV}$	4.8230
2.290	3 57 La	$L\beta_{10}$	$L_I M_{IV}$	5.415	2.58244	8 53 I	$L\gamma_1$	$L_{II}N_{IV}$	4.8009
2.2926	4 61 Pm	$L\alpha_2$	$L_{III}M_{IV}$	5.4078	2.5926	1 54 Xe	$L_{II}$	Abs. Edge	4.7822
2.293606	3 24 Cr	$K\alpha_2$	$KL_{II}$	5.405509	2.5932	2 55 Cs	$L\beta_6$	$L_{III}N_I$	4.7811
2.3030	3 57 La	$L\beta_{2,15}$	$L_{III}N_{IV,V}$	5.3835	2.618	5 90 Th		$M_{II}O_{IV}$	4.735
2.304	7 92 U		$M_{IO_{III}}$	5.38	2.6203	4 58 Ce	$L\eta$	$L_{II}M_I$	4.7315
2.3085	3 56 Ba	$L\gamma_5$	$L_{II}N_I$	5.3707	2.6285	2 55 Cs	$L\beta_3$	$L_I M_{III}$	4.7167
2.3109	3 58 Ce	$L\beta_3$	$L_I M_{III}$	5.3651	2.6388	1 51 Sb	$L_I$	Abs. Edge	4.6984
2.3122	2 64 Gd	$Ll$	$L_{III}M_I$	5.3621	2.6398	2 51 Sb	$L\gamma_4$	$L_{IO_{II,III}}$	4.6967
2.3139	1 55 Cs	$L_{II}$	Abs. Edge	5.3581	2.65710	9 53 I	$L\gamma_5$	$L_{II}N_I$	4.6660
2.3480	2 55 Cs	$L\gamma_1$	$L_{II}N_{IV}$	5.2804	2.66570	5 57 La	$L\alpha_1$	$L_{III}M_V$	4.65097
2.3497	4 58 Ce	$L\beta_4$	$L_I M_{II}$	5.2765	2.6666	2 55 Cs	$L\beta_4$	$L_I M_{II}$	4.6494
2.3561	3 58 Ce	$L\beta_1$	$L_{II}M_{IV}$	5.2622	2.67533	5 57 La	$L\alpha_2$	$L_{III}M_{IV}$	4.63423
2.3629	1 56 Ba	$L_{III}$	Abs. Edge	5.2470	2.6760	4 60 Nd	$Ll$	$L_{III}M_I$	4.6330
2.3704	2 60 Nd	$L\alpha_1$	$L_{III}M_V$	5.2304	2.6837	2 55 Cs	$L\beta_1$	$L_{II}M_{IV}$	4.6198
2.3764	2 56 Ba	$L\beta_9$	$L_I M_V$	5.2171	2.6879	1 52 Te	$L_{II}$	Abs. Edge	4.6126
2.3790	4 57 La	$L\beta_6$	$L_{III}N_I$	5.2114	2.6953	2 51 Sb	$L\gamma_{2,3}$	$L_{II}N_{II,III}$	4.5999
2.3806	2 56 Ba	$L\beta_7$	$L_{III}O_I$	5.2079	2.71241	6 52 Te	$L\gamma_1$	$L_{II}N_{IV}$	4.5709
2.3807	3 60 Nd	$L\alpha_2$	$L_{III}M_{IV}$	5.2077	2.71352	9 53 I	$L\beta_9$	$L_I M_V$	4.5690
2.3869	2 56 Ba	$L\beta_{10}$	$L_I M_{IV}$	5.1941	2.7196	5 53 I	$L_{III}$	Abs. Edge	4.5587
2.3880	5 53 I	$L_I$	Abs. Edge	5.192	2.72104	9 53 I	$L\beta_{10}$	$L_I M_{IV}$	4.5564

TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV		
2.7288	3 53 I	$L\beta_7$	$L_{III}O_I$	4.5435	3.04661	9 52 Te	$L\beta_4$	$L_{II}M_{II}$	4.0695
2.740	3 57 La	$L\eta$	$L_{II}M_I$	4.525	3.068	5 90 Th	$M_{III}$	Abs. Edge	4.041
2.74851	2 22 Ti	$K\alpha_1$	$KL_{III}$	4.51084	3.0703	1 20 Ca	$K$	Abs. Edge	4.0381
2.75053	8 53 I	$L\beta_{2,15}$	$L_{III}N_{IV,V}$	4.5075	3.0746	3 20 Ca	$K\beta_5$	$KM_{IV,V}$	4.0325
2.75216	2 22 Ti	$K\alpha_2$	$KL_{II}$	4.50486	3.07677	6 52 Te	$L\beta_1$	$L_{II}M_{IV}$	4.02958
2.753	8 92 U		$M_I N_{III}$	4.50	3.08475	9 50 Sn	$L\gamma_5$	$L_{II}N_I$	4.0192
2.762	1 21 Sc	$K$	Abs. Edge	4.489	3.0849	1 48 Cd	$L_I$	Abs. Edge	4.0190
2.7634	3 21 Sc	$K\beta_5$	$KM_{IV,V}$	4.4865	3.0897	2 20 Ca	$K\beta_{1,3}$	$KM_{II,III}$	4.0127
2.77595	5 56 Ba	$L\alpha_1$	$L_{III}M_V$	4.46626	3.094	5 83 Bi	$M_I$	Abs. Edge	4.007
2.7769	1 50 Sn	$L_I$	Abs. Edge	4.4648	3.11513	9 50 Sn	$L\beta_9$	$L_{II}M_V$	3.9800
2.7775	2 50 Sn	$L\gamma_4$	$L_I O_{II,III}$	4.4638	3.11513	9 51 Sb	$L\beta_6$	$L_{III}N_I$	3.9800
2.7796	2 21 Sc	$K\beta_{1,3}$	$KM_{II,III}$	4.4605	3.115	7 92 U		$M_{III}O_I$	3.980
2.7841	4 59 Pr	$L_I$	$L_{III}M_I$	4.4532	3.12170	9 50 Sn	$L\beta_{10}$	$L_I M_{IV}$	3.9716
2.78553	5 56 Ba	$L\alpha_2$	$L_{III}M_{IV}$	4.45090	3.131	3 90 Th		$M_{III}O_{IV,V}$	3.959
2.79007	9 52 Te	$L\gamma_5$	$L_{II}N_I$	4.4437	3.1355	2 56 Ba	$L_I$	$L_{III}M_I$	3.9541
2.817	2 92 U		$M_{II}N_{IV}$	4.401	3.1377	2 48 Cd	$L\gamma_2$	$L_I N_{II}$	3.9513
2.8294	5 51 Sb	$L_{II}$	Abs. Edge	4.3819	3.1473	1 49 In	$L_{II}$	Abs. Edge	3.9393
2.8327	2 50 Sn	$L\gamma_{2,3}$	$L_I N_{II,III}$	4.3768	3.14860	6 53 I	$L\alpha_1$	$L_{III}M_V$	3.93765
2.83672	9 53 I	$L\beta_6$	$L_{III}N_I$	4.3706	3.15258	9 51 Sb	$L\beta_3$	$L_I M_{III}$	3.9327
2.83897	9 52 Te	$L\beta_9$	$L_I M_V$	4.3671	3.1557	1 50 Sn	$L_{II}$	Abs. Edge	3.9288
2.84679	9 52 Te	$L\beta_{10}$	$L_I M_{IV}$	4.3551	3.1564	3 50 Sn	$L\beta_7$	$L_{III}O_I$	3.9279
2.85159	3 51 Sb	$L\gamma_1$	$L_{II}N_{IV}$	4.34779	3.15791	6 53 I	$L\alpha_2$	$L_{III}M_{IV}$	3.92604
2.8555	1 52 Te	$L_{III}$	Abs. Edge	4.3418	3.16213	4 49 In	$L\gamma_1$	$L_{II}N_{IV}$	3.92081
2.8627	3 56 Ba	$L\eta$	$L_{II}M_I$	4.3309	3.17505	3 50 Sn	$L\beta_{2,15}$	$L_{III}N_{IV,V}$	3.90486
2.8634	3 52 Te	$L\beta_7$	$L_{III}O_I$	4.3298	3.19014	9 51 Sb	$L\beta_4$	$L_I M_{II}$	3.8364
2.87429	9 53 I	$L\beta_3$	$L_I M_{III}$	4.3134	3.217	5 82 Pb	$M_I$	Abs. Edge	3.854
2.88217	8 52 Te	$L\beta_{2,15}$	$L_{III}N_{IV,V}$	4.3017	3.22567	4 51 Sb	$L\beta_1$	$L_{II}M_{IV}$	3.84357
2.884	5 92 U	$M_{III}$	Abs. Edge	4.299	3.245	9 91 Pa		$M_{III}O_I$	3.82
2.8917	4 58 Ce	$L_I$	$L_{III}M_I$	4.2875	3.24907	9 49 In	$L\gamma_5$	$L_{II}N_I$	3.8159
2.8924	2 55 Cs	$L\alpha_1$	$L_{III}M_V$	4.2865	3.2564	1 47 Ag	$L_I$	Abs. Edge	3.8072
2.9020	2 55 Cs	$L\alpha_2$	$L_{III}M_{IV}$	4.2722	3.2670	2 55 Cs	$L_I$	$L_{III}M_I$	3.7950
2.910	2 91 Pa		$M_{II}N_{IV}$	4.260	3.26763	9 49 In	$L\beta_9$	$L_I M_V$	3.7942
2.91207	9 53 I	$L\beta_4$	$L_I M_{II}$	4.2575	3.26901	9 50 Sn	$L\beta_6$	$L_{III}N_I$	3.7926
2.92	2 92 U		$M_I N_{II}$	4.25	3.27404	9 49 In	$L\beta_{10}$	$L_I M_{IV}$	3.7868
2.9260	1 49 In	$L_I$	Abs. Edge	4.2373	3.27979	9 53 I	$L\eta$	$L_{II}M_I$	3.7801
2.9264	2 49 In	$L\gamma_4$	$L_I O_{II,III}$	4.2367	3.283	9 90 Th		$M_{III}O_I$	3.78
2.93187	9 51 Sb	$L\gamma_5$	$L_{II}N_I$	4.2287	3.28920	6 52 Te	$L\alpha_1$	$L_{III}M_V$	3.76933
2.934	8 90 Th		$M_I N_{III}$	4.23	3.29846	9 52 Te	$L\alpha_2$	$L_{III}M_{IV}$	3.7588
2.93744	6 53 I	$L\beta_1$	$L_{II}M_{IV}$	4.22072	3.30585	3 50 Sn	$L\beta_3$	$L_I M_{III}$	3.7500
2.948	2 92 U		$M_{III}O_{IV,V}$	4.205	3.30635	9 47 Ag	$L\gamma_3$	$L_I N_{III}$	3.7498
2.97088	9 52 Te	$L\beta_6$	$L_{III}N_I$	4.1732	3.31216	9 47 Ag	$L\gamma_2$	$L_I N_{II}$	3.7432
2.97261	9 51 Sb	$L\beta_9$	$L_I M_V$	4.1708	3.3237	1 49 In	$L_{III}$	Abs. Edge	3.7302
2.97917	9 51 Sb	$L\beta_{10}$	$L_I M_{IV}$	4.1616	3.324	4 49 In	$L\beta_7$	$L_{III}O_I$	3.730
2.9800	2 49 In	$L\gamma_{2,3}$	$L_I N_{II,III}$	4.1605	3.3257	1 48 Cd	$L_{II}$	Abs. Edge	3.7280
2.9823	1 50 Sn	$L_{II}$	Abs. Edge	4.1573	3.329	4 92 U		$M_{II}N_I$	3.724
2.9932	2 55 Cs	$L\eta$	$L_{II}M_I$	4.1421	3.333	5 92 U	$M_{IV}$	Abs. Edge	3.720
3.0003	1 51 Sb	$L_{III}$	Abs. Edge	4.1323	3.33564	6 48 Cd	$L\gamma_1$	$L_{II}N_{IV}$	3.71686
3.00115	3 50 Sn	$L\gamma_1$	$L_{II}N_{IV}$	4.13112	3.33838	3 49 In	$L\beta_{2,15}$	$L_{III}N_{IV,V}$	3.71381
3.0052	3 51 Sb	$L\beta_7$	$L_{III}O_I$	4.1255	3.34335	9 50 Sn	$L\beta_4$	$L_I M_{II}$	3.7083
3.006	3 57 La	$L_I$	$L_{III}M_I$	4.124	3.346	5 81 Tl	$M_I$	Abs. Edge	3.705
3.00893	9 52 Te	$L\beta_3$	$L_I M_{III}$	4.1204	3.35839	3 20 Ca	$K\alpha_1$	$KL_{III}$	3.69168
3.011	2 90 Th		$M_{II}N_{IV}$	4.117	3.359	5 83 Bi	$M_{II}$	Abs. Edge	3.691
3.0166	2 54 Xe	$L\alpha_1$	$L_{III}M_V$	4.1099	3.36166	3 20 Ca	$K\alpha_2$	$KL_{II}$	3.68809
3.02335	3 51 Sb	$L\beta_{2,15}$	$L_{III}N_{IV,V}$	4.10078	3.38487	3 50 Sn	$L\beta_1$	$L_{II}M_{IV}$	3.66280
3.0309	1 21 Sc	$K\alpha_1$	$KL_{III}$	4.0906	3.42551	9 48 Cd	$L\gamma_5$	$L_{II}N_I$	3.61935
3.0342	1 21 Sc	$K\alpha_2$	$KL_{II}$	4.0861	3.43015	9 48 Cd	$L\beta_9$	$L_I M_V$	3.61445
3.038	2 91 Pa		$M_{III}O_{IV,V}$	4.081	3.43606	9 49 In	$L\beta_6$	$L_{III}N_I$	3.60823

TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV		
3.4365	1 19 K	<i>K</i>	Abs. Edge	3.6078	4 49 In	<i>Lα<sub>1</sub></i>	<i>L<sub>III</sub>M<sub>V</sub></i>	3.28694	
3.4367	2 48 Cd	<i>Lβ<sub>10</sub></i>	<i>L<sub>I</sub>M<sub>IV</sub></i>	3.6075	6 49 In	<i>Lα<sub>2</sub></i>	<i>L<sub>III</sub>M<sub>IV</sub></i>	3.27929	
3.437	1 46 Pd	<i>L<sub>I</sub></i>	Abs. Edge	3.607	5 80 Hg	<i>M<sub>II</sub></i>	Abs. Edge	3.277	
3.43832	9 52 Te	<i>Lη</i>	<i>L<sub>II</sub>M<sub>I</sub></i>	3.60586	9 50 Sn	<i>Lη</i>	<i>L<sub>II</sub>M<sub>I</sub></i>	3.27234	
3.43941	4 51 Sb	<i>Lα<sub>1</sub></i>	<i>L<sub>III</sub>M<sub>V</sub></i>	3.60472	2 46 Pd	<i>Lβ<sub>9</sub></i>	<i>L<sub>I</sub>M<sub>V</sub></i>	3.2696	
3.441	5 91 Pa		<i>M<sub>II</sub>N<sub>I</sub></i>	3.603	2 46 Pd	<i>Lβ<sub>10</sub></i>	<i>L<sub>I</sub>M<sub>IV</sub></i>	3.2637	
3.4413	4 19 K	<i>Kβ<sub>6</sub></i>	<i>KM<sub>IV,V</sub></i>	3.6027	9 47 Ag	<i>Lβ<sub>6</sub></i>	<i>L<sub>III</sub>N<sub>I</sub></i>	3.25603	
3.44840	6 51 Sb	<i>Lα<sub>2</sub></i>	<i>L<sub>III</sub>M<sub>IV</sub></i>	3.59532	3.808	4 90 Th	<i>M<sub>IV</sub>O<sub>II</sub></i>	3.256	
3.4539	2 19 K	<i>Kβ<sub>1,3</sub></i>	<i>KM<sub>II,III</sub></i>	3.5896	3.8222	2 46 Pd	<i>Lγ<sub>6</sub></i>	<i>L<sub>II</sub>N<sub>I</sub></i>	3.2437
3.46984	9 49 In	<i>Lβ<sub>3</sub></i>	<i>L<sub>I</sub>M<sub>III</sub></i>	3.57311	3.827	1 91 Pa	<i>Mβ</i>	<i>M<sub>IV</sub>N<sub>VI</sub></i>	3.2397
3.478	5 80 Hg	<i>M<sub>I</sub></i>	Abs. Edge	3.565	3.83313	9 47 Ag	<i>Lβ<sub>3</sub></i>	<i>L<sub>I</sub>M<sub>III</sub></i>	3.23446
3.479	1 92 U	<i>Mγ</i>	<i>M<sub>III</sub>N<sub>V</sub></i>	3.563	3.834	4 83 Bi		<i>M<sub>II</sub>N<sub>IV</sub></i>	3.234
3.4892	2 46 Pd	<i>Lγ<sub>2,3</sub></i>	<i>L<sub>I</sub>N<sub>II,III</sub></i>	3.5533	3.835	5 44 Ru	<i>L<sub>I</sub></i>	Abs. Edge	3.233
3.492	5 82 Pb	<i>M<sub>II</sub></i>	Abs. Edge	3.550	3.87023	5 47 Ag	<i>Lβ<sub>4</sub></i>	<i>L<sub>I</sub>M<sub>II</sub></i>	3.20346
3.497	5 92 U	<i>Mγ</i>	Abs. Edge	3.545	3.87090	5 18 A	<i>K</i>	Abs. Edge	3.20290
3.5047	1 48 Cd	<i>L<sub>III</sub></i>	Abs. Edge	3.5376	3.872	9 82 Pb		<i>M<sub>I</sub>N<sub>III</sub></i>	3.202
3.50697	9 49 In	<i>Lβ<sub>4</sub></i>	<i>L<sub>I</sub>M<sub>II</sub></i>	3.53528	3.8860	2 18 A	<i>Kβ<sub>1,3</sub></i>	<i>KM<sub>II,III</sub></i>	3.1905
3.51408	4 48 Cd	<i>Lβ<sub>2,15</sub></i>	<i>L<sub>III</sub>N<sub>IV,V</sub></i>	3.52812	3.88826	9 51 Sb	<i>L<sub>I</sub></i>	<i>L<sub>II</sub>M<sub>I</sub></i>	3.18860
3.5164	1 47 Ag	<i>L<sub>II</sub></i>	Abs. Edge	3.5258	3.892	9 83 Bi		<i>M<sub>I</sub>N<sub>II</sub></i>	3.185
3.521	2 92 U		<i>M<sub>III</sub>N<sub>IV</sub></i>	3.521	3.8977	2 44 Ru	<i>Lγ<sub>2,3</sub></i>	<i>L<sub>I</sub>N<sub>II,III</sub></i>	3.1809
3.52260	4 47 Ag	<i>Lγ<sub>1</sub></i>	<i>L<sub>II</sub>N<sub>IV</sub></i>	3.51959	3.904	5 83 Bi	<i>M<sub>III</sub></i>	Abs. Edge	3.176
3.537	9 90 Th		<i>M<sub>II</sub>N<sub>I</sub></i>	3.505	3.9074	1 46 Pd	<i>L<sub>III</sub></i>	Abs. Edge	3.17298
3.55531	4 49 In	<i>Lβ<sub>1</sub></i>	<i>L<sub>II</sub>M<sub>IV</sub></i>	3.48721	3.90887	4 46 Pd	<i>Lβ<sub>2,15</sub></i>	<i>L<sub>III</sub>N<sub>IV,V</sub></i>	3.17179
3.557	5 90 Th	<i>M<sub>IV</sub></i>	Abs. Edge	3.485	3.910	1 92 U	<i>Mα<sub>1</sub></i>	<i>M<sub>V</sub>N<sub>VII</sub></i>	3.1708
3.55754	9 53 I	<i>L<sub>I</sub></i>	<i>L<sub>III</sub>M<sub>I</sub></i>	3.48502	3.915	5 77 Ir	<i>M<sub>I</sub></i>	Abs. Edge	3.167
3.576	1 92 U		<i>M<sub>IV</sub>O<sub>II</sub></i>	3.4666	3.924	1 92 U	<i>Mα<sub>2</sub></i>	<i>M<sub>V</sub>N<sub>VI</sub></i>	3.1595
3.577	1 91 Pa	<i>Mγ</i>	<i>M<sub>III</sub>N<sub>V</sub></i>	3.4657	3.932	6 83 Bi		<i>M<sub>III</sub>O<sub>IV,V</sub></i>	3.153
3.59994	3 50 Sn	<i>Lα<sub>1</sub></i>	<i>L<sub>III</sub>M<sub>V</sub></i>	3.44398	3.93473	3 47 Ag	<i>Lβ<sub>1</sub></i>	<i>L<sub>II</sub>M<sub>IV</sub></i>	3.15094
3.60497	9 47 Ag	<i>Lβ<sub>9</sub></i>	<i>L<sub>I</sub>M<sub>V</sub></i>	3.43917	3.936	5 79 Au	<i>M<sub>II</sub></i>	Abs. Edge	3.150
3.60765	9 51 Sb	<i>Lη</i>	<i>L<sub>II</sub>M<sub>I</sub></i>	3.43661	3.941	1 90 Th	<i>Mβ</i>	<i>M<sub>IV</sub>N<sub>VI</sub></i>	3.1458
3.60891	4 50 Sn	<i>Lα<sub>2</sub></i>	<i>L<sub>III</sub>M<sub>IV</sub></i>	3.43542	3.9425	5 45 Rh	<i>L<sub>II</sub></i>	Abs. Edge	3.1448
3.61158	9 47 Ag	<i>Lβ<sub>10</sub></i>	<i>L<sub>I</sub>M<sub>IV</sub></i>	3.43287	3.9437	2 45 Rh	<i>Lγ<sub>1</sub></i>	<i>L<sub>II</sub>N<sub>IV</sub></i>	3.1438
3.614	2 91 Pa		<i>M<sub>III</sub>N<sub>IV</sub></i>	3.430	3.95635	4 48 Cd	<i>Lα<sub>1</sub></i>	<i>L<sub>III</sub>M<sub>V</sub></i>	3.13373
3.61467	9 48 Cd	<i>Lβ<sub>6</sub></i>	<i>L<sub>III</sub>N<sub>I</sub></i>	3.42994	3.96496	6 48 Cd	<i>Lα<sub>2</sub></i>	<i>L<sub>III</sub>M<sub>IV</sub></i>	3.12691
3.61638	9 47 Ag	<i>Lγ<sub>6</sub></i>	<i>L<sub>II</sub>N<sub>I</sub></i>	3.42832	3.968	5 82 Pb		<i>M<sub>II</sub>N<sub>IV</sub></i>	3.124
3.616	5 79 Au	<i>M<sub>I</sub></i>	Abs. Edge	3.428	3.98327	9 49 In	<i>Lη</i>	<i>L<sub>II</sub>M<sub>I</sub></i>	3.11254
3.629	5 45 Rh	<i>L<sub>I</sub></i>	Abs. Edge	3.417	4.013	9 81 Tl		<i>M<sub>I</sub>N<sub>III</sub></i>	3.089
3.634	5 81 Tl	<i>M<sub>II</sub></i>	Abs. Edge	3.412	4.0162	2 46 Pd	<i>Lβ<sub>8</sub></i>	<i>L<sub>III</sub>N<sub>I</sub></i>	3.0870
3.64495	9 48 Cd	<i>Lβ<sub>3</sub></i>	<i>L<sub>I</sub>M<sub>III</sub></i>	3.40145	4.022	1 91 Pa	<i>Mα<sub>1</sub></i>	<i>M<sub>V</sub>N<sub>VII</sub></i>	3.0823
3.679	2 90 Th	<i>Mγ</i>	<i>M<sub>III</sub>N<sub>V</sub></i>	3.370	4.0346	2 46 Pd	<i>Lβ<sub>3</sub></i>	<i>L<sub>I</sub>M<sub>III</sub></i>	3.0730
3.68203	9 48 Cd	<i>Lβ<sub>4</sub></i>	<i>L<sub>I</sub>M<sub>II</sub></i>	3.36719	4.035	3 91 Pa	<i>Mα<sub>2</sub></i>	<i>M<sub>V</sub>N<sub>VI</sub></i>	3.072
3.6855	2 45 Rh	<i>Lγ<sub>2,3</sub></i>	<i>L<sub>I</sub>N<sub>II,III</sub></i>	3.3640	4.0451	2 45 Rh	<i>Lγ<sub>6</sub></i>	<i>L<sub>II</sub>N<sub>I</sub></i>	3.0650
3.691	2 91 Pa		<i>M<sub>IV</sub>O<sub>II</sub></i>	3.359	4.047	1 82 Pb	<i>M<sub>III</sub></i>	Abs. Edge	3.0632
3.6999	1 47 Ag	<i>L<sub>III</sub></i>	Abs. Edge	3.35096	4.058	5 43 Te	<i>L<sub>I</sub></i>	Abs. Edge	3.055
3.70335	3 47 Ag	<i>Lβ<sub>2,15</sub></i>	<i>L<sub>III</sub>N<sub>IV,V</sub></i>	3.34781	4.069	6 82 Pb		<i>M<sub>III</sub>O<sub>IV,V</sub></i>	3.047
3.716	1 92 U	<i>Mβ</i>	<i>M<sub>IV</sub>N<sub>VI</sub></i>	3.3367	4.0711	2 46 Pd	<i>Lβ<sub>4</sub></i>	<i>L<sub>I</sub>M<sub>II</sub></i>	3.0454
3.71696	9 52 Te	<i>L<sub>I</sub></i>	<i>L<sub>III</sub>M<sub>I</sub></i>	3.33555	4.071	5 76 Os	<i>M<sub>I</sub></i>	Abs. Edge	3.045
3.718	3 90 Th		<i>M<sub>III</sub>N<sub>IV</sub></i>	3.335	4.07165	9 50 Sn	<i>L<sub>I</sub></i>	<i>L<sub>III</sub>M<sub>I</sub></i>	3.04499
3.7228	1 46 Pd	<i>L<sub>II</sub></i>	Abs. Edge	3.33031	4.093	5 78 Pt	<i>M<sub>II</sub></i>	Abs. Edge	3.029
3.7246	2 46 Pd	<i>Lγ<sub>1</sub></i>	<i>L<sub>II</sub>N<sub>IV</sub></i>	3.3287	4.105	9 83 Bi		<i>M<sub>III</sub>O<sub>I</sub></i>	3.021
3.729	5 90 Th	<i>Mγ</i>	Abs. Edge	3.325	4.116	4 81 Tl		<i>M<sub>II</sub>N<sub>IV</sub></i>	3.013
3.73823	4 48 Cd	<i>Lβ<sub>1</sub></i>	<i>L<sub>II</sub>M<sub>IV</sub></i>	3.31657	4.1299	5 45 Rh	<i>L<sub>III</sub></i>	Abs. Edge	3.0021
3.740	9 83 Bi		<i>M<sub>I</sub>N<sub>III</sub></i>	3.315	4.1310	2 45 Rh	<i>Lβ<sub>2,15</sub></i>	<i>L<sub>III</sub>N<sub>IV,V</sub></i>	3.0013
3.7414	2 19 K	<i>Kα<sub>1</sub></i>	<i>KL<sub>III</sub></i>	3.3138	4.1381	9 90 Th	<i>Mα<sub>1</sub></i>	<i>M<sub>V</sub>N<sub>VII</sub></i>	2.9961
3.7445	2 19 K	<i>Kα<sub>2</sub></i>	<i>KL<sub>II</sub></i>	3.3111	4.14622	5 46 Pd	<i>Lβ<sub>1</sub></i>	<i>L<sub>II</sub>M<sub>IV</sub></i>	2.99022
3.760	9 90 Th		<i>M<sub>V</sub>P<sub>III</sub></i>	3.298	4.151	2 90 Th	<i>Mα<sub>2</sub></i>	<i>M<sub>V</sub>N<sub>VI</sub></i>	2.987
3.762	5 78 Pt	<i>M<sub>I</sub></i>	Abs. Edge	3.296	4.15443	3 47 Ag	<i>Lα<sub>1</sub></i>	<i>L<sub>III</sub>M<sub>V</sub></i>	2.98431

TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV
4.16294	5 47 Ag	$L\alpha_2$	2.97821	4.6542	2 41 Nb	$L\gamma_{2,3}$	2.6638
4.180	1 44 Ru	$L_{II}$	2.9663	4.655	8 82 Pb	$M_{II}N_I$	2.664
4.1822	2 44 Ru	$L\gamma_1$	2.9645	4.6605	2 46 Pd	$L\eta$	2.6603
4.19180	5 18 A	$K\alpha_1$	2.95770	4.674	1 82 Pb	$M\gamma$	2.6527
4.19315	9 48 Cd	$L\eta$	2.95675	4.686	1 78 Pt	$M_{III}$	2.6459
4.19474	5 18 A	$K\alpha_2$	2.95563	4.694	8 78 Pt	$M_{III}O_{IV,v}$	2.641
4.198	1 81 Tl	$M_{III}$	2.9535	4.703	9 79 Au	$M_{III}O_I$	2.636
4.216	6 81 Tl	$M_{III}O_{IV,v}$	2.941	4.7076	2 47 Ag	$Ll$	2.6337
4.236	5 75 Re	$M_I$	2.927	4.715	3 82 Pb	$M_{III}N_{IV}$	2.630
4.2417	2 45 Rh	$L\beta_6$	2.9229	4.719	1 42 Mo	$L_{II}$	2.6274
4.244	9 82 Pb	$M_{III}O_I$	2.921	4.7258	2 42 Mo	$L\gamma_1$	2.6235
4.2522	2 45 Rh	$L\beta_3$	2.9157	4.7278	1 17 Cl	$K\alpha_1$	2.62239
4.260	5 77 Ir	$M_{II}$	2.910	4.7307	1 17 Cl	$K\alpha_2$	2.62078
4.26873	9 49 In	$Ll$	2.90440	4.757	5 82 Pb	$M_{IV}$	2.606
4.2873	2 44 Ru	$L\gamma_6$	2.8918	4.764	5 83 Bi	$M_V$	2.603
4.2888	2 45 Rh	$L\beta_4$	2.8908	4.780	4 77 Ir	$M_{II}N_{IV}$	2.594
4.300	9 79 Au	$M_I N_{III}$	2.883	4.79	2 76 Os	$M_I N_{III}$	2.59
4.304	5 42 Mo	$L_I$	2.881	4.815	5 74 W	$M_{II}$	2.575
4.330	2 92 U	$M_{III}N_I$	2.863	4.823	3 83 Bi	$M_{IV}O_{II}$	2.571
4.355	1 80 Hg	$M_{III}$	2.8469	4.823	4 81 Tl	$M\gamma$	2.571
4.36767	5 46 Pd	$L\alpha_1$	2.83861	4.8369	2 42 Mo	$L\gamma_6$	2.5632
4.369	1 44 Ru	$L_{III}$	2.8377	4.84575	5 44 Ru	$L\alpha_1$	2.55855
4.3718	2 44 Ru	$L\beta_{2,15}$	2.8360	4.85381	7 44 Ru	$L\alpha_2$	2.55431
4.37414	4 45 Rh	$L\beta_1$	2.83441	4.861	1 77 Ir	$M_{III}$	2.5505
4.37588	7 46 Pd	$L\alpha_2$	2.83329	4.865	5 81 Tl	$M_{III}N_{IV}$	2.548
4.3800	2 42 Mo	$L\gamma_{2,3}$	2.8306	4.869	9 77 Ir	$M_{III}O_{IV,v}$	2.546
4.3971	1 17 Cl	$K$	2.81960	4.876	9 78 Pt	$M_{III}O_I$	2.543
4.4034	3 17 Cl	$K\beta$	2.8156	4.879	5 40 Zr	$L_I$	2.541
4.407	5 74 W	$M_I$	2.813	4.8873	8 43 Tc	$L\beta_1$	2.5368
4.4183	2 47 Ag	$L\eta$	2.8061	4.909	1 83 Bi	$M\beta$	2.5255
4.432	4 79 Au	$M_{II}N_{IV}$	2.797	4.911	5 90 Th	$M_{IV}N_{III}$	2.524
4.433	5 76 Os	$M_{II}$	2.797	4.913	1 42 Mo	$L_{III}$	2.5234
4.436	1 43 Te	$L_{II}$	2.7948	4.9217	2 45 Rh	$L\eta$	2.5191
4.44	2 74 W	$M_I O_{II,III}$	2.79	4.9232	2 42 Mo	$L\beta_{2,15}$	2.5183
4.450	4 91 Pa	$M_{III}N_I$	2.786	4.946	2 92 U	$M\zeta_1$	2.507
4.460	9 78 Pt	$M_I N_{III}$	2.780	4.952	5 81 Tl	$M_{IV}$	2.504
4.48014	9 48 Cd	$Ll$	2.76735	4.9525	3 46 Pd	$Ll$	2.5034
4.4866	3 44 Ru	$L\beta_3$	2.7634	4.9536	3 40 Zr	$L\gamma_{2,3}$	2.5029
4.4866	3 44 Ru	$L\beta_6$	2.7634	4.955	4 76 Os	$M_{II}N_{IV}$	2.502
4.518	1 79 Au	$M_{III}$	2.7439	4.955	5 82 Pb	$M_V$	2.502
4.522	6 79 Au	$M_{III}O_{IV,v}$	2.742	4.984	2 80 Hg	$M\gamma$	2.4875
4.5230	2 44 Ru	$L\beta_4$	2.7411	5.004	9 82 Pb	$M_{IV}O_{II}$	2.477
4.532	2 83 Bi	$M\gamma$	2.735	5.0133	3 42 Mo	$L\beta_3$	2.4730
4.568	5 90 Th	$M_{III}N_I$	2.714	5.0185	1 16 S	$K$	2.47048
4.571	5 83 Bi	$M_{III}N_{IV}$	2.712	5.020	5 73 Ta	$M_{II}$	2.470
4.572	5 83 Bi	$M_{IV}$	2.711	5.0233	3 16 S	$K\beta_x$	2.4681
4.575	5 41 Nb	$L_I$	2.710	5.031	1 41 Nb	$L_{II}$	2.4641
4.585	5 73 Ta	$M_I$	2.704	5.0316	2 16 S	$K\beta_1$	2.46404
4.59	2 83 Bi	$M_{IV}P_{II,III}$	2.70	5.0361	3 41 Nb	$L\gamma_1$	2.4618
4.59743	9 45 Rh	$L\alpha_1$	2.69674	5.043	5 76 Os	$M_{III}$	2.458
4.601	4 78 Pt	$M_{II}N_{IV}$	2.695	5.0488	3 42 Mo	$L\beta_4$	2.4557
4.60545	9 45 Rh	$L\alpha_2$	2.69205	5.0488	5 42 Mo	$L\beta_6$	2.4557
4.620	5 75 Re	$M_{II}$	2.684	5.050	2 92 U	$M\zeta_2$	2.4548
4.62058	3 44 Ru	$L\beta_1$	2.68323	5.076	1 82 Pb	$M\beta$	2.4427
4.625	5 92 U	$M_{IV}N_{III}$	2.681	5.092	2 91 Pa	$M\zeta_1$	2.4350
4.630	1 43 Tc	$L_{III}$	2.6780	5.1148	3 43 Tc	$L\alpha_1$	2.4240
4.631	9 77 Ir	$M_I N_{III}$	2.677	5.118	1 83 Bi	$M\alpha_1$	2.4226



TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV		
5.130	2 83 Bi	$M\alpha_2$	$M_V N_{VI}$	2.4170	5.6445	3 38 Sr	$L\gamma_{2,3}$	$L_I N_{II,III}$	2.1965
5.145	4 79 Au	$M\gamma$	$M_{III} N_V$	2.410	5.6476	9 80 Hg	$M\alpha_1$	$M_V N_{VII}$	2.1953
5.1517	3 41 Nb	$L\gamma_5$	$L_{II} N_I$	2.4066	5.650	5 73 Ta	$M_{III}$	Abs. Edge	2.194
5.153	5 81 Tl	$M_V$	Abs. Edge	2.406	5.6681	3 40 Zr	$L\beta_4$	$L_I M_{II}$	2.1873
5.157	5 80 Hg	$M_{IV}$	Abs. Edge	2.404	5.67	3 73 Ta		$M_{III} O_{IV,V}$	2.19
5.168	9 82 Pb		$M_V O_{III}$	2.399	5.682	4 76 Os	$M\gamma$	$M_{III} N_V$	2.182
5.172	9 74 W		$M_I N_{III}$	2.397	5.704	8 82 Pb		$M_{III} N_I$	2.174
5.17708	8 42 Mo	$L\beta_1$	$L_{II} M_{IV}$	2.39481	5.7101	3 40 Zr	$L\beta_6$	$L_{III} N_I$	2.1712
5.186	5 79 Au		$M_{III} N_{IV}$	2.391	5.724	5 76 Os		$M_{III} N_{IV}$	2.166
5.193	2 91 Pa	$M\zeta_2$	$M_{IV} N_{II}$	2.3876	5.7243	2 41 Nb	$L\alpha_1$	$L_{III} M_V$	2.16589
5.196	9 81 Tl		$M_{IV} O_{II}$	2.386	5.7319	3 41 Nb	$L\alpha_2$	$L_{III} M_{IV}$	2.1630
5.2050	2 44 Ru	$L\eta$	$L_{II} M_I$	2.38197	5.756	1 39 Y	$L_{II}$	Abs. Edge	2.1540
5.217	5 39 Y	$L_I$	Abs. Edge	2.377	5.767	9 79 Au		$M_V O_{III}$	2.150
5.2169	3 45 Rh	$L_I$	$L_{III} M_I$	2.3765	5.784	1 15 P	$K$	Abs. Edge	2.1435
5.230	1 41 Nb	$L_{III}$	Abs. Edge	2.3706	5.796	2 15 P	$K\beta$	$KM$	2.1391
5.234	5 75 Re	$M_{III}$	Abs. Edge	2.369	5.81	2 76 Os		$M_{II} N_I$	2.133
5.2379	3 41 Nb	$L\beta_{2,15}$	$L_{III} N_{IV,V}$	2.3670	5.81	1 78 Pt	$M_V$	Abs. Edge	2.133
5.245	5 90 Th	$M\zeta_1$	$M_V N_{III}$	2.364	5.828	1 78 Pt	$M\beta$	$M_{IV} N_{VI}$	2.1273
5.249	1 81 Tl	$M\beta$	$M_{IV} N_{VI}$	2.3621	5.83	2 73 Ta		$M_{III} O_I$	2.126
5.2830	3 39 Y	$L\gamma_{2,3}$	$L_I N_{II,III}$	2.3468	5.83	1 77 Ir	$M_{IV}$	Abs. Edge	2.126
5.286	1 82 Pb	$M\alpha_1$	$M_V N_{VII}$	2.3455	5.8360	3 40 Zr	$L\beta_1$	$L_{II} M_{IV}$	2.1244
5.299	2 82 Pb	$M\alpha_2$	$M_V N_{VI}$	2.3397	5.840	1 79 Au	$M\alpha_1$	$M_V N_{VII}$	2.1229
5.3102	3 41 Nb	$L\beta_3$	$L_I M_{III}$	2.3348	5.8475	3 42 Mo	$L\eta$	$L_{II} M_I$	2.1202
5.319	4 78 Pt	$M\gamma$	$M_{III} N_V$	2.331	5.854	3 79 Au	$M\alpha_2$	$M_V N_{VI}$	2.118
5.340	5 90 Th	$M\zeta_2$	$M_{IV} N_{II}$	2.322	5.8754	3 39 Y	$L\gamma_5$	$L_{II} N_I$	2.1102
5.3455	3 41 Nb	$L\beta_4$	$L_I M_{II}$	2.3194	5.884	8 81 Tl		$M_{III} N_I$	2.107
5.357	4 74 W		$M_{II} N_{IV}$	2.314	5.885	2 75 Re	$M\gamma$	$M_{III} N_V$	2.1067
5.357	5 78 Pt		$M_{III} N_{IV}$	2.314	5.931	5 75 Re		$M_{III} N_{IV}$	2.090
5.36	1 80 Hg	$M_V$	Abs. Edge	2.313	5.962	1 39 Y	$L_{III}$	Abs. Edge	2.0794
5.3613	3 41 Nb	$L\beta_6$	$L_{III} N_I$	2.3125	5.9832	3 39 Y	$L\beta_3$	$L_I M_{III}$	2.0722
5.37216	7 16 S	$K\alpha_1$	$KL_{III}$	2.30784	5.987	9 78 Pt		$M_V O_{III}$	2.071
5.374	5 79 Au	$M_{IV}$	Abs. Edge	2.307	6.008	5 37 Rb	$L_I$	Abs. Edge	2.063
5.37496	8 16 S	$K\alpha_2$	$KL_{II}$	2.30664	6.0186	3 39 Y	$L\beta_4$	$L_I M_{II}$	2.0600
5.378	1 40 Zr	$L_{II}$	Abs. Edge	2.3053	6.038	1 77 Ir	$M\beta$	$M_{IV} N_{VI}$	2.0535
5.3843	3 40 Zr	$L\gamma_1$	$L_{II} N_{IV}$	2.3027	6.0458	3 37 Rb	$L\gamma_{2,3}$	$L_I N_{II,III}$	2.0507
5.40	2 73 Ta		$M_I N_{III}$	2.295	6.047	1 78 Pt	$M\alpha_1$	$M_V N_{VII}$	2.0505
5.40655	8 42 Mo	$L\alpha_1$	$L_{III} M_V$	2.29316	6.05	1 77 Ir	$M_V$	Abs. Edge	2.048
5.41437	8 42 Mo	$L\alpha_2$	$L_{III} M_{IV}$	2.28985	6.058	3 78 Pt	$M\alpha_2$	$M_V N_{VI}$	2.047
5.4318	9 80 Hg	$M\beta$	$M_{IV} N_{VI}$	2.2825	6.0705	2 40 Zr	$L\alpha_1$	$L_{III} M_V$	2.04236
5.435	1 74 W	$M_{III}$	Abs. Edge	2.2811	6.073	5 76 Os	$M_{IV}$	Abs. Edge	2.042
5.460	1 81 Tl	$M\alpha_1$	$M_V N_{VII}$	2.2706	6.0778	3 40 Zr	$L\alpha_2$	$L_{III} M_{IV}$	2.0399
5.472	2 81 Tl	$M\alpha_2$	$M_V N_{VI}$	2.2656	6.09	2 80 Hg		$M_{III} N_I$	2.036
5.4923	3 41 Nb	$L\beta_1$	$L_{II} M_{IV}$	2.2574	6.092	3 74 W	$M\gamma$	$M_{III} N_V$	2.035
5.4977	3 40 Zr	$L\gamma_5$	$L_{II} N_I$	2.2551	6.0942	3 39 Y	$L\beta_6$	$L_{III} N_I$	2.0344
5.500	4 77 Ir	$M\gamma$	$M_{III} N_V$	2.254	6.134	4 74 W		$M_{III} N_{IV}$	2.021
5.5035	3 44 Ru	$L_I$	$L_{III} M_I$	2.2528	6.1508	3 42 Mo	$L_I$	$L_{III} M_I$	2.01568
5.537	8 83 Bi		$M_{III} N_I$	2.239	6.157	1 15 P	$K\alpha_1$	$KL_{III}$	2.0137
5.540	5 77 Ir		$M_{III} N_{IV}$	2.238	6.160	1 15 P	$K\alpha_2$	$KL_{II}$	2.0127
5.570	4 73 Ta		$M_{II} N_{IV}$	2.226	6.162	8 83 Bi		$M_{IV} N_{III}$	2.012
5.579	1 40 Zr	$L_{III}$	Abs. Edge	2.2225	6.173	1 38 Sr	$L_{II}$	Abs. Edge	2.0085
5.584	5 79 Au	$M_V$	Abs. Edge	2.220	6.2109	3 41 Nb	$L\eta$	$L_{II} M_I$	1.99620
5.5863	3 40 Zr	$L\beta_{2,15}$	$L_{III} N_{IV,V}$	2.2194	6.2120	3 39 Y	$L\beta_1$	$L_{II} M_{IV}$	1.99584
5.59	1 78 Pt	$M_{IV}$	Abs. Edge	2.217	6.259	9 79 Au		$M_{III} N_I$	1.981
5.592	5 38 Sr	$L_I$	Abs. Edge	2.217	6.262	1 77 Ir	$M\alpha_1$	$M_V N_{VII}$	1.9799
5.624	1 79 Au	$M\beta$	$M_{IV} N_{VI}$	2.2046	6.267	1 76 Os	$M\beta$	$M_{IV} N_{VI}$	1.9783
5.628	8 74 W		$M_{III} O_I$	2.203	6.275	3 77 Ir	$M\alpha_2$	$M_V N_{VI}$	1.9758
5.6330	3 40 Zr	$L\beta_3$	$L_I M_{III}$	2.2010	6.28	2 74 W		$M_{II} N_I$	1.973

TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV
6.2961	3 38 Sr	$L\gamma_5$ $L_{II}N_I$	1.96916	7.101	8 79 Au	$M_{IV}N_{III}$	1.746
6.30	1 76 Os	$M_V$ Abs. Edge	1.967	7.11	1 73 Ta	$M_V$ Abs. Edge	1.743
6.312	4 73 Ta	$M_\gamma$ $M_{III}N_V$	1.964	7.12542	9 14 Si	$K\alpha_1$ $KL_{II}$	1.73998
6.33	1 75 Re	$M_{IV}$ Abs. Edge	1.958	7.12791	9 14 Si	$K\alpha_2$ $KL_{II}$	1.73938
6.353	5 73 Ta	$M_{III}N_{IV}$	1.951	7.168	1 36 Kr	$L_{II}$ Abs. Edge	1.7297
6.3672	3 38 Sr	$L\beta_3$ $L_I M_{III}$	1.94719	7.250	5 36 Kr	$L_{II}N_{III}$	1.710
6.384	7 82 Pb	$M_{IV}N_{III}$	1.942	7.252	1 73 Ta	$M\alpha$ $M_V N_{VI, VII}$	1.7096
6.387	1 38 Sr	$L_{III}$ Abs. Edge	1.9411	7.264	5 36 Kr	$L\beta_3$ $L_I M_{III}$	1.707
6.4026	3 38 Sr	$L\beta_4$ $L_I M_{II}$	1.93643	7.279	5 36 Kr	$L\gamma_5$ $L_{II}N_I$	1.703
6.4488	2 39 Y	$L\alpha_1$ $L_{III}M_V$	1.92256	7.30	2 73 Ta	$M_V O_{III}$	1.700
6.455	9 78 Pt	$M_{III}N_I$	1.921	7.303	1 72 Hf	$M\beta$ $M_{IV}N_{VI}$	1.6976
6.4558	3 39 Y	$L\alpha_2$ $L_{III}M_{IV}$	1.92047	7.304	5 36 Kr	$L\beta_4$ $L_I M_{II}$	1.697
6.47	1 36 Kr	$L_I$ Abs. Edge	1.915	7.3183	2 37 Rb	$L\alpha_1$ $L_{III}M_V$	1.69413
6.490	1 76 Os	$M\alpha$ $M_V N_{VI, VII}$	1.9102	7.3251	3 37 Rb	$L\alpha_2$ $L_{III}M_{IV}$	1.69256
6.504	1 75 Re	$M\beta$ $M_{IV}N_{VI}$	1.9061	7.3563	3 39 Y	$L_I$ $L_{III}M_I$	1.68536
6.5176	3 41 Nb	$L_I$ $L_{III}M_I$	1.90225	7.360	8 74 W	$M_{III}N_I$	1.684
6.5191	3 38 Sr	$L\beta_6$ $L_{III}N_I$	1.90181	7.371	8 78 Pt	$M_{IV}N_{III}$	1.682
6.521	4 83 Bi	$M\zeta_1$ $M_V N_{III}$	1.901	7.392	1 36 Kr	$L_{III}$ Abs. Edge	1.6772
6.544	4 72 Hf	$M_\gamma$ $M_{III}N_V$	1.895	7.466	4 79 Au	$M\zeta_1$ $M_V N_{III}$	1.6605
6.560	5 75 Re	$M_V$ Abs. Edge	1.890	7.503	1 34 Se	$L_I$ Abs. Edge	1.6525
6.585	5 83 Bi	$M\zeta_2$ $M_{IV}N_{II}$	1.883	7.510	4 36 Kr	$L\beta_6$ $L_{III}N_I$	1.6510
6.59	1 74 W	$M_{IV}$ Abs. Edge	1.880	7.5171	3 38 Sr	$L\eta$ $L_{II}M_I$	1.64933
6.6069	3 40 Zr	$L\eta$ $L_{II}M_I$	1.87654	7.523	5 79 Au	$M\zeta_2$ $M_{IV}N_{II}$	1.648
6.6239	3 38 Sr	$L\beta_1$ $L_{II}M_{IV}$	1.87172	7.539	1 72 Hf	$M\alpha$ $M_V N_{VI, VII}$	1.6446
6.644	1 37 Rb	$L_{II}$ Abs. Edge	1.8661	7.546	8 68 Er	$M_\gamma$ $M_{III}N_V$	1.643
6.669	9 77 Ir	$M_{III}N_I$	1.859	7.576	3 36 Kr	$L\beta_1$ $L_{II}M_{IV}$	1.6366
6.729	1 75 Re	$M\alpha$ $M_V N_{VI, VII}$	1.8425	7.60	1 68 Er	$M_{III}N_{IV}$	1.632
6.738	1 14 Si	$K$ Abs. Edge	1.8400	7.601	2 71 Lu	$M\beta$ $M_{IV}N_{VI}$	1.6312
6.740	3 82 Pb	$M\zeta_1$ $M_V N_{III}$	1.8395	7.612	9 73 Ta	$M_{III}N_I$	1.629
6.7530	1 14 Si	$K\beta$ $KM$	1.83594	7.645	8 77 Ir	$M_{IV}N_{III}$	1.622
6.755	3 37 Rb	$L\gamma_6$ $L_{II}N_{IV}$	1.83532	7.738	4 78 Pt	$M\zeta_1$ $M_V N_{III}$	1.6022
6.757	1 74 W	$M\beta$ $M_{IV}N_{VI}$	1.8349	7.753	5 35 Br	$L_{II}$ Abs. Edge	1.599
6.768	6 71 Lu	$M_\gamma$ $M_{III}N_V$	1.832	7.767	9 35 Br	$L\beta_{3,4}$ $L_I M_{II, III}$	1.596
6.7876	3 37 Rb	$L\beta_3$ $L_I M_{III}$	1.82659	7.790	5 78 Pt	$M\zeta_2$ $M_{IV}N_{II}$	1.592
6.802	5 82 Pb	$M\zeta_2$ $M_{IV}N_{II}$	1.823	7.817	3 36 Kr	$L\alpha_{1,2}$ $L_{III}M_{IV, V}$	1.5860
6.806	9 74 W	$M_{IV}O_{II}$	1.822	7.8362	3 38 Sr	$L_I$ $L_{III}M_I$	1.58215
6.8207	3 37 Rb	$L\beta_4$ $L_I M_{II}$	1.81771	7.840	2 71 Lu	$M\alpha$ $M_V N_{VI, VII}$	1.5813
6.83	1 74 W	$M_V$ Abs. Edge	1.814	7.865	9 67 Ho	$M_\gamma$ $M_{III}N_{IV, V}$	1.576
6.862	1 37 Rb	$L_{III}$ Abs. Edge	1.8067	7.887	9 72 Hf	$M_{III}N_I$	1.572
6.8628	2 38 Sr	$L\alpha_1$ $L_{III}M_V$	1.80656	7.909	2 70 Yb	$M\beta$ $M_{IV}N_{VI}$	1.5675
6.8697	3 38 Sr	$L\alpha_2$ $L_{III}M_{IV}$	1.80474	7.94813	5 13 Al	$K$ Abs. Edge	1.55988
6.87	1 73 Ta	$M_{IV}$ Abs. Edge	1.804	7.960	2 13 Al	$K\beta$ $KM$	1.55745
6.87	2 80 Hg	$\delta$ $M_{IV}N_{III}$	1.805	7.984	5 35 Br	$L_{III}$ Abs. Edge	1.5530
6.89	2 76 Os	$M_{III}N_I$	1.798	8.021	4 77 Ir	$M\zeta_1$ $M_V N_{III}$	1.5458
6.9185	3 40 Zr	$L_I$ $L_{III}M_I$	1.79201	8.0415	4 37 Rb	$L\eta$ $L_{II}M_I$	1.54177
6.959	5 35 Br	$L_I$ Abs. Edge	1.781	8.065	5 77 Ir	$M\zeta_2$ $M_{IV}N_{II}$	1.5373
6.974	4 81 Tl	$M\zeta_1$ $M_V N_{III}$	1.778	8.107	1 33 As	$L_I$ Abs. Edge	1.5293
6.983	1 74 W	$M\alpha_1$ $M_V N_{VII}$	1.7754	8.1251	5 35 Br	$L\beta_1$ $L_{II}M_{IV}$	1.52590
6.9842	3 37 Rb	$L\beta_6$ $L_{III}N_I$	1.77517	8.144	9 66 Dy	$M_\gamma$ $M_{III}N_{IV, V}$	1.522
6.992	2 74 W	$M\alpha_2$ $M_V N_{VI}$	1.7731	8.149	5 70 Yb	$M\alpha$ $M_V N_{VI, VII}$	1.5214
7.005	9 74 W	$M_V O_{III}$	1.770	8.239	8 75 Re	$M_{IV}N_{III}$	1.505
7.023	1 73 Ta	$M\beta$ $M_{IV}N_{VI}$	1.7655	8.249	7 69 Tm	$M\beta$ $M_{IV}N_{VI}$	1.503
7.024	8 70 Yb	$M_\gamma$ $M_{III}N_V$	1.765	8.310	4 76 Os	$M\zeta_1$ $M_V N_{III}$	1.4919
7.032	5 81 Tl	$M\zeta_2$ $M_{IV}N_{II}$	1.763	8.321	9 34 Se	$L\beta_{3,4}$ $L_I M_{II, III}$	1.490
7.0406	3 39 Y	$L\eta$ $L_{II}M_I$	1.76095	8.33934	9 13 Al	$K\alpha_1$ $KL_{III}$	1.48670
7.0759	3 37 Rb	$L\beta_1$ $L_{II}M_{IV}$	1.75217	8.34173	9 13 Al	$K\alpha_2$ $KL_{II}$	1.48627
7.09	2 73 Ta	$M_{IV}O_{II, III}$	1.748	8.359	5 76 Os	$M\zeta_2$ $M_{IV}N_{II}$	1.4831

TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV		
8.3636	4 37 Rb	<i>Ll</i>	<i>L<sub>III</sub>M<sub>I</sub></i>	1.48238	10.254	6 64 Gd	<i>Mβ</i>	<i>M<sub>IV</sub>N<sub>VI</sub></i>	1.2091
8.3746	5 35 Br	<i>Lα<sub>1,2</sub></i>	<i>L<sub>III</sub>M<sub>IV,V</sub></i>	1.48043	10.294	1 34 Se	<i>Ll</i>	<i>L<sub>III</sub>M<sub>I</sub></i>	1.2044
8.407	1 34 Se	<i>L<sub>II</sub></i>	Abs. Edge	1.4747	10.359	9 31 Ga	<i>Lβ<sub>3,4</sub></i>	<i>L<sub>I</sub>M<sub>II,III</sub></i>	1.197
8.470	9 70 Yb		<i>M<sub>III</sub>N<sub>I</sub></i>	1.464	10.40	7 92 U		<i>N<sub>II</sub>P<sub>I</sub></i>	1.192
8.48	1 69 Tm	<i>Mα</i>	<i>M<sub>V</sub>N<sub>VI,VII</sub></i>	1.462	10.4361	8 32 Ge	<i>Lα<sub>1,2</sub></i>	<i>L<sub>III</sub>M<sub>IV,V</sub></i>	1.18800
8.486	9 65 Tb	<i>Mγ</i>	<i>M<sub>III</sub>N<sub>IV,V</sub></i>	1.461	10.46	3 64 Gd	<i>Mα</i>	<i>M<sub>V</sub>N<sub>VI,VII</sub></i>	1.185
8.487	5 69 Tm	<i>Mν</i>	Abs. Edge	1.4609	10.48	1 70 Yb	<i>Mζ</i>	<i>M<sub>V</sub>N<sub>III</sub></i>	1.183
8.573	8 74 W		<i>M<sub>IV</sub>N<sub>III</sub></i>	1.446	10.505	9 60 Nd	<i>Mγ</i>	<i>M<sub>III</sub>N<sub>IV,V</sub></i>	1.180
8.592	3 68 Er	<i>Mβ</i>	<i>M<sub>IV</sub>N<sub>VI</sub></i>	1.4430	10.711	5 63 Eu	<i>M<sub>IV</sub></i>	Abs. Edge	1.1575
8.60	7 92 U		<i>N<sub>I</sub>P<sub>IV,V</sub></i>	1.44	10.734	1 33 As	<i>Lη</i>	<i>L<sub>II</sub>M<sub>I</sub></i>	1.1550
8.601	5 68 Er	<i>M<sub>IV</sub></i>	Abs. Edge	1.4415	10.750	7 63 Eu	<i>Mβ</i>	<i>M<sub>IV</sub>N<sub>VI</sub></i>	1.1533
8.629	4 75 Re	<i>Mζ<sub>1</sub></i>	<i>M<sub>V</sub>N<sub>III</sub></i>	1.4368	10.828	5 31 Ga	<i>L<sub>II</sub></i>	Abs. Edge	1.1450
8.646	1 34 Se	<i>L<sub>III</sub></i>	Abs. Edge	1.4340	10.96	3 63 Eu	<i>Mα</i>	<i>M<sub>V</sub>N<sub>VI,VII</sub></i>	1.131
8.664	5 75 Re	<i>Mζ<sub>2</sub></i>	<i>M<sub>IV</sub>N<sub>II</sub></i>	1.4310	10.998	9 59 Pr	<i>Mγ</i>	<i>M<sub>III</sub>N<sub>IV,V</sub></i>	1.1273
8.7358	5 34 Se	<i>Lβ<sub>1</sub></i>	<i>L<sub>II</sub>M<sub>IV</sub></i>	1.41923	11.013	5 63 Eu	<i>Mν</i>	Abs. Edge	1.1258
8.76	7 92 U		<i>N<sub>I</sub>P<sub>III</sub></i>	1.42	11.023	2 31 Ga	<i>Lβ<sub>1</sub></i>	<i>L<sub>II</sub>M<sub>IV</sub></i>	1.1248
8.773	1 32 Ge	<i>L<sub>I</sub></i>	Abs. Edge	1.4132	11.072	1 33 As	<i>Ll</i>	<i>L<sub>III</sub>M<sub>I</sub></i>	1.1198
8.81	7 92 U		<i>N<sub>I</sub>P<sub>II</sub></i>	1.41	11.07	7 90 Th		<i>N<sub>II</sub>P<sub>I</sub></i>	1.120
8.82	1 68 Er	<i>Mα</i>	<i>M<sub>V</sub>N<sub>VI,VII</sub></i>	1.406	11.100	1 31 Ga	<i>L<sub>III</sub></i>	Abs. Edge	1.1169
8.844	9 64 Gd	<i>Mγ</i>	<i>M<sub>III</sub>N<sub>IV,V</sub></i>	1.402	11.200	7 30 Zn	<i>Lβ<sub>3,4</sub></i>	<i>L<sub>I</sub>M<sub>II,III</sub></i>	1.1070
8.847	5 68 Er	<i>Mν</i>	Abs. Edge	1.4013	11.27	1 62 Sm	<i>Mβ</i>	<i>M<sub>IV</sub>N<sub>VI</sub></i>	1.0998
8.90	2 73 Ta		<i>M<sub>IV</sub>N<sub>III</sub></i>	1.393	11.288	5 62 Sm	<i>M<sub>IV</sub></i>	Abs. Edge	1.0983
8.929	1 33 As	<i>Lβ<sub>3,4</sub></i>	<i>L<sub>I</sub>M<sub>II,III</sub></i>	1.3884	11.292	1 31 Ga	<i>Lα<sub>1,2</sub></i>	<i>L<sub>III</sub>M<sub>IV,V</sub></i>	1.09792
8.962	4 74 W	<i>Mζ<sub>1</sub></i>	<i>M<sub>V</sub>N<sub>III</sub></i>	1.3835	11.37	1 68 Er	<i>Mζ</i>	<i>M<sub>V</sub>N<sub>III</sub></i>	1.0901
8.965	4 67 Ho	<i>Mβ</i>	<i>M<sub>IV</sub>N<sub>VI</sub></i>	1.3830	11.47	3 62 Sm	<i>Mα</i>	<i>M<sub>V</sub>N<sub>VI,VII</sub></i>	1.081
8.9900	5 34 Se	<i>Lα<sub>1,2</sub></i>	<i>L<sub>III</sub>M<sub>IV,V</sub></i>	1.37910	11.53	1 58 Ce	<i>Mγ</i>	<i>M<sub>III</sub>N<sub>IV,V</sub></i>	1.0749
8.993	5 74 W	<i>Mζ<sub>2</sub></i>	<i>M<sub>IV</sub>N<sub>II</sub></i>	1.3787	11.552	5 62 Sm	<i>Mν</i>	Abs. Edge	1.0732
9.125	1 33 As	<i>L<sub>II</sub></i>	Abs. Edge	1.3587	11.56	5 90 Th		<i>N<sub>II</sub>O<sub>IV</sub></i>	1.072
9.20	2 67 Ho	<i>Mα</i>	<i>M<sub>V</sub>N<sub>VI,VII</sub></i>	1.348	11.569	1 11 Na	<i>K</i>	Abs. Edge	1.07167
9.211	9 63 Eu	<i>Mγ</i>	<i>M<sub>III</sub>N<sub>IV,V</sub></i>	1.346	11.575	2 11 Na	<i>Kβ</i>	<i>KM</i>	1.0711
9.255	1 35 Br	<i>Lη</i>	<i>L<sub>II</sub>M<sub>I</sub></i>	1.3396	11.609	2 32 Ge		<i>L<sub>II</sub>M<sub>I</sub></i>	1.0680
9.316	4 73 Ta	<i>Mζ<sub>1</sub></i>	<i>M<sub>V</sub>N<sub>III</sub></i>	1.3308	11.862	1 30 Zn	<i>L<sub>II</sub></i>	Abs. Edge	1.04523
9.330	5 73 Ta	<i>Mζ<sub>2</sub></i>	<i>M<sub>IV</sub>N<sub>II</sub></i>	1.3288	11.86	1 67 Ho	<i>Mζ</i>	<i>M<sub>V</sub>N<sub>III</sub></i>	1.0450
9.357	6 66 Dy	<i>Mβ</i>	<i>M<sub>IV</sub>N<sub>VI</sub></i>	1.3250	11.9101	9 11 Na	<i>Kα<sub>1,2</sub></i>	<i>KL<sub>II,III</sub></i>	1.04098
9.367	1 33 As	<i>L<sub>III</sub></i>	Abs. Edge	1.3235	11.965	2 32 Ge	<i>Ll</i>	<i>L<sub>III</sub>M<sub>I</sub></i>	1.0362
9.40	7 90 Th		<i>N<sub>I</sub>P<sub>III</sub></i>	1.319	11.983	3 30 Zn	<i>Lβ<sub>1</sub></i>	<i>L<sub>II</sub>M<sub>IV</sub></i>	1.0347
9.4141	8 33 As	<i>Lβ<sub>1</sub></i>	<i>L<sub>II</sub>M<sub>IV</sub></i>	1.3170	12.08	4 57 La	<i>Mγ</i>	<i>M<sub>III</sub>N<sub>IV,V</sub></i>	1.027
9.44	7 90 Th		<i>N<sub>I</sub>P<sub>II</sub></i>	1.313	12.122	3 29 Cu	<i>Lβ<sub>3,4</sub></i>	<i>L<sub>I</sub>M<sub>II,III</sub></i>	1.0228
9.5122	1 12 Mg	<i>K</i>	Abs. Edge	1.30339	12.131	1 30 Zn	<i>L<sub>III</sub></i>	Abs. Edge	1.02201
9.517	5 31 Ga	<i>L<sub>I</sub></i>	Abs. Edge	1.3028	12.254	3 30 Zn	<i>Lα<sub>1,2</sub></i>	<i>L<sub>III</sub>M<sub>IV,V</sub></i>	1.0117
9.521	2 12 Mg	<i>Kβ</i>	<i>KM</i>	1.3022	12.43	2 66 Dy	<i>Mζ</i>	<i>M<sub>V</sub>N<sub>III</sub></i>	0.998
9.581	2 32 Ge	<i>Lβ<sub>3</sub></i>	<i>L<sub>I</sub>M<sub>III</sub></i>	1.2941	12.44	2 60 Nd	<i>Mβ</i>	<i>M<sub>IV</sub>N<sub>VI</sub></i>	0.997
9.585	1 35 Br	<i>Ll</i>	<i>L<sub>III</sub>M<sub>I</sub></i>	1.2935	12.459	5 60 Nd	<i>M<sub>IV</sub></i>	Abs. Edge	0.9951
9.59	2 66 Dy	<i>Mα</i>	<i>M<sub>V</sub>N<sub>VI,VII</sub></i>	1.293	12.597	2 31 Ga	<i>Lη</i>	<i>L<sub>II</sub>M<sub>I</sub></i>	0.9842
9.600	9 62 Sm	<i>Mγ</i>	<i>M<sub>III</sub>N<sub>IV,V</sub></i>	1.291	12.68	2 60 Nd	<i>Mα</i>	<i>M<sub>V</sub>N<sub>VI,VII</sub></i>	0.978
9.640	2 32 Ge	<i>Lβ<sub>4</sub></i>	<i>L<sub>I</sub>M<sub>II</sub></i>	1.2861	12.737	5 60 Nd	<i>Mν</i>	Abs. Edge	0.9734
9.6709	8 33 As	<i>Lα<sub>1,2</sub></i>	<i>L<sub>III</sub>M<sub>IV,V</sub></i>	1.2820	12.75	3 56 Ba	<i>Mγ</i>	<i>M<sub>III</sub>N<sub>IV,V</sub></i>	0.973
9.686	7 72 Hf	<i>Mζ<sub>2</sub></i>	<i>M<sub>IV</sub>N<sub>II</sub></i>	1.2800	12.90	9 92 U		<i>N<sub>III</sub>O<sub>V</sub></i>	0.961
9.686	7 72 Hf	<i>Mζ<sub>1</sub></i>	<i>M<sub>V</sub>N<sub>III</sub></i>	1.2800	12.953	2 31 Ga	<i>Ll</i>	<i>L<sub>III</sub>M<sub>I</sub></i>	0.9572
9.792	6 65 Tb	<i>Mβ</i>	<i>M<sub>IV</sub>N<sub>VI</sub></i>	1.2661	12.98	2 65 Tb	<i>Mζ</i>	<i>M<sub>V</sub>N<sub>III</sub></i>	0.955
9.8900	2 12 Mg	<i>Kα<sub>1,2</sub></i>	<i>KL<sub>II,III</sub></i>	1.25360	13.014	1 29 Cu	<i>L<sub>II</sub></i>	Abs. Edge	0.95268
9.924	1 32 Ge	<i>L<sub>II</sub></i>	Abs. Edge	1.2494	13.053	3 29 Cu	<i>Lβ<sub>1</sub></i>	<i>L<sub>II</sub>M<sub>IV</sub></i>	0.9498
9.962	1 34 Se	<i>Lη</i>	<i>L<sub>II</sub>M<sub>I</sub></i>	1.2446	13.06	2 59 Pr	<i>Mβ</i>	<i>M<sub>IV</sub>N<sub>VI</sub></i>	0.950
10.00	2 65 Tb	<i>Mα</i>	<i>M<sub>V</sub>N<sub>VI,VII</sub></i>	1.240	13.06	1 30 Zn	<i>L<sub>I</sub></i>	Abs. Edge	0.9495
10.09	7 92 U		<i>N<sub>I</sub>O<sub>III</sub></i>	1.229	13.122	5 59 Pr	<i>M<sub>IV</sub></i>	Abs. Edge	0.9448
10.175	1 32 Ge	<i>Lβ<sub>1</sub></i>	<i>L<sub>II</sub>M<sub>IV</sub></i>	1.2185	13.18	2 28 Ni	<i>Lβ<sub>3,4</sub></i>	<i>L<sub>I</sub>M<sub>II,III</sub></i>	0.941
10.187	1 32 Ge	<i>L<sub>III</sub></i>	Abs. Edge	1.2170	13.288	1 29 Cu	<i>L<sub>III</sub></i>	Abs. Edge	0.93306

TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV
13.30	6 83 Bi	$N_{I}P_{II,III}$	0.932	18.8	2 47 Ag	$M_{I}N_{II,III}$	0.658
13.336	3 29 Cu	$L\alpha_{1,2}$ $L_{III}M_{IV,V}$	0.9297	18.96	4 24 Cr	$L\beta_{3,4}$ $L_{I}M_{II,III}$	0.654
13.343	5 59 Pr	$M\alpha$ $M_{V}N_{VI,VII}$	0.9292	19.11	2 25 Mn	$L\beta_{1}$ $L_{II}M_{IV}$	0.6488
13.394	5 59 Pr	$M_{V}$ Abs. Edge	0.9257	19.1	1 52 Te	$M_{III}N_{I}$	0.648
13.57	2 64 Gd	$M\zeta$ $M_{V}N_{III}$	0.914	19.40	7 48 Cd	$M_{II}N_{IV}$	0.639
13.68	2 30 Zn	$L\eta$ $L_{II}M_{I}$	0.906	19.44	5 57 La	$M\zeta$ $M_{V}N_{III}$	0.638
13.75	4 58 Ce	$M\beta$ $M_{IV}N_{VI}$	0.902	19.45	1 25 Mn	$L\alpha_{1,2}$ $L_{III}M_{IV,V}$	0.6374
13.8	1 90 Th	$N_{III}O_{V}$	0.897	19.66	5 53 I	$M_{IV,V}$ Abs. Edge	0.631
14.02	2 30 Zn	$L\iota$ $L_{III}M_{I}$	0.884	19.75	4 26 Fe	$L\eta$ $L_{II}M_{I}$	0.628
14.04	2 58 Ce	$M\alpha$ $M_{V}N_{VI,VII}$	0.883	20.0	1 50 Sn	$M_{II}N_{I}$	0.619
14.22	2 63 Eu	$M\zeta$ $M_{V}N_{III}$	0.872	20.1	2 46 Pd	$M_{I}N_{II,III}$	0.616
14.242	5 28 Ni	$L_{II}$ Abs. Edge	0.8706	20.15	1 26 Fe	$L\iota$ $L_{III}M_{I}$	0.6152
14.271	6 28 Ni	$L\beta_{1}$ $L_{II}M_{IV}$	0.8688	20.2	1 51 Sb	$M_{III}N_{I}$	0.612
14.3018	1 10 Ne	$K$ Abs. Edge	0.866889	20.47	7 48 Cd	$M_{\gamma}$ $M_{III}N_{IV,V}$	0.606
14.31	3 27 Co	$L\beta_{3,4}$ $L_{I}M_{II,III}$	0.870	20.64	4 56 Ba	$M\zeta$ $M_{V}N_{III}$	0.601
14.39	5 58 Ce	$M_{V}O_{II,III}$	0.862	20.66	7 47 Ag	$M_{II}N_{IV}$	0.600
14.452	5 10 Ne	$K\beta$ $KM$	0.8579	20.7	1 24 Cr	$L_{III}$ Abs. Edge	0.598
14.51	5 57 La	$M\beta$ $M_{IV}N_{VI}$	0.854	21.19	5 23 Va	$L\beta_{3,4}$ $L_{I}M_{II,III}$	0.585
14.525	5 28 Ni	$L_{III}$ Abs. Edge	0.8536	21.27	1 24 Cr	$L\beta_{1}$ $L_{II}M_{IV}$	0.5828
14.561	3 28 Ni	$L\alpha_{1,2}$ $L_{III}M_{IV,V}$	0.8515	21.34	5 52 Te	$M_{IV}O_{II,III}$	0.581
14.610	3 10 Ne	$K\alpha_{1,2}$ $KL_{II,III}$	0.8486	21.5	1 50 Sn	$M_{III}N_{I}$	0.575
14.88	5 57 La	$M\alpha$ $M_{V}N_{VI,VII}$	0.833	21.64	3 24 Cr	$L\alpha_{1,2}$ $L_{III}M_{IV,V}$	0.5728
14.90	2 29 Cu	$L\eta$ $L_{II}M_{I}$	0.832	21.78	5 52 Te	$M_{V}O_{III}$	0.569
14.91	4 62 Sm	$M\zeta$ $M_{V}N_{III}$	0.831	21.82	7 47 Ag	$M_{\gamma}$ $M_{III}N_{IV,V}$	0.568
15.286	9 29 Cu	$L\iota$ $L_{III}M_{I}$	0.8111	21.85	2 25 Mn	$L\eta$ $L_{II}M_{I}$	0.5675
15.56	1 56 Ba	$M_{IV}$ Abs. Edge	0.7967	22.1	1 46 Pd	$M_{II}N_{IV}$	0.560
15.618	5 27 Co	$L_{II}$ Abs. Edge	0.7938	22.29	1 25 Mn	$L\iota$ $L_{III}M_{I}$	0.5563
15.65	4 26 Fe	$L\beta_{3,4}$ $L_{I}M_{II,III}$	0.792	22.9	2 48 Cd	$M_{II}N_{I}$	0.540
15.666	8 27 Co	$L\beta_{1}$ $L_{II}M_{IV}$	0.7914	23.32	1 8 O	$K$ Abs. Edge	0.5317
15.72	9 56 Ba	$M_{IV}O_{III}$	0.789	23.3	1 46 Pd	$M_{\gamma}$ $M_{III}N_{IV,V}$	0.531
15.89	1 56 Ba	$M_{V}$ Abs. Edge	0.7801	23.62	3 8 O	$K\alpha$ $KL$	0.5249
15.91	5 56 Ba	$M_{IV}O_{II}$	0.779	23.88	4 23 Va	$L\beta_{1}$ $L_{II}M_{IV}$	0.5192
15.915	5 27 Co	$L_{III}$ Abs. Edge	0.7790	24.25	3 23 Va	$L\alpha_{1,2}$ $L_{III}M_{IV,V}$	0.5113
15.93	4 52 Te	$M_{\gamma}$ $M_{III}N_{IV,V}$	0.778	24.28	5 50 Sn	$M_{IV,V}$ Abs. Edge	0.511
15.972	6 27 Co	$L\alpha_{1,2}$ $L_{III}M_{IV,V}$	0.7762	24.30	3 24 Cr	$L\eta$ $L_{II}M_{I}$	0.5102
15.98	5 51 Sb	$M_{II}N_{IV}$	0.776	24.4	2 47 Ag	$M_{V}N_{I}$	0.509
16.20	5 56 Ba	$M_{V}O_{III}$	0.765	24.5	1 48 Cd	$M_{III}N_{I}$	0.507
16.27	3 28 Ni	$L\eta$ $L_{II}M_{I}$	0.762	24.78	1 24 Cr	$L\iota$ $L_{III}M_{I}$	0.5003
16.46	4 60 Nd	$M\zeta$ $M_{V}N_{III}$	0.753	25.01	9 45 Rh	$M_{\gamma}$ $M_{III}N_{IV,V}$	0.496
16.693	9 28 Ni	$L\iota$ $L_{III}M_{I}$	0.7427	25.3	1 50 Sn	$M_{IV}O_{II,III}$	0.491
16.7	1 24 Cr	$L_{I}$ Abs. Edge	0.741	25.50	9 44 Ru	$M_{II}N_{IV}$	0.486
16.92	4 51 Sb	$M_{\gamma}$ $M_{III}N_{IV,V}$	0.733	25.7	1 50 Sn	$M_{V}O_{III}$	0.483
16.93	5 50 Sn	$M_{II}N_{IV}$	0.733	26.0	1 47 Ag	$M_{III}N_{I}$	0.478
17.19	4 25 Mn	$L\beta_{3,4}$ $L_{I}M_{II,III}$	0.721	26.2	2 46 Pd	$M_{II}N_{I}$	0.474
17.202	5 26 Fe	$L_{II}$ Abs. Edge	0.7208	26.72	9 52 Te	$M\zeta$ $M_{IV,V}N_{II,III}$	0.464
17.26	1 26 Fe	$L\beta_{1}$ $L_{II}M_{IV}$	0.7185	26.9	1 44 Ru	$M_{\gamma}$ $M_{III}N_{IV,V}$	0.462
17.38	4 59 Pr	$M\zeta$ $M_{V}N_{III}$	0.714	27.05	2 22 Ti	$L\beta_{1}$ $L_{I}M_{IV}$	0.4584
17.525	5 26 Fe	$L_{III}$ Abs. Edge	0.7074	27.29	1 22 Ti	$L_{II,III}$ Abs. Edge	0.4544
17.59	2 26 Fe	$L\alpha_{1,2}$ $L_{III}M_{IV,V}$	0.7050	27.34	3 23 Va	$L\eta$ $L_{II}M_{I}$	0.4535
17.6	1 52 Te	$M_{II}N_{I}$	0.703	27.42	2 22 Ti	$L\alpha_{1,2}$ $L_{III}M_{IV,V}$	0.4522
17.87	3 27 Co	$L\eta$ $L_{II}M_{I}$	0.694	27.77	1 23 Va	$L\iota$ $L_{III}M_{I}$	0.4465
17.94	5 50 Sn	$M_{\gamma}$ $M_{III}N_{IV,V}$	0.691	27.9	1 46 Pd	$M_{II}N_{IV}$	0.445
17.9	1 24 Cr	$L_{II}$ Abs. Edge	0.691	28.1	2 45 Rh	$M_{II}N_{I}$	0.442
18.292	8 27 Co	$L\iota$ $L_{III}M_{I}$	0.6778	28.13	5 48 Cd	$M_{IV,V}$ Abs. Edge	0.4408
18.32	2 9 F	$K\alpha$ $KL$	0.6768	28.88	8 51 Sb	$M\zeta$ $M_{IV,V}N_{II,III}$	0.429
18.35	4 58 Ce	$M\zeta$ $M_{V}N_{III}$	0.676	29.8	1 45 Rh	$M_{III}N_{I}$	0.417
18.8	1 51 Sb	$M_{II}N_{I}$	0.658	30.4	1 48 Cd	$M_{IV}O_{II,III}$	0.408

TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV
30.8	1 48 Cd	$M_{V}O_{III}$	0.403	49.4	1 79 Au	$N_{V}N_{VI,VII}$	0.2510
30.82	5 47 Ag	$M_{IV}$ Abs. Edge	0.4022	49.5	1 90 Th	$N_{VI}O_{IV}$	0.2505
30.89	3 22 Ti	$L_{\eta}$ $L_{II}M_{I}$	0.4013	50.0	1 90 Th	$N_{VII}O_{V}$	0.2479
30.99	1 7 N	$K$ Abs. Edge	0.4000	50.2	1 77 Ir	$N_{IV}N_{VI}$	0.2470
31.02	2 21 Sc	$L\beta_{1}$ $L_{II}M_{IV}$	0.3996	50.3	1 52 Te	$M_{III}M_{V}$	0.2465
31.14	5 47 Ag	$M_{V}$ Abs. Edge	0.3981	50.9	1 78 Pt	$N_{V}N_{VI,VII}$	0.2436
31.24	9 50 Sn	$M\zeta$ $M_{IV,V}N_{II,III}$	0.397	51.3	1 38 Sr	$M_{II}N_{I}$	0.2416
31.35	3 21 Sc	$L\alpha_{1,2}$ $L_{III}M_{IV,V}$	0.3954	51.9	1 76 Os	$N_{IV}N_{VI}$	0.2388
31.36	2 22 Ti	$Ll$ $L_{III}M_{I}$	0.3953	52.0	2 48 Cd	$M_{II}M_{IV}$	0.2384
31.60	4 7 N	$K\alpha$ $KL$	0.3924	52.2	1 51 Sb	$M_{III}M_{V}$	0.2375
31.8	1 92 U	$N_{IV}N_{VI}$	0.390	52.34	7 44 Ru	$M\zeta$ $M_{IV,V}N_{II,III}$	0.2369
32.3	2 44 Ru	$M_{II}N_{I}$	0.384	52.8	1 77 Ir	$N_{V}N_{VI,VII}$	0.2348
33.1	2 41 Nb	$M_{II}N_{IV}$	0.375	53.6	1 38 Sr	$M_{III}N_{I}$	0.2313
33.5	3 47 Ag	$M_{IV,V}O_{II,III}$	0.370	54.0	2 74 W	$N_{II}N_{VI}$	0.2295
33.57	9 90 Th	$N_{IV}N_{VI}$	0.3693	54.0	1 47 Ag	$M_{II}M_{IV}$	0.2295
34.8	1 92 U	$N_{V}N_{VI,VII}$	0.357	54.2	1 50 Sn	$M_{III}M_{V}$	0.2287
34.9	2 41 Nb	$M_{\gamma}$ $M_{III}N_{IV,V}$	0.356	54.7	2 76 Os	$N_{V}N_{VI,VII}$	0.2266
35.13	2 21 Sc	$L_{\eta}$ $L_{II}M_{I}$	0.3529	54.8	2 42 Mo	$M_{IV,V}O_{II,III}$	0.2262
35.13	1 20 Ca	$L_{II}$ Abs. Edge	0.3529	55.8	1 74 W	$N_{IV}N_{VI}$	0.2221
35.3	3 42 Mo	$M_{II}N_{I}$	0.351	55.9	1 18 A	$L_{\eta}$ $L_{II}M_{I}$	0.2217
35.49	1 20 Ca	$L_{III}$ Abs. Edge	0.34931	56.3	1 18 A	$Ll$ $L_{III}M_{I}$	0.2201
35.59	3 21 Sc	$Ll$ $L_{III}M_{I}$	0.3483	56.5	1 46 Pd	$M_{II}M_{IV}$	0.2194
35.63	1 20 Ca	$L_{II,III}$ Abs. Edge	0.34793	57.0	2 37 Rb	$M_{II}N_{I}$	0.2174
35.94	2 20 Ca	$L\beta_{1}$ $L_{II}M_{IV}$	0.3449	58.2	1 73 Ta	$N_{IV}N_{VI}$	0.2130
36.32	9 90 Th	$N_{V}N_{VI,VII}$	0.3414	58.4	1 74 W	$N_{V}N_{VII}$	0.2122
36.33	2 20 Ca	$L\alpha_{1,2}$ $L_{III}M_{IV,V}$	0.3413	58.7	2 48 Cd	$M_{III}M_{V}$	0.2111
36.8	1 48 Cd	$M\zeta$ $M_{IV,V}N_{II,III}$	0.3371	59.3	1 45 Rh	$M_{II}M_{IV}$	0.2090
37.4	2 46 Pd	$M_{IV,V}O_{II,III}$	0.332	59.5	3 74 W	$N_{V}N_{VI}$	0.208
37.5	2 42 Mo	$M_{III}N_{I}$	0.331	59.5	2 37 Rb	$M_{III}N_{I}$	0.2083
38.4	3 41 Nb	$M_{II}N_{I}$	0.323	60.5	1 47 Ag	$M_{III}M_{V}$	0.2048
39.77	7 47 Ag	$M\zeta$ $M_{IV,V}N_{II,III}$	0.3117	61.1	2 73 Ta	$N_{V}N_{VI,VII}$	0.2028
40.46	2 20 Ca	$L_{\eta}$ $L_{II}M_{I}$	0.3064	61.9	2 41 Nb	$M_{IV,V}O_{II,III}$	0.2002
40.7	2 41 Nb	$M_{III}N_{I}$	0.305	62.2	1 44 Ru	$M_{II}M_{IV}$	0.1992
40.9	2 45 Rh	$M_{IV,V}O_{II,III}$	0.303	62.9	1 46 Pd	$M_{III}M_{V}$	0.1970
40.96	2 20 Ca	$Ll$ $L_{III}M_{I}$	0.3027	63.0	5 71 Lu	$N_{IV}N_{VI}$	0.197
42.1	2 92 U	$N_{VI}O_{V}$	0.295	64.38	7 42 Mo	$M\zeta$ $M_{IV,V}N_{II,III}$	0.1926
42.1	1 19 K	$L_{II,III}$ Abs. Edge	0.2946	65.1	7 70 Yb	$N_{IV}N_{VI}$	0.190
42.3	2 82 Pb	$N_{IV}N_{VI}$	0.293	65.5	1 45 Rh	$M_{III}M_{V}$	0.1892
43.3	2 92 U	$N_{VI}O_{IV}$	0.286	65.7	2 71 Lu	$N_{V}N_{VI,VII}$	0.1886
43.6	1 46 Pd	$M\zeta$ $M_{IV,V}N_{II,III}$	0.2844	67.33	9 17 Cl	$L_{\eta}$ $L_{II}M_{I}$	0.1841
43.68	1 6 C	$K$ Abs. Edge	0.28384	67.6	3 5 B	$K\alpha$ $KL$	0.1833
44.7	3 6 C	$K\alpha$ $KL$	0.277	67.90	9 17 Cl	$Ll$ $L_{III}M_{I}$	0.1826
44.8	1 44 Ru	$M_{IV,V}O_{II,III}$	0.2768	68.2	3 90 Th	$O_{III}P_{IV,V}$	0.1817
45.0	1 82 Pb	$N_{V}N_{VI,VII}$	0.2756	68.3	1 44 Ru	$M_{III}M_{V}$	0.1814
45.2	3 80 Hg	$N_{IV}N_{VI}$	0.274	68.9	2 42 Mo	$M_{II}M_{IV}$	0.1798
45.2	1 51 Sb	$M_{II}M_{IV}$	0.2743	69.3	5 70 Yb	$N_{V}N_{VI,VII}$	0.179
46.48	9 39 Y	$M_{II}N_{I}$	0.267	70.0	4 40 Zr	$M_{IV,V}O_{II,III}$	0.177
46.5	2 81 Tl	$N_{V}N_{VI,VII}$	0.267	72.1	3 41 Nb	$M_{II}M_{IV}$	0.1718
46.8	2 79 Au	$N_{IV}N_{VI}$	0.265	72.19	9 41 Nb	$M\zeta$ $M_{IV,V}N_{II,III}$	0.1717
47.24	2 19 K	$Ll$ $L_{II}M_{I}$	0.2625	72.7	9 68 Er	$N_{IV}N_{VI}$	0.171
47.3	1 50 Sn	$M_{II}M_{IV}$	0.2621	74.9	1 42 Mo	$M_{III}M_{V}$	0.1656
47.67	9 45 Rh	$M\zeta$ $M_{IV,V}N_{II,III}$	0.2601	76.3	7 68 Er	$N_{V}N_{VI,VII}$	0.163
47.74	1 19 K	$Ll$ $L_{III}M_{I}$	0.25971	76.7	2 40 Zr	$M_{II}M_{IV}$	0.1617
47.9	3 80 Hg	$N_{V}N_{VI,VII}$	0.259	76.9	2 35 Br	$M_{II}N_{I}$	0.1613
48.1	2 78 Pt	$N_{IV}N_{VI}$	0.258	78.4	2 41 Nb	$M_{III}M_{V}$	0.1582
48.2	1 90 Th	$N_{VI}O_{V}$	0.2572	79.8	3 35 Br	$M_{III}N_{I}$	0.1554
48.5	2 39 Y	$M_{III}N_{I}$	0.256	80.9	3 40 Zr	$M_{III}M_{V}$	0.1533

TABLE VI (Continued)

Wavelength Å*	p.e. Element	Designation	keV	Wavelength Å*	p.e. Element	Designation	keV
81.5	2 39 Y	$M_{II}M_{IV}$	0.1522	157.	3 30 Zn	$M_{II,III}M_{IV,V}$	0.079
82.1	2 40 Zr	$M_{IV,V}N_{II,III}$	0.1511	159.0	2 56 Ba	$N_{IV}O_{III}$	0.07796
83.	1 66 Dy	$N_{IV,V}N_{VI,VII}$	0.149	159.5	5 29 Cu	$M_{II}$ Abs. Edge	0.0777
83.4	3 16 S	$L_{II,III}M_I$	0.1487	163.3	2 56 Ba	$N_{IV}O_{II}$	0.07590
85.7	2 38 Sr	$M_{II}M_{IV}$	0.1447	164.6	2 56 Ba	$N_VO_{III}$	0.07530
86.	1 65 Tb	$N_{IV,V}N_{VI,VII}$	0.144	164.7	3 35 Br	$M_I M_{III}$	0.0753
86.5	2 39 Y	$M_{III}M_{IV,V}$	0.1434	166.0	5 29 Cu	$M_{III}$ Abs. Edge	0.0747
91.4	2 38 Sr	$M_{III}M_{IV,V}$	0.1357	170.4	1 13 Al	$L_{II,III}$ Abs. Edge	0.07278
91.5	2 37 Rb	$M_{II}M_{IV}$	0.1355	171.4	5 13 Al	$L_{II,III}M$	0.0724
91.6	1 83 Bi	$N_{VI}O_{IV}$	0.1354	173.	3 29 Cu	$M_{II,III}M_{IV,V}$	0.072
93.2	1 83 Bi	$N_{VII}O_V$	0.1330	181.	5 90 Th	$O_{IV,V}Q_{II,III}$	0.068
93.4	2 39 Y	$M_{IV,V}N_{II,III}$	0.1328	183.8	1 55 Cs	$N_{IV}O_{III}$	0.06746
94.	1 15 P	$L_{II,III}$ Abs. Edge	0.132	184.6	3 35 Br	$M_I M_{II}$	0.0672
96.7	2 37 Rb	$M_{III}M_{IV,V}$	0.1282	188.4	1 28 Ni	$M_{III}$ Abs. Edge	0.06581
97.2	8 66 Dy	$N_{IV,V}O_{II,III}$	0.128	188.6	1 55 Cs	$N_{IV}O_{II}$	0.06574
98.	1 62 Sm	$N_{IV,V}N_{VI,VII}$	0.126	189.5	3 35 Br	$M_{IV}N_{III}$	0.0654
100.2	2 82 Pb	$N_{VI}O_V$	0.1237	190.3	1 55 Cs	$N_VO_{III}$	0.06515
102.2	4 65 Tb	$N_{IV,V}O_{II,III}$	0.1213	190.	2 28 Ni	$M_{II,III}M_{IV,V}$	0.0651
102.4	1 82 Pb	$N_{VI}O_{IV}$	0.1211	191.1	2 35 Br	$M_{\zeta_2}$ $M_{IV}N_{II}$	0.06488
103.8	4 15 P	$L_{II,III}M$	0.1194	192.6	2 35 Br	$M_{\zeta_1}$ $M_V N_{III}$	0.06437
104.3	1 82 Pb	$N_{VII}O_V$	0.1189	197.3	1 12 Mg	$L_I$ Abs. Edge	0.06284
107.	1 60 Nd	$N_{IV,V}N_{VI,VII}$	0.116	202.	5 27 Co	$M_{II,III}$ Abs. Edge	0.061
108.0	2 38 Sr	$M_{IV}N_{II,III}$	0.1148	203.	1 16 S	$L_I L_{II,III}$	0.061
108.7	1 38 Sr	$M_V N_{III}$	0.1140	214.	6 27 Co	$M_{II,III}M_{IV,V}$	0.058
109.4	3 35 Br	$M_{II}M_{IV}$	0.1133	224.	1 53 I	$N_{IV,V}$ Abs. Edge	0.0552
110.6	5 29 Cu	Abs. Edge	0.1121	226.5	1 3 Li	$K$ Abs. Edge	0.05475
111.	1 4 Be	$K$ Abs. Edge	0.111	227.8	1 34 Se	$M_V$ Abs. Edge	0.05443
112.0	6 63 Eu	$N_{IV,V}O_{II,III}$	0.1107	228.	1 3 Li	$K\alpha$ $KL$	0.0543
113.0	1 81 Tl	$N_{VI}O_V$	0.10968	230.	2 34 Se	$M_V N_{III}$	0.0538
113.	1 59 Pr	$N_{IV,V}N_{VI,VII}$	0.1095	230.	1 26 Fe	$M_{II,III}$ Abs. Edge	0.0538
113.8	3 35 Br	$M_{III}M_{IV,V}$	0.1089	243.	5 26 Fe	$M_{II,III}M_{IV,V}$	0.051
114.	1 4 Be	$K\alpha$ $KL$	0.1085	249.3	1 12 Mg	$L_{II}$ Abs. Edge	0.04973
115.3	2 81 Tl	$N_{VI}O_{IV}$	0.1075	250.7	1 12 Mg	$L_{III}$ Abs. Edge	0.04945
117.4	4 62 Sm	$N_{IV,V}O_{II,III}$	0.1056	251.5	5 12 Mg	$L_{II,III}M$	0.04929
117.7	1 81 Tl	$N_{VII}O_V$	0.10530	273.	6 25 Mn	$M_{II,III}M_{IV,V}$	0.045
123.	1 14 Si	$L_{II,III}$ Abs. Edge	0.1006	290.	1 13 Al	$L_I L_{II,III}$	0.0428
126.8	2 37 Rb	$M_{IV}N_{III}$	0.0978	309.	9 24 Cr	$M_{II,III}M_{IV,V}$	0.040
127.8	2 37 Rb	$M_{IV}N_{II}$	0.0970	317.	1 12 Mg	$L_I L_{II,III}$	0.0392
128.7	2 37 Rb	$M_V N_{III}$	0.0964	337.	9 23 V	$M_{II,III}M_{IV,V}$	0.0368
128.9	7 60 Nd	$N_{IV,V}O_{II,III}$	0.0962	376.	1 11 Na	$L_I L_{II,III}$	0.03299
135.5	4 14 Si	$L_{II,III}M$	0.0915	399.	5 35 Br	$N_I$ Abs. Edge	0.0311
136.5	4 59 Pr	$N_{IV,V}O_{II,III}$	0.0908	405.	5 11 Na	$L_{II,III}$ Abs. Edge	0.0306
137.0	5 30 Zn	$M_{II}$ Abs. Edge	0.0905	407.1	5 11 Na	$L_{II,III}M$	0.03045
142.5	1 13 Al	$L_I$ Abs. Edge	0.08701	417.	5 17 Cl	$M_I$ Abs. Edge	0.0297
143.9	5 30 Zn	$M_{III}$ Abs. Edge	0.0862	444.	5 53 I	$O_I$ Abs. Edge	0.0279
144.4	6 58 Ce	$N_{IV,V}O_{II,III}$	0.0859	525.	9 20 Ca	$M_{II,III}N_I$	0.0236
144.4	3 37 Rb	$M_I M_{III}$	0.0859	692.	9 19 K	$M_{II,III}N_I$	0.0179
152.6	6 57 La	$N_{IV,V}O_{II,III}$	0.0812				

$W K\alpha_1=0.2090100 \text{ \AA}^*$ ) and the probable errors in the third column, which apply to the last listed figure, are based on the error in the wavelength relative to the  $W K\alpha_1$  line. The probable error on an absolute scale (angstroms) can be easily calculated by converting the listed error into parts per million and adding statistically an error of five ppm which is due to the uncertainty in the wavelength of the primary  $W K\alpha_1$  standard. In more than 98% of the listed wavelengths, the errors shown in the third column are so large that the added error due to the primary standard is insignificant. The energy of the lines in keV ( $V\lambda=12398.10\pm 0.13 \text{ eV} - \text{\AA}^*$ ) are shown in column four. This probable error includes that of the primary wavelength standard, and hence this ten ppm error combined with that in the last figure in the wavelength values yields the absolute probable errors in the keV energy values. The values for a second element are likewise shown in columns five, six, and seven. Data for other elements follow in a similar format.

In the study of the x-ray literature, the wavelengths of a number of lines were noted which appeared inconsistent with the remaining data. A Moseley-type diagram was constructed, and if the value was clearly outside estimated probable error, it was assumed that an experimental or typographical error had occurred, and the interpolated value was listed in the table. Such cases are marked with a dagger<sup>†</sup> as a superscript to the wavelength. For elements of atomic number 85 through 89 and 91, there are no measured lines of the  $K$  series and very few of other series except for 88 radium and 91 protactinium. Likewise there are very few measurements for 43 technetium and 54 xenon. In these cases, interpolated values are listed for the more prominent lines and marked with a dagger<sup>†</sup>. More recent measurements<sup>46</sup> of the  $L$  lines of

<sup>46</sup> G. D. Deodhar and R. C. Karnatak, *J. Sci. Ind. Res.* **15B**, 615 (1956).

61 samarium have been brought to our attention. Since these appear to be substantially more accurate than all the  $L$  data previously used for samarium<sup>12</sup>, they are listed in Tables V and VI (corrected to  $\text{\AA}^*$  units) in place of the former values. A few misprints and incorrect line designations, discussed in the appendices of Ref. 12 of the succeeding paper, have been corrected in Tables V and VI.

For the convenience of those interested in x-ray chemical analysis and nuclear conversion problems, the x-ray wavelengths of both the emission lines and absorption edges are listed in numerical order in Table VI. The wavelengths are given in  $\text{\AA}^*$  units, together with their energy equivalents in keV. The probable error applies to the last wavelength figure. The interpolated lines and edges have not been marked by a dagger<sup>†</sup> in this table.

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