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# Dirac-Fock photoionization parameters for HAXPES applications, Part II: Inner atomic shells



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## HIGHLIGHTS

- Photoionization parameters are given for inner atomic shells with binding energies  $\geq$  1.5 keV.
- The data are extension of our calculations for use in the HAXPES spectroscopy studies.
- Relativistic calculations were performed by the Dirac-Fock method.
- Photoionization cross sections were calculated including all multipoles.
- The angular distribution parameters were obtained in the quadrupole approximation.

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#### ABSTRACT

Presented here are the photoionization cross sections and parameters of the photoelectron angular distribution for inner atomic subshells with binding energies beyond 1.5 keV in the photon energy range from 2 keV to 12 keV. The calculations are an extension of our previous paper containing the photoionization parameters for comparatively outer shells with binding energies lower than 1.5 keV (Trzhaskovskaya and Yarzhemsky, 2018). The calculations are intended for use in the experimental HAXPES spectroscopy investigations. The up-to-date HAXPES activity tends to increase the photon energy to investigate the deep core levels resulting in a necessity of theoretical consideration of photoionization parameters for inner atomic shells. Our relativistic calculations have been performed by the Dirac–Fock method. The photoionization cross sections have been found including all multipoles of the radiative field while the photoelectron angular distribution parameters have been obtained in the quadrupole approximation. The effect of the hole resulting in the atomic subshell after photoionization has been taken into account using the frozen orbital model.

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## 1. Introduction

Our calculations of the photoionization cross sections and the photoelectron angular distribution parameters [1] have been designed to be used in experimental studies by methods of the hard X-ray photoelectron spectroscopy (HAXPES). The HAXPES spectroscopy enables one to investigate electron states of deep core levels as well as to probe a bulk of electrical and chemical properties of buried layers of various materials non-destructively due to its large analysis depth [2–8].

Nowadays the HAXPES spectroscopy is progressing rapidly. The current trend in the HAXPES experimental studies is toward increase in the photon energy [9-12]. New X-ray sources and powerful analyzers allow the analysis to be carried out in a wide kinetic energy range. Recently a number of experiments has been made which perform the spectra measurements using large probing depth [3,11,12]. For example, HAXPES measurements of the 1s-shell spectra of S (Z = 16) with the binding energy  $E_b \approx 2.8 \text{ keV}$  were performed for various sulfur species [3]. Using the found 1s binding energies, behavior of the electric potentials of various S species was studied. In paper [11], a novel laboratory-based HAXPES prototype system is described. The system employs the monochromated microfocused Ga K<sub>\alpha</sub> X-ray source which yields a photon energy of 9.25 keV. The feasibility of the HAXPES method for heavier elements using synchrotron radiation up to 35.5 keV at SPring-8 undulator beamlines is demonstrated in paper [12]. As illustration, the 1s corelevel photoelectron spectra are presented for the Ar, Kr, and Xe atoms at photon energies k = 6, 20, and 35.5 keV, respectively. The iodine 1s photoelectron spectrum of the CH<sub>3</sub>I molecule was measured at k = 35.46 keV.

These experimental studies call for the theoretical values of photoionization cross sections and photoelectron angular distribution parameters for more inner shells as compared with those presented in [1] where the comparatively outer atomic shells with binding energies  $E_b \leq 1.5$  keV have been considered. Recently we have carried out calculations of the photoionization parameters for inner 3s, 3p, and 3d subshells of heavy elements Ir (Z=77) and Au (Z=79). The data are required for experiments under development at Scienta Omicron Lab [9]. Binding energies of the subshells fall in the range between 2.04 keV and 3.424 keV. In connection with the requirements of HAXPES experiments, we present here calculations for inner atomic shells with 1.5 keV  $\lesssim$   $E_b \lesssim$  10 keV of atoms with  $1.5 \leq Z \leq 100$ . The tabulations provide an extension of our calculations [1].

The photoionization parameters have been calculated using the same approximations and formulas. The fundamental approximations are the following. The calculations are based on fully relativistic treatment of photoeffect. The electron wave functions are found by the Dirac–Fock method where the electron exchange is considered properly between atomic electrons as well as between atomic and free electrons [13,14]. The subshell photoionization cross sections  $\sigma^{(i)}$  are calculated taking into account all multipoles of the radiative field. Parameters of the photoelectron angular distribution  $\beta$ ,  $\gamma$ , and  $\delta$  are obtained in the quadrupole approximation.

The method of calculations was described in detail [1]. However in order to better appreciate the calculations in hand we present briefly basic formulas. The total photoionization cross section  $\sigma^{(i)}$  for the ith subshell is written as

$$\begin{split} \sigma^{(i)} &= \frac{4\pi^2\alpha}{k} \sum_{L} \sum_{\kappa} \left\{ (2L+1)[Q_{A=L,L}^{(i)}(\kappa)]^2 + L[Q_{A=L+1,L}^{(i)}(\kappa)]^2 + \right. \\ &+ (L+1)[Q_{A=L-1,L}^{(i)}(\kappa)]^2 \\ &- 2\sqrt{L(L+1)} \; Q_{A=L-1,L}^{(i)}(\kappa)Q_{A=L+1,L}^{(i)}(\kappa) \right\} \,. \end{split} \tag{1}$$

Here  $\alpha$  is the fine structure constant, k is the photon energy, L is the multipolarity of the radiative field,  $\kappa = (\ell - j)(2j + 1)$  is the relativistic quantum number,  $\ell$  and j are quantum numbers of the orbital and total angular momenta of the electron. The reduced matrix element  $Q_{\Lambda,L}(\kappa)$  has the form

$$Q_{\Lambda,L}(\kappa) = (-1)^{\bar{\ell}_{\kappa} - \ell_{i}} \left[ \bar{\ell}_{\kappa} \ell_{i} j_{\kappa} j_{i} \Lambda 1 \right]^{1/2}$$

$$\times \begin{pmatrix} \bar{\ell}_{\kappa} & \ell_{i} & \Lambda \\ 0 & 0 & 0 \end{pmatrix} \begin{cases} \bar{\ell}_{\kappa} & 1/2 & j_{\kappa} \\ \ell_{i} & 1/2 & j_{i} \\ \Lambda & 1 & L \end{cases} R_{1\Lambda} +$$

$$+ (-1)^{\ell_{\kappa} - \bar{\ell}_{i}} \left[ \ell_{\kappa} \bar{\ell}_{i} j_{\kappa} j_{i} \Lambda 1 \right]^{1/2}$$

$$\times \begin{pmatrix} \ell_{\kappa} & \bar{\ell}_{i} & \Lambda \\ 0 & 0 & 0 \end{pmatrix} \begin{cases} \frac{\ell_{\kappa}}{\bar{\ell}_{i}} & 1/2 & j_{\kappa} \\ \bar{\ell}_{i} & 1/2 & j_{i} \\ \Lambda & 1 & L \end{cases} R_{2\Lambda},$$
(2)

where  $\bar{\ell}=2j-\ell$  and the notation [ab]=(2a+1)(2b+1). Radial integrals  $R_{1A}$  and  $R_{2A}$  can be written as

$$R_{1\Lambda} = \int_0^\infty G_i(r) F_{\kappa}(r) j_{\Lambda}(kr) dr ,$$

$$R_{2\Lambda} = \int_0^\infty F_i(r) G_{\kappa}(r) j_{\Lambda}(kr) dr .$$
(3)

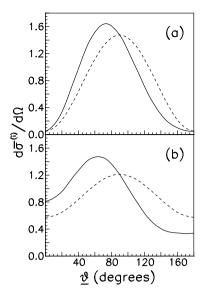
Here  $j_{\Lambda}(kr)$  is the spherical Bessel function of order  $\Lambda$ , G(r) = rg(r) and F(r) = rf(r) are the large and small components of the Dirac radial electron wave function. Indices i and  $\kappa$  refer to the initial bound and final continuum electron states, respectively.

It should be noted that the photoionization cross sections calculated in the dipole approximation which is of frequent use in calculations and the cross sections obtained taking into account all significant terms differ in magnitude considerably at a high photon energy. For example, the difference between the two calculations may exceed 10% at  $k \ge 10$  keV.

The photoelectron angular distribution at photon energies of interest is adequately described with simple expressions involving three parameters  $\beta$ ,  $\gamma$ , and  $\delta$  [15–17]. The parameter  $\beta$  is the dipole one while  $\gamma$  and  $\delta$  are non-dipole parameters associated with the terms of the first order O(kr) where r is the radius of the ionized atomic shell. In the case of circular polarized and unpolarized photons, the relevant expression is written as

$$\frac{d\sigma^{(i)}}{d\Omega} = \frac{\sigma^{(i)}}{4\pi} \left[ 1 - \frac{\beta}{2} P_2(\cos\underline{\theta}) + \left( \frac{\gamma}{2} \sin^2\underline{\theta} + \delta \right) \cos\underline{\theta} \right], \tag{4}$$

where  $P_2(\cos \underline{\theta})$  is the second order Legendre polynomial,  $\underline{\theta}$  is the angle between vectors of the photon  $\mathbf{k}$  and photoelectron  $\mathbf{p}$ . Notations of angles and directions are given in Fig. 1 from paper [1].



**Fig. 1.** The photoelectron angular distribution  $\frac{d\bar{\sigma}^{(i)}}{d\Omega}(\underline{\vartheta}) = \frac{d\sigma^{(i)}}{d\Omega}(\underline{\vartheta})/\frac{\sigma^{(i)}}{4\pi}$ , in the case of unpolarized and circularly polarized radiation at the photon energy k=12 keV for the 1s shell of P, Z=15 (a) and the  $3d_{5/2}$  shell of Hf, Z=72 (b). Solid, calculations in the quadrupole approximation; dashed, the dipole approximation.  $\underline{\theta}$  is the angle between vectors of the photon  $\mathbf{k}$  and photoelectron  $\mathbf{p}$ .

For linear polarized photons, the angular distribution is represented by the expression involving the same three parameters

$$\frac{d\sigma^{(i)}}{d\Omega} = \frac{\sigma^{(i)}}{4\pi} \left[ 1 + \beta P_2(\cos\theta) + (\delta + \gamma \cos^2\theta) \sin\theta \cos\varphi \right], \quad (5)$$

where  $\theta$  is the angle between the vector  $\mathbf{p}$  and the photon polarization direction  $\varepsilon$ , vector  $\boldsymbol{\varepsilon}$  being coincident with the z axis;  $\varphi$  is the angle between the vector  $\mathbf{k}$  and the plane going through the z axis and the vector  $\mathbf{p}$ .

In the photon energy range in question, the magnitude of non-dipole parameters  $\gamma$  and  $\delta$  may be comparable with the  $\beta$  magnitude. In this situation, the inclusion of quadrupole terms in Eqs. (4) and (5) changes the photoelectron angular distribution significantly. Fig. 1 demonstrates the angular distribution for the case of circular polarized and unpolarized photons [see Eq. (4)] for a photoelectron emitted from the 1s state of P, Z=15 (a) and from the  $3d_{5/2}$  state of Hf, Z=72 (b) at photon energy k=12 keV. Dashed curves refer to the dipole approximation and solid curves refer to calculations with consideration

for quadrupole terms. As is seen, including quadrupole terms changes the photoelectron angular distribution drastically.

Experimental values of the electron binding energies used in the calculations were taken from paper [18]. The binding energy values are listed in Table 1 for all subshells under consideration. As in previous our calculations, the hole in the atomic shell from which an electron was emitted was taken into account in the framework of the frozen orbital approximation [19]. The computational accuracy of our calculations is better than 0.1%. This accuracy does not include possible uncertainties due to the physical approximations mentioned above.

The table contains values of the photoionization cross sections  $\sigma^{(i)}$  and of the photoelectron angular distribution parameters  $\beta$ ,  $\gamma$  and  $\delta$  at eleven photon energies in the range 2 keV  $\leq k \leq$  12, keV for atomic subshells with binding energies  $E_b \geq$  1.5 keV. If binding energies  $E_b$  for all listed shells of a specific atom exceed one or more k-values, data for  $k \geq E_b$  are given and those for higher values of k from the predetermined set from 14 keV to 30 keV are added. For example, in the case of Ca (Z=20), the 1s binding energy is equal 4.038 keV. So eight k-values are selected in the range 5 keV  $\leq k \leq$  12 keV and k=14, 16, and 18 keV are added. Values of photon energies for each Z are presented in the table.

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## **Explanation of tables**

## Table 1. Subshell photoionization cross sections and photoelectron angular distribution parameters

Note: The photoionization cross sections  $\sigma^{(i)}$  are given in kb (=10<sup>-21</sup> cm<sup>2</sup>) for completely filled subshells.

## Example

In the Table, the first data block gives the parameters for the  $1s_{1/2}$  shell of the aluminum atom, Z=13. The experimental binding energy of this shell is equal to 1559.6 eV. At the photon energy k=2000 eV, the photoionization cross section for the completely filled 1s shell is  $\sigma^{(1s)}=8.930\times10^{1}$  kb  $=8.930\times10^{-1}$  kb  $=8.930\times10^{-20}$  cm<sup>2</sup>. The angular distribution parameters are  $\beta=1.996$ ,  $\gamma=2.53-1=2.53\times10^{-1}$ , and  $\delta=-5.08-6=-5.08\times10^{-6}$ .

 Table 1

 Subshell photoionization cross sections and photoelectron angular distribution parameters.

Z = 13, Al:	[Ne]3s <sup>2</sup>	2 1/2 <b>3p</b> 1/2 k (eV)	•			-						
Shell		2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
S <sub>1/2</sub>	σ	8.930+1	3.124+1	1.429+1	7.669+0	4.568+0	2.929+0	1.985+0	1.404+0	1.028+0	7.742-1	5.966-
b=	β	1.996	1.986	1.976	1.966	1.956	1.946	1.935	1.925	1.915	1.905	1.896
559.6 eV	γ	2.53 - 1	7.04 - 1	9.99 - 1	1.23+0	1.42+0	1.59+0	1.74+0	1.88+0	2.01+0	2.13+0	2.24+0
= 14, Si:	δ [Ne]3s <sup>2</sup>	-5.08-6	-4.60-6	-3.83-6	-2.82-6	-1.63-6	-1.39-7	1.47-6	3.37-6	5.36-6	7.66-6	1.02-
_ 11, 51.	[140]33]	k (eV)										
hell		2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
S <sub>1/2</sub>	σ	1.108+2	4.022+1	1.866+1	1.010+1	6.051+0	3.901+0	2.655+0	1.884+0	1.383+0	1.044+0	8.062-
E <sub>b</sub> = 838.9 eV	β	1.998 5.00-3	1.989	1.979	1.969	1.958	1.948 1.54+0	1.938	1.928	1.918	1.908	1.898
838.9 ev	$\gamma \\ \delta$	-8.28-6	5.85-1 -5.88-6	9.09-1 -5.15-6	1.15+0 -4.14-6	1.36+0 -2.91-6	-1.54+0 -1.50-6	1.69+0 1.76-7	1.84+0 2.06-6	1.97+0 4.23-6	2.09+0 6.71-6	2.20+0 9.40-
= 15, P:				-3.13-0	-4.14-0	-2.31-0	-1.50-0	1.70-7	2.00-0	4.25-0	0.71-0	3.40
		k (eV)										
hell		3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	14000
$S_{1/2}$	$\sigma$	5.058+1	2.380+1	1.299+1	7.836+0	5.075+0	3.467+0	2.469+0	1.818+0	1.376+0	1.065+0	6.736-
$E_b =$	β	1.991	1.982	1.971	1.961	1.951	1.941	1.931	1.921	1.911	1.901	1.881
145.5 eV	γ	4.41-1	8.08-1	1.07+0	1.29+0	1.47+0	1.63+0	1.78+0	1.92+0	2.04+0	2.16+0	2.37+0
	δ	-7.37-6	-6.68-6	-5.74-6	-4.54-6	-3.09-6	-1.41-6	5.07-7	2.68-6	5.12-6	7.85-6	1.43-
= 16, S:	[Ne]3s	<sup>2</sup> <sub>1/2</sub> 3p <sub>1/2</sub> 3p <sub>3/2</sub> k (eV)	2									
hell		3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	14000
S <sub>1/2</sub>	σ	6.194+1	2.967+1	1.635+1	9.926+0	6.460+0	4.431+0	3.166+0	2.337+0	1.773+0	1.375+0	8.733-
b =	β	1.994	1.985	1.975	1.964	1.954	1.944	1.934	1.924	1.914	1.904	1.884
472.0 eV	γ	2.51 - 1	6.87 - 1	9.77 - 1	1.21+0	1.40+0	1.57+0	1.72+0	1.86+0	1.99+0	2.11+0	2.33+0
17.0	δ	-9.17-6	-8.39-6	-7.51-6	-6.38-6	-4.96-6	-3.28-6	-1.32-6	9.10-7	3.41-6	6.19-6	1.27-
= 1/, U:	[Ne]3S	$\frac{2}{1/2} 3p_{1/2}^2 3p_{3/2}^3 \ k \text{ (eV)}$	2									
hell		3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	14000
S <sub>1/2</sub>	σ	7.333+1	3.626+1	2.018+1	1.234+1	8.074+0	5.560+0	3.986+0	2.951+0	2.243+0	1.744+0	1.111+
$E_b =$	β	1.997	1.988	1.978	1.968	1.958	1.948	1.938	1.927	1.917	1.907	1.888
2822.4 eV	γ	-5.06-2	5.42 - 1	8.65 - 1	1.11+0	1.32+0	1.50+0	1.66+0	1.80+0	1.94+0	2.06+0	2.28+0
7 = 18 Ar	δ [Ne]3s	$\frac{-1.15-5}{^{2}_{1/2} 3p_{1/2}^{2} 3p_{3/2}^{4}}$	-1.04-5	-9.57-6	-8.47-6	-7.13-6	-5.47-6	-3.52-6	-1.30-6	1.27-6	4.12-6	1.07-
10,111	[]	k (eV)	2									
Shell		4000	5000	6000	7000	8000	9000	10000	11000	12000	14000	16000
ls <sub>1/2</sub>	σ	4.359+1	2.454+1	1.511+1	9.938+0	6.872+0	4.943+0	3.669+0	2.796+0	2.177+0	1.393+0	9.417-
$E_b =$	β	1.991	1.981	1.971	1.961	1.951	1.941	1.931	1.921	1.911	1.891	1.872
3202.9 eV	γ	3.57 - 1	7.36 - 1	1.01+0	1.23+0	1.42+0	1.59+0	1.74+0	1.88+0	2.00+0	2.23+0	2.43+0
	δ	-1.25-5	-1.20-5	-1.10-5	-9.66 - 6	-8.07 - 6	-6.16 - 6	-3.97 - 6	-1.44-6	1.44-6	8.15-6	1.63-
Z = 19, K:	[Ar]4s	1 1/2 k (eV)										
hell		4000	5000	6000	7000	8000	9000	10000	11000	12000	14000	16000
S <sub>1/2</sub>	σ	5.111+1	2.932+1	1.818+1	1.203+1	8.350+0	6.026+0	4.487+0	3.427+0	2.675+0	1.717+0	1.165+
$E_{b} =$	β	1.994	1.985	1.975	1.965	1.955	1.945	1.935	1.925	1.915	1.895	1.875
8607.4 eV	γ	1.01-1	5.91-1	8.91-1	1.13+0	1.33+0	1.51+0	1.66+0	1.80+0	1.94+0	2.17+0	2.38+0
	δ	-1.45-5	-1.47 - 5	-1.38-5	-1.25-5	-1.09-5	-9.10-6	-6.82-6	-4.28-6	-1.44-6	5.42-6	1.36-
z = 20, Ca:	[Ar]4s	k (eV)										
hell		5000	6000	7000	8000	9000	10000	11000	12000	14000	16000	18000
ls <sub>1/2</sub>	σ	3.450+1	2.160+1	1.437+1	1.002+1	7.257+0	5.419+0	4.150+0	3.246+0	2.091+0	1.422+0	1.009+
$\Xi_b =$	β	1.988	1.979	1.969	1.959	1.949	1.939	1.929	1.919	1.899	1.879	1.860
1038.1 eV	$\gamma \delta$	4.04-1 $-1.76-5$	7.56-1 -1.68-5	1.02+0 -1.57-5	1.24+0 -1.41-5	1.42+0 -1.23-5	1.58+0 -1.02-5	1.73+0 -7.69-6	1.87+0 -4.81-6	2.11+0 1.85-6	2.33+0 1.01-5	2.52+0 2.00-
Z = 21, Sc:	-		-1.00-3	-1.37-3	-1.41-3	-1.23-3	-1.02-3	-7.03-0	- <del>-</del> 01-0	1.03-0	1.01-3	2.00-3
	- '	k (eV)										
hell		5000	6000	7000	8000	9000	10000	11000	12000	14000	16000	18000
S <sub>1/2</sub>	σ	3.993+1	2.535+1	1.697+1	1.189+1	8.642+0	6.472+0	4.968+0	3.894+0	2.518+0	1.718+0	1.222+
b=	β	1.992	1.983	1.973	1.963	1.953	1.943	1.933	1.923	1.903	1.883	1.864
492.8 eV	$\gamma \\ \delta$	1.41-1 $-2.08-5$	5.94-1 -2.04-5	8.95-1 -1.93-5	1.13+0 -1.79-5	1.32+0 -1.61-5	1.50+0 1.405	1.65+0 1.165	1.80+0 -8.82-6	2.05+0 -2.16-6	2.27+0 6.03-6	2.47+0 1.59-
= 22, Ti:			2.04 3	1.55 5	1,, 3 3	1.01 3	1.10 3	1.10 3	0.02 0	2.10 0	0.03 0	1,33
, .		k (eV)										
					0000	0000	10000	44000	10000	1 4000	10000	10000
hell		5000	6000	7000	8000	9000	10000	11000	12000	14000	16000	
Shell S <sub>1/2</sub>	σ	4.298+1	2.935+1	1.980+1	1.394+1	1.017+1	7.639+0	5.879+0	4.619+0	2.997+0	2.050+0	18000
Shell Is <sub>1/2</sub> E <sub>b</sub> = 4966.4 eV	σ β γ											

	δ	-6.57-5	-2.42-5	-2.35 - 5	-2.19-5	-2.04-5	-1.83-5	-1.60-5	-1.33-5	-6.68 - 6	1.49-6	1.12-5
Z=23, V:	[Ar]4s <sup>2</sup>											
		k (eV)										
Shell		6000	7000	8000	9000	10000	11000	12000	14000	16000	18000	20000
$E_{b}=$	$\frac{\sigma}{\beta}$	3.346+1 1.990	2.286+1 1.981	1.618+1 1.971	1.185+1 1.962	8.929+0 1.952	6.890+0 1.942	5.425+0 1.932	3.533+0 1.912	2.424+0 1.892	1.733+0 1.873	1.280+ 1.853
5465.1 eV	γ	1.12-1	5.71-1	8.66-1	1.10+0	1.30+0	1.47+0	1.63+0	1.90+0	2.14+0	2.35+0	2.54+0
	δ	-2.92 - 5	-2.82 - 5	-2.67 - 5	-2.52-5	-2.33-5	-2.10-5	-1.84-5	-1.19-5	-3.79 - 6	5.97-6	1.76-
Z = 24, Cr:	[Ar]4s	$^{1}_{1/2}$ 3d $^{4}_{3/2}$ 3d $^{1}_{5/2}$	!									
		k (eV)	=000			10000	11000	10000	1 1000	10000	10000	
Shell		6000	7000	8000	9000	10000	11000	12000	14000	16000	18000	20000 1.507+
$E_{b}=$	$\frac{\sigma}{\beta}$	3.459+1 1.992	2.612+1 1.986	1.862+1 1.976	1.370+1 1.966	1.036+1 1.956	8.012+0 1.946	6.322+0 1.936	4.131+0 1.917	2.842+0 1.897	2.036+0 1.877	1.858
5989.2 eV	γ	-4.68-1	3.42-1	6.99-1	9.67-1	1.18+0	1.37+0	1.54+0	1.82+0	2.07+0	2.28+0	2.48+0
	δ	-3.53 - 4	-3.36 - 5	-3.25 - 5	-3.09 - 5	-2.91-5	-2.69-5	-2.44-5	-1.81-5	-1.01-5	-2.70-7	1.13-
z = 25, Mn	: [Ar]4:	$s_{1/2}^2 \ 3d_{3/2}^4 \ 3d_5^1$	/2									
		k (eV)										
Shell		7000	8000	9000	10000	11000	12000	14000	16000	18000	20000	22000
$1s_{1/2}$ $E_b =$	$\frac{\sigma}{\beta}$	2.930+1 1.990	2.120+1 1.981	1.567+1 1.971	1.189+1 1.961	9.222+0 1.951	7.294+0 1.941	4.785+0 1.921	3.303+0 1.902	2.372+0 1.882	1.759+0 1.863	1.339+ 1.844
ε <sub>ь</sub> = 6539.0 eV	P γ	3.82-3	1.981 5.05—1	8.08-1	1.961	1.951	1.43+0	1.921 1.73+0	1.902 1.99+0	2.21+0	2.41+0	2.60+0
	δ	-4.06 - 5	-3.86 - 5	-3.71-5	-3.53-5	-3.33-5	-3.10-5	-2.47-5	-1.69-5	-7.32-6	4.27-6	1.77
z = 26, Fe:	[Ar]4s <sup>2</sup>	$^2_{1/2}3d^4_{3/2}3d^2_{5/2}$	2									
		k (eV)										
Shell		8000	9000	10000	11000	12000	14000	16000	18000	20000	22000	25000
ls <sub>1/2</sub>	$\sigma_{\rho}$	2.388+1	1.779+1	1.355+1	1.054+1	8.359+0 1.046	5.505+0 1.027	3.811+0	2.743+0	2.038+0	1.554+0	1.077+
E <sub>b</sub> = 7113.0 eV	$\beta$ $\gamma$	1.985 2.37-1	1.976 6.24-1	1.966 8.97-1	1.956 1.12+0	1.946 1.31+0	1.927 1.63+0	1.907 1.90+0	1.887 2.14+0	1.868 2.34+0	1.849 2.53+0	1.820 2.78+0
	δ	-4.60 - 5	-4.44 - 5	-4.28-5	-4.08-5	-3.84-5	-3.25-5	-2.48-5	-1.54-5	-3.97-6	9.44-6	3.34-
z = 27, Co:	[Ar]4s	$^2_{1/2}$ 3d $^4_{3/2}$ 3d $^3_{5/2}$										
		k (eV)										
Shell		8000	9000	10000	11000	12000	14000	16000	18000	20000	22000	25000
1s <sub>1/2</sub>	$\sigma$	2.629+1	2.001+1	1.532+1	1.196+1	9.507+0	6.286+0	4.365+0	3.149+0	2.345+0	1.791+0	1.244+
E <sub>b</sub> = 7708.9 eV	$\beta$ $\gamma$	1.990 -2.14-1	1.981 3.95-1	1.971 7.23-1	1.961 9.77-1	1.952 1.19+0	1.932 1.53+0	1.912 1.81+0	1.893 2.06+0	1.873 2.27+0	1.854 2.46+0	1.825 2.72+0
7700.5 CV	δ	-5.71-5	-5.30-5	-5.14-5	-4.94-5	-4.68-5	-4.11-5	-3.36-5	-2.44-5	-1.32-5	7.54-9	2.41-5
Z = 28, Ni:	[Ar]4s <sup>2</sup>	$^2_{1/2}$ 3d $^4_{3/2}$ 3d $^4_{5/2}$	1									
		k (eV)										
Shell		9000	10000	11000	12000	14000	16000	18000	20000	22000	25000	30000
1s <sub>1/2</sub>	σ	2.224+1	1.719+1	1.348+1	1.074+1	7.134+0	4.968+0	3.594+0	2.681+0	2.052+0	1.428+0	8.461-
E <sub>b</sub> = 8332.8 eV	$\beta$ $\gamma$	1.986 6.10-2	1.976 5.08-1	1.967 8.07-1	1.957 1.04+0	1.937 1.42+0	1.918 1.72+0	1.898 1.97+0	1.879 2.19+0	1.859 2.39+0	1.831 2.66+0	1.784 3.03+0
3332.0 CV	δ	-6.39-5	-6.11-5	-5.92-5	-5.67-5	-5.08-5	-4.36-5	-3.46-5	-2.37-5	-1.07-5	1.31-5	6.43-5
Z = 29, Cu:	[Ar]4s	$^2_{1/2}$ 3d $^4_{3/2}$ 3d $^5_{5/2}$										
		k (eV)										
Shell		9000	10000	11000	12000	14000	16000	18000	20000	22000	25000	30000
$1s_{1/2}$ $E_{h} =$	σ	2.248+1 1.992	1.913+1 1.982	1.510+1 1.972	1.207+1 1.963	8.048+0 1.943	5.624+0 1.923	4.079+0 1.904	3.049+0 1.884	2.337+0 1.865	1.630+0 1.836	9.683- 1.789
			1.982 2.24—1	6.04—1	8.72-1	1.943	1.923	1.904 1.88+0	2.11+0	2.32+0	2.59+0	2.97+0
	$\beta$	-6.11-1								-2.26-5	4.31-7	5.16-
	Ρ γ δ	-6.11-1 $-3.29-5$	-7.34 - 5	-7.06 - 5	-6.78 - 5	-6.16 - 5	-5.45-5	-4.57 - 5	-3.51-5	-2.20-3	1131	<u> </u>
8978.9 eV	γ δ	$-3.29-5$ $\frac{2}{1/2} 3d_{3/2}^4 3d_{5/2}^6$	-7.34 - 5	-7.06-5	-6.78-5				-3.51-5	-2.20-3		3.10
Z = 30, Zn:	γ δ	$-3.29-5$ $\frac{^{2}_{1/2}}{^{1/2}} 3d_{3/2}^{4} 3d_{5/2}^{6}$ $\frac{k \text{ (eV)}}{}$	-7.34-5 2			-6.16-5	-5.45-5	-4.57-5				
$\mathbf{Z} = 30,  \mathbf{Zn}$ :	γ δ [Ar]4s	$-3.29-5$ $\frac{{}^{2}_{1/2}  3d_{3/2}^{4}  3d_{5/2}^{6}}{k  (eV)}$ $9000$	-7.34-5 2 10000	11000	12000	-6.16-5 14000	-5.45-5 16000	-4.57-5 18000	20000	22000	25000	30000
$Z = 30, Zn$ : Shell $1s_{1/2}$	$\frac{\gamma}{\delta}$ [Ar]4s	$ \begin{array}{r} -3.29 - 5 \\ ^{2}_{1/2} \ 3d_{3/2}^{4} \ 3d_{5/2}^{6} \\ \underline{k \ (eV)} \\ 9000 \\ 0.000 + 0 \end{array} $	-7.34-5 2 10000 2.083+1	11000 1.676+1	12000 1.346+1	-6.16-5 14000 9.023+0	-5.45-5 16000 6.325+0	-4.57-5 18000 4.599+0	20000 3.445+0	22000 2.645+0	25000 1.849+0	30000 1.102+
$Z = 30, Zn$ : Shell $S_{b} = S_{b} = S_{b}$	$\beta$ [Ar]4s	$-3.29-5$ $\frac{{}^{2}_{1/2}  3d_{3/2}^{4}  3d_{5/2}^{6}}{k  (eV)}$ $9000$	-7.34-5 2 10000	11000 1.676+1 1.978	12000 1.346+1 1.968	-6.16-5 14000 9.023+0 1.949	-5.45-5 16000 6.325+0 1.929	-4.57-5 18000 4.599+0 1.910	20000 3.445+0 1.890	22000	25000	30000 1.102+ 1.795
$Z = 30$ , $Zn$ :  Shell $S_{b} = S_{b} = S_{b}$ $S_{b} = S_{b}$ $S_{b} = S_{b}$ $S_{b} = S_{b}$	γ δ [Ar]4s σ β γ δ	$\begin{array}{c} -3.29 - 5 \\ {}^{2}_{1/2} \ \mathbf{3d_{3/2}^4} \ \mathbf{3d_{5/2}^6} \\ \underline{k \ (eV)} \\ \hline 9000 \\ \hline 0.000 + 0 \\ 0.000 \\ 0.00 + 0 \\ 0.00 + 0 \\ 0.00 + 0 \end{array}$	-7.34-5 2 10000 2.083+1 1.987 -2.65-1 -8.37-5	11000 1.676+1	12000 1.346+1	-6.16-5 14000 9.023+0	-5.45-5 16000 6.325+0	-4.57-5 18000 4.599+0	20000 3.445+0	22000 2.645+0 1.871	25000 1.849+0 1.842	30000 1.102+ 1.795 2.91+0
$Z = 30$ , $Zn$ :  Shell $S_{b} = S_{b} = S_{b}$ $S_{b} = S_{b} = S_{b}$ $S_{b} = S_{b}$	γ δ [Ar]4s σ β γ δ	$-3.29-5$ $\frac{2}{1/2}$ $3d_{3/2}^4$ $3d_{5/2}^6$ $\frac{4}{8}$ (eV) $\frac{9000}{0.000+0}$ $0.000+0$ $0.00+0$ $0.00+0$ $\frac{2}{1/2}$ $3d_{3/2}^4$ $3d_{5/2}^6$	-7.34-5 2 10000 2.083+1 1.987 -2.65-1 -8.37-5	11000 1.676+1 1.978 3.40-1	12000 1.346+1 1.968 6.79-1	14000 9.023+0 1.949 1.15+0	-5.45-5 16000 6.325+0 1.929 1.49+0	-4.57-5 18000 4.599+0 1.910 1.78+0	20000 3.445+0 1.890 2.02+0	22000 2.645+0 1.871 2.24+0	25000 1.849+0 1.842 2.52+0	30000 1.102+ 1.795 2.91+0
2978.9 eV $Z = 30$ , $Zn$ :  Shell $\frac{Is_{1/2}}{E_b} = 0658.6$ eV $Z = 31$ , $Ga$ :	γ δ [Ar]4s σ β γ δ	$\begin{array}{c} -3.29-5 \\ \frac{2}{1/2} \ \mathbf{3d_{3/2}^4} \ \mathbf{3d_{5/2}^6} \\ \frac{k \ (\mathrm{eV})}{9000} \\ 0.000+0 \\ 0.000+0 \\ 0.00+0 \\ \frac{2}{1/2} \ \mathbf{3d_{3/2}^4} \ \mathbf{3d_{5/2}^6} \\ k \ (\mathrm{eV}) \end{array}$	-7.34-5 2 10000 2.083+1 1.987 -2.65-1 -8.37-5 2.4P <sub>1/2</sub>	11000 1.676+1 1.978 3.40-1 -8.37-5	12000 1.346+1 1.968 6.79-1 -8.13-5	14000 9.023+0 1.949 1.15+0 -7.44-5	16000 6.325+0 1.929 1.49+0 -6.71-5	18000 4.599+0 1.910 1.78+0 -5.86-5	20000 3.445+0 1.890 2.02+0 -4.83-5	22000 2.645+0 1.871 2.24+0 -3.60-5	25000 1.849+0 1.842 2.52+0 -1.33-5	30000 1.102+ 1.795 2.91+0 3.71-
$z = 30$ , $z_0 = $	γ δ [Ar]4s σ β γ δ [Ar]4s	$\begin{array}{c} -3.29-5 \\ \frac{2}{1/2} \ \mathbf{3d_{3/2}^4} \ \mathbf{3d_{5/2}^6} \\ \frac{k \ (\mathrm{eV})}{9000} \\ 0.000+0 \\ 0.00+0 \\ 0.00+0 \\ \frac{2}{1/2} \ \mathbf{3d_{3/2}^4} \ \mathbf{3d_{5/2}^6} \\ \frac{k \ (\mathrm{eV})}{9000} \end{array}$	-7.34-5 2 10000 2.083+1 1.987 -2.65-1 -8.37-5 2.4p <sup>1</sup> <sub>1/2</sub> 10000	11000 1.676+1 1.978 3.40-1 -8.37-5	12000 1.346+1 1.968 6.79-1 -8.13-5	14000 9.023+0 1.949 1.15+0 -7.44-5	16000 6.325+0 1.929 1.49+0 -6.71-5	18000 4.599+0 1.910 1.78+0 -5.86-5	20000 3.445+0 1.890 2.02+0 -4.83-5	22000 2.645+0 1.871 2.24+0 -3.60-5	25000 1.849+0 1.842 2.52+0 -1.33-5	30000 1.102+ 1.795 2.91+0 3.71-5
2978.9 eV $Z = 30$ , $Zn$ :  Shell $\frac{ S_1 _2}{ S_2 _2} = 0658.6$ eV $Z = 31$ , $Ga$ :  Shell $\frac{ S_2 _2}{ S_3 _2} = 0658.6$	γ δ [Ar]4s σ β γ δ [Ar]4s	$\begin{array}{c} -3.29-5 \\ \frac{2}{1/2} \ \mathbf{3d_{3/2}^4} \ \mathbf{3d_{5/2}^6} \\ k \ (eV) \\ \hline 9000 \\ 0.000+0 \\ 0.00+0 \\ 0.00+0 \\ \frac{2}{1/2} \ \mathbf{3d_{3/2}^4} \ \mathbf{3d_{5/2}^6} \\ k \ (eV) \\ \hline 9000 \\ 0.000+0 \\ \end{array}$	-7.34-5 2 10000 2.083+1 1.987 -2.65-1 -8.37-5 2 4p <sub>1/2</sub> 10000 0.000+0	11000 1.676+1 1.978 3.40-1 -8.37-5 11000 1.836+1	12000 1.346+1 1.968 6.79-1 -8.13-5	14000 9.023+0 1.949 1.15+0 -7.44-5	16000 6.325+0 1.929 1.49+0 -6.71-5	18000 4.599+0 1.910 1.78+0 -5.86-5 18000 5.156+0	20000 3.445+0 1.890 2.02+0 -4.83-5 20000 3.871+0	22000 2.645+0 1.871 2.24+0 -3.60-5 22000 2.978+0	25000 1.849+0 1.842 2.52+0 -1.33-5 25000 2.087+0	30000 1.102+ 1.795 2.91+0 3.71- 30000 1.247+
2978.9 eV $Z = 30$ , $Zn$ :  Shell $S_{1/2}$ $S_{2/2}$ $S_{3/2}$	γ δ [Ar]4s σ β γ δ [Ar]4s	$\begin{array}{c} -3.29-5 \\ ^{2}_{1/2} \ \mathbf{3d_{3/2}^4} \ \mathbf{3d_{5/2}^6} \\ k \ (eV) \\ \hline 9000 \\ 0.000+0 \\ 0.00+0 \\ 0.00+0 \\ k \ (eV) \\ \hline \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000 \end{array}$	-7.34-5 2 10000 2.083+1 1.987 -2.65-1 -8.37-5 2.4p <sub>1/2</sub> 10000 0.000+0 0.000+0 0.000	11000 1.676+1 1.978 3.40-1 -8.37-5 11000 1.836+1 1.983	12000 1.346+1 1.968 6.79-1 -8.13-5 12000 1.491+1 1.974	14000 9.023+0 1.949 1.15+0 -7.44-5 14000 1.005+1 1.955	16000 6.325+0 1.929 1.49+0 -6.71-5 16000 7.072+0 1.935	18000 4.599+0 1.910 1.78+0 -5.86-5 18000 5.156+0 1.916	20000 3.445+0 1.890 2.02+0 -4.83-5 20000 3.871+0 1.896	22000 2.645+0 1.871 2.24+0 -3.60-5 22000 2.978+0 1.877	25000 1.849+0 1.842 2.52+0 -1.33-5 25000 2.087+0 1.848	30000 1.102+ 1.795 2.91+0 3.71- 30000 1.247+ 1.801
2978.9 eV $Z = 30$ , $Zn$ :  Shell $\frac{ S_1 _2}{ S_2 _2} = 0658.6$ eV $Z = 31$ , $Ga$ :  Shell $\frac{ S_2 _2}{ S_3 _2} = 0658.6$	γ δ [Ar]4s σ β γ δ [Ar]4s	$\begin{array}{c} -3.29-5 \\ \frac{2}{1/2} \ \mathbf{3d_{3/2}^4} \ \mathbf{3d_{5/2}^6} \\ k \ (eV) \\ \hline 9000 \\ 0.000+0 \\ 0.00+0 \\ 0.00+0 \\ \frac{2}{1/2} \ \mathbf{3d_{3/2}^4} \ \mathbf{3d_{5/2}^6} \\ k \ (eV) \\ \hline 9000 \\ 0.000+0 \\ \end{array}$	-7.34-5 2 10000 2.083+1 1.987 -2.65-1 -8.37-5 2 4p <sub>1/2</sub> 10000 0.000+0	11000 1.676+1 1.978 3.40-1 -8.37-5 11000 1.836+1	12000 1.346+1 1.968 6.79-1 -8.13-5	14000 9.023+0 1.949 1.15+0 -7.44-5	16000 6.325+0 1.929 1.49+0 -6.71-5	18000 4.599+0 1.910 1.78+0 -5.86-5 18000 5.156+0	20000 3.445+0 1.890 2.02+0 -4.83-5 20000 3.871+0	22000 2.645+0 1.871 2.24+0 -3.60-5 22000 2.978+0	25000 1.849+0 1.842 2.52+0 -1.33-5 25000 2.087+0	30000 1.102+ 1.795 2.91+( 3.71- 30000 1.247+ 1.801 2.85+(
2978.9 eV $Z = 30$ , $Zn$ :  Shell $\frac{IS_{1/2}}{z_b} = 0658.6$ eV $Z = 31$ , $Ga$ :  Shell $\frac{IS_{1/2}}{z_b} = 10367.1$ eV	γ δ [Ar]4s σ β γ δ [Ar]4s	$\begin{array}{c} -3.29-5 \\ ^{2}_{1/2} \ \mathbf{3d_{3/2}^4} \ \mathbf{3d_{5/2}^6} \\ k \ (eV) \\ \hline 9000 \\ 0.000+0 \\ 0.000+0 \\ 0.00+0 \\ \frac{2}{1/2} \ \mathbf{3d_{3/2}^4} \ \mathbf{3d_{5/2}^6} \\ k \ (eV) \\ \hline 9000 \\ 0.000+0 \\ 0.000 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \end{array}$	-7.34-5 2 10000 2.083+1 1.987 -2.65-1 -8.37-5 2.4P <sub>1/2</sub> 10000 0.000+0 0.000 0.00+0 0.00+0	11000 1.676+1 1.978 3.40-1 -8.37-5 11000 1.836+1 1.983 -4.87-2	12000 1.346+1 1.968 6.79-1 -8.13-5 12000 1.491+1 1.974 4.32-1	14000 9.023+0 1.949 1.15+0 -7.44-5 14000 1.005+1 1.955 9.74-1	16000 6.325+0 1.929 1.49+0 -6.71-5 16000 7.072+0 1.935 1.35+0	18000 4.599+0 1.910 1.78+0 -5.86-5 18000 5.156+0 1.916 1.66+0	20000 3.445+0 1.890 2.02+0 -4.83-5 20000 3.871+0 1.896 1.92+0	22000 2.645+0 1.871 2.24+0 -3.60-5 22000 2.978+0 1.877 2.14+0	25000 1.849+0 1.842 2.52+0 -1.33-5 25000 2.087+0 1.848 2.44+0	30000 1.102+ 1.795 2.91+0 3.71- 30000 1.247+ 1.801 2.85+0
2978.9 eV $Z = 30$ , $Zn$ :  Shell $\frac{IS_{1/2}}{z_b} = 0658.6$ eV $Z = 31$ , $Ga$ :  Shell $\frac{IS_{1/2}}{z_b} = 10367.1$ eV	γ δ [Ar]4s σ β γ δ [Ar]4s	-3.29-5 21/2 3d <sup>4</sup> <sub>3/2</sub> 3d <sup>6</sup> <sub>5/</sub> k (eV) 9000 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0	-7.34-5 2 10000 2.083+1 1.987 -2.65-1 -8.37-5 2.4P <sub>1/2</sub> 10000 0.000+0 0.000 0.00+0 0.00+0	11000 1.676+1 1.978 3.40-1 -8.37-5 11000 1.836+1 1.983 -4.87-2	12000 1.346+1 1.968 6.79-1 -8.13-5 12000 1.491+1 1.974 4.32-1	14000 9.023+0 1.949 1.15+0 -7.44-5 14000 1.005+1 1.955 9.74-1	16000 6.325+0 1.929 1.49+0 -6.71-5 16000 7.072+0 1.935 1.35+0	18000 4.599+0 1.910 1.78+0 -5.86-5 18000 5.156+0 1.916 1.66+0	20000 3.445+0 1.890 2.02+0 -4.83-5 20000 3.871+0 1.896 1.92+0	22000 2.645+0 1.871 2.24+0 -3.60-5 22000 2.978+0 1.877 2.14+0	25000 1.849+0 1.842 2.52+0 -1.33-5 25000 2.087+0 1.848 2.44+0	30000 1.102+ 1.795 2.91+0 3.71- 30000 1.247+
2978.9 eV	γ δ [Ar]4s σ β γ δ [Ar]4s [Ar]4s	$\begin{array}{c} -3.29-5 \\ ^{2}_{1/2} \ \mathbf{3d_{3/2}^4} \ \mathbf{3d_{5/2}^6} \\ k \ (eV) \\ \hline 9000 \\ 0.000+0 \\ 0.000+0 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \\ \hline 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.0$	-7.34-5 2 10000 2.083+1 1.987 -2.65-1 -8.37-5 2 4P <sup>1</sup> <sub>1/2</sub> 10000 0.000+0 0.000+0 0.00+0 0.00+0 2 4P <sup>2</sup> <sub>1/2</sub> 10000	11000 1.676+1 1.978 3.40-1 -8.37-5 11000 1.836+1 1.983 -4.87-2 -9.92-5	12000 1.346+1 1.968 6.79-1 -8.13-5 12000 1.491+1 1.974 4.32-1 -9.62-5	14000 9.023+0 1.949 1.15+0 -7.44-5 14000 1.005+1 1.955 9.74-1 -8.91-5	16000 6.325+0 1.929 1.49+0 -6.71-5 16000 7.072+0 1.935 1.35+0 -8.20-5	18000 4.599+0 1.910 1.78+0 -5.86-5 18000 5.156+0 1.916 1.66+0 -7.35-5	20000 3.445+0 1.890 2.02+0 -4.83-5 20000 3.871+0 1.896 1.92+0 -6.33-5	22000 2.645+0 1.871 2.24+0 -3.60-5 22000 2.978+0 1.877 2.14+0 -5.11-5	25000 1.849+0 1.842 2.52+0 -1.33-5 25000 2.087+0 1.848 2.44+0 -2.87-5	30000 1.102+ 1.795 2.91+0 3.71- 30000 1.247+ 1.801 2.85+0 2.09-
2978.9 eV $Z = 30$ , $Zn$ :  Shell $S_{1/2}$ $S_{2/2}$	γ δ [Ar]4s σ β γ δ [Ar]4s	-3.29-5 21/2 3d <sup>4</sup> <sub>3/2</sub> 3d <sup>6</sup> <sub>5/</sub> k (eV) 9000 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0	-7.34-5 2 10000 2.083+1 1.987 -2.65-1 -8.37-5 2.4p <sub>1/2</sub> 10000 0.000+0 0.000 0.00+0 0.00+0 0.00+0 2.4p <sub>1/2</sub>	11000 1.676+1 1.978 3.40-1 -8.37-5 11000 1.836+1 1.983 -4.87-2 -9.92-5	12000 1.346+1 1.968 6.79-1 -8.13-5 12000 1.491+1 1.974 4.32-1 -9.62-5	14000 9.023+0 1.949 1.15+0 -7.44-5 14000 1.005+1 1.955 9.74-1 -8.91-5	16000 6.325+0 1.929 1.49+0 -6.71-5 16000 7.072+0 1.935 1.35+0 -8.20-5	18000 4.599+0 1.910 1.78+0 -5.86-5 18000 5.156+0 1.916 1.66+0 -7.35-5	20000 3.445+0 1.890 2.02+0 -4.83-5 20000 3.871+0 1.896 1.92+0 -6.33-5	22000 2.645+0 1.871 2.24+0 -3.60-5 22000 2.978+0 1.877 2.14+0 -5.11-5	25000 1.849+0 1.842 2.52+0 -1.33-5 25000 2.087+0 1.848 2.44+0 -2.87-5	30000 1.102+ 1.795 2.91+0 3.71-! 30000 1.247+ 1.801 2.85+0 2.09-!

7 00 1	δ	0.00+0	0.00+0	0.00+0	-1.15-4	-1.05-4	-9.74-5	-8.89-5	-7.90-5	-6.72-5	-4.52-5	3.09-6
L = 33, As:	[Ar]4s	$^{2}_{1/2}$ 3d $^{4}_{3/2}$ 3d $^{6}_{5/2}$	2 4p <sub>1/2</sub> 4p <sub>3/2</sub>									
		k (eV)										
Shell		2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
$2s_{1/2}$ $E_b =$	$\frac{\sigma}{\beta}$	5.537+1 1.990	2.767+1 1.998	1.596+1 1.998	1.014+1 1.995	6.889+0 1.990	4.916+0 1.984	3.642+0 1.977	2.780+0 1.969	2.173+0 1.961	1.734+0 1.952	1.406+ 1.944
ւ <sub>ն</sub> — 1526.5 eV	γ	1.530	-6.43-2	7.25-2	2.63-1	4.58-1	6.43-1	8.18-1	9.81-1	1.13+0	1.28+0	1.41+(
1020.0 01	δ	-4.79 - 5	-5.60-5	-5.46-5	-5.25-5	-5.01-5	-4.76-5	-4.50-5	-4.23-5	-3.92-5	-3.59-5	-3.22
Z = 34, Se:	[Ar]4s	2 1/2 3d <sup>4</sup> <sub>3/2</sub> 3d <sup>6</sup> <sub>5/2</sub>										
		k (eV)	-//-									
Shell		2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
2s <sub>1/2</sub>	σ	5.762+1	2.936+1	1.709+1	1.092+1	7.451+0	5.335+0	3.964+0	3.033+0	2.377+0	1.900+0	1.544-
$E_b =$	β	1.986	1.997	1.998	1.996	1.992	1.986	1.979	1.971	1.963	1.955	1.947
1653.9 eV	γ	3.03-1	-7.26-2	2.92-2	2.08-1	3.97-1	5.82-1	7.56-1	9.19-1	1.07+0	1.22+0	1.35+0
7 _ 25 Dm	δ [Δη]Δς	$-4.94-5$ $\frac{2}{1/2}$ 3d $_{3/2}^4$ 3d $_{5/3}^6$	$\frac{-6.45-5}{{}_{2}\mathbf{4p}_{1/2}^{2}\mathbf{4p}_{3/2}^{3}}$	-6.40-5	-6.18-5	-5.95-5	-5.70-5	-5.43-5	-5.16-5	-4.84-5	-4.50-5	-4.11
Z = 33, Br.	[AI]45	k (eV)	2 4P <sub>1/2</sub> 4P <sub>3/2</sub>									
Shell		2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
$2s_{1/2}$	σ	5.932+1	3.099+1	1.820+1	1.170+1	8.021+0	5.764+0	4.295+0	3.295+0	2.588+0	2.072+0	1.687-
$E_{b}=$	β	1.983	1.995	1.998	1.997	1.993	1.987	1.981	1.974	1.966	1.958	1.950
1782.0 eV	γ	5.28-1	-6.73-2	-7.89-3	1.55-1	3.39-1	5.20-1	6.93-1	8.56-1	1.01+0	1.15+0	1.29+0
	δ	-4.54-5	-7.35-5	-7.41-5	-7.23-5	-7.00-5	-6.74-5	-6.48 - 5	-6.20-5	-5.90-5	-5.56-5	-5.17
$2p_{1/2}$	σ	1.060+2	3.594+1	1.584+1	8.199+0	4.723+0	2.936+0	1.932+0	1.330+0	9.484-1	6.965-1	5.241
$E_b =$	β	1.330	1.432	1.374	1.294	1.215	1.140	1.070	1.006	0.947	0.893	0.841
1596.0 eV	γ	-8.57-2	3.77-1	6.90-1	9.12-1	1.08+0	1.20+0	1.31+0	1.39+0	1.46+0	1.52+0	1.57+0
<u></u>	δ	1.27-2	3.32-2	4.89-2	6.48-2	8.07-2	9.69-2	1.13-1	1.30-1	1.46-1	1.62-1	1.77-
$2p_{3/2}$ $E_b =$	$\frac{\sigma}{\beta}$	2.027+2 1.372	6.722+1 1.467	2.929+1 1.410	1.503+1 1.332	8.598+0 1.253	5.313+0 1.178	3.479+0 1.109	2.383+0 1.045	1.692+0 0.986	1.237+0 0.932	9.275 0.880
<i>E<sub>b</sub>=</i> 1549.9 eV	P γ	-6.56-2	4.04-1	7.22-1	9.48–1	1.255 1.12+0	1.178	1.109	1.045 1.43+0	0.986 1.50+0	0.932 1.56+0	1.61+0
	δ	1.51 - 2	3.40 - 2	4.84-2	6.31-2	7.81-2	9.34-2	1.09-1	1.25-1	1.40-1	1.56-1	1.71-
Z = 36, Kr:	[Ar]4s	$^{2}_{1/2}$ 3d $^{4}_{3/2}$ 3d $^{6}_{5/2}$	$_{2}4p_{1/2}^{2}4p_{3/2}^{4}$									
		k (eV)	,,-									
Shell		2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
2s <sub>1/2</sub>	σ	5.970+1	3.262+1	1.933+1	1.251+1	8.611+0	6.210+0	4.641+0	3.569+0	2.809+0	2.254+0	1.838+
$E_b =$	β	1.979	1.993	1.998	1.997	1.994	1.989	1.983	1.976	1.969	1.961	1.953
1921.0 eV	γ	8.79-1	-4.53-2	-3.90-2	1.05-1	2.80-1	4.58-1	6.30-1	7.93-1	9.46-1	1.09+0	1.23+0
2	δ	-1.87-5	-8.28-5	-8.56-5	-8.43-5	-8.16-5	-7.93-5	-7.66-5	-7.38-5	-7.07-5	-6.73-5	-6.37
$2p_{1/2}$ $E_b =$	$\frac{\sigma}{eta}$	1.168+2 1.239	4.052+1 1.434	1.799+1 1.389	9.358+0 1.317	5.410+0 1.240	3.373+0 1.167	2.226+0 1.099	1.536+0 1.036	1.098+0 0.978	8.075-1 0.924	6.088- 0.874
1727.2 eV	γ	-1.66-1	3.08-1	6.39-1	8.76-1	1.05+0	1.19+0	1.30+0	1.39+0	1.46+0	1.53+0	1.58+0
	δ	6.55-3	3.07-2	4.60-2	6.16-2	7.71-2	9.26-2	1.08-1	1.24-1	1.40-1	1.56-1	1.71-
2p <sub>3/2</sub>	σ	2.245+2	7.575+1	3.320+1	1.712+1	9.823+0	6.087+0	3.995+0	2.742+0	1.951+0	1.429+0	1.073+
$E_b =$	β	1.296	1.471	1.428	1.356	1.280	1.207	1.140	1.077	1.019	0.966	0.915
1674.9 eV	γ	-1.47 - 1	3.36 - 1	6.73 - 1	9.15 - 1	1.09+0	1.23+0	1.34+0	1.43+0	1.51+0	1.57+0	1.63+0
7 OF DI	δ	9.70-3	3.19-2	4.58-2	6.01-2	7.45-2	8.91-2	1.04-1	1.19-1	1.34-1	1.49-1	1.64-
Z = 37, Rb:	[Kr]5s	k (eV)										
Chall			2000	4000	5000	6000	7000	9000	0000	10000	11000	12000
Shell 2s <sub>1/2</sub>	σ	2000 0.000+0	3000 3.414+1	4000 2.044+1	5000 1.330+1	9.197+0	7000 6.657+0	8000 4.991+0	9000 3.848+0	10000 3.036+0	11000 2.441+0	12000 1.994
$E_b =$	β	0.000	1.991	1.997	1.998	1.995	1.991	1.985	1.978	1.971	1.964	1.956
2065.1 eV	γ	0.00+0	-4.05 - 3	-6.16-2	5.94-2	2.24-1	3.95-1	5.64-1	7.27-1	8.81-1	1.03+0	1.17+0
	δ	0.00+0	-9.26 - 5	-9.83 - 5	-9.81-5	-9.55 - 5	-9.29 - 5	-8.98 - 5	-8.66 - 5	-8.33-5	-7.94-5	-7.55
$2p_{1/2}$	σ	1.244+2	4.527+1	2.025+1	1.059+1	6.151+0	3.849+0	2.548+0	1.762+0	1.262+0	9.303-1	7.026-
$E_b =$	β	1.064	1.431	1.402	1.336	1.265	1.196	1.131	1.069	1.011	0.956	0.905
1863.9 eV	γ	-2.14-1	2.37-1	5.85-1	8.34-1	1.02+0	1.17+0	1.29+0	1.38+0	1.46+0	1.53+0	1.59+0
n n	δ	-7.98-4	2.82-2	4.31-2	5.77-2	7.29-2	8.86-2	1.04-1	1.20-1	1.36-1	1.51-1	1.66-
$\begin{array}{c} 2p_{3/2} \\ E_b = \end{array}$	$\frac{\sigma}{\beta}$	2.430+2 1.167	8.456+1 1.470	3.732+1 1.442	1.933+1 1.377	1.114+1 1.307	6.923+0 1.239	4.556+0 1.174	3.134+0 1.112	2.234+0 1.054	1.640+0 1.000	1.233- 0.949
<sub>ь=</sub> 1804.4 eV	$\gamma$	-2.12-1	2.67-1	6.20-1	8.74–1	1.07+0	1.239	1.174	1.112	1.51+0	1.58+0	1.64+0
	δ	2.02-3	3.00-2	4.32-2	5.64-2	7.04-2	8.51-2	1.00-1	1.15-1	1.30-1	1.44-1	1.59-
Z = 38, Sr:	[Kr]5s <sup>2</sup>											
		k (eV)										
Shell		2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
$2s_{1/2}$	σ	0.000+0	3.562+1	2.154+1	1.411+1	9.803+0	7.121+0	5.355+0	4.139+0	3.272+0	2.636+0	2.157+
-/-	β	0.000	1.988	1.996	1.998	1.996	1.992	1.987	1.981	1.974	1.966	1.959
$E_b =$	γ	0.00+0	6.27-2	-7.55-2	1.87-2	1.72-1	3.39-1	5.06-1	6.68-1	8.23-1	9.70-1	1.11+0
$E_b =$		0.00+0	-1.03-4	-1.13-4 2.270+1	-1.13-4	-1.10-4	-1.07-4	-1.04-4	-1.01-4	-9.74-5	-9.34-5	-8.96
E <sub>b</sub> = 2216.3 eV	δ			7 7 /O+1	1.194+1	6.963+0	4.371+0	2.901+0	2.011+0	1.443+0	1.066+0	8.065
$E_b = 2216.3 \text{ eV}$ $2p_{1/2}$	σ	0.000+0	5.036+1				1 210	1 152	1.001			0.000
$E_b = 2216.3 \text{ eV}$ $2p_{1/2}$ $E_b = 6$	$\frac{\sigma}{\beta}$	0.000	1.423	1.412	1.352	1.285	1.218 1.15+0	1.153 1.27+0	1.091 1.37+0	1.033	0.979	0.928
$E_b = 2216.3 \text{ eV}$ $2p_{1/2}$	σ β γ	0.000 0.00+0	1.423 1.61-1	1.412 5.28-1	1.352 7.93-1	1.285 9.91-1	1.15+0	1.27+0	1.37+0	1.033 1.46+0	0.979 1.53+0	1.59+0
$E_b = 2216.3 \text{ eV}$ $2p_{1/2}$ $E_b = 2p_{1/2}$	$\frac{\sigma}{\beta}$	0.000	1.423	1.412	1.352	1.285				1.033	0.979	0.928 1.59+0 1.59- 1.409+

able 1 (conti		102 1	102 1	F.CF 1	0.26 1	1.04:0	1.10+0	1 22 . 0	1.42.0	151.0	1.50.0	1.64.0
1939.6 eV	$\delta$	-1.93-1 2.64-5	1.93-1 2.79-2	5.65-1 4.11-2	8.36-1 5.43-2	1.04+0 6.78-2	1.19+0 8.15-2	1.32+0 9.55-2	1.42+0 1.09-1	1.51+0 1.23-1	1.58+0 1.37-1	1.64+0 1.51-1
= 39, Y:	[Kr]5s <sub>1</sub>	k (eV)										
hell		3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	14000
2s <sub>1/2</sub>	σ	3.701+1	2.264+1	1.492+1	1.042+1	7.594+0	5.727+0	4.437+0	3.516+0	2.837+0	2.326+0	1.624+
$E_b =$	β	1.985	1.995	1.997	1.996	1.993	1.988	1.983	1.976	1.969	1.961	1.945
372.5 eV	γ	1.63 - 1	-7.83 - 2	-1.73-2	1.21 - 1	2.82 - 1	4.45 - 1	6.05 - 1	7.59 - 1	9.05 - 1	1.04+0	1.30+0
	δ	-1.11-4	-1.28 - 4	-1.29-4	-1.28 - 4	-1.24-4	-1.21-4	-1.18-4	-1.14-4	-1.11-4	-1.07 - 4	<b>−9.78</b> ·
$p_{1/2}$	σ	5.580+1	2.537+1	1.341+1	7.852+0	4.945+0	3.291+0	2.287+0	1.645+0	1.217+0	9.222 - 1	5.611-
ь= 155.5 eV	β	1.406	1.419	1.368	1.305	1.239	1.176	1.116	1.059	1.006	0.956	0.865
155.5 eV	$_{\delta}^{\gamma}$	7.72-2 2.26-2	4.64-1 3.81-2	7.44-1 5.20-2	9.54-1 6.63-2	1.12+0 8.06-2	1.25+0 9.50-2	1.36+0 1.09-1	1.45+0	1.52+0 1.38-1	1.59+0	1.69+0
p <sub>3/2</sub>	$\sigma$	2.20-2 1.042+2	4.662+1	2.437+1	0.03-2 1.414+1	8.842+0	5.847+0	4.039+0	1.24-1 2.890+0	2.128+0	1.52-1 1.605+0	1.80- 9.684-
)= =	β	1.452	1.463	1.413	1.351	1.287	1.224	1.164	1.107	1.054	1.003+0	0.913
) 080.0 eV	γ	1.11-1	5.04-1	7.89-1	1.00+0	1.17+0	1.30+0	1.41+0	1.50+0	1.58+0	1.65+0	1.75+0
	δ	2.54 - 2	3.91-2	5.15-2	6.43-2	7.74-2	9.07 - 2	1.04-1	1.18-1	1.31-1	1.45-1	1.71-
= 40, Zr:	[Kr]5s <sub>1</sub>	k (eV)										
nell		3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	14000
S <sub>1/2</sub>	σ	3.826+1	2.371+1	1.573+1	1.103+1	8.071+0	6.105+0	4.742+0	3.765+0	3.044+0	2.500+0	1.751+
b=	β	1.982	1.993	1.997	1.997	1.994	1.990	1.985	1.978	1.972	1.964	1.949
531.6 eV	γ	3.10 - 1	-6.81-2	-4.66-2	7.45 - 2	2.26 - 1	3.85 - 1	5.42 - 1	6.95 - 1	8.40 - 1	9.80 - 1	1.24+0
,	δ	-1.19-4	-1.45-4	-1.48 - 4	-1.47 - 4	-1.43-4	-1.40-4	-1.37 - 4	-1.33-4	-1.30-4	-1.26-4	-1.17
p <sub>1/2</sub>	σ	6.140+1	2.820+1	1.499+1	8.812+0	5.568+0	3.716+0	2.588+0	1.865+0	1.383+0	1.049+0	6.404
_	$\beta$	1.380	1.424	1.382	1.323	1.261	1.200	1.141	1.085	1.033	0.984	0.894
306.7 eV	γ	-1.12-2	3.98-1	6.92-1	9.13-1	1.09+0	1.22+0	1.34+0	1.43+0	1.52+0	1.59+0	1.70+0
•	δ	1.88-2 1.148+2	3.57-2 5.176+1	4.94-2 2.719+1	6.31-2	7.69-2	9.08-2	1.05-1 4.555+0	1.19-1	1.33-1	1.47-1	1.74-
03/2	σ	1.148+2 1.430	5.176+1 1.470	2.719+1 1.429	1.583+1 1.372	9.928+0 1.310	6.580+0 1.249	4.555+0 1.191	3.265+0 1.136	2.408+0 1.084	1.819+0 1.034	1.101- 0.945
,= 222.3 eV	$\beta$ $\gamma$	2.57-2	4.39-1	7.39-1	9.65—1	1.14+0	1.249	1.191	1.50+0	1.58+0	1.65+0	1.76+0
.22.5 CV	δ	2.24-2	3.72-2	4.92-2	6.13-2	7.38-2	8.65-2	9.94-2	1.12-1	1.26-1	1.39-1	1.65-
= 41, Nb:	[Kr]5s	1 <sub>1/2</sub> 4d <sup>4</sup> <sub>3/2</sub>										
		k (eV)	1000	<b>5000</b>	2000	<b>7</b> 000			10000	11000	10000	1 1000
nell		3000	4000 2.479+1	5000 1.655+1	6000	7000 8.560+0	8000 6.494+0	9000 5.057+0	10000 4.024+0	11000 3.260+0	12000 2.681+0	14000
S <sub>1/2</sub> =	$\frac{\sigma}{\beta}$	3.930+1 1.977	1.990	1.055+1	1.166+1 1.997	8.560+0 1.995	1.991	1.986	1.981	3.260+0 1.974	1.967	1.952
.— 697.7 eV	γ	5.30-1	-4.13-2	-6.81-2	3.09-2	1.71-1	3.24-1	4.79-1	6.31-1	7.77-1	9.17-1	1.18+(
	δ	-1.22-4	-1.64-4	-1.67 - 4	-1.67 - 4	-1.64-4	-1.61-4	-1.57-4	-1.53-4	-1.50-4	-1.46-4	-1.37
$p_{1/2}$	σ	6.727+1	3.128+1	1.672+1	9.866+0	6.254+0	4.184+0	2.920+0	2.109+0	1.566+0	1.191+0	7.285-
b=	β	1.337	1.425	1.395	1.342	1.284	1.224	1.166	1.111	1.058	1.009	0.919
464.7 eV	γ	-1.07 - 1	3.25 - 1	6.34 - 1	8.69 - 1	1.05+0	1.20+0	1.32+0	1.42+0	1.51+0	1.58+0	1.70+0
	δ	1.35 - 2	3.34-2	4.70 - 2	6.04 - 2	7.41 - 2	8.78 - 2	1.01 - 1	1.15 - 1	1.28 - 1	1.41 - 1	1.68-
p <sub>3/2</sub>	$\sigma$	1.262+2	5.740+1	3.028+1	1.769+1	1.112+1	7.388+0	5.124+0	3.678+0	2.717+0	2.056+0	1.247+
b=	β	1.395	1.474	1.445	1.393	1.336	1.276	1.219	1.163	1.111	1.062	0.972
370.5 eV	γ	-6.69-2	3.68-1	6.83-1	9.23-1	1.11+0	1.26+0	1.38+0	1.49+0	1.57+0	1.65+0	1.77+(
_ 42 Mas	δ [[[[]]]]	$\begin{array}{c} 1.85 - 2 \\ \mathbf{5_{1/2}^1 4d_{3/2}^4 4d_5^1} \end{array}$	3.55-2	4.72-2	5.91-2	7.12-2	8.35-2	9.59-2	1.08-1	1.21-1	1.33-1	1.58-
= 42, MO	. [KI]38	k (eV)	/2									
nell		3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	14000
\$1/2	σ	3.971+1	2.580+1	1.734+1	1.227+1	9.046+0	6.883+0	5.374+0	4.285+0	3.478+0	2.865+0	2.018-
,=	β	1.972	1.988	1.994	1.996	1.995	1.992	1.988	1.983	1.976	1.970	1.955
365.5 eV	γ	8.62-1	4.61-3	-8.07 - 2	-6.25 - 3	1.21-1	2.67-1	4.18-1	5.68-1	7.13-1	8.53-1	1.11+(
14.12	$\frac{\delta}{\sigma}$	-7.67-5 7.286+1	-1.83-4 3.447+1	-1.90-4 1.853+1	-1.89-4 1.098+1	-1.88-4 6.984+0	-1.84-4 4.686+0	-1.80-4 3.278+0	-1.76-4 2.372+0	-1.72-4 1.765+0	-1.68-4 1.344+0	-1.59 8.247
$p_{1/2} =$	$\beta$	1.267	1.422	1.405	1.358	1.303	1.246	1.190	2.372+0 1.135	1.765+0	1.034	0.945
.— 625.1 eV	γ	-2.03-1	2.47-1	5.72-1	8.19-1	1.01+0	1.17+0	1.30+0	1.40+0	1.49+0	1.57+0	1.70+0
	δ	6.15-3	3.06-2	4.42-2	5.72-2	7.06-2	8.40-2	9.72-2	1.10-1	1.23-1	1.36-1	1.62-
03/2	σ	1.374+2	6.320+1	3.350+1	1.964+1	1.239+1	8.248+0	5.732+0	4.123+0	3.050+0	2.311+0	1.405
=	β	1.341	1.473	1.456	1.411	1.357	1.301	1.245	1.190	1.138	1.090	1.001
520.2 eV	γ	-1.61-1	2.92 - 1	6.23 - 1	8.76 - 1	1.07+0	1.23+0	1.37+0	1.47+0	1.56+0	1.64+0	1.77+0
	δ	1.30-2	3.33-2	4.49-2	5.62-2	6.80-2	8.00-2	9.20-2	1.04-1	1.16-1	1.28-1	1.52-
= 43, Tc:	[Kr]5s <sub>1</sub>	k (eV)	2									
nell		3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	14000
\$1/2	σ	0.000+0	2.676+1	1.814+1	1.290+1	9.540+0	7.280+0	5.698+0	4.553+0	3.702+0	3.055+0	2.158-
, <u> </u>	β	0.000	1.984	1.993	1.996	1.996	1.993	1.989	1.984	1.979	1.972	1.958
042.5 eV	γ	0.00+0	7.47 - 2	-8.34 - 2	-3.78 - 2	7.51 - 2	2.13 - 1	3.59 - 1	5.06 - 1	6.49 - 1	7.87 - 1	1.05+0
	δ	0.00+0	-2.02-4	-2.14-4	-2.15-4	-2.13-4	-2.10-4	-2.07 - 4	-2.03-4	-1.99-4	-1.95-4	-1.86
p <sub>1/2</sub>	σ	7.738+1	3.780+1	2.045+1	1.217+1	7.768+0	5.226+0	3.665+0	2.657+0	1.981+0	1.511+0	9.299
,=	β	1.133	1.414	1.412	1.371	1.319	1.264	1.210	1.157	1.107	1.059	0.972
793.2 eV	γ	-2.88 - 1	1.66-1	5.10-1	7.69-1	9.72-1	1.14+0	1.27+0	1.38+0	1.48+0	1.56+0	1.70+0
	δ	-5.45 - 3	2.77-2	4.19-2	5.47-2	6.74-2	8.00-2	9.27-2	1.05-1	1.18-1	1.31-1	1.56-

$2p_{3/2}$	$\frac{\text{inued}}{\sigma}$	1.481+2	6.931+1	3.693+1	2.173+1	1.374+1	9.171+0	6.386+0	4.602+0	3.410+0	2.587+0	1.577+
$\vec{z}_b =$	β	1.254	1.468	1.465	1.426	1.375	1.321	1.267	1.214	1.164	1.117	1.030
676.9 eV	γ	-2.53-1	2.15 - 1	5.64 - 1	8.29 - 1	1.04+0	1.20+0	1.34+0	1.46+0	1.55+0	1.64+0	1.77+0
	δ	4.23-3	3.13-2	4.33-2	5.42-2	6.53-2	7.64-2	8.77-2	9.89-2	1.11-1	1.22-1	1.46-
= 44, Ru:	[Kr]5s	$^{1}_{1/2}$ 4d $^{4}_{3/2}$ 4d $^{3}_{5/2}$	2									
		k (eV)										
hell		3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	14000
$S_{1/2}$	σ	0.000+0	2.770+1	1.892+1	1.352+1	1.004+1	7.683+0	6.028+0	4.827+0	3.933+0	3.251+0	2.303
b=	β	0.000	1.981	1.991	1.995	1.996	1.994	1.991	1.986	1.981	1.975	1.961
224.0 eV	γ	0.00+0	1.79-1	-7.34-2	-6.33-2	3.19-2	1.59-1 -2.39-4	2.98-1	4.41-1	5.84-1	7.23-1 $-2.22-4$	9.85-
$p_{1/2}$	$\frac{\delta}{\sigma}$	0.00+0 7.505+1	-2.13-4 4.144+1	-2.38-4 2.255+1	-2.43-4 1.347+1	-2.42-4 8.626+0	5.820+0	-2.35-4 4.091+0	-2.31-4 2.973+0	-2.27-4 2.220+0	1.696+0	-2.13 1.046
P1/2 b=	β	0.710	1.399	1.416	1.382	1.335	1.285	1.233	1.182	1.132	1.083	0.994
966.9 eV	γ	-1.63-1	7.37-2	4.37-1	7.09-1	9.22-1	1.10+0	1.24+0	1.36+0	1.46+0	1.55+0	1.69+
	δ	1.63 - 2	2.41 - 2	3.88 - 2	5.12 - 2	6.35 - 2	7.63 - 2	8.92 - 2	1.02 - 1	1.14 - 1	1.27 - 1	1.50-
p <sub>3/2</sub>	σ	1.566+2	7.594+1	4.065+1	2.400+1	1.522+1	1.018+1	7.105+0	5.129+0	3.806+0	2.891+0	1.766
b=	β	1.073	1.458	1.472	1.440	1.394	1.344	1.293	1.242	1.192	1.144	1.055
837.9 eV	γ	-3.18 - 1	1.26-1	4.93-1	7.71-1	9.90-1	1.17+0	1.32+0	1.44+0	1.54+0	1.63+0	1.77+
	δ	-1.03-2	2.86-2	4.09-2	5.12-2	6.18-2	7.29-2	8.45-2	9.59-2	1.07-1	1.18-1	1.40-
= 45, Kh:	[Kr]59	1 <sub>1/2</sub> 4d <sub>3/2</sub> 4d <sub>5/</sub>	2									
		k (eV)										
hell		4000	5000	6000	7000	8000	9000	10000	11000	12000	14000	16000
S <sub>1/2</sub>	σ	2.855+1	1.969+1	1.415+1	1.054+1	8.089+0	6.362+0	5.105+0	4.167+0	3.451+0	2.452+0	1.809
b= 4110 oV	β	1.976	1.988	1.993	1.995	1.994	1.992	1.988	1.983	1.977	1.964	1.949
411.9 eV	$\gamma \\ \delta$	3.28-1 -2.20-4	-4.83-2 $-2.64-4$	-8.08-2 $-2.74-4$	-6.02 - 3 $-2.74 - 4$	1.10-1 -2.72-4	2.42-1 $-2.68-4$	3.80-1 $-2.63-4$	5.19-1 -2.59-4	6.57-1 -2.54-4	9.20-1 -2.44-4	1.16+ -2.3
$2p_{1/2}$	$\sigma$	4.514+1	2.475+1	1.485+1	9.539+0	6.453+0	4.547+0	3.311+0	2.476+0	1.895+0	1.172+0	7.691
$E_b =$	β	1.375	1.418	1.392	1.349	1.301	1.253	1.204	1.155	1.107	1.018	0.939
146.1 eV	γ	-2.24-2	3.62-1	6.50-1	8.73-1	1.05+0	1.21+0	1.33+0	1.44+0	1.53+0	1.68+0	1.80+
	δ	1.99 - 2	3.63 - 2	4.86 - 2	6.04 - 2	7.25 - 2	8.51 - 2	9.78 - 2	1.10 - 1	1.22 - 1	1.45 - 1	1.69-
$2p_{3/2}$	σ	8.279+1	4.456+1	2.640+1	1.678+1	1.126+1	7.871+0	5.691+0	4.231+0	3.218+0	1.970+0	1.281
b=	β	1.440	1.476	1.452	1.410	1.363	1.315	1.267	1.218	1.170	1.081	1.002
003.8 eV	γ	3.46-2	4.22-1	7.14-1	9.43-1	1.13+0	1.29+0	1.42+0	1.53+0	1.62+0	1.77+0	1.88+
	δ	2.56-2	3.91-2	4.93-2	5.91-2	6.95-2	8.06-2	9.18-2	1.03-1	1.14-1	1.35-1	1.56-
Z = 46, Pd:	[Kr]40											
		k (eV)										
Shell		4000	5000	6000	7000	8000	9000	10000	11000	12000	14000	16000
$2s_{1/2}$	σ	2.926+1	2.046+1	1.477+1	1.105+1	8.507+0	6.705+0	5.390+0	4.406+0	3.654+0	2.604+0	1.927
E <sub>b</sub> = 8604.3 eV	β	1.971	1.985 -3.87-3	1.992	1.994	1.994	1.992	1.989	1.984	1.979	1.967	1.953
1004.5 EV	$\gamma \\ \delta$	5.44-1 -2.04-4	-3.87 - 3 -2.86 - 4	-8.78-2 $-3.02-4$	-3.85-2 $-3.06-4$	6.41-2 $-3.06-4$	1.89-1 -3.04-4	3.22-1 -3.01-4	4.56-1 $-2.96-4$	5.89-1 -2.91-4	8.51-1 $-2.78-4$	1.10+ -2.67
$2p_{1/2}$	σ	4.899+1	2.712+1	1.635+1	1.053+1	7.140+0	5.040+0	3.677+0	2.755+0	2.112+0	1.311+0	8.616
$E_b =$	β	1.336	1.416	1.401	1.363	1.316	1.268	1.222	1.176	1.132	1.045	0.963
330.3 eV	γ	-1.28 - 1	2.79 - 1	5.82 - 1	8.22 - 1	1.01+0	1.17+0	1.30+0	1.41+0	1.51+0	1.67+0	1.79+
	δ	1.39 - 2	3.33 - 2	4.62 - 2	5.83 - 2	6.98 - 2	8.09 - 2	9.26 - 2	1.05 - 1	1.17 - 1	1.41 - 1	1.64-
$p_{3/2}$	σ	8.997+1	4.877+1	2.900+1	1.848+1	1.242+1	8.695+0	6.297+0	4.689+0	3.572+0	2.193+0	1.428
$E_b =$	β	1.411	1.477	1.463	1.426	1.380	1.333	1.287	1.243	1.198	1.111	1.029
3173.3 eV	γ	-6.42-2	3.42-1	6.51-1	8.96-1	1.09+0	1.25+0	1.39+0	1.50+0	1.61+0	1.77+0	1.89+
	δ [17. ]=	2.16-2	3.72-2	4.77-2	5.77-2	6.71-2	7.66-2	8.69-2	9.80-2	1.09-1	1.31-1	1.51-
L = 47, Ag:	[Kr]5s	1 <sub>1/2</sub> 4d <sub>3/2</sub> 4d <sub>5/2</sub>	2									
		k (eV)										
		4000	5000	6000	7000	8000	9000	10000	11000	12000 3.861+0	14000	16000
		2.001.1	2.110 1	1 500 1	1 15- 1	0.044.0	70440			3 661TU	2.759+0	2.046
S <sub>1/2</sub>	σ	2.961+1	2.116+1	1.538+1	1.155+1	8.914+0	7.044+0	5.675+0	4.648+0			
$2s_{1/2}$ $s_b =$	β	1.966	1.981	1.989	1.993	1.994	1.993	5.675+0 1.990	1.986	1.981	1.969	1.956
$2s_{1/2}$ $s_b =$	$\beta$ $\gamma$	1.966 8.62-1	1.981 6.18-2	1.989 -8.56-2	1.993 -6.44-2	1.994 2.24-2	1.993 1.38-1	5.675+0 1.990 2.64-1	1.986 3.95-1	1.981 5.26-1	1.969 7.86-1	1.956 1.03+
$2s_{1/2}$ $E_b =$ 8805.8 eV	$eta \ eta \ \delta$	1.966 8.62-1 -1.55-4	1.981 6.18-2 -3.12-4	1.989 -8.56-2 -3.38-4	1.993 -6.44-2 -3.44-4	1.994 2.24-2 -3.45-4	1.993 1.38-1 -3.43-4	5.675+0 1.990 2.64-1 -3.39-4	1.986 3.95-1 -3.34-4	1.981 5.26-1 -3.29-4	1.969 7.86-1 -3.17-4	1.956 1.03+ -3.00
$S_{1/2}$ $S_b = 805.8 \text{ eV}$	$\beta$ $\gamma$	1.966 8.62-1	1.981 6.18-2	1.989 -8.56-2	1.993 -6.44-2	1.994 2.24-2	1.993 1.38-1	5.675+0 1.990 2.64-1	1.986 3.95-1	1.981 5.26-1	1.969 7.86-1	1.956 1.03+ -3.00 9.613
$S_{1/2}$ $S_{b} =$ 1805.8  eV $19_{1/2}$ $19_{b} =$	$\beta$ $\gamma$ $\delta$ $\sigma$	1.966 8.62-1 -1.55-4 5.267+1 1.273 -2.39-1	1.981 6.18-2 -3.12-4 2.954+1 1.410 1.94-1	1.989 -8.56-2 -3.38-4 1.789+1 1.407 5.16-1	1.993 -6.44-2 -3.44-4 1.157+1 1.374 7.64-1	1.994 2.24-2 -3.45-4 7.864+0 1.331 9.62-1	1.993 1.38-1 -3.43-4 5.565+0 1.286 1.13+0	5.675+0 1.990 2.64-1 -3.39-4 4.068+0 1.241 1.27+0	1.986 3.95-1 -3.34-4 3.054+0 1.197 1.39+0	1.981 5.26-1 -3.29-4 2.345+0 1.153 1.49+0	1.969 7.86-1 -3.17-4 1.459+0 1.066 1.66+0	1.956 1.03+ -3.00 9.613 0.986 1.79+
S <sub>1/2</sub> S <sub>b</sub> = 1805.8 eV P <sub>1/2</sub> S <sub>b</sub> = 1523.7 eV	β γ δ σ β γ δ	1.966 8.62-1 -1.55-4 5.267+1 1.273 -2.39-1 5.45-3	1.981 6.18-2 -3.12-4 2.954+1 1.410 1.94-1 3.04-2	1.989 -8.56-2 -3.38-4 1.789+1 1.407 5.16-1 4.37-2	1.993 -6.44-2 -3.44-4 1.157+1 1.374 7.64-1 5.52-2	1.994 2.24-2 -3.45-4 7.864+0 1.331 9.62-1 6.62-2	1.993 1.38-1 -3.43-4 5.565+0 1.286 1.13+0 7.74-2	5.675+0 1.990 2.64-1 -3.39-4 4.068+0 1.241 1.27+0 8.91-2	1.986 3.95-1 -3.34-4 3.054+0 1.197 1.39+0 1.01-1	1.981 5.26-1 -3.29-4 2.345+0 1.153 1.49+0 1.13-1	1.969 7.86-1 -3.17-4 1.459+0 1.066 1.66+0 1.36-1	1.956 1.03+ -3.00 9.613 0.986 1.79+ 1.58-
S <sub>1/2</sub> S <sub>b</sub> = 1805.8 eV 19 <sub>1/2</sub> S <sub>b</sub> = 1523.7 eV 19 <sub>3/2</sub>	$\begin{array}{c} \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \end{array}$	1.966 8.62-1 -1.55-4 5.267+1 1.273 -2.39-1 5.45-3 9.715+1	1.981 6.18-2 -3.12-4 2.954+1 1.410 1.94-1 3.04-2 5.309+1	1.989 -8.56-2 -3.38-4 1.789+1 1.407 5.16-1 4.37-2 3.169+1	1.993 -6.44-2 -3.44-4 1.157+1 1.374 7.64-1 5.52-2 2.025+1	1.994 2.24-2 -3.45-4 7.864+0 1.331 9.62-1 6.62-2 1.364+1	1.993 1.38-1 -3.43-4 5.565+0 1.286 1.13+0 7.74-2 9.571+0	5.675+0 1.990 2.64-1 -3.39-4 4.068+0 1.241 1.27+0 8.91-2 6.944+0	1.986 3.95-1 -3.34-4 3.054+0 1.197 1.39+0 1.01-1 5.178+0	1.981 5.26-1 -3.29-4 2.345+0 1.153 1.49+0 1.13-1 3.950+0	1.969 7.86-1 -3.17-4 1.459+0 1.066 1.66+0 1.36-1 2.430+0	1.956 1.03+ -3.00 9.613 0.986 1.79+ 1.58-
$S_{1/2}$ $b =$ $805.8 \text{ eV}$ $P_{1/2}$ $b =$ $523.7 \text{ eV}$ $P_{3/2}$ $b =$	$\begin{array}{c} \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \end{array}$	1.966 8.62-1 -1.55-4 5.267+1 1.273 -2.39-1 5.45-3 9.715+1 1.368	1.981 6.18-2 -3.12-4 2.954+1 1.410 1.94-1 3.04-2 5.309+1 1.475	1.989 -8.56-2 -3.38-4 1.789+1 1.407 5.16-1 4.37-2 3.169+1 1.471	1.993 -6.44-2 -3.44-4 1.157+1 1.374 7.64-1 5.52-2 2.025+1 1.439	1.994 2.24-2 -3.45-4 7.864+0 1.331 9.62-1 6.62-2 1.364+1 1.398	1.993 1.38-1 -3.43-4 5.565+0 1.286 1.13+0 7.74-2 9.571+0 1.354	5.675+0 1.990 2.64-1 -3.39-4 4.068+0 1.241 1.27+0 8.91-2 6.944+0 1.310	1.986 3.95-1 -3.34-4 3.054+0 1.197 1.39+0 1.01-1 5.178+0 1.266	1.981 5.26-1 -3.29-4 2.345+0 1.153 1.49+0 1.13-1 3.950+0 1.222	1.969 7.86-1 -3.17-4 1.459+0 1.066 1.66+0 1.36-1 2.430+0 1.135	1.956 1.03+ -3.00 9.613 0.986 1.79+ 1.58- 1.585
$S_{1/2}$ $b =$ $805.8 \text{ eV}$ $P_{1/2}$ $b =$ $523.7 \text{ eV}$ $P_{3/2}$ $b =$	$ \beta $ $ \gamma $ $ \delta $ $ \sigma $ $ \beta $ $ \gamma $ $ \delta $ $ \sigma $ $ \beta $ $ \gamma $ $ \gamma $	1.966 8.62-1 -1.55-4 5.267+1 1.273 -2.39-1 5.45-3 9.715+1 1.368 -1.68-1	1.981 6.18-2 -3.12-4 2.954+1 1.410 1.94-1 3.04-2 5.309+1 1.475 2.62-1	1.989 -8.56-2 -3.38-4 1.789+1 1.407 5.16-1 4.37-2 3.169+1 1.471 5.87-1	1.993 -6.44-2 -3.44-4 1.157+1 1.374 7.64-1 5.52-2 2.025+1 1.439 8.41-1	1.994 2.24-2 -3.45-4 7.864+0 1.331 9.62-1 6.62-2 1.364+1 1.398 1.04+0	1.993 1.38-1 -3.43-4 5.565+0 1.286 1.13+0 7.74-2 9.571+0 1.354 1.21+0	5.675+0 1.990 2.64-1 -3.39-4 4.068+0 1.241 1.27+0 8.91-2 6.944+0 1.310 1.36+0	1.986 3.95 – 1 -3.34 – 4 3.054+0 1.197 1.39+0 1.01 – 1 5.178+0 1.266 1.48+0	1.981 5.26-1 -3.29-4 2.345+0 1.153 1.49+0 1.13-1 3.950+0 1.222 1.59+0	1.969 7.86-1 -3.17-4 1.459+0 1.066 1.66+0 1.36-1 2.430+0 1.135 1.76+0	1.956 1.03+ -3.00 9.613 0.986 1.79+ 1.58- 1.585 1.054 1.89+
S <sub>1/2</sub> S <sub>b</sub> = 1805.8 eV 191/2 S <sub>b</sub> = 1523.7 eV 193/2 S <sub>b</sub> = 1351.1 eV	$ \begin{array}{c} \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta \end{array} $	1.966 8.62-1 -1.55-4 5.267+1 1.273 -2.39-1 5.45-3 9.715+1 1.368 -1.68-1 1.61-2	1.981 6.18-2 -3.12-4 2.954+1 1.410 1.94-1 3.04-2 5.309+1 1.475 2.62-1 3.53-2	1.989 -8.56-2 -3.38-4 1.789+1 1.407 5.16-1 4.37-2 3.169+1 1.471	1.993 -6.44-2 -3.44-4 1.157+1 1.374 7.64-1 5.52-2 2.025+1 1.439	1.994 2.24-2 -3.45-4 7.864+0 1.331 9.62-1 6.62-2 1.364+1 1.398	1.993 1.38-1 -3.43-4 5.565+0 1.286 1.13+0 7.74-2 9.571+0 1.354	5.675+0 1.990 2.64-1 -3.39-4 4.068+0 1.241 1.27+0 8.91-2 6.944+0 1.310	1.986 3.95-1 -3.34-4 3.054+0 1.197 1.39+0 1.01-1 5.178+0 1.266	1.981 5.26-1 -3.29-4 2.345+0 1.153 1.49+0 1.13-1 3.950+0 1.222	1.969 7.86-1 -3.17-4 1.459+0 1.066 1.66+0 1.36-1 2.430+0 1.135	1.956 1.03+ -3.00 9.613 0.986 1.79+ 1.58- 1.585 1.054 1.89+
$\frac{2S_{1/2}}{S_b} = \frac{2P_{1/2}}{8805.8 \text{ eV}}$ $\frac{2P_{1/2}}{S_b} = \frac{2P_{3/2}}{S_b} = \frac{2P_{3/2}}{S_b} = \frac{2P_{3/2}}{3351.1 \text{ eV}}$	$ \begin{array}{c} \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta \end{array} $	$\begin{array}{c} 1.966 \\ 8.62 - 1 \\ -1.55 - 4 \\ \hline 5.267 + 1 \\ 1.273 \\ -2.39 - 1 \\ 5.45 - 3 \\ \hline 9.715 + 1 \\ 1.368 \\ -1.68 - 1 \\ 1.61 - 2 \\ \begin{array}{c} 2 \\ 2 \\ 1/2 \end{array} \mathbf{4d_{3/2}^4 \mathbf{4d_{5/6}^6}} \end{array}$	1.981 6.18-2 -3.12-4 2.954+1 1.410 1.94-1 3.04-2 5.309+1 1.475 2.62-1 3.53-2	1.989 -8.56-2 -3.38-4 1.789+1 1.407 5.16-1 4.37-2 3.169+1 1.471 5.87-1	1.993 -6.44-2 -3.44-4 1.157+1 1.374 7.64-1 5.52-2 2.025+1 1.439 8.41-1	1.994 2.24-2 -3.45-4 7.864+0 1.331 9.62-1 6.62-2 1.364+1 1.398 1.04+0	1.993 1.38-1 -3.43-4 5.565+0 1.286 1.13+0 7.74-2 9.571+0 1.354 1.21+0	5.675+0 1.990 2.64-1 -3.39-4 4.068+0 1.241 1.27+0 8.91-2 6.944+0 1.310 1.36+0	1.986 3.95 – 1 -3.34 – 4 3.054+0 1.197 1.39+0 1.01 – 1 5.178+0 1.266 1.48+0	1.981 5.26-1 -3.29-4 2.345+0 1.153 1.49+0 1.13-1 3.950+0 1.222 1.59+0	1.969 7.86-1 -3.17-4 1.459+0 1.066 1.66+0 1.36-1 2.430+0 1.135 1.76+0	1.956 1.03+ -3.00 9.613 0.986 1.79+ 1.58- 1.585 1.054 1.89+
$S_{1/2}$ $S_{b}$ = 1805.8 eV $S_{b}$ = 1805.8 eV $S_{b}$ = 1805.2.7 eV $S_{b}$ = 18351.1 eV $S_{b}$ = 18351.1 eV	$ \begin{array}{c} \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta \end{array} $	$\begin{array}{c} 1.966 \\ 8.62-1 \\ -1.55-4 \\ \hline 5.267+1 \\ 1.273 \\ -2.39-1 \\ 5.45-3 \\ 9.715+1 \\ 1.368 \\ -1.68-1 \\ 1.61-2 \\ \frac{1}{2} \ \mathbf{4d_{3/2}^4} \ \mathbf{4d_{5/2}^6} \\ k \ (\mathrm{eV}) \end{array}$	1.981 6.18-2 -3.12-4 2.954+1 1.410 1.94-1 3.04-2 5.309+1 1.475 2.62-1 3.53-2	1.989 -8.56-2 -3.38-4 1.789+1 1.407 5.16-1 4.37-2 3.169+1 1.471 5.87-1 4.59-2	1.993 -6.44-2 -3.44-4 1.157+1 1.374 7.64-1 5.52-2 2.025+1 1.439 8.41-1 5.52-2	1.994 2.24-2 -3.45-4 7.864+0 1.331 9.62-1 6.62-2 1.364+1 1.398 1.04+0 6.42-2	1.993 1.38-1 -3.43-4 5.565+0 1.286 1.13+0 7.74-2 9.571+0 1.354 1.21+0 7.36-2	5.675+0 1.990 2.64-1 -3.39-4 4.068+0 1.241 1.27+0 8.91-2 6.944+0 1.310 1.36+0 8.37-2	1.986 3.95-1 -3.34-4 3.054+0 1.197 1.39+0 1.01-1 5.178+0 1.266 1.48+0 9.43-2	1.981 5.26-1 -3.29-4 2.345+0 1.153 1.49+0 1.13-1 3.950+0 1.222 1.59+0 1.05-1	1.969 7.86-1 -3.17-4 1.459+0 1.066 1.66+0 1.36-1 2.430+0 1.135 1.76+0 1.25-1	1.956 1.03+ -3.00 9.613 0.986 1.79+ 1.58- 1.585 1.054 1.89+ 1.45-
Shell	β γ δ σ β γ δ σ β γ δ	$\begin{array}{c} 1.966 \\ 8.62-1 \\ -1.55-4 \\ \hline 5.267+1 \\ 1.273 \\ -2.39-1 \\ 5.45-3 \\ \hline 9.715+1 \\ 1.368 \\ -1.68-1 \\ 1.61-2 \\ \frac{2}{1/2} \mathbf{4d_{3/2}^4} \mathbf{4d_{5/2}^6} \\ \underline{k \ (eV)} \\ \hline 4000 \end{array}$	1.981 6.18-2 -3.12-4 2.954+1 1.410 1.94-1 3.04-2 5.309+1 1.475 2.62-1 3.53-2	1.989 -8.56-2 -3.38-4 1.789+1 1.407 5.16-1 4.37-2 3.169+1 1.471 5.87-1 4.59-2	1.993 -6.44-2 -3.44-4 1.157+1 1.374 7.64-1 5.52-2 2.025+1 1.439 8.41-1 5.52-2	1.994 2.24-2 -3.45-4 7.864+0 1.331 9.62-1 6.62-2 1.364+1 1.398 1.04+0 6.42-2	1.993 1.38-1 -3.43-4 5.565+0 1.286 1.13+0 7.74-2 9.571+0 1.354 1.21+0 7.36-2	5.675+0 1.990 2.64-1 -3.39-4 4.068+0 1.241 1.27+0 8.91-2 6.944+0 1.316+0 8.37-2	1.986 3.95-1 -3.34-4 3.054+0 1.197 1.39+0 1.01-1 5.178+0 1.266 1.48+0 9.43-2	1.981 5.26-1 -3.29-4 2.345+0 1.153 1.49+0 1.13-1 3.950+0 1.222 1.59+0 1.05-1	1.969 7.86-1 -3.17-4 1.459+0 1.066 1.66+0 1.36-1 2.430+0 1.135 1.76+0 1.25-1	1.956 1.03+ -3.00 9.613 0.986 1.79+ 1.58- 1.054 1.89+ 1.45-
$\frac{2s_{1/2}}{E_b} = \frac{2s_{1/2}}{8805.8 \text{ eV}}$ $\frac{2p_{1/2}}{E_b} = \frac{3s_{2/2}}{8523.7 \text{ eV}}$ $\frac{2p_{3/2}}{E_b} = \frac{3s_{2/2}}{3351.1 \text{ eV}}$ $\frac{2}{2} = \frac{48}{8}$ , Cd:	β γ δ σ β γ δ σ β γ δ σ β κ σ β σ β σ σ β σ σ σ σ σ σ σ σ σ σ	$\begin{array}{c} 1.966 \\ 8.62-1 \\ -1.55-4 \\ \hline 5.267+1 \\ 1.273 \\ -2.39-1 \\ 5.45-3 \\ 9.715+1 \\ 1.368 \\ -1.68-1 \\ 1.61-2 \\ \frac{2}{1/2} \mathbf{4d_{3/2}^4} \mathbf{4d_{5/2}^6} \\ \frac{k \text{ (eV)}}{4000} \\ \hline 0.000+0 \end{array}$	1.981 6.18-2 -3.12-4 2.954+1 1.410 1.94-1 3.04-2 5.309+1 1.475 2.62-1 3.53-2	1.989 -8.56-2 -3.38-4 1.789+1 1.407 5.16-1 4.37-2 3.169+1 1.471 5.87-1 4.59-2	1.993 -6.44-2 -3.44-4 1.157+1 1.374 7.64-1 5.52-2 2.025+1 1.439 8.41-1 5.52-2 7000 1.204+1	1.994 2.24-2 -3.45-4 7.864+0 1.331 9.62-1 6.62-2 1.364+1 1.398 1.04+0 6.42-2	1.993 1.38-1 -3.43-4 5.565+0 1.286 1.13+0 7.74-2 9.571+0 1.354 1.21+0 7.36-2	5.675+0 1.990 2.64-1 -3.39-4 4.068+0 1.241 1.27+0 8.91-2 6.944+0 1.310 1.36+0 8.37-2	1.986 3.95-1 -3.34-4 3.054+0 1.197 1.39+0 1.01-1 5.178+0 1.266 1.48+0 9.43-2	1.981 5.26-1 -3.29-4 2.345+0 1.153 1.49+0 1.13-1 3.950+0 1.222 1.59+0 1.05-1	1.969 7.86-1 -3.17-4 1.459+0 1.066 1.66+0 1.36-1 2.430+0 1.135 1.76+0 1.25-1	1.956 1.03+ -3.00 9.613 0.986 1.79+ 1.58- 1.054 1.89+ 1.45-
$\frac{2S_{1/2}}{S_{b}} = \frac{2S_{1/2}}{8805.8 \text{ eV}}$ $\frac{2P_{1/2}}{S_{b}} = \frac{2P_{3/2}}{S_{b}} = \frac{2P_{3/2}}{8351.1 \text{ eV}}$ $\frac{2P_{3/2}}{S_{b}} = \frac{2P_{3/2}}{S_{b}} = \frac{2P_{3/2}}{$	β γ δ σ β γ δ δ ( <b>Kr</b> )5s	$\begin{array}{c} 1.966 \\ 8.62-1 \\ -1.55-4 \\ \hline 5.267+1 \\ 1.273 \\ -2.39-1 \\ 5.45-3 \\ 9.715+1 \\ 1.368 \\ -1.68-1 \\ 1.61-2 \\ \hline 2_{1/2}^2  \mathbf{4d_{3/2}^4}  \mathbf{4d_{5/2}^6} \\ k  (\text{eV}) \\ \hline 4000 \\ 0.000+0 \\ 0.000 \end{array}$	1.981 6.18-2 -3.12-4 2.954+1 1.410 1.94-1 3.04-2 5.309+1 1.475 2.62-1 3.53-2 2	1.989 -8.56-2 -3.38-4 1.789+1 1.407 5.16-1 4.37-2 3.169+1 1.471 5.87-1 4.59-2 6000 1.597+1 1.987	1.993 -6.44-2 -3.44-4 1.157+1 1.374 7.64-1 5.52-2 2.025+1 1.439 8.41-1 5.52-2 7000 1.204+1 1.992	1.994 2.24-2 -3.45-4 7.864+0 1.331 9.62-1 6.62-2 1.364+1 1.398 1.04+0 6.42-2	1.993 1.38-1 -3.43-4 5.565+0 1.286 1.13+0 7.74-2 9.571+0 1.354 1.21+0 7.36-2	5.675+0 1.990 2.64-1 -3.39-4 4.068+0 1.241 1.27+0 8.91-2 6.944+0 1.310 1.36+0 8.37-2	1.986 3.95-1 -3.34-4 3.054+0 1.197 1.39+0 1.01-1 5.178+0 1.266 1.48+0 9.43-2 11000 4.896+0 1.987	1.981 5.26-1 -3.29-4 2.345+0 1.153 1.49+0 1.13-1 3.950+0 1.222 1.59+0 1.05-1 12000 4.074+0 1.983	1.969 7.86-1 -3.17-4 1.459+0 1.066 1.66+0 1.36-1 2.430+0 1.135 1.76+0 1.25-1 14000 2.919+0 1.972	1.956 1.03+ -3.00 9.613 0.986 1.79+ 1.58- 1.054 1.89+ 1.45- 16000 2.170 1.959
$\frac{2S_{1/2}}{S_b} =$ $\frac{2P_{1/2}}{S_b} =$ $\frac{2P_{1/2}}{S_b} =$ $\frac{2P_{3/2}}{S_b} =$ $2P_{3$	β γ δ σ β γ δ δ ( <b>Kr</b> )5s	$\begin{array}{c} 1.966 \\ 8.62-1 \\ -1.55-4 \\ \hline 5.267+1 \\ 1.273 \\ -2.39-1 \\ 5.45-3 \\ \hline 9.715+1 \\ 1.368 \\ -1.68-1 \\ 1.61-2 \\ \frac{2}{1/2} \mathbf{4d_{3/2}^4} \mathbf{4d_{5/2}^6} \\ \hline k \ (eV) \\ \hline 4000 \\ 0.000+0 \\ 0.000+0 \\ \end{array}$	1.981 6.18-2 -3.12-4 2.954+1 1.410 1.94-1 3.04-2 5.309+1 1.475 2.62-1 3.53-2 2	1.989 -8.56-2 -3.38-4 1.789+1 1.407 5.16-1 4.37-2 3.169+1 1.471 5.87-1 4.59-2 6000 1.597+1 1.987 -6.90-2	1.993 -6.44-2 -3.44-4 1.157+1 1.374 5.52-2 2.025+1 1.439 8.41-1 5.52-2 7000 1.204+1 1.992 -8.27-2	1.994 2.24-2 -3.45-4 7.864+0 1.331 9.62-1 6.62-2 1.364+1 1.398 1.04+0 6.42-2 8000 9.325+0 1.994 -1.47-2	1.993 1.38-1 -3.43-4 5.565+0 1.286 1.13+0 7.74-2 9.571+0 1.354 1.21+0 7.36-2 9000 7.388+0 1.993 8.89-2	5.675+0 1.990 2.64-1 -3.39-4 4.068+0 1.241 1.27+0 8.91-2 6.944+0 1.310 1.36+0 8.37-2 10000 5.966+0 1.991 2.09-1	1.986 3.95-1 -3.34-4 3.054+0 1.197 1.39+0 1.01-1 5.178+0 1.266 1.48+0 9.43-2 11000 4.896+0 1.987 3.35-1	1.981 5.26-1 -3.29-4 2.345+0 1.153 1.49+0 1.13-1 3.950+0 1.222 1.59+0 1.05-1	1.969 7.86-1 -3.17-4 1.459+0 1.066 1.66+0 1.36-1 2.430+0 1.135 1.76+0 1.25-1 14000 2.919+0 1.972 7.21-1	1.956 1.03+ -3.06 9.613 0.986 1.79+ 1.58- 1.585 1.054 1.45- 16000 2.170 1.959 9.64-
$\frac{2S_{1/2}}{S_{b}} = \frac{2S_{1/2}}{8805.8 \text{ eV}}$ $\frac{2P_{1/2}}{S_{b}} = \frac{2P_{3/2}}{S_{b}} = \frac{2P_{3/2}}{8351.1 \text{ eV}}$ $\frac{2P_{3/2}}{S_{b}} = \frac{2P_{3/2}}{S_{b}} = \frac{2P_{3/2}}{$	β γ δ σ β γ δ δ ( <b>Kr</b> )5s	$\begin{array}{c} 1.966 \\ 8.62-1 \\ -1.55-4 \\ \hline 5.267+1 \\ 1.273 \\ -2.39-1 \\ 5.45-3 \\ 9.715+1 \\ 1.368 \\ -1.68-1 \\ 1.61-2 \\ \hline 2_{1/2}^2  \mathbf{4d_{3/2}^4}  \mathbf{4d_{5/2}^6} \\ k  (\text{eV}) \\ \hline 4000 \\ 0.000+0 \\ 0.000 \end{array}$	1.981 6.18-2 -3.12-4 2.954+1 1.410 1.94-1 3.04-2 5.309+1 1.475 2.62-1 3.53-2 2	1.989 -8.56-2 -3.38-4 1.789+1 1.407 5.16-1 4.37-2 3.169+1 1.471 5.87-1 4.59-2 6000 1.597+1 1.987	1.993 -6.44-2 -3.44-4 1.157+1 1.374 7.64-1 5.52-2 2.025+1 1.439 8.41-1 5.52-2 7000 1.204+1 1.992	1.994 2.24-2 -3.45-4 7.864+0 1.331 9.62-1 6.62-2 1.364+1 1.398 1.04+0 6.42-2	1.993 1.38-1 -3.43-4 5.565+0 1.286 1.13+0 7.74-2 9.571+0 1.354 1.21+0 7.36-2	5.675+0 1.990 2.64-1 -3.39-4 4.068+0 1.241 1.27+0 8.91-2 6.944+0 1.310 1.36+0 8.37-2	1.986 3.95-1 -3.34-4 3.054+0 1.197 1.39+0 1.01-1 5.178+0 1.266 1.48+0 9.43-2 11000 4.896+0 1.987	1.981 5.26-1 -3.29-4 2.345+0 1.153 1.49+0 1.13-1 3.950+0 1.222 1.59+0 1.05-1 12000 4.074+0 1.983	1.969 7.86-1 -3.17-4 1.459+0 1.066 1.66+0 1.36-1 2.430+0 1.135 1.76+0 1.25-1 14000 2.919+0 1.972	1.956 1.03+ -3.06 9.613 0.986 1.79+ 1.585 1.054 1.89+ 1.45- 16000 2.170 1.959 9.64- -3.445

T <b>able 1</b> (conti	inued)											
3727.0 eV	γ	-3.46 - 1	9.88 - 2	4.37 - 1	6.99 - 1	9.08 - 1	1.08+0	1.23+0	1.36+0	1.47+0	1.64+0	1.78+0
	δ	-8.72-3	2.65-2	4.05-2	5.20-2	6.30-2	7.44-2	8.60-2	9.76-2	1.09-1	1.31-1	1.52-1
$2p_{3/2}$	σ	1.043+2	5.769+1	3.456+1	2.215+1	1.495+1	1.051+1	7.640+0	5.705+0	4.357+0	2.686+0	1.756+0
$E_b = 3537.5 \text{ eV}$	β	1.298 -2.78-1	1.467 1.71-1	1.477 5.12-1	1.452 7.79-1	1.415 9.94—1	1.374 1.17+0	1.331 1.33+0	1.288 1.46+0	1.244 1.57+0	1.159 1.75+0	1.080 1.88+0
3537.5 eV	$\gamma \\ \delta$	-2.78 - 1 7.21-3	3.27-2	5.12-1 4.37-2	7.79-1 5.27-2	9.94—1 6.17—2	7.11–2	8.09-2	9.11-2	1.57+0	1.75+0	1.39-1
Z = 49 In:		$^{\frac{2}{1/2}}4d_{3/2}^{4}4d_{5/2}^{6}$		7,57 2	3,21 2	0.17 2	7,11 2	0.03 2	3,11 2	1.01 1	1.20 1	1,55
2 10, 111.	[111]00	k (eV)	2 °P1/2									
Shell		4000	5000	6000	7000	8000	9000	10000	11000	12000	14000	16000
2s <sub>1/2</sub>	σ	0.000+0	2.249+1	1.656+1	1.253+1	9.738+0	7.736+0	6.260+0	5.147+0	4.290+0	3.081+0	2.295+0
$E_b =$	$\beta$	0.000	1.972	1.984	1.990	1.993	1.993	1.991	1.988	1.984	1.974	1.962
4237.5 eV	γ	0.00+0	2.92-1	-3.66-2	-9.13-2	-4.57 - 2	4.47-2	1.57-1	2.79-1	4.05-1	6.56-1	8.95-1
2p <sub>1/2</sub>	$\frac{\delta}{\sigma}$	0.00+0 5.495+1	-3.46-4 3.476+1	-4.08-4 2.128+1	-4.24-4 1.386+1	-4.28-4 9.474+0	-4.28-4 6.736+0	-4.26-4 4.943+0	-4.23-4 3.723+0	-4.18-4 2.866+0	-4.09-4 1.793+0	-3.98-4 1.187+0
$E_b =$	β	0.817	1.378	1.411	1.393	1.359	1.319	1.276	1.233	1.190	1.107	1.031
3938.0 eV	γ	-3.02-1	-1.05 - 3	3.57-1	6.33-1	8.54-1	1.04+0	1.19+0	1.32+0	1.44+0	1.62+0	1.76+0
	δ	-1.82 - 2	2.23 - 2	3.78 - 2	4.97 - 2	6.08 - 2	7.20 - 2	8.30 - 2	9.38 - 2	1.05 - 1	1.26 - 1	1.47 - 1
2p <sub>3/2</sub>	σ	1.104+2	6.249+1	3.760+1	2.416+1	1.635+1	1.152+1	8.381+0	6.266+0	4.791+0	2.960+0	1.939+0
$E_b =$	β	1.170	1.454	1.481	1.463	1.431	1.392	1.349	1.307	1.264	1.181	1.106
3730.1 eV	γ	-3.79 - 1	7.82-2	4.36-1	7.17-1	9.45-1	1.13+0	1.29+0	1.43+0	1.54+0	1.73+0	1.88+0
Z = 50, Sn:	δ [Kr]5c	$-8.06-3$ $\frac{^{2}_{1/2}}{^{1}_{1/2}} 4d_{3/2}^{4} 4d_{5/3}^{6}$	3.02-2	4.21-2	5.13-2	6.03-2	6.93-2	7.84-2	8.75-2	9.66-2	1.15-1	1.34-1
<u>L = 30, 311.</u>	[KI]JS	k (eV)	<sub>2</sub> JP <sub>1/2</sub>									
Shell		4000	5000	6000	7000	8000	9000	10000	11000	12000	14000	16000
2s <sub>1/2</sub>	σ	0.000+0	2.304+1	1.713+1	1.303+1	1.015+1	8.085+0	6.557+0	5.400+0	4.507+0	3.246+0	2.423+0
$E_b =$	β	0.000	1.967	1.980	1.987	1.991	1.992	1.992	1.989	1.986	1.976	1.964
4464.7 eV	γ	0.00+0	4.86 - 1	1.43 - 2	-9.10 - 2	-7.09 - 2	4.92 - 3	1.08 - 1	2.24 - 1	3.45 - 1	5.89 - 1	8.25 - 1
	δ	0.00+0	-3.44-4	-4.47 - 4	-4.72 - 4	-4.80 - 4	-4.81-4	-4.80 - 4	-4.77 - 4	-4.72 - 4	-4.63-4	-4.51 - 4
$2p_{1/2}$	σ	0.000+0	3.747+1	2.311+1	1.510+1	1.035+1	7.378+0	5.424+0	4.092+0	3.156+0	1.979+0	1.314+0
$E_b = 4156.1 \text{ eV}$	$\beta$ $\gamma$	0.000 0.00+0	1.347 -1.11-1	1.409 2.72-1	1.399 5.64-1	1.369 7.96-1	1.332 9.88-1	1.291 1.15+0	1.249 1.28+0	1.208 1.40+0	1.129 1.60+0	1.055 1.75+0
4130.1 CV	δ	0.00+0	1.63-2	3.48-2	4.70-2	5.79-2	6.85-2	7.88-2	8.92-2	9.96-2	1.21-1	1.42-1
2p <sub>3/2</sub>	σ	1.102+2	6.746+1	4.079+1	2.629+1	1.782+1	1.258+1	9.167+0	6.863+0	5.255+0	3.255+0	2.136+0
$E_b =$	$\beta$	0.834	1.432	1.481	1.472	1.443	1.407	1.367	1.326	1.285	1.206	1.132
3928.8 eV	γ	-3.37 - 1	-2.39-2	3.56 - 1	6.52 - 1	8.90 - 1	1.09+0	1.25+0	1.39+0	1.51+0	1.71+0	1.87+0
7 F1 Ch.	δ	-2.64-2	2.65-2	4.03-2	4.96-2	5.80-2	6.64-2	7.48-2	8.33-2	9.21-2	1.10-1	1.29-1
L = 51, SD:	[Kr]5s	<sup>2</sup> <sub>1/2</sub> 4d <sup>4</sup> <sub>3/2</sub> 4d <sup>6</sup> <sub>5/3</sub> k (eV)	<sub>2</sub> 5p <sub>1/2</sub> 5p <sub>3/2</sub>									
CI II		(01)										
Shell		5000	6000	7000	8000	9000	10000	11000	12000	14000	16000	18000
Shell 2s <sub>1/2</sub>	σ	5000 2.339+1	6000 1.768+1	7000 1.350+1	8000 1.056+1	9000 8.430+0	10000 6.851+0	11000 5.653+0	12000 4.726+0	14000 3.413+0	16000 2.554+0	18000 1.966+0
2s <sub>1/2</sub>	σ β	5000 2.339+1 1.961	6000 1.768+1 1.975	7000 1.350+1 1.984	8000 1.056+1 1.989	9000 8.430+0 1.991	10000 6.851+0 1.991	11000 5.653+0 1.990	12000 4.726+0 1.987	14000 3.413+0 1.978	16000 2.554+0 1.967	18000 1.966+0 1.954
$2s_{1/2}$ $E_b =$ 4698.3 eV	σ β γ	2.339+1 1.961 7.74-1	1.768+1 1.975 8.97-2	1.350+1	1.056+1	8.430+0	6.851+0	5.653+0	4.726+0	3.413+0 1.978 5.23-1	2.554+0	1.966+0 1.954 9.82-1
$2s_{1/2}$ $E_b =$ 4698.3 eV	$\beta$	2.339+1 1.961 7.74-1 -2.98-4	1.768+1 1.975 8.97-2 -4.82-4	1.350+1 1.984 -7.78-2 -5.21-4	1.056+1 1.989 -8.81-2 -5.34-4	8.430+0 1.991 -3.00-2 -5.37-4	6.851+0 1.991 6.14-2 -5.36-4	5.653+0 1.990 1.69-1 -5.34-4	4.726+0 1.987 2.85-1 -5.30-4	3.413+0 1.978 5.23-1 -5.19-4	2.554+0 1.967 7.57-1 -5.07-4	1.966+0 1.954 9.82-1 -4.92-4
$ 2s_{1/2}  E_b =  4698.3 eV $ $ 2p_{1/2} $	$\beta$ $\gamma$ $\delta$ $\sigma$	2.339+1 1.961 7.74-1 -2.98-4 4.016+1	1.768+1 1.975 8.97-2 -4.82-4 2.501+1	1.350+1 1.984 -7.78-2 -5.21-4 1.641+1	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0	6.851+0 1.991 6.14-2 -5.36-4 5.936+0	5.653+0 1.990 1.69-1 -5.34-4 4.487+0	4.726+0 1.987 2.85-1 -5.30-4 3.466+0	3.413+0 1.978 5.23-1 -5.19-4 2.180+0	2.554+0 1.967 7.57-1 -5.07-4 1.450+0	1.966+0 1.954 9.82-1 -4.92-4 1.008+0
$2s_{1/2}$ $E_b =$ $4698.3 \text{ eV}$ $2p_{1/2}$ $E_b =$	$\begin{array}{c} \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \end{array}$	2.339+1 1.961 7.74-1 -2.98-4 4.016+1 1.296	1.768+1 1.975 8.97-2 -4.82-4 2.501+1 1.401	1.350+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008
$ \begin{array}{c} 2s_{1/2} \\ E_b = \\ 4698.3 \text{ eV} \\ \hline 2p_{1/2} \end{array} $	$\begin{array}{c} \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \end{array}$	2.339+1 1.961 7.74-1 -2.98-4 4.016+1 1.296 -2.32-1	1.768+1 1.975 8.97-2 -4.82-4 2.501+1 1.401 1.79-1	1.350+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0
$2s_{1/2}$ $E_b$ = $4698.3 \text{ eV}$ $2p_{1/2}$ $E_b$ = $4380.4 \text{ eV}$	$\beta$ $\gamma$ $\delta$ $\sigma$ $\beta$ $\gamma$ $\delta$	2.339+1 1.961 7.74-1 -2.98-4 4.016+1 1.296 -2.32-1 8.07-3	1.768+1 1.975 8.97-2 -4.82-4 2.501+1 1.401 1.79-1 3.13-2	1.350+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1
$2s_{1/2}$ $E_b =$ 4698.3  eV $2p_{1/2}$ $E_b =$	$\begin{array}{c} \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \end{array}$	2.339+1 1.961 7.74-1 -2.98-4 4.016+1 1.296 -2.32-1	1.768+1 1.975 8.97-2 -4.82-4 2.501+1 1.401 1.79-1	1.350+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0
$2s_{1/2}$ $E_b$ = $4698.3 \text{ eV}$ $2p_{1/2}$ $E_b$ = $4380.4 \text{ eV}$	$\beta$ $\gamma$ $\delta$ $\sigma$ $\beta$ $\gamma$ $\delta$	2.339+1 1.961 7.74-1 -2.98-4 4.016+1 1.296 -2.32-1 8.07-3 7.254+1 1.400 -1.33-1	1.768+1 1.975 8.97-2 -4.82-4 2.501+1 1.401 1.79-1 3.13-2 4.412+1 1.478 2.69-1	1.350+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2 1.000+1 1.385 1.21+0	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346 1.35+0	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1 1.614+0 1.089 1.99+0
$2s_{1/2}$ $E_b =$ $4698.3 \text{ eV}$ $2p_{1/2}$ $E_b =$ $4380.4 \text{ eV}$ $2p_{3/2}$ $E_b =$ $4132.3 \text{ eV}$	$ \begin{array}{c} \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta \end{array} $	2.339+1 1.961 7.74-1 -2.98-4 4.016+1 1.296 -2.32-1 8.07-3 7.254+1 1.400 -1.33-1 2.15-2	1.768+1 1.975 8.97-2 -4.82-4 2.501+1 1.401 1.79-1 3.13-2 4.412+1 1.478 2.69-1 3.82-2	1.350+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2 1.000+1 1.385	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346	4.726+0 1.987 2.85 – 1 -5.30–4 3.466+0 1.228 1.37+0 9.59–2 5.750+0 1.308	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1 1.614+0 1.089
$2s_{1/2}$ $E_b =$ $4698.3 \text{ eV}$ $2p_{1/2}$ $E_b =$ $4380.4 \text{ eV}$ $2p_{3/2}$ $E_b =$ $4132.3 \text{ eV}$	$ \begin{array}{c} \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta \end{array} $	2.339+1 $1.961$ $7.74-1$ $-2.98-4$ $4.016+1$ $1.296$ $-2.32-1$ $8.07-3$ $7.254+1$ $1.400$ $-1.33-1$ $2.15-2$ $1$ $2$ $2$ $1$ $2$ $4$ $3$ $4$ $4$ $6$ $5$	1.768+1 1.975 8.97-2 -4.82-4 2.501+1 1.401 1.79-1 3.13-2 4.412+1 1.478 2.69-1 3.82-2	1.350+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2 1.000+1 1.385 1.21+0	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346 1.35+0	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0 1.308 1.48+0	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1 1.614+0 1.089 1.99+0
$ 2s_{1/2}  E_b = 4698.3 \text{ eV}  2p_{1/2}  E_b = 4380.4 \text{ eV}  2p_{3/2}  E_b = 4132.3 \text{ eV}  Z = 52, Te:$	$ \begin{array}{c} \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta \end{array} $	$\begin{array}{c} 2.339+1 \\ 1.961 \\ 7.74-1 \\ -2.98-4 \\ 4.016+1 \\ 1.296 \\ -2.32-1 \\ 8.07-3 \\ \hline 7.254+1 \\ 1.400 \\ -1.33-1 \\ 2.152 \\ 2.122 \\ \mathbf{4d_{3/2}^4 4d_{5/2}^6} \\ k \ (\mathrm{eV}) \end{array}$	$1.768+1$ $1.975$ $8.97-2$ $-4.82-4$ $2.501+1$ $1.401$ $1.79-1$ $3.13-2$ $4.412+1$ $1.478$ $2.69-1$ $3.82-2$ $2.5p_{1/2}^2.5p_{3/2}^2$	1.350+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2 1.000+1 1.385 1.21+0 7.17-2	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346 1.35+0 8.00-2	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0 1.308 1.48+0 8.87-2	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008+0 1.59-1 1.614+0 1.089 1.99+0 1.43-1
$2s_{1/2}$ $E_b$ = 4698.3 eV $2p_{1/2}$ $E_b$ = 4380.4 eV $2p_{3/2}$ $E_b$ = 4132.3 eV $\mathbf{Z} = 52$ , $\mathbf{Te}$ : Shell	β γ δ σ β γ δ σ β γ δ (Kr)5s	$\begin{array}{c} 2.339+1 \\ 1.961 \\ 7.74-1 \\ -2.98-4 \\ 4.016+1 \\ 1.296 \\ -2.32-1 \\ 8.07-3 \\ 7.254+1 \\ 1.400 \\ -1.33-1 \\ 2.15-2 \\ \frac{2}{1/2} \mathbf{4d_{3/2}^4} \mathbf{4d_{5/2}^6} \\ k \text{ (eV)} \\ \hline 5000 \end{array}$	1.768+1 1.975 8.97-2 -4.82-4 2.501+1 1.401 1.79-1 3.13-2 4.412+1 1.478 2.69-1 3.82-2 2.5p <sub>1/2</sub> <sup>2</sup> 5p <sub>3/2</sub> <sup>2</sup>	1.350+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2 1.000+1 1.385 1.21+0 7.17-2	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346 1.35+0 8.00-2	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0 1.308 1.48+0 8.87-2	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1 1.614+0 1.089 1.99+0 1.43-1
$2s_{1/2}$ $E_b =$ $4698.3 \text{ eV}$ $2p_{1/2}$ $E_b =$ $4380.4 \text{ eV}$ $2p_{3/2}$ $E_b =$ $4132.3 \text{ eV}$ $\mathbf{Z} = 52, \mathbf{Te}$ : Shell $2s_{1/2}$	β γ δ σ β γ δ σ β γ δ (Kr)5s	$\begin{array}{c} 2.339+1 \\ 1.961 \\ 7.74-1 \\ -2.98-4 \\ 4.016+1 \\ 1.296 \\ -2.32-1 \\ 8.07-3 \\ 7.254+1 \\ 1.400 \\ -1.33-1 \\ 2.15-2 \\ \frac{2}{12} \mathbf{4d_{3/2}^4} \mathbf{4d_{5/2}^6} \\ k \text{ (eV)} \\ \hline 5000 \\ 2.301+1 \end{array}$	1.768+1 1.975 8.97-2 -4.82-4 2.501+1 1.401 1.79-1 3.13-2 4.412+1 1.478 2.69-1 3.82-2 2.5p <sub>1/2</sub> <sup>2</sup> 5p <sub>3/2</sub> <sup>2</sup> 6000 1.819+1	1.350+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2 1.000+1 1.385 1.21+0 7.17-2	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.345 1.35+0 8.00-2	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0 1.308 1.48+0 8.87-2	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1 1.614+0 1.089 1.99+0 1.43-1
$2s_{1/2}$ $E_b =$ $4698.3 \text{ eV}$ $2p_{1/2}$ $E_b =$ $4380.4 \text{ eV}$ $2p_{3/2}$ $E_b =$ $4132.3 \text{ eV}$ $\mathbf{Z} = 52, \mathbf{Te}$ : Shell $2s_{1/2}$ $E_b =$	β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ δ δ δ δ δ δ δ δ δ δ δ δ	2.339+1 1.961 7.74-1 -2.98-4 4.016+1 1.296 -2.32-1 8.07-3 7.254+1 1.400 -1.33-1 2.15-2 2 k (eV) 5000 2.301+1 1.955	$1.768+1$ $1.975$ $8.97-2$ $-4.82-4$ $2.501+1$ $1.401$ $1.79-1$ $3.13-2$ $4.412+1$ $1.478$ $2.69-1$ $3.82-2$ $2.5p_{1/2}^2.5p_{3/2}^2$ $6000$ $1.819+1$ $1.970$	1.350+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2 8000 1.096+1 1.987	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2 1.000+1 1.385 1.21+0 7.17-2	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346 1.35+0 8.00-2	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0 1.308 1.48+0 8.87-2	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.59-1 1.614+0 1.089 1.99+0 1.43-1 18000 2.073+0 1.957
$ 2s_{1/2}  E_b =  4698.3 eV $ $ 2p_{1/2}  E_b =  4380.4 eV $ $ 2p_{3/2}  E_b =  4132.3 eV $ $ \mathbf{Z} = 52, \mathbf{Te}: $ Shell $ 2s_{1/2} $	β γ δ σ β γ δ σ β γ δ (Kr)5s	$\begin{array}{c} 2.339+1 \\ 1.961 \\ 7.74-1 \\ -2.98-4 \\ 4.016+1 \\ 1.296 \\ -2.32-1 \\ 8.07-3 \\ 7.254+1 \\ 1.400 \\ -1.33-1 \\ 2.15-2 \\ \frac{2}{12} \mathbf{4d_{3/2}^4} \mathbf{4d_{5/2}^6} \\ k \text{ (eV)} \\ \hline 5000 \\ 2.301+1 \end{array}$	1.768+1 1.975 8.97-2 -4.82-4 2.501+1 1.401 1.79-1 3.13-2 4.412+1 1.478 2.69-1 3.82-2 2.5p <sub>1/2</sub> <sup>2</sup> 5p <sub>3/2</sub> <sup>2</sup> 6000 1.819+1	1.350+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2 1.000+1 1.385 1.21+0 7.17-2	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.345 1.35+0 8.00-2	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0 1.308 1.48+0 8.87-2	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1 1.614+0 1.089 1.99+0 1.43-1
$2s_{1/2}$ $E_b$ = 4698.3 eV $2p_{1/2}$ $E_b$ = 4380.4 eV $2p_{3/2}$ $E_b$ = 4132.3 eV $\mathbf{Z} = 52$ , $\mathbf{Te}$ : Shell $2s_{1/2}$ $E_b$ = $2s_{1/2}$	β γ δ σ β γ δ δ β γ δ (Kr)5s	$\begin{array}{c} 2.339+1 \\ 1.961 \\ 7.74-1 \\ -2.98-4 \\ 4.016+1 \\ 1.296 \\ -2.32-1 \\ 8.07-3 \\ \hline 7.254+1 \\ 1.400 \\ -1.33-1 \\ 2.15-2 \\ \frac{2}{1/2}  \mathbf{4d_{3/2}^4}  \mathbf{4d_{5/2}^6} \\ k  (\text{eV}) \\ \hline 5000 \\ 2.301+1 \\ 1.955 \\ 1.24+0 \\ -2.47-5 \\ 4.258+1 \end{array}$	1.768+1 1.975 8.97-2 -4.82-4 2.501+1 1.401 1.79-1 3.13-2 4.412+1 1.478 2.69-1 3.82-2 2.5p <sup>2</sup> <sub>1/2</sub> 5p <sup>2</sup> <sub>3/2</sub> 6000 1.819+1 1.970 1.96-1 -5.10-4 2.700+1	1.350+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2 7000 1.397+1 1.981 -4.97-2 -5.69-4 1.779+1	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2 8000 1.096+1 1.987 -9.63-2 -5.90-4 1.226+1	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2 9000 8.776+0 1.990 -5.87-2 -5.96-4 8.781+0	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2 1.000+1 1.385 1.21+0 7.17-2 10000 7.147+0 1.991 1.94-2 -5.95-4 6.482+0	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346 1.35+0 8.00-2 11000 5.908+0 1.990 1.18-1 -5.93-4 4.909+0	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0 1.308 1.48+0 8.87-2 12000 4.948+0 1.988 2.28-1 -5.89-4 3.798+0	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1 14000 3.583+0 1.980 4.59-1 -5.79-4 2.395+0	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1 16000 2.688+0 1.970 6.92-1 -5.66-4 1.597+0	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1 1.614+0 1.089 1.99+0 1.43-1 18000 2.073+0 1.957 9.16-1 -5.52-4 1.112+0
$2s_{1/2}$ $E_b$ = 4698.3 eV $2p_{1/2}$ $E_b$ = 4380.4 eV $2p_{3/2}$ $E_b$ = 4132.3 eV $\mathbf{Z} = 52$ , $\mathbf{Te}$ : Shell $2s_{1/2}$ $E_b$ = 4939.2 eV $2p_{1/2}$ $E_b$ = $2p_{1/2}$	β γ δ σ β γ δ δ β γ δ (Kr)5s	$2.339+1$ $1.961$ $7.74-1$ $-2.98-4$ $4.016+1$ $1.296$ $-2.32-1$ $8.07-3$ $7.254+1$ $1.400$ $-1.33-1$ $2.15-2$ $2.1/2$ $4\mathbf{d}_{3/2}^{4}$ $4\mathbf{d}_{5/2}^{6}$ $k$ (eV) $5000$ $2.301+1$ $1.955$ $1.24+0$ $-2.47-5$ $4.258+1$ $1.210$	$1.768+1$ $1.975$ $8.97-2$ $-4.82-4$ $2.501+1$ $1.401$ $1.79-1$ $3.13-2$ $4.412+1$ $1.478$ $2.69-1$ $3.82-2$ $2.5p_{1/2}^2.5p_{3/2}^2$ $6000$ $1.819+1$ $1.970$ $1.96-1$ $-5.10-4$ $2.700+1$ $1.389$	1.350+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2 7000 1.397+1 1.981 -4.97-2 -5.69-4 1.779+1 1.405	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2 8000 1.096+1 1.987 -9.63-2 -5.90-4 1.226+1 1.387	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2 9000 8.776+0 1.990 -5.87-2 -5.96-4 8.781+0 1.357	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2 1.000+1 1.385 1.21+0 7.17-2 10000 7.147+0 1.991 1.94-2 -5.95-4 6.482+0 1.322	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346 1.35+0 8.00-2 11000 5.908+0 1.990 1.18-1 -5.93-4 4.909+0 1.284	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0 1.308 1.48+0 8.87-2 12000 4.948+0 1.988 2.28-1 -5.89-4 3.798+0 1.246	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1 14000 3.583+0 1.980 4.59-1 -5.79-4 2.395+0 1.170	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1 16000 2.688+0 1.970 6.92-1 -5.66-4 1.597+0 1.097	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.59-1 1.614+0 1.089 1.99+0 1.43-1 18000 2.073+0 1.957 9.16-1 -5.52-4 1.112+0 1.028
$ 2s_{1/2} E_b = 4698.3 \text{ eV} $ $ 2p_{1/2} E_b = 4380.4 \text{ eV} $ $ 2p_{3/2} E_b = 4132.3 \text{ eV} $ $ \mathbf{Z} = 52, \mathbf{Te}: $ Shell $ 2s_{1/2} E_b = 4939.2 \text{ eV} $ $ 2p_{1/2} $	β γ δ σ β γ δ ( <b>Kr</b> )5s	2.339+1 1.961 7.74-1 -2.98-4 4.016+1 1.296 -2.32-1 8.07-3 7.254+1 1.400 -1.33-1 2.15-2 21/2 4d <sup>4</sup> <sub>3/2</sub> 4d <sup>6</sup> <sub>5/2</sub> k (eV) 5000 2.301+1 1.955 1.24+0 -2.47-5 4.258+1 1.210 -3.59-1	1.768+1 1.975 8.97-2 -4.82-4 2.501+1 1.401 1.79-1 3.13-2 4.412+1 1.478 2.69-1 3.82-2 2.5p <sup>2</sup> <sub>1/2</sub> 5p <sup>2</sup> <sub>3/2</sub> 6000 1.819+1 1.970 1.96-1 -5.10-4 2.700+1 1.389 7.85-2	1.350+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2 7000 1.397+1 1.981 -4.97-2 -5.69-4 1.779+1 1.405 4.05-1	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2 8000 1.096+1 1.987 -9.63-2 -5.90-4 1.226+1 1.387 6.60-1	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2 9000 8.776+0 1.990 -5.87-2 -5.96-4 8.781+0 1.357 8.69-1	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2 1.000+1 1.385 1.21+0 7.17-2 10000 7.147+0 1.991 1.94-2 -5.95-4 6.482+0 1.322 1.05+0	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.35+0 8.00-2 11000 5.908+0 1.990 1.18-1 -5.93-4 4.909+0 1.284 1.20+0	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0 1.308 1.48+0 8.87-2 12000 4.948+0 1.988 2.28-1 -5.89-4 3.798+0 1.246 1.33+0	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1 14000 3.583+0 1.980 4.59-1 -5.79-4 2.395+0 1.170 1.54+0	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1 16000 2.688+0 1.970 6.92-1 -5.66-4 1.597+0 1.097 1.71+0	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1 1.614+0 1.089 1.99+0 1.43-1 18000 2.073+0 1.957 9.16-1 -5.52-4 1.112+0 1.028 1.85+0
$2s_{1/2}$ $E_b$ = 4698.3 eV $2p_{1/2}$ $E_b$ = 4380.4 eV $2p_{3/2}$ $E_b$ = 4132.3 eV $\mathbf{Z} = 52$ , $\mathbf{Te}$ : Shell $2s_{1/2}$ $E_b$ = 4939.2 eV $2p_{1/2}$ $E_b$ = 4612.0 eV	β γ δ σ β γ δ δ [Kr]5s σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ δ σ δ β γ δ δ δ σ δ β γ δ δ δ σ δ β γ δ δ δ σ δ δ δ δ δ δ δ δ δ δ δ δ δ δ δ	2.339+1 1.961 7.74-1 -2.98-4 4.016+1 1.296 -2.32-1 8.07-3 7.254+1 1.400 -1.33-1 2.15-2 2/1/2 4d <sup>4</sup> <sub>3/2</sub> 4d <sup>6</sup> <sub>5/2</sub> k (eV) 5000 2.301+1 1.955 1.24+0 -2.47-5 4.258+1 1.210 -3.59-1 -5.65-3	1.768+1 1.975 8.97-2 -4.82-4 2.501+1 1.401 1.79-1 3.13-2 4.412+1 1.478 2.69-1 3.82-2 2.5p <sup>2</sup> <sub>1/2</sub> 5p <sup>2</sup> <sub>3/2</sub> 6000 1.819+1 1.970 1.96-1 -5.10-4 2.700+1 1.389 7.85-2 2.72-2	1.350+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2 7000 1.397+1 1.981 -4.97-2 -5.69-4 1.779+1 1.405 4.05-1 4.10-2	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2 8000 1.096+1 1.987 -9.63-2 -5.90-4 1.226+1 1.387 6.60-1 5.17-2	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2 9000 8.776+0 1.990 -5.87-2 -5.96-4 8.781+0 1.357 8.69-1 6.19-2	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2 1.000+1 1.385 1.21+0 7.17-2 10000 7.147+0 1.991 1.94-2 -5.95-4 6.482+0 1.322 1.05+0 7.21-2	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346 1.35+0 8.00-2 11000 5.908+0 1.990 1.18-1 -5.93-4 4.909+0 1.284 1.20+0 8.24-2	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0 1.308 1.48+0 8.87-2 12000 4.948+0 1.988 2.28-1 -5.89-4 3.798+0 1.246 1.33+0 9.28-2	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1 14000 3.583+0 1.980 4.59-1 -5.79-4 2.395+0 1.170 1.170 1.579-1 1.170 1.170 1.13-1	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1 16000 2.688+0 1.970 6.92-1 -5.66-4 1.597+0 1.097 1.71+0 1.34-1	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1 1.614+0 1.089 1.99+0 1.43-1 18000 2.073+0 1.957 9.16-1 -5.52-4 1.112+0 1.028 1.85+0 1.54-1
$2s_{1/2}$ $E_b$ = 4698.3 eV $2p_{1/2}$ $E_b$ = 4380.4 eV $2p_{3/2}$ $E_b$ = 4132.3 eV $\mathbf{Z} = 52, \mathbf{Te}$ : Shell $2s_{1/2}$ $E_b$ = 4939.2 eV $2p_{1/2}$ $E_b$ = 4612.0 eV $2p_{3/2}$	β γ δ σ β γ δ δ δ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ σ β γ δ δ σ σ β γ δ δ σ σ β γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ σ σ σ σ σ σ σ σ σ σ σ σ σ σ	2.339+1 1.961 7.74-1 -2.98-4 4.016+1 1.296 -2.32-1 8.07-3 7.254+1 1.400 -1.33-1 2.15-2 2 1/2 4d <sup>4</sup> <sub>3/2</sub> 4d <sup>6</sup> <sub>5/2</sub> k (eV) 5000 2.301+1 1.955 1.24+0 -2.47-5 4.258+1 1.210 -3.59-1 -5.65-3 7.768+1	1.768+1 1.975 8.97-2 -4.82-4 2.501+1 1.401 1.79-1 3.13-2 4.412+1 1.478 2.69-1 3.82-2 2.5p <sup>2</sup> <sub>1/2</sub> 5p <sup>3</sup> <sub>3/2</sub> 6000 1.819+1 1.970 1.96-1 -5.10-4 2.700+1 1.389 7.85-2 2.72-2 4.761+1	1.350+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2 7000 1.397+1 1.981 -4.97-2 -5.69-4 1.779+1 1.405 4.05-1 4.10-2 3.087+1	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2 8000 1.096+1 1.987 -9.63-2 -5.90-4 1.226+1 1.387 6.60-1 5.17-2 2.102+1	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2 9000 8.776+0 1.990 -5.87-2 -5.96-4 8.781+0 1.357 8.69-1 6.19-2 1.489+1	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2 1.000+1 1.385 1.21+0 7.17-2 10000 7.147+0 1.991 1.94-2 -5.95-4 6.482+0 1.322 1.05+0 7.21-2 1.089+1	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346 1.35+0 8.00-2 11000 5.908+0 1.990 1.18-1 -5.93-4 4.909+0 1.284 1.20+0 8.24-2 8.177+0	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0 1.308 1.48+0 8.87-2 12000 4.948+0 1.988 2.28-1 -5.89-4 3.798+0 1.246 1.33+0 9.28-2 6.278+0	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1 14000 3.583+0 1.980 4.59-1 -5.79-4 2.395+0 1.170 1.54+0 1.13-1 3.906+0	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1 16000 2.688+0 1.970 6.92-1 -5.66-4 1.597+0 1.097 1.71+0 1.34-1 2.573+0	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.59-1 1.614+0 1.089 1.99+0 1.43-1  18000 2.073+0 1.957 9.16-1 -5.52-4 1.112+0 1.028 1.85+0 1.54-1 1.772+0
$2s_{1/2}$ $E_b$ = $4698.3$ eV $2p_{1/2}$ $E_b$ = $4380.4$ eV $2p_{3/2}$ $E_b$ = $4132.3$ eV $2 = 52$ , Te:  Shell $2s_{1/2}$ $E_b$ = $4939.2$ eV $2p_{1/2}$ $E_b$ = $4612.0$ eV $2p_{3/2}$ $E_b$ = $4612.0$ eV	β γ δ σ β γ δ δ [Kr]5s σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ δ σ β γ δ δ σ β β γ δ δ σ δ β β γ δ δ σ δ β β γ δ δ σ δ β β γ δ δ σ δ β β γ δ δ σ δ β β γ δ δ σ δ β β γ δ δ σ δ β β γ δ δ δ σ δ δ δ δ δ δ δ δ δ δ δ δ δ δ δ	2.339+1 1.961 7.74-1 -2.98-4 4.016+1 1.296 -2.32-1 8.07-3 7.254+1 1.400 -1.33-1 2.15-2 21/2 4d <sup>4</sup> / <sub>3/2</sub> 4d <sup>6</sup> / <sub>5/3</sub> k (eV) 5000 2.301+1 1.955 1.24+0 -2.47-5 4.258+1 1.210 -3.59-1 -5.65-3 7.768+1 1.349	1.768+1 1.975 8.97-2 -4.82-4 2.501+1 1.401 1.79-1 3.13-2 4.412+1 1.478 2.69-1 3.82-2 2.5p <sup>2</sup> <sub>1/2</sub> 5p <sup>2</sup> <sub>3/2</sub> 6000 1.819+1 1.970 1.96-1 -5.10-4 2.700+1 1.389 7.85-2 2.72-2 4.761+1 1.471	1.350+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2 7000 1.397+1 1.981 -4.97-2 -5.69-4 1.779+1 1.405 4.05-1 4.10-2 3.087+1 1.483	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2 8000 1.096+1 1.987 -9.63-2 -5.90-4 1.226+1 1.387 6.60-1 5.17-2 2.102+1 1.466	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2  9000 8.776+0 1.990 -5.87-2 -5.96-4 8.781+0 1.357 8.69-1 6.19-2 1.489+1 1.437	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2 1.000+1 1.385 1.21+0 7.17-2  10000 7.147+0 1.991 1.94-2 -5.95-4 6.482+0 1.322 1.05+0 7.21-2 1.089+1 1.403	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346 1.35+0 8.00-2 11000 5.908+0 1.990 1.18-1 -5.93-4 4.909+0 1.284 1.20+0 8.24-2 8.177+0 1.366	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0 1.308 1.48+0 8.87-2 12000 4.948+0 1.988 2.28-1 -5.89-4 3.798+0 1.246 1.33+0 9.28-2 6.278+0 1.329	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1 14000 3.583+0 1.980 4.59-1 -5.79-4 2.395+0 1.170 1.54+0 1.13-1 3.906+0 1.254	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1 16000 2.688+0 1.970 6.92-1 -5.66-4 1.597+0 1.097 1.71+0 1.34-1 2.573+0 1.181	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1 1.614+0 1.089 1.99+0 1.43-1  18000 2.073+0 1.957 9.16-1 -5.52-4 1.112+0 1.028 1.85+0 1.54-1 1.772+0 1.111
$2s_{1/2}$ $E_b$ = 4698.3 eV $2p_{1/2}$ $E_b$ = 4380.4 eV $2p_{3/2}$ $E_b$ = 4132.3 eV $\mathbf{Z} = 52$ , $\mathbf{Te}$ : Shell $2s_{1/2}$ $E_b$ = 4939.2 eV $2p_{1/2}$ $E_b$ = $2p_{1/2}$	β γ δ σ β γ δ δ δ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ σ β γ δ δ σ σ β γ δ δ σ σ β γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ σ σ σ σ σ σ σ σ σ σ σ σ σ σ	2.339+1 1.961 7.74-1 -2.98-4 4.016+1 1.296 -2.32-1 8.07-3 7.254+1 1.400 -1.33-1 2.15-2 2 1/2 4d <sup>4</sup> <sub>3/2</sub> 4d <sup>6</sup> <sub>5/2</sub> k (eV) 5000 2.301+1 1.955 1.24+0 -2.47-5 4.258+1 1.210 -3.59-1 -5.65-3 7.768+1	1.768+1 1.975 8.97-2 -4.82-4 2.501+1 1.401 1.79-1 3.13-2 4.412+1 1.478 2.69-1 3.82-2 2.5p <sup>2</sup> <sub>1/2</sub> 5p <sup>3</sup> <sub>3/2</sub> 6000 1.819+1 1.970 1.96-1 -5.10-4 2.700+1 1.389 7.85-2 2.72-2 4.761+1	1.350+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2 7000 1.397+1 1.981 -4.97-2 -5.69-4 1.779+1 1.405 4.05-1 4.10-2 3.087+1	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2 8000 1.096+1 1.987 -9.63-2 -5.90-4 1.226+1 1.387 6.60-1 5.17-2 2.102+1	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2 9000 8.776+0 1.990 -5.87-2 -5.96-4 8.781+0 1.357 8.69-1 6.19-2 1.489+1	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2 1.000+1 1.385 1.21+0 7.17-2 10000 7.147+0 1.991 1.94-2 -5.95-4 6.482+0 1.322 1.05+0 7.21-2 1.089+1	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346 1.35+0 8.00-2 11000 5.908+0 1.990 1.18-1 -5.93-4 4.909+0 1.284 1.20+0 8.24-2 8.177+0	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0 1.308 1.48+0 8.87-2 12000 4.948+0 1.988 2.28-1 -5.89-4 3.798+0 1.246 1.33+0 9.28-2 6.278+0	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1 14000 3.583+0 1.980 4.59-1 -5.79-4 2.395+0 1.170 1.54+0 1.13-1 3.906+0	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1 16000 2.688+0 1.970 6.92-1 -5.66-4 1.597+0 1.097 1.71+0 1.34-1 2.573+0	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1 1.614+0 1.089 1.99+0 1.43-1  18000 2.073+0 1.957 9.16-1 -5.52-4 1.112+0 1.028 1.85+0 1.54-1 1.772+0
$2s_{1/2}$ $E_b$ = 4698.3 eV $2p_{1/2}$ $E_b$ = 4380.4 eV $2p_{3/2}$ $E_b$ = 4132.3 eV $\mathbf{Z} = 52$ , $\mathbf{Te}$ : Shell $2s_{1/2}$ $E_b$ = 4939.2 eV $2p_{1/2}$ $E_b$ = 4612.0 eV $2p_{3/2}$ $E_b$ = 4341.4 eV	β         γ           δ         σ           β         γ           δ         δ           (Kr)5s         σ           β         γ           δ         σ           β         γ           δ         σ           β         γ           δ         σ           β         γ           δ         δ </td <td><math display="block">\begin{array}{c} 2.339+1 \\ 1.961 \\ 7.74-1 \\ -2.98-4 \\ 4.016+1 \\ 1.296 \\ -2.32-1 \\ 8.07-3 \\ 7.254+1 \\ 1.400 \\ -1.33-1 \\ 2.15-2 \\ \frac{2}{1/2} \mathbf{4d}_{3/2}^4 \mathbf{4d}_{5/2}^6 \\ \frac{k \text{ (eV)}}{5000} \\ 2.301+1 \\ 1.955 \\ 1.24+0 \\ -2.47-5 \\ 4.258+1 \\ 1.210 \\ -3.59-1 \\ -5.65-3 \\ 7.768+1 \\ 1.349 \\ -2.51-1 \\ 1.43-2 \end{array}</math></td> <td>1.768+1 1.975 8.97-2 -4.82-4 2.501+1 1.401 1.79-1 3.13-2 4.412+1 1.478 2.69-1 3.82-2 2.5p<sup>2</sup><sub>1/2</sub>5p<sup>2</sup><sub>3/2</sub> 6000 1.819+1 1.970 1.96-1 -5.10-4 2.700+1 1.389 7.85-2 2.72-2 4.761+1 1.471 1.75-1 3.59-2</td> <td>7000 1.397+1 1.981 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2 7000 1.397+1 1.981 -4.97-2 -5.69-4 1.779+1 1.405 4.05-1 4.10-2 3.087+1 1.483 5.02-1</td> <td>1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2 8000 1.096+1 1.987 -9.63-2 -5.90-4 1.226+1 1.387 6.60-1 5.17-2 2.102+1 1.466 7.61-1</td> <td>8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2 9000 8.776+0 1.990 -5.87-2 -5.96-4 8.781+0 1.357 8.69-1 6.19-2 1.437 9.76-1</td> <td>6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 7.51-2 1.000+1 1.385 1.21+0 7.17-2 10000 7.147+0 1.991 1.94-2 -5.95-4 6.482+0 1.322 1.05+0 7.21-2 1.089+1 1.403 1.16+0</td> <td>5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346 1.35+0 8.00-2 11000 5.908+0 1.990 1.18-1 -5.93-4 4.909+0 1.284 1.20+0 8.24-2 8.177+0 1.366 1.32+0</td> <td>4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0 1.308 1.48+0 8.87-2 12000 4.948+0 1.988 2.28-1 -5.89-4 3.798+0 1.246 1.33+0 9.28-2 6.278+0 1.329 1.45+0</td> <td>3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1 14000 3.583+0 1.980 4.59-1 -5.79-4 2.395+0 1.170 1.54+0 1.13-1 3.906+0 1.254 1.68+0</td> <td>2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1 16000 2.688+0 1.970 6.92-1 -5.66-4 1.597+0 1.097 1.71+0 1.34-1 2.573+0 1.181 1.85+0</td> <td>1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1 1.614+0 1.089 1.99+0 1.43-1  18000 2.073+0 1.957 9.16-1 -5.52-4 1.112+0 1.028 1.85+0 1.54-1 1.772+0 1.111 1.98+0</td>	$\begin{array}{c} 2.339+1 \\ 1.961 \\ 7.74-1 \\ -2.98-4 \\ 4.016+1 \\ 1.296 \\ -2.32-1 \\ 8.07-3 \\ 7.254+1 \\ 1.400 \\ -1.33-1 \\ 2.15-2 \\ \frac{2}{1/2} \mathbf{4d}_{3/2}^4 \mathbf{4d}_{5/2}^6 \\ \frac{k \text{ (eV)}}{5000} \\ 2.301+1 \\ 1.955 \\ 1.24+0 \\ -2.47-5 \\ 4.258+1 \\ 1.210 \\ -3.59-1 \\ -5.65-3 \\ 7.768+1 \\ 1.349 \\ -2.51-1 \\ 1.43-2 \end{array}$	1.768+1 1.975 8.97-2 -4.82-4 2.501+1 1.401 1.79-1 3.13-2 4.412+1 1.478 2.69-1 3.82-2 2.5p <sup>2</sup> <sub>1/2</sub> 5p <sup>2</sup> <sub>3/2</sub> 6000 1.819+1 1.970 1.96-1 -5.10-4 2.700+1 1.389 7.85-2 2.72-2 4.761+1 1.471 1.75-1 3.59-2	7000 1.397+1 1.981 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2 7000 1.397+1 1.981 -4.97-2 -5.69-4 1.779+1 1.405 4.05-1 4.10-2 3.087+1 1.483 5.02-1	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2 8000 1.096+1 1.987 -9.63-2 -5.90-4 1.226+1 1.387 6.60-1 5.17-2 2.102+1 1.466 7.61-1	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2 9000 8.776+0 1.990 -5.87-2 -5.96-4 8.781+0 1.357 8.69-1 6.19-2 1.437 9.76-1	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 7.51-2 1.000+1 1.385 1.21+0 7.17-2 10000 7.147+0 1.991 1.94-2 -5.95-4 6.482+0 1.322 1.05+0 7.21-2 1.089+1 1.403 1.16+0	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346 1.35+0 8.00-2 11000 5.908+0 1.990 1.18-1 -5.93-4 4.909+0 1.284 1.20+0 8.24-2 8.177+0 1.366 1.32+0	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0 1.308 1.48+0 8.87-2 12000 4.948+0 1.988 2.28-1 -5.89-4 3.798+0 1.246 1.33+0 9.28-2 6.278+0 1.329 1.45+0	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1 14000 3.583+0 1.980 4.59-1 -5.79-4 2.395+0 1.170 1.54+0 1.13-1 3.906+0 1.254 1.68+0	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1 16000 2.688+0 1.970 6.92-1 -5.66-4 1.597+0 1.097 1.71+0 1.34-1 2.573+0 1.181 1.85+0	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1 1.614+0 1.089 1.99+0 1.43-1  18000 2.073+0 1.957 9.16-1 -5.52-4 1.112+0 1.028 1.85+0 1.54-1 1.772+0 1.111 1.98+0
$2s_{1/2}$ $E_b =$ $4698.3 \text{ eV}$ $2p_{1/2}$ $E_b =$ $4380.4 \text{ eV}$ $2p_{3/2}$ $E_b =$ $4132.3 \text{ eV}$ $2 = 52, Te$ :  Shell $2s_{1/2}$ $E_b =$ $4939.2 \text{ eV}$ $2p_{1/2}$ $E_b =$ $4612.0 \text{ eV}$ $2p_{3/2}$ $E_b =$ $4341.4 \text{ eV}$	β         γ           δ         σ           β         γ           δ         δ           (Kr)5s         σ           β         γ           δ         σ           β         γ           δ         σ           β         γ           δ         σ           β         γ           δ         δ </td <td>2.339+1 1.961 7.74-1 -2.98-4 4.016+1 1.296 -2.32-1 8.07-3 7.254+1 1.400 -1.33-1 2.15-2 21/2 4d<sup>4</sup>/<sub>3/2</sub> 4d<sup>6</sup>/<sub>5/2</sub> k (eV) 5000 2.301+1 1.955 1.24+0 -2.47-5 4.258+1 1.210 -3.59-1 -5.65-3 7.768+1 1.349 -2.51-1 1.43-2</td> <td><math>1.768+1</math> <math>1.975</math> <math>8.97-2</math> <math>-4.82-4</math> <math>2.501+1</math> <math>1.401</math> <math>1.79-1</math> <math>3.13-2</math> <math>4.412+1</math> <math>1.478</math> <math>2.69-1</math> <math>3.82-2</math> <math>2.5p_{1/2}^2.5p_{3/2}^2</math> <math display="block">6000</math> <math>1.819+1</math> <math>1.970</math> <math>1.96-1</math> <math>-5.10-4</math> <math>2.700+1</math> <math>1.389</math> <math>7.85-2</math> <math>2.72-2</math> <math>4.761+1</math> <math>1.471</math> <math>1.75-1</math> <math>3.59-2</math> <math>5p_{1/2}^2.5p_{3/2}^3</math></td> <td>7000 1.397+1 1.981 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2 7000 1.397+1 1.981 -4.97-2 -5.69-4 1.779+1 1.405 4.05-1 4.10-2 3.087+1 1.483 5.02-1</td> <td>1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2 8000 1.096+1 1.987 -9.63-2 -5.90-4 1.226+1 1.387 6.60-1 5.17-2 2.102+1 1.466 7.61-1</td> <td>8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2 9000 8.776+0 1.990 -5.87-2 -5.96-4 8.781+0 1.357 8.69-1 6.19-2 1.437 9.76-1</td> <td>6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 7.51-2 1.000+1 1.385 1.21+0 7.17-2 10000 7.147+0 1.991 1.94-2 -5.95-4 6.482+0 1.322 1.05+0 7.21-2 1.089+1 1.403 1.16+0</td> <td>5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346 1.35+0 8.00-2 11000 5.908+0 1.990 1.18-1 -5.93-4 4.909+0 1.284 1.20+0 8.24-2 8.177+0 1.366 1.32+0</td> <td>4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0 1.308 1.48+0 8.87-2 12000 4.948+0 1.988 2.28-1 -5.89-4 3.798+0 1.246 1.33+0 9.28-2 6.278+0 1.329 1.45+0</td> <td>3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1 14000 3.583+0 1.980 4.59-1 -5.79-4 2.395+0 1.170 1.54+0 1.13-1 3.906+0 1.254 1.68+0</td> <td>2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1 16000 2.688+0 1.970 6.92-1 -5.66-4 1.597+0 1.097 1.71+0 1.34-1 2.573+0 1.181 1.85+0</td> <td>1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1 1.614+0 1.089 1.99+0 1.43-1  18000 2.073+0 1.957 9.16-1 -5.52-4 1.112+0 1.028 1.85+0 1.54-1 1.772+0 1.111 1.98+0 1.38-1</td>	2.339+1 1.961 7.74-1 -2.98-4 4.016+1 1.296 -2.32-1 8.07-3 7.254+1 1.400 -1.33-1 2.15-2 21/2 4d <sup>4</sup> / <sub>3/2</sub> 4d <sup>6</sup> / <sub>5/2</sub> k (eV) 5000 2.301+1 1.955 1.24+0 -2.47-5 4.258+1 1.210 -3.59-1 -5.65-3 7.768+1 1.349 -2.51-1 1.43-2	$1.768+1$ $1.975$ $8.97-2$ $-4.82-4$ $2.501+1$ $1.401$ $1.79-1$ $3.13-2$ $4.412+1$ $1.478$ $2.69-1$ $3.82-2$ $2.5p_{1/2}^2.5p_{3/2}^2$ $6000$ $1.819+1$ $1.970$ $1.96-1$ $-5.10-4$ $2.700+1$ $1.389$ $7.85-2$ $2.72-2$ $4.761+1$ $1.471$ $1.75-1$ $3.59-2$ $5p_{1/2}^2.5p_{3/2}^3$	7000 1.397+1 1.981 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2 7000 1.397+1 1.981 -4.97-2 -5.69-4 1.779+1 1.405 4.05-1 4.10-2 3.087+1 1.483 5.02-1	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2 8000 1.096+1 1.987 -9.63-2 -5.90-4 1.226+1 1.387 6.60-1 5.17-2 2.102+1 1.466 7.61-1	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2 9000 8.776+0 1.990 -5.87-2 -5.96-4 8.781+0 1.357 8.69-1 6.19-2 1.437 9.76-1	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 7.51-2 1.000+1 1.385 1.21+0 7.17-2 10000 7.147+0 1.991 1.94-2 -5.95-4 6.482+0 1.322 1.05+0 7.21-2 1.089+1 1.403 1.16+0	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346 1.35+0 8.00-2 11000 5.908+0 1.990 1.18-1 -5.93-4 4.909+0 1.284 1.20+0 8.24-2 8.177+0 1.366 1.32+0	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0 1.308 1.48+0 8.87-2 12000 4.948+0 1.988 2.28-1 -5.89-4 3.798+0 1.246 1.33+0 9.28-2 6.278+0 1.329 1.45+0	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1 14000 3.583+0 1.980 4.59-1 -5.79-4 2.395+0 1.170 1.54+0 1.13-1 3.906+0 1.254 1.68+0	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1 16000 2.688+0 1.970 6.92-1 -5.66-4 1.597+0 1.097 1.71+0 1.34-1 2.573+0 1.181 1.85+0	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1 1.614+0 1.089 1.99+0 1.43-1  18000 2.073+0 1.957 9.16-1 -5.52-4 1.112+0 1.028 1.85+0 1.54-1 1.772+0 1.111 1.98+0 1.38-1
$2s_{1/2}$ $E_b =$ $4698.3 \text{ eV}$ $2p_{1/2}$ $E_b =$ $4380.4 \text{ eV}$ $2p_{3/2}$ $E_b =$ $4132.3 \text{ eV}$ $\mathbf{Z} = 52, \mathbf{Te}$ :  Shell $2s_{1/2}$ $E_b =$ $4939.2 \text{ eV}$ $2p_{3/2}$ $E_b =$ $4612.0 \text{ eV}$ $2p_{3/2}$ $E_b =$ $4341.4 \text{ eV}$ $\mathbf{Z} = 53, \mathbf{I}$ : Shell	β         γ           δ         σ           β         γ           δ         δ           (Kr)5s         σ           β         γ           δ         σ           β         γ           δ         σ           β         γ           δ         σ           β         γ           δ         δ </td <td><math display="block">\begin{array}{c} 2.339+1 \\ 1.961 \\ 7.74-1 \\ -2.98-4 \\ 4.016+1 \\ 1.296 \\ -2.32-1 \\ 8.07-3 \\ 7.254+1 \\ 1.400 \\ -1.33-1 \\ 2.15-2 \\ \frac{2}{1/2} \mathbf{4d_{3/2}^4} \mathbf{4d_{5/2}^6} \\ \frac{k \text{ (eV)}}{5000} \\ 2.301+1 \\ 1.955 \\ 1.24+0 \\ -2.47-5 \\ 4.258+1 \\ 1.210 \\ -3.59-1 \\ -5.65-3 \\ 7.768+1 \\ 1.349 \\ -2.51-1 \\ 1.43-2 \\ \frac{4}{12} \mathbf{4d_{3/2}^4} \mathbf{4d_{5/2}^6} \\ \frac{k \text{ (eV)}}{5000} \\ \end{array}</math></td> <td><math>1.768+1</math> <math>1.975</math> <math>8.97-2</math> <math>-4.82-4</math> <math>2.501+1</math> <math>1.401</math> <math>1.79-1</math> <math>3.13-2</math> <math>4.412+1</math> <math>1.478</math> <math>2.69-1</math> <math>3.82-2</math> <math>2.5p_{1/2}^2.5p_{3/2}^2</math> <math>6000</math> <math>1.819+1</math> <math>1.970</math> <math>1.96-1</math> <math>-5.10-4</math> <math>2.700+1</math> <math>1.389</math> <math>7.85-2</math> <math>2.72-2</math> <math>4.761+1</math> <math>1.471</math> <math>1.75-1</math> <math>3.59-2</math> <math>5p_{1/2}^2.5p_{3/2}^3</math> <math>6000</math></td> <td>7000 1.397+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2 7000 1.397+1 1.981 -4.97-2 -5.69-4 1.779+1 1.405 4.05-1 4.10-2 3.087+1 1.483 5.02-1 4.59-2</td> <td>1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2 8000 1.096+1 1.987 -9.63-2 -5.90-4 1.226+1 1.387 6.60-1 5.17-2 2.102+1 1.466 7.61-1 5.38-2</td> <td>8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2 9000 8.776+0 1.990 -5.87-2 -5.96-4 8.781+0 1.357 8.69-1 6.19-2 1.489+1 1.437 9.76-1 6.15-2</td> <td>6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2 1.000+1 1.385 1.21+0 7.17-2  10000 7.147+0 1.991 1.94-2 -5.95-4 6.482+0 1.322 1.05+0 7.21-2 1.089+1 1.403 1.16+0 6.94-2</td> <td>5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346 1.35+0 8.00-2 11000 5.908+0 1.990 1.18-1 -5.93-4 4.909+0 1.284 1.20+0 8.24-2 8.177+0 1.366 1.32+0 7.77-2</td> <td>4.726+0 1.987 2.85 - 1 -5.30 - 4 3.466+0 1.228 1.37+0 9.59 - 2 5.750+0 1.308 1.48+0 8.87 - 2 12000 4.948+0 1.988 2.28 - 1 -5.89 - 4 3.798+0 1.246 1.33+0 9.28 - 2 6.278+0 1.329 1.45+0 8.61 - 2</td> <td>3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1 14000 3.583+0 1.980 4.59-1 -5.79-4 2.395+0 1.170 1.54+0 1.13-1 3.906+0 1.254 1.68+0 1.03-1</td> <td>2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1 16000 2.688+0 1.970 6.92-1 -5.66-4 1.597+0 1.097 1.71+0 1.34-1 2.573+0 1.181 1.85+0 1.21-1</td> <td>1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1 1.614+0 1.089 1.99+0 1.43-1  18000 2.073+0 1.957 9.16-1 -5.52-4 1.112+0 1.028 1.85+0 1.54-1 1.772+0 1.111 1.98+0 1.38-1</td>	$\begin{array}{c} 2.339+1 \\ 1.961 \\ 7.74-1 \\ -2.98-4 \\ 4.016+1 \\ 1.296 \\ -2.32-1 \\ 8.07-3 \\ 7.254+1 \\ 1.400 \\ -1.33-1 \\ 2.15-2 \\ \frac{2}{1/2} \mathbf{4d_{3/2}^4} \mathbf{4d_{5/2}^6} \\ \frac{k \text{ (eV)}}{5000} \\ 2.301+1 \\ 1.955 \\ 1.24+0 \\ -2.47-5 \\ 4.258+1 \\ 1.210 \\ -3.59-1 \\ -5.65-3 \\ 7.768+1 \\ 1.349 \\ -2.51-1 \\ 1.43-2 \\ \frac{4}{12} \mathbf{4d_{3/2}^4} \mathbf{4d_{5/2}^6} \\ \frac{k \text{ (eV)}}{5000} \\ \end{array}$	$1.768+1$ $1.975$ $8.97-2$ $-4.82-4$ $2.501+1$ $1.401$ $1.79-1$ $3.13-2$ $4.412+1$ $1.478$ $2.69-1$ $3.82-2$ $2.5p_{1/2}^2.5p_{3/2}^2$ $6000$ $1.819+1$ $1.970$ $1.96-1$ $-5.10-4$ $2.700+1$ $1.389$ $7.85-2$ $2.72-2$ $4.761+1$ $1.471$ $1.75-1$ $3.59-2$ $5p_{1/2}^2.5p_{3/2}^3$ $6000$	7000 1.397+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2 7000 1.397+1 1.981 -4.97-2 -5.69-4 1.779+1 1.405 4.05-1 4.10-2 3.087+1 1.483 5.02-1 4.59-2	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2 8000 1.096+1 1.987 -9.63-2 -5.90-4 1.226+1 1.387 6.60-1 5.17-2 2.102+1 1.466 7.61-1 5.38-2	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2 9000 8.776+0 1.990 -5.87-2 -5.96-4 8.781+0 1.357 8.69-1 6.19-2 1.489+1 1.437 9.76-1 6.15-2	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2 1.000+1 1.385 1.21+0 7.17-2  10000 7.147+0 1.991 1.94-2 -5.95-4 6.482+0 1.322 1.05+0 7.21-2 1.089+1 1.403 1.16+0 6.94-2	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346 1.35+0 8.00-2 11000 5.908+0 1.990 1.18-1 -5.93-4 4.909+0 1.284 1.20+0 8.24-2 8.177+0 1.366 1.32+0 7.77-2	4.726+0 1.987 2.85 - 1 -5.30 - 4 3.466+0 1.228 1.37+0 9.59 - 2 5.750+0 1.308 1.48+0 8.87 - 2 12000 4.948+0 1.988 2.28 - 1 -5.89 - 4 3.798+0 1.246 1.33+0 9.28 - 2 6.278+0 1.329 1.45+0 8.61 - 2	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1 14000 3.583+0 1.980 4.59-1 -5.79-4 2.395+0 1.170 1.54+0 1.13-1 3.906+0 1.254 1.68+0 1.03-1	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1 16000 2.688+0 1.970 6.92-1 -5.66-4 1.597+0 1.097 1.71+0 1.34-1 2.573+0 1.181 1.85+0 1.21-1	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1 1.614+0 1.089 1.99+0 1.43-1  18000 2.073+0 1.957 9.16-1 -5.52-4 1.112+0 1.028 1.85+0 1.54-1 1.772+0 1.111 1.98+0 1.38-1
$2s_{1/2}$ $E_b$ = $4698.3 \text{ eV}$ $2p_{1/2}$ $E_b$ = $4380.4 \text{ eV}$ $2p_{3/2}$ $E_b$ = $4132.3 \text{ eV}$ $\mathbf{Z} = 52, \mathbf{Te}$ :  Shell $2s_{1/2}$ $E_b$ = $4939.2 \text{ eV}$ $2p_{3/2}$ $E_b$ = $4341.4 \text{ eV}$ $\mathbf{Z} = 53, \mathbf{I}$ : $ \mathbf{Shell} $ $2s_{1/2}$	β γ δ σ β γ δ δ [Kr]5s σ β γ δ δ σ β δ γ δ δ σ β δ σ δ σ δ	2.339+1 1.961 7.74-1 -2.98-4 4.016+1 1.296 -2.32-1 8.07-3 7.254+1 1.400 -1.33-1 2.15-2 21/2 4d <sup>4</sup> <sub>3/2</sub> 4d <sup>6</sup> <sub>5/2</sub> k (eV) 5000 2.301+1 1.955 1.24+0 -2.47-5 4.258+1 1.210 -3.59-1 -5.65-3 7.768+1 1.349 -2.51-1 1.43-2 24/2 4d <sup>3</sup> <sub>3/2</sub> 4d <sup>6</sup> <sub>5/2</sub> k (eV) 5000 0.000+0	$1.768+1$ $1.975$ $8.97-2$ $-4.82-4$ $2.501+1$ $1.401$ $1.79-1$ $3.13-2$ $4.412+1$ $1.478$ $2.69-1$ $3.82-2$ $2.5p_{1/2}^2.5p_{3/2}^2$ $6000$ $1.819+1$ $1.970$ $1.96-1$ $-5.10-4$ $2.700+1$ $1.389$ $7.85-2$ $2.72-2$ $4.761+1$ $1.471$ $1.75-1$ $3.59-2$ $5p_{1/2}^2.5p_{3/2}^3$ $6000$ $1.866+1$	7000 1.397+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2 7000 1.397+1 1.981 -4.97-2 -5.69-4 1.779+1 1.405 4.05-1 4.10-2 3.087+1 1.485 5.02-1 4.59-2	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2 8000 1.096+1 1.987 -9.63-2 -5.90-4 1.226+1 1.387 6.60-1 5.17-2 2.102+1 1.466 7.61-1 5.38-2	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2 9000 8.776+0 1.990 -5.87-2 -5.96-4 8.781+0 1.357 8.69-1 6.19-2 1.489+1 1.437 9.76-1 6.15-2	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2 1.000+1 1.385 1.21+0 7.17-2  10000 7.147+0 1.991 1.94-2 -5.95-4 6.482+0 1.322 1.05+0 7.21-2 1.089+1 1.403 1.16+0 6.94-2	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346 1.35+0 8.00-2 11000 5.908+0 1.990 1.18-1 -5.93-4 4.909+0 1.284 1.20+0 8.24-2 8.177+0 1.366 1.32+0 7.77-2	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0 1.308 1.48+0 8.87-2 12000 4.948+0 1.988 2.28-1 -5.89-4 3.798+0 1.246 1.33+0 9.28-2 6.278+0 1.329 1.45+0 8.61-2	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1 14000 3.583+0 1.980 4.59-1 -5.79-4 2.395+0 1.170 1.54+0 1.13-1 3.906+0 1.254 1.68+0 1.03-1	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1 16000 2.688+0 1.970 6.92-1 -5.66-4 1.597+0 1.097 1.71+0 1.34-1 2.573+0 1.181 1.85+0 1.21-1	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1 1.614+0 1.089 1.99+0 1.43-1  18000 2.073+0 1.957 9.16-1 -5.52-4 1.112+0 1.028 1.85+0 1.54-1 1.772+0 1.111 1.98+0 1.38-1
$2s_{1/2}$ $E_b = 4698.3 \text{ eV}$ $2p_{1/2}$ $E_b = 4380.4 \text{ eV}$ $2p_{3/2}$ $E_b = 4132.3 \text{ eV}$ $\mathbf{Z} = 52, \mathbf{Te}$ :  Shell $2s_{1/2}$ $E_b = 4612.0 \text{ eV}$ $2p_{3/2}$ $E_b = 4341.4 \text{ eV}$ $\mathbf{Z} = 53, \mathbf{I}$ :  Shell $2s_{1/2}$ $2s_{1/2}$ $2s_{1/2}$ $2s_{1/2}$ $2s_{1/2}$ $2s_{1/2}$ $2s_{1/2}$ $2s_{1/2}$ $2s_{1/2}$	β γ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β β γ δ δ σ β β γ δ δ σ β β γ δ δ σ β β γ δ δ σ β β γ δ δ σ β β γ δ δ σ β β γ δ δ σ β β γ δ δ σ β β γ δ δ σ β β γ δ δ σ β β γ δ δ σ β β γ δ δ σ β β γ δ δ σ β β γ δ δ δ δ σ β β γ δ δ δ σ β β γ δ δ δ σ β β γ δ δ δ σ β β γ δ δ δ σ δ δ δ δ δ δ δ δ δ δ δ δ δ δ δ	$\begin{array}{c} 2.339+1 \\ 1.961 \\ 7.74-1 \\ -2.98-4 \\ 4.016+1 \\ 1.296 \\ -2.32-1 \\ 8.07-3 \\ 7.254+1 \\ 1.400 \\ -1.33-1 \\ 2.15-2 \\ \frac{2}{12} \begin{array}{c} \mathbf{4d_{3/2}^4} & \mathbf{4d_{5/2}^6} \\ k & (\text{eV}) \\ \hline 5000 \\ 2.301+1 \\ 1.955 \\ 1.24+0 \\ -2.47-5 \\ 4.258+1 \\ 1.210 \\ -3.59-1 \\ -5.65-3 \\ 7.768+1 \\ 1.349 \\ -2.51-1 \\ 1.43-2 \\ \hline \begin{array}{c} \mathbf{4d_{3/2}^4} & \mathbf{4d_{5/2}^6} \\ k & (\text{eV}) \\ \hline \end{array}$	$1.768+1$ $1.975$ $8.97-2$ $-4.82-4$ $2.501+1$ $1.401$ $1.79-1$ $3.13-2$ $4.412+1$ $1.478$ $2.69-1$ $3.82-2$ $2.5p_{1/2}^2.5p_{3/2}^2$ $6000$ $1.819+1$ $1.970$ $1.96-1$ $-5.10-4$ $2.700+1$ $1.389$ $7.85-2$ $2.72-2$ $4.761+1$ $1.471$ $1.75-1$ $3.59-2$ $5p_{1/2}^2.5p_{3/2}^3$ $6000$ $1.866+1$ $1.965$	7000 1.397+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2 7000 1.397+1 1.981 -4.97-2 -5.69-4 1.779+1 1.405 4.05-1 4.10-2 3.087+1 1.483 5.02-1 4.59-2	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2 8000 1.096+1 1.987 -9.63-2 -5.90-4 1.226+1 1.387 6.60-1 5.17-2 2.102+1 1.466 7.61-1 5.38-2	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2  9000 8.776+0 1.990 -5.87-2 -5.96-4 8.781+0 1.357 8.69-1 6.19-2 1.489+1 1.437 9.76-1 6.15-2	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2 1.000+1 1.385 1.21+0 7.17-2  10000 7.147+0 1.991 1.94-2 -5.95-4 6.482+0 1.322 1.05+0 7.21-2 1.089+1 1.403 1.16+0 6.94-2  10000 7.445+0 1.990	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346 1.35+0 8.00-2 11000 5.908+0 1.990 1.18-1 -5.93-4 4.909+0 1.284 1.20+0 8.24-2 8.177+0 1.366 1.32+0 7.77-2	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0 1.308 1.48+0 8.87-2 12000 4.948+0 1.988 2.28-1 -5.89-4 3.798+0 1.246 1.33+0 9.28-2 6.278+0 1.329 1.45+0 8.61-2	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1  14000 3.583+0 1.980 4.59-1 -5.79-4 2.395+0 1.170 1.13-1 3.906+0 1.254 1.68+0 1.03-1	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1 16000 2.688+0 1.970 6.92-1 -5.66-4 1.597+0 1.097 1.71+0 1.34-1 2.573+0 1.181 1.85+0 1.21-1	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1 1.614+0 1.089 1.99+0 1.43-1  18000 2.073+0 1.957 9.16-1 -5.52-4 1.112+0 1.028 1.85+0 1.54-1 1.772+0 1.111 1.98+0 1.38-1
$2s_{1/2}$ $E_b$ = $4698.3 \text{ eV}$ $2p_{1/2}$ $E_b$ = $4380.4 \text{ eV}$ $2p_{3/2}$ $E_b$ = $4132.3 \text{ eV}$ $2 = 52$ ,	β γ δ σ β γ δ δ [Kr]5s σ β γ δ δ σ β δ γ δ δ σ β δ σ δ σ δ	2.339+1 1.961 7.74-1 -2.98-4 4.016+1 1.296 -2.32-1 8.07-3 7.254+1 1.400 -1.33-1 2.15-2 2/2 4d <sup>4</sup> <sub>3/2</sub> 4d <sup>6</sup> <sub>5/2</sub> k (eV) 5000 2.301+1 1.955 1.24+0 -2.47-5 4.258+1 1.210 -3.59-1 -5.65-3 7.768+1 1.349 -2.51-1 1.43-2 2/2 4d <sup>3</sup> <sub>3/2</sub> 4d <sup>6</sup> <sub>5/2</sub> k (eV) 5000 0.000+0	$1.768+1$ $1.975$ $8.97-2$ $-4.82-4$ $2.501+1$ $1.401$ $1.79-1$ $3.13-2$ $4.412+1$ $1.478$ $2.69-1$ $3.82-2$ $2.5p_{1/2}^2.5p_{3/2}^2$ $6000$ $1.819+1$ $1.970$ $1.96-1$ $-5.10-4$ $2.700+1$ $1.389$ $7.85-2$ $2.72-2$ $4.761+1$ $1.471$ $1.75-1$ $3.59-2$ $5p_{1/2}^2.5p_{3/2}^3$ $6000$ $1.866+1$	7000 1.397+1 1.984 -7.78-2 -5.21-4 1.641+1 1.404 4.87-1 4.40-2 2.852+1 1.479 5.79-1 4.76-2 7000 1.397+1 1.981 -4.97-2 -5.69-4 1.779+1 1.405 4.05-1 4.10-2 3.087+1 1.485 5.02-1 4.59-2	1.056+1 1.989 -8.81-2 -5.34-4 1.128+1 1.379 7.30-1 5.47-2 1.938+1 1.455 8.27-1 5.56-2 8000 1.096+1 1.987 -9.63-2 -5.90-4 1.226+1 1.387 6.60-1 5.17-2 2.102+1 1.466 7.61-1 5.38-2	8.430+0 1.991 -3.00-2 -5.37-4 8.058+0 1.345 9.30-1 6.49-2 1.370+1 1.422 1.03+0 6.36-2 9000 8.776+0 1.990 -5.87-2 -5.96-4 8.781+0 1.357 8.69-1 6.19-2 1.489+1 1.437 9.76-1 6.15-2	6.851+0 1.991 6.14-2 -5.36-4 5.936+0 1.307 1.10+0 7.51-2 1.000+1 1.385 1.21+0 7.17-2  10000 7.147+0 1.991 1.94-2 -5.95-4 6.482+0 1.322 1.05+0 7.21-2 1.089+1 1.403 1.16+0 6.94-2	5.653+0 1.990 1.69-1 -5.34-4 4.487+0 1.267 1.24+0 8.54-2 7.500+0 1.346 1.35+0 8.00-2 11000 5.908+0 1.990 1.18-1 -5.93-4 4.909+0 1.284 1.20+0 8.24-2 8.177+0 1.366 1.32+0 7.77-2	4.726+0 1.987 2.85-1 -5.30-4 3.466+0 1.228 1.37+0 9.59-2 5.750+0 1.308 1.48+0 8.87-2 12000 4.948+0 1.988 2.28-1 -5.89-4 3.798+0 1.246 1.33+0 9.28-2 6.278+0 1.329 1.45+0 8.61-2	3.413+0 1.978 5.23-1 -5.19-4 2.180+0 1.151 1.57+0 1.17-1 3.569+0 1.231 1.70+0 1.06-1 14000 3.583+0 1.980 4.59-1 -5.79-4 2.395+0 1.170 1.54+0 1.13-1 3.906+0 1.254 1.68+0 1.03-1	2.554+0 1.967 7.57-1 -5.07-4 1.450+0 1.077 1.73+0 1.38-1 2.347+0 1.158 1.86+0 1.25-1 16000 2.688+0 1.970 6.92-1 -5.66-4 1.597+0 1.097 1.71+0 1.34-1 2.573+0 1.181 1.85+0 1.21-1	1.966+0 1.954 9.82-1 -4.92-4 1.008+0 1.008 1.86+0 1.59-1 1.614+0 1.089 1.99+0 1.43-1  18000 2.073+0 1.957 9.16-1 -5.52-4 1.112+0 1.028 1.85+0 1.54-1 1.772+0 1.111 1.98+0 1.38-1

able 1 (cont		4.200+1	2.005 - 1	1.02.4 : 1	1 221 : 1	0.5.40+0	7.004.0	F 250+0	4.153.0	2.020.0	1.75.4.0	1 222 . 0
$2p_{1/2}$	σ	4.369+1	2.905+1	1.924+1	1.331+1	9.548+0	7.064+0	5.359+0	4.152+0	2.626+0	1.754+0	1.223+0
E <sub>b</sub> = 4852.1 eV	β	1.005	1.368	1.404	1.393	1.367	1.335	1.299	1.262	1.188	1.116	1.046
4852.1 eV	γ	-4.40-1	-3.14-2	3.18-1	5.87-1	8.06-1	9.91-1	1.15+0	1.29+0	1.52+0	1.69+0	1.83+0
	δ	-2.90-2	2.21-2	3.79-2	4.90-2	5.90-2	6.92-2	7.95-2	8.97-2	1.10-1	1.29-1	1.48-1
$2p_{3/2}$	σ	8.252+1	5.126+1	3.335+1	2.276+1	1.615+1	1.183+1	8.897+0	6.839+0	4.263+0	2.813+0	1.941+0
$E_b =$	β	1.266	1.458	1.485	1.475	1.450	1.419	1.384	1.348	1.274	1.201	1.132
1557.1 eV	γ	-3.74 - 1	7.48 - 2	4.20 - 1	6.92 - 1	9.17 - 1	1.11+0	1.28+0	1.42+0	1.65+0	1.83+0	1.97+0
	δ	2.02 - 3	3.29 - 2	4.42 - 2	5.21 - 2	5.96 - 2	6.74 - 2	7.55 - 2	8.36 - 2	1.00 - 1	1.16 - 1	1.33 - 1
Z=54, Xe:	[Kr]5s	$^2_{1/2}4d^4_{3/2}4d^6_{5/}$	$_{2}5p_{1/2}^{2}5p_{3/2}^{4}$									
		k (eV)										
Shell		5000	6000	7000	8000	9000	10000	11000	12000	14000	16000	18000
$2s_{1/2}$	$\sigma$	0.000+0	1.907+1	1.489+1	1.177+1	9.473+0	7.748+0	6.430+0	5.403+0	3.935+0	2.965+0	2.296+0
$E_b =$	β	0.000	1.959	1.972	1.981	1.986	1.989	1.989	1.988	1.983	1.974	1.963
5452.8 eV	γ	0.00+0	5.61 - 1	6.65 - 2	-7.94 - 2	-9.54 - 2	-4.97 - 2	2.76 - 2	1.23 - 1	3.38 - 1	5.63 - 1	7.83 - 1
	δ	0.00+0	-5.08 - 4	-6.62 - 4	-7.10 - 4	-7.27 - 4	-7.30 - 4	-7.29 - 4	-7.27 - 4	-7.20 - 4	-7.09 - 4	-6.97-
$2p_{1/2}$	σ	0.000+0	3.116+1	2.078+1	1.442+1	1.037+1	7.686+0	5.841+0	4.533+0	2.873+0	1.924+0	1.344+0
$E_b =$	β	0.000	1.334	1.399	1.398	1.376	1.347	1.313	1.278	1.205	1.133	1.065
5103.7 eV		0.000	-1.54-1	2.21-1	5.09-1	7.38-1	9.33-1	1.10+0	1.25+0	1.48+0	1.66+0	1.81+0
7103.7 CV	$\gamma \\ \delta$	0.00+0	1.53-2	3.42-2	4.62-2	5.61-2	6.62-2	7.64-2	8.64-2	1.06-1	1.24-1	1.43-1
$2p_{3/2}$	σ	8.608+1	5.510+1	3.599+1	2.461+1	1.749+1	1.284+1	9.666+0	7.438+0	4.646+0	3.071+0	2.121+0
$E_b =$	β	1.098	1.437	1.484	1.482	1.461	1.433	1.400	1.365	1.293	1.222	1.154
1782.2 eV	γ	-4.75 - 1	-3.47 - 2	3.31 - 1	6.19 - 1	8.54 - 1	1.06+0	1.23+0	1.38+0	1.62+0	1.81+0	1.96+0
	δ	-2.13-2	2.91-2	4.24 - 2	5.06 - 2	5.78 - 2	6.54 - 2	7.32 - 2	8.09 - 2	9.62 - 2	1.12 - 1	1.27 - 1
z = 55, Cs:	[Xe]6s											
D11		k (eV)	7000	0000	0000	10000	11000	12000	1.4000	10000	10000	20000
Shell		6000	7000	8000	9000	10000	11000	12000	14000	16000	18000	20000
2s <sub>1/2</sub>	$\sigma$	1.927+1	1.530+1	1.215+1	9.807+0	8.043+0	6.688+0	5.628+0	4.110+0	3.103+0	2.407+0	1.909+0
$E_b =$	β	1.952	1.967	1.977	1.984	1.987	1.988	1.988	1.984	1.976	1.965	1.953
5714.3 eV	γ	8.78 - 1	1.61 - 1	-4.98 - 2	-9.95 - 2	-7.46 - 2	-1.02 - 2	7.64 - 2	2.80 - 1	4.97 - 1	7.12 - 1	9.22 - 1
	δ	-4.24 - 4	-7.08 - 4	-7.67 - 4	-7.94 - 4	-8.06 - 4	-8.11 - 4	-8.12 - 4	-8.06 - 4	-7.95 - 4	-7.83 - 4	-7.68-
$2p_{1/2}$	σ	3.316+1	2.233+1	1.555+1	1.122+1	8.332+0	6.342+0	4.928+0	3.132+0	2.102+0	1.472+0	1.066+0
$E_b =$	β	1.283	1.389	1.400	1.384	1.357	1.325	1.290	1.221	1.153	1.087	1.025
5359.4 eV	γ	-2.84-1	1.20-1	4.23-1	6.70-1	8.76-1	1.05+0	1.20+0	1.44+0	1.63+0	1.79+0	1.92+0
3335.4 CV	δ	5.22-3	3.01-2	4.30-2	5.39-2	6.38-2	7.31-2	8.21-2	1.01-1	1.19-1	1.38-1	1.56-1
n												
$2p_{3/2}$	σ	5.889+1	3.866+1	2.652+1	1.889+1	1.388+1	1.046+1	8.061+0	5.046+0	3.341+0	2.312+0	1.657+0
$E_b =$	β	1.407	1.480	1.487	1.471	1.445	1.414	1.381	1.312	1.245	1.180	1.118
5011.9 eV	γ	-1.49 - 1	2.36 - 1	5.40 - 1	7.92 - 1	1.00+0	1.18+0	1.33+0	1.59+0	1.79+0	1.95+0	2.08+0
	δ	2.40-2	4.00-2	4.91-2	5.68-2	6.39-2	7.07-2	7.74-2	9.16-2	1.07-1	1.22-1	1.38-1
Z = 56, Ba:	[Xe]6s	k (eV)										
Shell		6000	7000	8000	9000	10000	11000	12000	14000	16000	18000	20000
$2s_{1/2}$	σ	1.800+1	1.569+1	1.252+1	1.014+1	8.335+0	6.943+0	5.852+0	4.286+0	3.244+0	2.521+0	2.003+0
$E_b =$	β	1.948	1.961	1.973	1.980	1.985	1.987	1.988	1.984	1.977	1.968	1.956
5988.8 eV	γ	1.34+0	2.93 - 1	-3.95 - 3	-9.42 - 2	-9.25 - 2	-4.32-2	3.24 - 2	2.22 - 1	4.32 - 1	6.44 - 1	8.53 - 1
	δ	2.98 - 4	-7.35 - 4	-8.32 - 4	-8.73 - 4	-8.90 - 4	-8.94 - 4	-8.95 - 4	-8.89 - 4	-8.79 - 4	-8.66 - 4	-8.50-
$2p_{1/2}$	σ	3.491+1	2.393+1	1.674+1	1.210+1	9.008+0	6.870+0	5.348+0	3.409+0	2.293+0	1.609+0	1.168+0
$E_b =$	β	1.187	1.373	1.399	1.389	1.366	1.337	1.306	1.239	1.173	1.108	1.046
5623.6 eV	γ	-4.26 - 1	9.69 - 3	3.33 - 1	5.92 - 1	8.04 - 1	9.85 - 1	1.14+0	1.40+0	1.60+0	1.77+0	1.90+0
-	δ	-1.17 - 2	2.52-2	3.96-2	5.04-2	6.00-2	6.94-2	7.87-2	9.77-2	1.16-1	1.35-1	1.53-1
$2p_{3/2}$	σ	6.272+1	4.144+1	2.850+1	2.034+1	1.497+1	1.130+1	8.719+0	5.471+0	3.629+0	2.515+0	1.805+0
$E_b =$	β	1.359	1.470	1.489	1.479	1.458	1.430	1.399	1.334	1.268	1.203	1.141
<sub>ь</sub> = 5247.0 eV		-2.74-1	1.470	4.57—1	7.18-1	9.36—1	1.430	1.29+0	1.55+0	1.77+0	1.203	2.07+0
0247.0 EV	γ											
z = 57, La:	δ [ <b>Y</b> o]5d	1.65-2	3.74-2	4.72-2	5.46-2	6.13-2	6.81-2	7.50-2	8.95-2	1.04-1	1.19-1	1.34-1
2 — 37, Eu.	[AC]3u	k (eV)										
Shell		6000	7000	8000	9000	10000	11000	12000	14000	16000	18000	20000
2s <sub>1/2</sub>	σ	0.000+0	1.602+1	1.288+1	1.046+1	8.622+0	7.197+0	6.077+0	4.464+0	3.387+0	2.637+0	2.098+0
$E_b =$	β	0.000	1.955	1.968	1.977	1.982	1.985	1.987	1.985	1.979	1.970	1.959
5266.3 eV	γ	0.00+0	4.74 - 1	6.27 - 2	-7.56-2	-1.01-1	-6.98 - 2	-6.39 - 3	1.69 - 1	3.72 - 1	5.81 - 1	7.88 - 1
	δ	0.00+0	-7.39 - 4	-8.92 - 4	-9.48 - 4	-9.72 - 4	-9.81 - 4	-9.84 - 4	-9.81 - 4	-9.73 - 4	-9.60 - 4	-9.45-
$2p_{1/2}$	σ	3.511+1	2.555+1	1.796+1	1.303+1	9.719+0	7.426+0	5.791+0	3.702+0	2.496+0	1.754+0	1.275+0
$E_b =$	β	0.935	1.347	1.394	1.393	1.374	1.349	1.319	1.255	1.189	1.124	1.062
5890.6 eV	γ	-4.87 - 1	-1.09 - 1	2.37 - 1	5.09 - 1	7.33 - 1	9.24 - 1	1.09+0	1.36+0	1.57+0	1.74+0	1.88+0
	δ	-3.92-2	1.91-2	3.60-2	4.73-2	5.72-2	6.67-2	7.61-2	9.47-2	1.13-1	1.30-1	1.48-1
$2p_{3/2}$	$\sigma$	6.633+1	4.430+1	3.056+1	2.186+1	1.611+1	1.218+1	9.411+0	5.917+0	3.933+0	2.730+0	1.962+0
$E_b = \frac{100.7 - 100}{100}$	β	1.283	1.456	1.489	1.486	1.468	1.444	1.415	1.352	1.287	1.223	1.161
5482.7 eV	γ	-4.07 - 1	3.21-2	3.68-1	6.41-1	8.70-1	1.07+0	1.24+0	1.52+0	1.74+0	1.92+0	2.06+0
, ,,	δ	4.30-3	3.44-2	4.55-2	5.30-2	5.98-2	6.65-2	7.33-2	8.72-2	1.01-1	1.15-1	1.29-1
Z = 58, Ce:	[Xe]4f	<sup>2</sup> <sub>5/2</sub> 6s <sup>2</sup> <sub>1/2</sub> k (eV)										
Shell		6000	7000	8000	9000	10000	11000	12000	14000	16000	18000	20000
		0.000+0				8.925+0						
2s <sub>1/2</sub>	σ		1.629+1	1.324+1	1.080+1		7.464+0	6.313+0	4.648+0	3.534+0	2.757+0	2.197+0
$E_b =$	β	0.000	1.947	1.962	1.972	1.979	1.983	1.985	1.984	1.980	1.972	1.962

able 1 (conti	inued)											
6548.8 eV	γ	0.00+0	7.44-1	1.59-1	-4.21-2	-1.02-1	-9.12-2	-4.13-2	1.17-1	3.10-1	5.12-1	7.15-1
2	δ	0.00+0	-6.76-4	-9.46-4	-1.03-3	-1.07-3	-1.09-3	-1.09-3	-1.09-3	-1.08-3	-1.07-3	-1.05-3
$\begin{array}{c} 2p_{1/2} \\ E_b = \end{array}$	$\sigma_{\rho}$	0.000+0 0.000	2.727+1 1.305	1.930+1 1.385	1.404+1 1.394	1.050+1 1.381	8.034+0 1.358	6.273+0 1.330	4.020+0 1.269	2.716+0 1.206	1.913+0 1.144	1.393+0 1.084
<sub>Бь</sub> = 6164.2 eV	$\beta$ $\gamma$	0.000	-2.47 - 1	1.365	4.23-1	6.60-1	8.59—1	1.03+0	1.31+0	1.53+0	1.71+0	1.86+0
0104.2 CV	δ	0.00+0	9.96-3	3.18-2	4.44-2	5.44-2	6.36-2	7.23-2	9.00-2	1.08-1	1.26-1	1.43-1
$2p_{3/2}$	σ	6.941+1	4.744+1	3.284+1	2.353+1	1.737+1	1.315+1	1.016+1	6.402+0	4.262+0	2.962+0	2.132+0
$E_b =$	β	1.138	1.432	1.485	1.491	1.477	1.455	1.428	1.369	1.307	1.246	1.186
5723.4 eV	γ	-5.32 - 1	-8.64 - 2	2.73-1	5.63-1	8.03-1	1.01+0	1.18+0	1.47+0	1.71+0	1.89+0	2.04+0
	δ	-2.02 - 2	3.02 - 2	4.37 - 2	5.19-2	5.85-2	6.45 - 2	7.05 - 2	8.33-2	9.69 - 2	1.11 - 1	1.25 - 1
Z = 59, Pr:	[Xe]4f	3 5/2 6s <sup>2</sup> <sub>1/2</sub>										
		k (eV)										
Shell		2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
$2s_{1/2}$	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	1.628+1	1.357+1	1.112+1	9.211+0	7.720+0	6.541+0
$E_b =$	β	0.000	0.000	0.000	0.000	0.000	1.939	1.955	1.967	1.975	1.980	1.983
6834.8 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	1.17+0	2.88 - 1	9.36 - 3	-9.02 - 2	-1.04-1	-6.96-2
	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-3.71 - 4	-9.88 - 4	-1.11 - 3	-1.16 - 3	-1.19 - 3	-1.20-3
$2p_{1/2}$	$\sigma$	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	2.881+1	2.063+1	1.507+1	1.129+1	8.658+0	6.771+0
$E_b =$	$\beta$	0.000	0.000	0.000	0.000	0.000	1.237	1.370	1.393	1.386	1.366	1.341
6440.4 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-3.91-1	1.89 - 2	3.30 - 1	5.81 - 1	7.90 - 1	9.68 - 1
	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-3.86-3	2.67 - 2	4.10-2	5.16 - 2	6.08 - 2	6.95 - 2
$2p_{3/2}$	$\sigma$	0.000+0	0.000+0	0.000+0	0.000+0	6.631+1	5.050+1	3.511+1	2.521+1	1.864+1	1.413+1	1.094+1
$E_b =$	β	0.000	0.000	0.000	0.000	0.654	1.398	1.477	1.493	1.485	1.466	1.442
5964.3 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	-3.39 - 1	-2.10-1	1.73-1	4.78-1	7.30-1	9.44-1	1.13+0
	δ	0.00+0	0.00+0	0.00+0	0.00+0	-3.00-2	2.44-2	4.15-2	5.04-2	5.72-2	6.31-2	6.89-2
3s <sub>1/2</sub>	σ	3.590+1	1.946+1	1.197+1	8.037+0	5.732+0	4.273+0	3.294+0	2.607+0	2.108+0	1.734+0	1.448+0
$E_b =$	β	1.949	1.959	1.967	1.974	1.978	1.982	1.984	1.984	1.984	1.983	1.980
1511.0 eV	γ	6.16-1	1.64-1	-3.48 - 2	-1.17 - 1	-1.33-1	-1.08-1	-5.72-2	1.01-2	8.82-2	1.73-1	2.63-1
	δ	-1.87-4	-5.07 - 4	-6.41-4	-7.17 - 4	-7.70-4	-8.08 - 4	-8.38 - 4	-8.60-4	-8.79-4	-8.94-4	-9.05-4
Z = 60, Nd:	[Xe]4	k (eV)										
Shell		2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
2s <sub>1/2</sub>	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	1.387+1	1.142+1	9.491+0	7.972+0	6.767+0
$E_b =$	β	0.000	0.000	0.000	0.000	0.000	0.000	1.948	1.961	1.970	1.977	1.980
7126.0 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	4.67-1	8.22-2	-6.49-2	-1.06-1	-9.10-2
2	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-1.00-3	-1.19-3	-1.26-3	-1.29-3	-1.31-3
$2p_{1/2}$	σ	0.000+0 0.000	0.000+0 0.000	0.000+0 0.000	0.000+0 0.000	0.000+0 0.000	2.991+1 1.101	2.198+1 1.347	1.612+1 1.388	1.212+1 1.388	9.309+0	7.292+0 1.350
$E_b = 6721.5 \text{ eV}$	β	0.000	0.000	0.000	0.000	0.000	-5.28-1	-1.03-1	2.30-1	4.96—1	1.373 7.16-1	9.03-1
0/21.5 EV	$\gamma \\ \delta$	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-3.28-1 -2.81-2	2.03-1	3.71-2	4.84-2	5.81-2	6.68-2
$2p_{3/2}$	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	5.351+1	3.744+1	2.696+1	1.997+1	1.516+1	1.175+1
$E_b =$	β	0.000	0.000	0.000	0.000	0.000	1.346	1.465	1.493	1.491	1.476	1.454
6207.9 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-3.44-1	6.59-2	3.88-1	6.53-1	8.77-1	1.07+0
0207.0 01	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	1.55-2	3.87-2	4.89-2	5.59-2	6.19-2	6.76-2
3s <sub>1/2</sub>	σ	3.649+1	2.000+1	1.237+1	8.329+0	5.954+0	4.446+0	3.433+0	2.720+0	2.202+0	1.813+0	1.516+0
$E_b =$	β	1.945	1.955	1.964	1.971	1.976	1.980	1.982	1.983	1.983	1.982	1.980
1575.3 eV	γ	6.82 - 1	2.03 - 1	-1.37 - 2	-1.09-1	-1.36-1	-1.20-1	-7.61-2	-1.47 - 2	5.84 - 2	1.39 - 1	2.25 - 1
	δ	-1.54-4	-5.37 - 4	-6.90 - 4	-7.76 - 4	-8.35 - 4	-8.79 - 4	-9.13 - 4	-9.39 - 4	-9.61 - 4	-9.78 - 4	-9.92-4
Z = 61, Pm	: [Xe]4											
		k (eV)										
Shell		2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
2s <sub>1/2</sub>	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	1.410+1	1.172+1	9.768+0	8.223+0	6.993+0
$E_b =$	β	0.000	0.000	0.000	0.000	0.000	0.000	1.940	1.955	1.965	1.973	1.978
7427.9 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	7.15 - 1	1.83 - 1	-2.36-2	-9.84 - 2	-1.05-1
	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-9.44-4	-1.25 - 3	-1.36 - 3	-1.41-3	-1.43-3
$2p_{1/2}$	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	2.335+1	1.723+1	1.298+1	9.994+0	7.843+0
$E_b =$	β	0.000	0.000	0.000	0.000	0.000	0.000	1.310	1.378	1.389	1.379	1.359
7012.8 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-2.38-1	1.22-1	4.04-1	6.36-1	8.34-1
	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	1.16-2	3.26-2	4.50-2	5.50-2	6.40-2
$2p_{3/2}$	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	5.639+1	3.987+1	2.879+1	2.136+1	1.624+1	1.260+1
$E_b =$	$\beta$	0.000	0.000	0.000	0.000	0.000	1.264	1.446	1.489	1.495	1.484	1.465
6459.3 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-4.83-1	-4.97-2	2.91-1	5.69-1	8.04-1	1.01+0
n-	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	5.36-4	3.49-2	4.70-2	5.46-2	6.07-2	6.62-2
	$\frac{\sigma}{\beta}$	3.702+1	2.056+1	1.278+1	8.630+0	6.182+0	4.625+0	3.576+0	2.837+0	2.299+0	1.895+0	1.585+0
		1.940 7.67-1	1.951	1.960	1.968	1.973	1.977 1.29 1	1.980	1.981	1.982	1.981	1.980
$E_b =$			2.46 - 1	1.11-2	-9.84-2 $-8.37-4$	-1.36-1 $-9.03-4$	-1.29-1 $-9.54-4$	-9.35-2 $-9.93-4$	-3.84-2 $-1.02-3$	2.96-2 $-1.05-3$	1.06-1 $-1.07-3$	1.89-1 -1.09-3
	γ		_5.65 4	_7 / 11 /		-3.03-4	-3.34-4	-3.33-4	-1.02-3	- 1.05-3	-1.07-3	- 1.09-3
E <sub>b</sub> = 1648.6 eV	$_{\delta}^{\gamma}$	-9.15 - 5	-5.65-4	-7.41-4	-0.57 -4							
E <sub>b</sub> = 1648.6 eV	$_{\delta}^{\gamma}$	$\begin{array}{c} -9.15 - 5 \\ \mathbf{f_{5/2}^6  6s_{1/2}^2} \end{array}$	-5.65-4	-7.41-4	-0.57-4							
Z = 62, Sm	$_{\delta}^{\gamma}$	$-9.15-5$ $f_{5/2}^{6} 6s_{1/2}^{2}$ $k \text{ (eV)}$				6000	7000	8000	0000	10000	11000	12000
$E_b = 1648.6 \text{ eV}$ <b>Z</b> = <b>62</b> , <b>Sm</b> : Shell	γ δ : [Xe]4	$   \begin{array}{r}     -9.15 - 5 \\     \hline{\mathbf{f_{5/2}^6 6s_{1/2}^2}} \\     \hline{k (eV)} \\     \hline     2000   \end{array} $	3000	4000	5000	6000	7000	8000	9000	10000	11000 8 470+0	12000
$E_b = 1648.6 \text{ eV}$ $\mathbf{Z} = 62, \mathbf{Sm}$ Shell $2s_{1/2}$	$\frac{\gamma}{\delta}$ : [Xe]4	$ \begin{array}{r} -9.15-5 \\ \hline{\mathbf{f}_{5/2}^{6}  6 \mathbf{s}_{1/2}^{2}} \\ \underline{k  (\text{eV})} \\ 2000 \\ 0.000+0 \end{array} $	3000 0.000+0	4000 0.000+0	5000 0.000+0	0.000+0	0.000+0	1.418+1	1.199+1	1.004+1	8.470+0	7.216+0
$E_b = 1648.6 \text{ eV}$ $Z = 62, \text{ Sm}$ Shell $2s_{1/2}$ $E_b = 62$	γ δ : [ <b>Xe]4</b> σ β	$ \begin{array}{r} -9.15-5 \\ \hline{\mathbf{f}_{5/2}^{6}  6 \mathbf{s}_{1/2}^{2}} \\ \underline{k  (\text{eV})} \\ 2000 \\ 0.000+0 \\ 0.000 \end{array} $	3000 0,000+0 0,000	4000 0.000+0 0.000	5000 0.000+0 0.000	0.000+0 0.000	0.000+0 0.000	1.418+1 1.931	1.199+1 1.947	1.004+1 1.959	8.470+0 1.968	7.216+0 1.974
$E_b = 1648.6 \text{ eV}$ $\mathbf{Z} = 62, \mathbf{Sm}$ Shell $2s_{1/2}$	$\frac{\gamma}{\delta}$ : [Xe]4	$ \begin{array}{r} -9.15-5 \\ \hline{\mathbf{f}_{5/2}^{6} 6 \mathbf{s}_{1/2}^{2}} \\ \underline{k \text{ (eV)}} \\ 2000 \\ 0.000+0 \end{array} $	3000 0.000+0	4000 0.000+0	5000 0.000+0	0.000+0	0.000+0	1.418+1	1.199+1	1.004+1	8.470+0	7.216+0

$p_{1/2}$	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	2.466+1	1.836+1	1.388+1	1.071+1	8.421+0
<u> </u>	β	0.000	0.000	0.000	0.000	0.000	0.000	1.251	1.363	1.386	1.382	1.367
11.8 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-3.89 - 1	4.17 - 3	3.05 - 1	5.50 - 1	7.58 - 1
	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-1.82 - 3	2.72 - 2	4.12 - 2	5.18 - 2	6.10 - 2
3/2	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	5.855+1	4.236+1	3.069+1	2.282+1	1.737+1	1.350+1
=	β	0.000	0.000	0.000	0.000	0.000	1.109	1.418	1.482	1.497	1.491	1.476
16.2 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-5.99 - 1	-1.74-1	1.87 - 1	4.79 - 1	7.25 - 1	9.38 - 1
	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-2.75 - 2	2.97 - 2	4.49 - 2	5.31 - 2	5.94 - 2	6.51 - 2
1/2	σ	3.743+1	2.109+1	1.318+1	8.929+0	6.410+0	4.804+0	3.719+0	2.955+0	2.397+0	1.978+0	1.656+0
=	β	1.935	1.947	1.956	1.964	1.970	1.975	1.978	1.979	1.980	1.980	1.979
722.8 eV	γ	8.65 - 1	2.94 - 1	3.87 - 2	-8.51 - 2	-1.34-1	-1.37 - 1	-1.09-1	-6.02 - 2	2.43 - 3	7.46 - 2	1.53 - 1
	δ	1.53 - 5	-5.90 - 4	-7.92 - 4	-9.01 - 4	-9.75 - 4	-1.03 - 3	-1.08 - 3	-1.11 - 3	-1.14 - 3	-1.17 - 3	-1.19-
01/2	σ	5.554+1	2.975+1	1.740+1	1.102+1	7.417+0	5.228+0	3.821+0	2.876+0	2.217+0	1.744+0	1.396+0
,=	β	1.306	1.571	1.603	1.589	1.560	1.525	1.488	1.450	1.412	1.375	1.339
540.7 eV	γ	3.20 - 1	-1.13-2	3.55 - 2	1.86 - 1	3.59 - 1	5.31 - 1	6.93 - 1	8.42 - 1	9.78 - 1	1.10+0	1.22+0
	δ	4.42 - 2	2.53 - 3	2.06 - 3	5.53 - 3	1.05 - 2	1.64 - 2	2.30 - 2	3.00 - 2	3.73 - 2	4.50 - 2	5.29 - 2
= <b>63</b> , Eu:	[Xe]4f	$\frac{6}{5/2}$ 4f <sup>1</sup> <sub>7/2</sub> 6s <sup>2</sup> <sub>1/2</sub>	2									
		k (eV)										
hell		2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
61/2	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	1.222+1	1.028+1	8.698+0	7.427+0
)1/2 =	β	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.939	1.953	1.963	1.970
)— 052.0 eV	γ	0.000	0.000	0.000	0.000	0.00+0	0.00+0	0.00+0	4.95-1	1.17-1	-4.47 - 2	-1.04-
.52.5 CV	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-1.31-3	-1.55-3	-4.47-2 -1.64-3	-1.69-
D <sub>1/2</sub>	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	2.567+1	1.946+1	1.477+1	1.143+1	9.001+0
/1/2 =	β	0.000	0.000	0.000	0.000	0.000	0.000	1.147	1.340+1	1.380	1.384	1.372
— 617.1 eV	γ	0.000	0.000	0.000	0.000	0.00+0	0.000	-5.33-1	-1.19-1	2.01-1	4.63-1	6.80-1
	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-2.29-2	2.04-2	3.68-2	4.84-2	5.79-2
3/2	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	5.532+1	4.472+1	3.256+1	2.425+1	1.850+1	1.439+1
=	β	0.000	0.000	0.000	0.000	0.000	0.568	1.379	1.471	1.496	1.496	1.484
– 976.9 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-2.91-1	-3.01-1	8.16-2	3.88-1	6.46-1	8.65-1
•	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-1.13-2	2.26-2	4.22-2	5.14-2	5.82-2	6.37-2
1/2	σ	3.758+1	2.154+1	1.353+1	9.203+0	6.624+0	4.973+0	3.856+0	3.068+0	2.491+0	2.058+0	1.725+0
=	β	1.930	1.943	1.953	1.960	1.967	1.972	1.976	1.978	1.979	1.979	1.978
300.0 eV	γ	9.53-1	3.40-1	6.66-2	-7.08 - 2	-1.30-1	-1.41-1	-1.20-1	-7.85 - 2	-2.19-2	4.50-2	1.19-1
	δ	1.55 - 4	-6.13 - 4	-8.38 - 4	-9.73 - 4	-1.05 - 3	-1.11 - 3	-1.16 - 3	-1.20 - 3	-1.23 - 3	-1.26 - 3	-1.28-
1/2	σ	5.608+1	3.062+1	1.807+1	1.152+1	7.791+0	5.512+0	4.042+0	3.050+0	2.358+0	1.859+0	1.490+0
=	β	1.246	1.561	1.602	1.593	1.567	1.534	1.499	1.463	1.426	1.390	1.355
513.9 eV	γ	3.64-1	-6.59-4	1.97-2	1.59-1	3.27-1	4.95-1	6.55-1	8.05-1	9.44-1	1.07+0	1.19+0
	δ	5.79 - 2	3.28 - 3	1.72 - 3	4.71 - 3	9.40 - 3	1.51 - 2	2.14 - 2	2.83 - 2	3.57 - 2	4.34 - 2	5.13 - 2
= 64, Gd:				1.72-3	4./1-3	9.40-3	1.51-2	2.14-2	2.83-2	3.57-2	4.34-2	5.13-2
= 64, Gd:		$rac{1}{5/2}^{6}4 m f_{7/2}^{1}5 m d_{3/2}^{1}$		1.72-3	4.71-3	9.40-3	1.51-2	2.14-2	2.83-2	3.57-2	4.34-2	5.13-2
		<sup>6</sup> <sub>5/2</sub> <b>4f</b> <sup>1</sup> <sub>7/2</sub> 5 <b>d</b> <sup>1</sup> <sub>3/</sub> <u>k</u> (eV)	2 6s <sub>1/2</sub>									
hell	[Xe]4f	$\frac{{}_{5/2}^{6} 4 f_{7/2}^{1} 5 d_{3/2}^{1}}{\frac{k \text{ (eV)}}{2000}}$	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
nell 61/2	[Xe]4i	$ \frac{{}_{5/2}^{6} 4 f_{7/2}^{1} 5 d_{3/2}^{1}}{\frac{k \text{ (eV)}}{2000}} $ $ 0.000+0 $	3000 0.000+0	4000 0.000+0	5000 0.000+0	6000 0.000+0	7000 0.000+0	8000 0.000+0	9000 1.242+1	10000 1.053+1	11000 8.940+0	12000 7.648+0
nell 61/2	σ β	$ \frac{{}^{6}_{5/2}  4 f^{1}_{7/2}  5 d^{1}_{3/4}}{{}^{k}  (eV)} $ $ 0.000+0 $ $0.000$	3000 0.000+0 0.000	4000 0,000+0 0,000	5000 0,000+0 0.000	6000 0.000+0 0.000	7000 0.000+0 0.000	8000 0.000+0 0.000	9000 1.242+1 1.930	10000 1.053+1 1.945	11000 8.940+0 1.957	12000 7.648+0 1.965
nell 1/2 =	σ β γ	$ \frac{k \text{ (eV)}}{2000} $ $ 0.000+0 $ $0.000+0 $	3000 0.000+0 0.000 0.00+0	4000 0.000+0 0.000 0.00+0	5000 0.000+0 0.000 0.00+0	6000 0.000+0 0.000 0.00+0	7000 0.000+0 0.000 0.00+0	8000 0.000+0 0.000 0.00+0	9000 1.242+1 1.930 7.58-1	10000 1.053+1 1.945 2.31-1	11000 8.940+0 1.957 7.90-3	12000 7.648+0 1.965 -8.67-
nell 1/2 = 875.6 eV	σ β γ δ	$ \frac{k \text{ (eV)}}{2000} $ $ \frac{0.000+0}{0.000+0} $ $0.000+0$ $0.000+0$ $0.000+0$	3000 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0	4000 0.000+0 0.000 0.00+0 0.00+0	5000 0.000+0 0.000 0.00+0 0.00+0	6000 0.000+0 0.000 0.00+0 0.00+0	7000 0.000+0 0.000 0.00+0 0.00+0	8000 0.000+0 0.000 0.00+0 0.00+0	9000 1.242+1 1.930 7.58-1 -1.23-3	10000 1.053+1 1.945 2.31-1 -1.62-3	11000 8.940+0 1.957 7.90-3 -1.76-3	12000 7.648+0 1.965 -8.67- -1.83-
nell i 1/2 = 375.6 eV	σ β γ δ	$\begin{array}{c} \mathbf{f_{5/2}} \ \mathbf{4f_{7/2}} \ \mathbf{5d_{3/2}} \\ \underline{k} \ (\text{eV}) \\ \hline 2000 \\ 0.000+0 \\ 0.000 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \\ \hline \end{array}$	3000 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0	4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0	5000 0.000+0 0.000 0.00+0 0.00+0 0.000+0	6000 0.000+0 0.000 0.00+0 0.00+0 0.000+0	7000 0.000+0 0.000 0.00+0 0.00+0 0.00+0	8000 0.000+0 0.000 0.00+0 0.00+0 2.512+1	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1	12000 7.648+0 1.965 -8.67- -1.83- 9.638+0
nell 1/2 = 875.6 eV 01/2 =	$egin{array}{c} \sigma & & & & \\ \beta & & & & \\ \gamma & \delta & & & \\ \sigma & & \beta & & \\ \end{array}$	$\begin{array}{c} \mathbf{f}_{5/2}  \mathbf{4f}_{7/2}^1  \mathbf{5d}_{3/}^1 \\ \hline k  (\text{eV}) \\ \hline 2000 \\ 0.000+0 \\ 0.000 \\ 0.00+0 \\ 0.000+0 \\ \hline 0.000+0 \\ 0.000+0 \\ 0.000 \end{array}$	3000 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 0.000+0	4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000	5000 0.000+0 0.000 0.00+0 0.00+0 0.000+0	6000 0.000+0 0.000 0.00+0 0.00+0 0.000+0	7000 0.000+0 0.000 0.00+0 0.00+0 0.000+0	8000 0.000+0 0.000 0.00+0 0.00+0 2.512+1 0.791	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383	12000 7.648+0 1.965 -8.67- -1.83- 9.638+0 1.376
nell 61/2 == 375.6 eV	σ β γ δ σ β γ	\$\frac{\mathbf{s}_{1/2}}{k} \frac{4\mathbf{r}_{1/2}}{2\mathbf{d}_{3/2}} \frac{\mathbf{d}_{1/2}}{k} \text{ (eV)} \\ \frac{2000}{0.000+0} \\ 0.000+0 \\ 0.00	3000 0.000+0 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0	4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000 0.00+0	5000 0.000+0 0.000 0.000 0.00+0 0.000+0 0.000+0 0.000+0	6000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000 0.00+0	7000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000 0.00+0	8000 0.000+0 0.000 0.000 0.00+0 0.00+0 2.512+1 0.791 -4.93-1	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1	12000 7.648+0 1.965 -8.67- -1.83- 9.638+0 1.376 5.94-1
nell  51/2  = 375.6 eV  71/2  = 930.3 eV	σ β γ δ σ β γ δ	$\begin{array}{c} {}^{8}_{5/2} \ \mathbf{4f}^{1}_{7/2} \ \mathbf{5d}^{1}_{3/} \\ k \ (\text{eV}) \\ \hline 2000 \\ 0.000+0 \\ 0.00+0 \\ 0.00+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ \end{array}$	3000 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0	4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0	5000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0	6000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0	7000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0	8000 0.000+0 0.000 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2	12000 7.648+0 1.965 -8.67- -1.83- 9.638+0 1.376 5.94-1 5.47-2
nell  51/2  = 375.6 eV  01/2  = 930.3 eV	σ β γ δ σ β γ δ	$\begin{array}{c} \frac{8}{5/2}  4f_{7/2}^{1}  5d_{3/}^{1} \\ k  (\text{eV}) \\ \hline 2000 \\ 0.000+0 \\ 0.000+0 \\ 0.00+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ \end{array}$	3000 0.000+0 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.000+0	4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.000+0	5000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0	6000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0	7000 0.000+0 0.000 0.00+0 0.00+0 0.00+0 0.000+0 0.00+0 0.00+0	8000 0.000+0 0.000 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1	12000 7.648+0 1.965 -8.67- -1.83- 9.638+0 1.376 5.94-1 5.47-2 1.538+1
nell  51/2  == 375.6 eV  71/2  == 930.3 eV	Xe   4f   F   F   F   F   F   F   F   F   F	\$\frac{4\frac{1}{5}/2}{24\frac{1}{7}/2} 5\d\frac{1}{3}/2}\$ \$\frac{k}{(eV)}\$  \[ \frac{2000}{0.000+0} 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	3000 0.000+0 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0	5000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0	6000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 0.000+0	7000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 0.000+0	8000 0.000+0 0.000 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.492	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499	12000 7.648+0 1.965 -8.67- -1.83- 9.638+0 1.376 5.94-1 5.47-2 1.538+1 1.492
nell  61/2 = 875.6 eV  71/2 = 930.3 eV	Xe   4f   F   F   F   F   F   F   F   F   F	\$\frac{4\frac{1}{5}/2}{2}\frac{4\frac{1}{7}/2}{5}\frac{1}{3}\frac{1}{3}\frac{1}{7}\frac{1}{5}\frac{1}{3}\frac{1}{7}\frac{1}{5}\frac{1}{3}\frac{1}{7}\frac{1}{5}\frac{1}{3}\frac{1}{7}\frac{1}{5}\frac{1}{3}\frac{1}{7}\frac{1}{5}\frac{1}{3}\frac{1}{7}\frac{1}{3}	3000 0.000+0 0.000+0 0.000 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	4000 0.000+0 0.000 0.00+0 0.000+0 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0	5000 0.000+0 0.000 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	6000 0.000+0 0.000 0.00+0 0.000+0 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0	7000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0	8000 0.000+0 0.000 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.492 2.88-1	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1	12000 7.648+0 1.965 -8.67- -1.83- 9.638+0 1.376 5.94-1 5.47-2 1.538+1 1.492 7.89-1
nell  S <sub>1/2</sub> =  375.6 eV  P <sub>1/2</sub> =  930.3 eV  P <sub>3/2</sub> =  242.8 eV	(Xe)4i	\$\frac{4\frac{1}{5}/2}{2}\frac{4\frac{1}{7}/2}{5}\frac{1}{3}\frac{1}{3}\frac{1}{5}/2}\$\$ \$\frac{k}{2}\text{(eV)}\$\$ \$\frac{1}{2}\text{000}\$\$ \$0.000+0\$\$ \$0.0	3000 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0	4000 0.000+0 0.000 0.00+0 0.000+0 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0	5000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0	6000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0	7000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0	8000 0.000+0 0.000 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.492 2.88-1 4.99-2	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2	12000 7.648+0 1.965 -8.67- -1.83- 9.638+0 1.376 5.94-1 5.47-2 1.538+1 1.492 7.89-1 6.26-2
nell  51/2  = 375.6 eV  01/2  = 930.3 eV  023/2  = 242.8 eV	(Xe)4i    σ   β   γ   δ     σ   β   γ   δ     σ   β   γ   δ     σ   β   γ   δ     σ   β   γ   δ     σ   σ   σ   σ     σ   σ   σ   σ   σ	8 47,2 45,2 46,2 46,3 46,2 47,2 50,3 47,2 50,3 47,2 50,3 47,2 50,3 47,2 50,3 47,2 50,3 47,2 50,3 47,2 50,3 47,2 50,3 47,2 50,3 47,2 50,3 47,2 50,3 47,2 50,3 50,3 50,3 50,3 50,3 50,3 50,3 50,3	3000 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	4000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.394+1	5000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0	6000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	7000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	8000 0.000+0 0.000 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2 4.007+0	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2 3.191+0	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.499-2 2.594+0	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2 2.145+0	12000 7.648+0 1.965 -8.67- -1.83- 9.638+0 1.376 5.94-1 5.47-2 1.538+1 1.492 7.89-1 6.26-2 1.799+0
nell  i1/2 = 875.6 eV  O1/2 = 030.3 eV  O2/2 = 242.8 eV	(Xe)44    σ   β   γ   δ   δ   σ   β   γ   δ   δ   σ   β   γ   δ   σ   β   γ   δ   σ   β   β   σ   β   β   β   σ   β   β	8 47/2 5d <sub>3</sub> /4 (eV) 2000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.000+0 0.000+0 0.000+0 1.000	3000 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 1.938	4000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.394+1 1.948	5000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.000+0 1.000+0 1.000+0	6000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.000+0 1.000+0 1.000+0	7000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.969	8000 0.000+0 0.000 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2 4.007+0 1.973	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2 3.191+0 1.975	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.492 2.88-1 4.99-2 2.594+0 1.977	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2 2.145+0 1.977	12000 7.648+0 1.965 -8.67 - -1.83 - 9.638+0 1.376 5.94 - 1 5.47 - 2 1.538+1 1.492 7.89 - 1 6.26 - 2 1.799+0 1.977
nell  51/2 == 375.6 eV  01/2 == 930.3 eV  03/2 == 242.8 eV	σ         β           γ         δ           σ         β           γ         δ           σ         β           γ         δ           σ         β           γ         γ           δ         γ	8 47/2 5d <sub>3</sub> /4 k (eV) 2000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.000+0 0.000+0 1.924 1.09+0	3000 0.000+0 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.938 3.97-1	4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.394+1 1.948 1.02-1	5000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.957 -5.13-2	6000 0.000+0 0.000 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 1.963 -1.23-1	7000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.969 -1.45-1	8000 0.000+0 0.000 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2 4.007+0 1.973 -1.33-1	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2 3.191+0 1.975 -9.77-2	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.492 2.88-1 4.99-2 2.594+0 1.977 -4.64-2	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2 2.145+0 1.977 1.60-2	12000 7.648+0 1.965 -8.67 - -1.83 - 9.638+0 1.376 5.94-1 5.47-2 1.538+1 1.492 7.89-1 6.26-2 1.799+0 1.977 8.61-2
nell  51/2  == 375.6 eV  91/2  == 930.3 eV  93/2  == 242.8 eV  51/2  == 880.8 eV	σ         β           γ         δ           σ         β           γ         δ           σ         β           γ         δ           σ         β           γ         δ           δ         γ	6 47/2 5d <sub>3</sub> /4 60/3/4 6	3000 0.000+0 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.938 3.97-1 -6.20-4	4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.000+0 0.00+0 0.00+0 1.394+1 1.948 1.02-1 -8.93-4	5000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 1.957 -5.13-2 -1.04-3	6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.963 -1.23-1 -1.14-3	7000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.000+0 0.00+0 0.00+0 0.00+0 1.969 -1.45-1 -1.21-3	8000 0.000+0 0.000 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2 4.007+0 1.973 -1.33-1 -1.27-3	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2 3.191+0 1.975 -9.77-2 -1.31-3	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.492 2.88-1 4.99-2 2.594+0 1.977 -4.64-2 -1.35-3	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2 2.145+0 1.977 1.60-2 -1.38-3	12000 7.648+( 1.965 -8.67- -1.83- 9.638+( 1.376 5.94-1 5.47-2 1.538+1 1.492 7.89-1 6.26-2 1.799+( 1.977 8.61-2 -1.40-
hell  \$\frac{5}{1/2} = \frac{1}{2} = 1	σ         β           γ         δ           σ         β           γ         δ           σ         β           γ         δ           σ         β           γ         δ           σ         β           γ         δ           σ         σ	\$\frac{4\frac{1}{5}/2}{4\frac{7}/2} 5\d\frac{1}{3}/2}\$ \$\frac{k}(eV)\$ \( \frac{2}{2000} \)  0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.924 1.09+0 5.17-4 5.655+1	3000 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.00+0 0.000+0 0.00+0 0.00+0 2.206+1 1.938 3.97-1 -6.20-4 3.163+1	4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.000+0 0.00+0 0.00+0 1.394+1 1.948 1.02-1 -8.93-4 1.885+1	5000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.000+0 0.00+0 0.00+0 1.957 -5.13-2 -1.04-3 1.209+1	6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 6.861+0 1.963 -1.23-1 -1.14-3 8.209+0	7000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.969 -1.45-1 -1.21-3 5.828+0	8000 0.000+0 0.000 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2 4.007+0 1.973 -1.33-1 -1.27-3 4.285+0	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2 3.191+0 1.975 -9.77-2 -1.31-3 3.242+0	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.492 2.88-1 4.99-2 2.594+0 1.977 -4.64-2 -1.35-3 2.511+0	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2 2.145+0 1.977 1.60-2 -1.38-3 1.983+0	12000 7.648+0 1.965 -8.67- -1.83- 9.638+0 1.376 5.94-1 5.47-2 1.538+1 1.492 7.89-1 6.26-2 1.799+0 1.977 8.61-2 -1.40- 1.593+0
hell $S_{1/2}$ = 375.6  eV $P_{1/2}$ = 930.3  eV $P_{3/2}$ = 242.8  eV $S_{1/2}$ = = 880.8  eV $P_{1/2}$ =	$ \begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \sigma \\ \beta \\ \sigma \\ \beta \\ \sigma \\ \beta \\ \sigma \\ \delta \\ \sigma \\ \beta \\ \sigma \\ \delta \\ \sigma \\ \sigma$	8 47,2 47,2 5d3/ k (eV) 2000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.000+0 0.000+0 0.000+0 1.000+0	3000 0.000+0 0.000 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 1.938 3.97-1 -6.20-4 3.163+1 1.545	4000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.394+1 1.948 1.02-1 -8.93-4 1.885+1 1.599	5000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.00+0 0.00+0 1.957 -5.13-2 -1.04-3 1.209+1 1.596	6000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.000+0 0.00+0 0.00+0 0.00+0 1.963 -1.23-1 -1.14-3 8.209+0 1.573	7000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 1.969 -1.45-1 -1.21-3 5.828+0 1.542	8000 0.000+0 0.000 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2 4.007+0 1.973 -1.33-1 -1.27-3 4.285+0 1.508	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2 3.191+0 1.975 -9.77-2 -1.31-3 3.242+0 1.473	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.492 2.88-1 4.99-2 2.594+0 1.977 -4.64-2 -1.35-3 2.511+0 1.437	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2 2.145+0 1.977 1.60-2 -1.38-3 1.983+0 1.402	12000 7.648+0 1.965 -8.67- -1.83- 9.638+0 5.94-1 5.47-2 1.538+1 1.492 7.89-1 6.26-2 1.799+0 1.977 8.61-2 -1.40- 1.593+1 1.368
nell  61/2 = 375.6 eV  701/2 = 930.3 eV  703/2 = 242.8 eV  61/2 = 380.8 eV	(Xe)4    σ   β   γ   δ   σ   β   γ   δ   δ   β   γ   δ   δ   δ   δ   δ   δ   δ   δ   δ   δ	8 47,2 47,2 5d3,4 k (eV) 2000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.000+0 0.000+0 1.755+1 1.924 1.09+0 5.17-4 5.655+1 1.152 4.09-1	3000 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.00+0 0.000+0 0.00+0 0.00+0 0.00+0 1.938 3.97-1 -6.20-4 3.163+1 1.545 1.75-2	4000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.394+1 1.948 1.02-1 -8.93-4 1.885+1 1.599 5.29-3	5000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.957 -5.13-2 -1.04-3 1.209+1 1.596 1.30-1	6000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.963 -1.23-1 -1.14-3 8.209+0 1.573 2.93-1	7000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.969 -1.45-1 -1.21-3 5.828+0 1.542 4.60-1	8000 0.000+0 0.000+0 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2 4.007+0 1.973 -1.33-1 -1.27-3 4.285+0 1.508 6.20-1	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2 3.191+0 1.975 -9.77-2 -1.31-3 3.242+0 1.473 7.69-1	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.499-2 2.594+0 1.977 -4.64-2 -1.35-3 2.511+0 1.437 9.08-1	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2 2.145+0 1.977 1.60-2 -1.38-3 1.983+0 1.402 1.402 1.04+0	12000 7.648+0 1.965 -8.67- -1.83- 9.638+0 5.94-1 5.47-2 1.538+1 1.492 7.89-1 1.977 8.61-2 -1.40- 1.593+0 1.368 1.15+0
nell  61/2 = 375.6 eV  01/2 = 930.3 eV  03/2 = 242.8 eV  61/2 = 380.8 eV  01/2 = 6588.3 eV	$ \begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \sigma \\ \delta \\ \sigma \\ \sigma \\ \sigma \\ \delta \\ \sigma \\ \sigma$	8 47,2 5d3,4 k (eV) 2000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.924 1.09+0 5.17-4 5.655+1 1.152 4.09-1 8.33-2	3000 0.000+0 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.00+0 0.00+0 0.000+0 0.00+0 2.206+1 1.938 3.97-1 -6.20-4 3.163+1 1.545 1.75-2 4.55-3	4000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.394+1 1.948 1.02-1 -8.93-4 1.885+1 1.599 5.29-3 1.40-3	5000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.957 -5.13-2 -1.04-3 1.209+1 1.596 1.30-1 3.95-3	6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.963 -1.23-1 -1.14-3 8.209+0 1.573 2.93-1 8.23-3	7000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.969 -1.45-1 -1.21-3 5.828+0 1.542 4.60-1 1.35-2	8000 0.000+0 0.000+0 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2 4.007+0 1.973 -1.33-1 -1.27-3 4.285+0 1.508 6.20-1 1.94-2	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2 3.191+0 1.975 -9.77-2 -1.31-3 3.242+0 1.473 7.69-1 2.58-2	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.492 2.88-1 4.99-2 2.594+0 1.977 -4.64-2 -1.35-3 2.511+0 1.437 9.08-1 3.27-2	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2 2.145+0 1.977 1.60-2 -1.38-3 1.983+0 1.402 1.04+0 3.99-2	12000 7.648+0 1.965 -8.67 - -1.83 - 9.638+0 5.94-1 5.47-2 1.538+1 6.26-2 1.799+0 1.977 8.61-2 -1.40- 1.538+ 1.368 1.15+0 4.74-2
nell  1/2 = 375.6 eV  1/2 = 330.3 eV  1/2 = 242.8 eV  1/2 = 880.8 eV  1/2 = 888.3 eV	(Xe)44    σ   β   γ   δ     σ   β   γ   δ     σ   β   γ   δ     σ   β   γ   δ     σ   β   γ   δ     σ   β   γ   δ     σ   β   γ   δ     σ   β   γ   δ     σ   β   γ   δ     σ   σ   σ   σ     σ   σ   σ   σ     σ   σ	8 47/2 5d3/ k (eV) 2000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.924 1.09+0 5.17-4 5.655+1 1.152 4.09-1 8.33-2 1.277+2	3000 0.000+0 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.938 3.97-1 -6.20-4 3.163+1 1.545 1.75-2 4.55-3 6.421+1	4000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.394+1 1.948 1.02-1 -8.93-4 1.885+1 1.599 1.40-3 3.629+1	5000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.957 -5.13-2 -1.04-3 1.209+1 1.596 1.30-1 3.95-3 2.245+1	6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.963 -1.23-1 -1.14-3 8.209+0 1.573 8.293-1 8.23-3 1.484+1	7000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.969 -1.45-1 -1.21-3 5.828+0 1.542 4.60-1 1.35-2 1.031+1	8000 0.000+0 0.000+0 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2 4.007+0 1.973 -1.33-1 -1.27-3 4.285+0 1.508 6.20-1 1.94-2 7.443+0	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2 3.191+0 1.975 -9.77-2 -1.31-3 3.242+0 1.473 7.69-1 2.58-2 5.542+0	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.492 2.88-1 4.99-2 2.594+0 1.977 -4.64-2 -1.35-3 2.511+0 1.437 9.08-1 3.27-2 4.232+0	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2 2.145+0 1.977 1.60-2 -1.38-3 1.983+0 1.402 3.99-2 3.300+0	12000 7.648+0 1.965 -8.67- -1.83- 9.638+0 1.376 5.94-1 5.47-2 1.538+1 1.492 7.89-1 6.26-2 1.799+0 1.977 8.61-2 -1.40- 1.368 1.15+0 4.74-2 2.620+0
Poly 2 Po	(Xe)44    σ	$\begin{array}{l} {\bf fs}_{5/2} \ {\bf 4f}_{7/2} \ {\bf 5d}_{3/}^{\bullet} \\ {\bf k} \ ({\rm eV}) \\ \hline 2000 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 3.755+1 \\ 1.924 \\ 1.09+0 \\ 5.17-4 \\ 5.655+1 \\ 1.152 \\ 4.09-1 \\ 8.33-2 \\ 1.277+2 \\ 1.271 \end{array}$	3000 0.000+0 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 2.206+1 1.938 3.97-1 -6.20-4 3.163+1 1.545 1.75-2 4.55-3 6.421+1 1.601	4000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.00+0 0.000+0 0.000+0 0.00+0 1.394+1 1.948 1.02-1 -8.93-4 1.885+1 1.599 5.29-3 1.40-3 3.629+1 1.667	5000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.957 -5.13-2 -1.04-3 1.209+1 1.596 1.30-1 3.95-3 2.245+1 1.674	6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.963 -1.23-1 -1.14-3 8.209+0 1.573 2.93-1 8.23-3 1.484+1 1.660	7000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.969 -1.45-1 -1.21-3 5.828+0 1.542 4.60-1 1.35-2 1.031+1 1.636	8000 0.000+0 0.000 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2 4.007+0 1.973 -1.33-1 -1.27-3 4.285+0 1.508 6.20-1 1.943-0 1.607	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2 3.191+0 1.975 -9.77-2 -1.31-3 3.242+0 1.473 7.69-1 2.58-2 5.542+0 1.576	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.492 2.88-1 4.99-2 2.594+0 1.977 -4.64-2 -1.35-3 2.511+0 1.437 9.08-1 3.27-2 4.232+0 1.543	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2 2.145+0 1.977 1.60-2 -1.38-3 1.983+0 1.402 1.04+0 3.99-2 3.300+0 1.511	12000 7.648+( 1.965 -8.67 - -1.83 - 9.638+( 1.376 5.94-1 5.47-2 1.538+1 1.492 7.89-1 6.26-2 1.799+( 1.977 8.61-2 -1.40- 1.593+( 1.368 1.15+0 4.74-2 2.620+( 1.478
Poly 2 Po	(Xe)4    σ   β   γ   δ   σ   β   γ   δ   δ   σ   β   γ   δ   δ   γ   δ   δ   η   δ   δ   η   δ   η   η   η   η   η   η   η   η   η   η	$\begin{array}{l} {}^{\bf 6}_{5/2} \ {\bf 4f}_{7/2}^{\prime} \ {\bf 5d}_{3/}^{} \\ {}^{}_{} \ {}^{}_{} \ {}^{}_{} \\ {}^{}_{} \ {}^{$	3000 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.00+0 0.000+0 0.00+0 0.00+0 2.206+1 1.938 3.97-1 -6.20-4 3.163+1 1.545 1.75-2 4.55-3 6.421+1 1.601 -3.63-2	4000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.00+0 0.000+0 0.00+0 0.00+0 1.394+1 1.948 1.02-1 -8.93-4 1.885+1 1.599 5.29-3 1.40-3 3.629+1 1.667 1.06-2	5000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.957 -5.13-2 -1.04-3 1.209+1 1.596 1.30-1 3.95-3 2.245+1 1.674 1.67-1	6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.963 -1.23-1 -1.14-3 8.209+0 1.573 2.93-1 8.23-3 1.484+1 1.660 3.51-1	7000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.969 -1.45-1 -1.21-3 5.828+0 1.542 4.60-1 1.35-2 1.031+1 1.636 5.35-1	8000 0.000+0 0.000 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2 4.007+0 1.973 -1.33-1 -1.27-3 4.285+0 1.508 6.20-1 1.94-2 7.443+0 1.607 7.11-1	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2 3.191+0 1.975 -9.77-2 -1.31-3 3.242+0 1.473 7.69-1 2.58-2 5.542+0 1.576 8.74-1	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.492 2.88-1 4.99-2 2.594+0 1.977 -4.64-2 -1.35-3 2.511+0 1.437 9.08-1 3.27-2 4.232+0 1.543 1.02+0	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2 2.145+0 1.977 1.60-2 -1.38-3 1.983+0 1.402 1.04+0 3.99-2 3.300+0 1.511 1.16+0	12000 7.648+(1.965 -8.671.83- 9.638+(1.376 5.94-1 5.47-2 1.538+1 1.492 7.89-1 6.26-2 1.799+(1.977 8.61-2 -1.40- 1.593+(
P <sub>3/2</sub> = 930.3 eV  P <sub>1/2</sub> = 930.3 eV  P <sub>3/2</sub> = 242.8 eV  S <sub>1/2</sub> = 880.8 eV  P <sub>3/2</sub> = 688.3 eV	(Xe)4    σ   β   γ   δ     σ   δ   σ   δ   δ     σ   σ   σ   δ   δ     σ   σ   σ   δ   δ     σ   σ   σ   σ   δ     σ   σ   σ   σ   σ     σ   σ   σ   σ	8 47,2 47,2 5d3,4 k (eV) 2000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.924 1.09+0 5.17-4 5.655+1 1.152 4.09-1 8.33-2 1.277+2 1.271 2.72-1 4.32-2	3000 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 2.206+1 1.938 3.97-1 -6.20-4 3.163+1 1.545 1.75-2 4.55-3 6.421+1 1.601 -3.63-2 7.35-3	4000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.00+0 0.000+0 0.000+0 0.00+0 1.394+1 1.948 1.02-1 -8.93-4 1.885+1 1.599 5.29-3 1.40-3 3.629+1 1.667	5000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.957 -5.13-2 -1.04-3 1.209+1 1.596 1.30-1 3.95-3 2.245+1 1.674	6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.963 -1.23-1 -1.14-3 8.209+0 1.573 2.93-1 8.23-3 1.484+1 1.660	7000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.969 -1.45-1 -1.21-3 5.828+0 1.542 4.60-1 1.35-2 1.031+1 1.636	8000 0.000+0 0.000 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2 4.007+0 1.973 -1.33-1 -1.27-3 4.285+0 1.508 6.20-1 1.943-0 1.607	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2 3.191+0 1.975 -9.77-2 -1.31-3 3.242+0 1.473 7.69-1 2.58-2 5.542+0 1.576	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.492 2.88-1 4.99-2 2.594+0 1.977 -4.64-2 -1.35-3 2.511+0 1.437 9.08-1 3.27-2 4.232+0 1.543	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2 2.145+0 1.977 1.60-2 -1.38-3 1.983+0 1.402 1.04+0 3.99-2 3.300+0 1.511	12000 7.648+(1.965 -8.671.83- 9.638+(1.376 5.94-1 5.47-2 1.538+1 1.492 7.89-1 6.26-2 1.799+(1.977 8.61-2 -1.40- 1.593+(
nell  51/2  = 375.6 eV  01/2  = 930.3 eV  03/2  = 242.8 eV  01/2  = 880.8 eV  01/2  = 688.3 eV	(Xe)4    σ   β   γ   δ     σ   δ   σ   δ   δ     σ   σ   σ   δ   δ     σ   σ   σ   δ   δ     σ   σ   σ   σ   δ     σ   σ   σ   σ   σ     σ   σ   σ   σ	$\begin{array}{l} \frac{8}{5} \cdot 24 \frac{7}{1/2} \cdot 26 \frac{1}{3/2} \\ k \; (eV) \\ \hline 2000 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.00+0 \\ 0.00+0 \\ 1.924 \\ 1.09+0 \\ 5.17-4 \\ 5.655+1 \\ 1.152 \\ 4.09-1 \\ 8.33-2 \\ 1.277+2 \\ 1.277+2 \\ 1.277+2 \\ 1.277-1 \\ 4.32-2 \\ 6\frac{5}{1/2} \cdot 46 \frac{7}{3/2} \cdot 68 \frac{2}{1/2} \cdot 68 \frac{2}$	3000 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 2.206+1 1.938 3.97-1 -6.20-4 3.163+1 1.545 1.75-2 4.55-3 6.421+1 1.601 -3.63-2 7.35-3	4000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.00+0 0.000+0 0.00+0 0.00+0 1.394+1 1.948 1.02-1 -8.93-4 1.885+1 1.599 5.29-3 1.40-3 3.629+1 1.667 1.06-2	5000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.957 -5.13-2 -1.04-3 1.209+1 1.596 1.30-1 3.95-3 2.245+1 1.674 1.67-1	6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.963 -1.23-1 -1.14-3 8.209+0 1.573 2.93-1 8.23-3 1.484+1 1.660 3.51-1	7000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.969 -1.45-1 -1.21-3 5.828+0 1.542 4.60-1 1.35-2 1.031+1 1.636 5.35-1	8000 0.000+0 0.000 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2 4.007+0 1.973 -1.33-1 -1.27-3 4.285+0 1.508 6.20-1 1.94-2 7.443+0 1.607 7.11-1	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2 3.191+0 1.975 -9.77-2 -1.31-3 3.242+0 1.473 7.69-1 2.58-2 5.542+0 1.576 8.74-1	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.492 2.88-1 4.99-2 2.594+0 1.977 -4.64-2 -1.35-3 2.511+0 1.437 9.08-1 3.27-2 4.232+0 1.543 1.02+0	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2 2.145+0 1.977 1.60-2 -1.38-3 1.983+0 1.402 1.04+0 3.99-2 3.300+0 1.511 1.16+0	12000 7.648+(1.965 -8.671.83- 9.638+(1.376 5.94-1 5.47-2 1.538+ 1.492 7.89-1 6.26-2 1.799+(1.977 8.61-2 -1.40- 1.593+(1.478 1.1540 4.74-2 2.620+(1.478 1.29+0
nell  61/2  = 375.6 eV  71/2  = 930.3 eV  72/2  = 242.8 eV  71/2  = 380.8 eV  71/2  = 6544.0 eV  = 65, Tb:	(Xe)4    σ   β   γ   δ     σ   δ   σ   δ   δ     σ   σ   σ   δ   δ     σ   σ   σ   δ   δ     σ   σ   σ   σ   δ     σ   σ   σ   σ   σ     σ   σ   σ   σ	$\begin{array}{l} \frac{8}{5} \cdot 24 \frac{7}{1/2} \cdot 5d\frac{1}{3} / \\ k \cdot (eV) \\ \hline 2000 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 1.924 \\ 1.09+0 \\ 5.17-4 \\ 5.655+1 \\ 1.152 \\ 4.09-1 \\ 8.33-2 \\ 1.277+2 \\ 1.277+2 \\ 1.277+2 \\ 1.277+1 \\ 2.72-1 \\ 4.32-2 \\ \frac{6}{5} \cdot 24 \frac{47}{1/2} \cdot 6s^{2}_{1/2} \cdot 6s^{2}_{1/2} \\ k \cdot (eV) \end{array}$	3000 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 1.938 3.97-1 -6.20-4 3.163+1 1.545 1.75-2 4.55-3 6.421+1 1.601 -3.63-2 7.35-3	4000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.394+1 1.948 1.02-1 -8.93-4 1.885+1 1.599 5.29-3 1.40-3 3.629+1 1.667 1.06-2 9.66-3	5000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.957 -5.13-2 -1.04-3 1.209+1 1.596 1.30-1 3.95-3 2.245+1 1.674 1.67-1 1.34-2	6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 6.861+0 1.963 -1.23-1 -1.14-3 8.209+0 1.573 2.93-1 8.23-3 1.484+1 1.660 3.51-1 1.73-2	7000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.969 -1.45-1 -1.21-3 5.828+0 1.542 4.60-1 1.35-2 1.031+1 1.636 5.35-1 2.13-2	8000 0.000+0 0.000 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2 4.007+0 1.973 -1.33-1 -1.27-3 4.285+0 1.508 6.20-1 1.94-2 7.443+0 1.607 7.11-1 2.56-2	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2 3.191+0 1.975 -9.77-2 -1.31-3 3.242+0 1.473 7.69-1 2.58-2 5.542+0 1.576 8.74-1 3.00-2	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.492 2.88-1 4.99-2 2.594+0 1.977 -4.64-2 -1.35-3 2.511+0 1.437 9.08-1 3.27-2 4.232+0 1.543 1.02+0 3.48-2	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2 2.145+0 1.977 1.60-2 -1.38-3 1.983+0 1.402 1.04+0 3.99-2 3.300+0 1.511 1.16+0 3.99-2	12000 7.648+1 1.965 -8.67-1.83- 9.638+1 1.376 5.94-1 5.47-2 1.538+ 1.492 7.89-1 6.26-2 1.799+1 1.977 8.61-2 -1.40- 1.593+1 1.368 1.15+0 4.74-2 2.620+1 1.478 1.29+0 4.53-2
nell  1/2 = 375.6 eV  1/2 = 930.3 eV  2/3/2 = 2/42.8 eV  1/2 = 880.8 eV  2/3/2 = 688.3 eV  2/3/2 = 644.0 eV = 65, Tb:	(Xe)4    σ   β   γ   δ     σ   δ   σ   δ   δ     σ   σ   σ   δ   δ     σ   σ   σ   δ   δ     σ   σ   σ   σ   δ     σ   σ   σ   σ   σ     σ   σ   σ   σ	$\begin{array}{l} \frac{8}{5} \cdot 24 \frac{7}{1/2} \cdot 5d\frac{1}{3} \\ k \cdot (eV) \\ \hline 2000 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \\ 1.924 \\ 1.09+0 \\ 5.17-4 \\ 5.655+1 \\ 1.152 \\ 4.09-1 \\ 8.33-2 \\ 1.277+2 \\ 1.277+2 \\ 1.277-1 \\ 4.32-2 \\ \frac{6}{5/2} \cdot 24 \frac{7}{1/2} \cdot 65 \frac{2}{1/2} \\ \frac{k}{(eV)} \\ \hline 2000 \end{array}$	3000 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 2.206+1 1.938 3.97-1 -6.20-4 3.163+1 1.545 1.75-2 4.55-3 6.421+1 1.601 -3.63-2 7.35-3	4000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.394+1 1.948 1.02-1 -8.93-4 1.885+1 1.599 5.29-3 1.40-3 3.629+1 1.667 1.06-2 9.66-3	5000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.957 -5.13-2 -1.04-3 1.209+1 1.596 1.30-1 3.95-3 2.245+1 1.67-1 1.34-2	6000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 1.963 -1.23-1 -1.14-3 8.209+0 1.573 2.93-1 8.23-3 1.484+1 1.660 3.51-1 1.73-2	7000  0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.969 -1.45-1 -1.21-3 5.828+0 1.542 4.60-1 1.35-2 1.031+1 1.636 5.35-1 2.13-2	8000 0.000+0 0.000+0 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2 4.007+0 1.973 -1.33-1 -1.27-3 4.285+0 1.508 6.20-1 1.94-2 7.443+0 1.607 7.11-1 2.56-2	9000 1.242+1 1.930 7.58-1 -1.23-3 2.06341 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2 3.191+0 1.975 -9.77-2 -1.31-3 3.242+0 1.473 7.69-1 2.58-2 5.542+0 1.576 8.74-1 3.00-2	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.499-2 2.594+0 1.977 -4.64-2 -1.35-3 2.511+0 1.437 9.08-1 3.27-2 4.232+0 1.543 1.02+0 3.48-2	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2 2.145+0 1.977 1.60-2 -1.38-3 1.983+0 1.402 1.04+0 3.99-2 3.300+0 1.511 1.16+0 3.99-2	12000 7.648+ 1.965 -8.671.83- 9.638+ 1.376 5.94-1 5.47-2 1.538+ 1.492 1.799+ 1.977 8.61-2 -1.40- 1.593+ 1.368 1.15+0 4.74-2 2.620+ 1.478 4.53-2
nell  61/2 =375.6 eV  701/2 =930.3 eV  703/2 =242.8 eV  61/2 =380.8 eV  703/2 =6544.0 eV	(Xe)4    σ   β   γ   δ     σ   δ   σ   δ   δ     σ   σ   σ   δ   δ     σ   σ   σ   δ   δ     σ   σ   σ   σ   δ     σ   σ   σ   σ   σ     σ   σ   σ   σ	$\begin{array}{l} \frac{8}{5} \cdot 24 \frac{7}{1/2} \cdot 5d\frac{1}{3} / \\ k \cdot (eV) \\ \hline 2000 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 1.924 \\ 1.09+0 \\ 5.17-4 \\ 5.655+1 \\ 1.152 \\ 4.09-1 \\ 8.33-2 \\ 1.277+2 \\ 1.277+2 \\ 1.277+2 \\ 1.277+1 \\ 2.72-1 \\ 4.32-2 \\ \frac{6}{5} \cdot 24 \frac{47}{1/2} \cdot 6s^{2}_{1/2} \cdot 6s^{2}_{1/2} \\ k \cdot (eV) \end{array}$	3000 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 1.938 3.97-1 -6.20-4 3.163+1 1.545 1.75-2 4.55-3 6.421+1 1.601 -3.63-2 7.35-3	4000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.394+1 1.948 1.02-1 -8.93-4 1.885+1 1.599 5.29-3 1.40-3 3.629+1 1.667 1.06-2 9.66-3	5000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.957 -5.13-2 -1.04-3 1.209+1 1.596 1.30-1 3.95-3 2.245+1 1.674 1.67-1 1.34-2	6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 6.861+0 1.963 -1.23-1 -1.14-3 8.209+0 1.573 2.93-1 8.23-3 1.484+1 1.660 3.51-1 1.73-2	7000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.969 -1.45-1 -1.21-3 5.828+0 1.542 4.60-1 1.35-2 1.031+1 1.636 5.35-1 2.13-2	8000 0.000+0 0.000 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2 4.007+0 1.973 -1.33-1 -1.27-3 4.285+0 1.508 6.20-1 1.94-2 7.443+0 1.607 7.11-1 2.56-2	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2 3.191+0 1.975 -9.77-2 -1.31-3 3.242+0 1.473 7.69-1 2.58-2 5.542+0 1.576 8.74-1 3.00-2	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.492 2.88-1 4.99-2 2.594+0 1.977 -4.64-2 -1.35-3 2.511+0 1.437 9.08-1 3.27-2 4.232+0 1.543 1.02+0 3.48-2	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2 2.145+0 1.977 1.60-2 -1.38-3 1.983+0 1.402 1.04+0 3.99-2 3.300+0 1.511 1.16+0 3.99-2	12000 7.648+4 1.965 -8.671.83- 9.638+4 1.376 5.94-1 5.47-2 1.538+ 1.492 1.789-1 6.26-2 1.799+4 1.977 8.61-2 -1.40- 1.593+1 1.368 1.15+0 4.74-2 2.620+1 1.478 1.29+0 4.53-2
hell  S <sub>1/2</sub> b= 375.6 eV  P <sub>1/2</sub> b= 930.3 eV  P <sub>3/2</sub> b= 242.8 eV  S <sub>1/2</sub> b= 688.3 eV  P <sub>3/2</sub> b= 544.0 eV  = <b>65</b> , <b>Tb</b> :  hell  S <sub>1/2</sub> b=	[Xe]4     σ   β     γ   δ     σ   β     γ   δ     σ   β     γ   δ     σ   β     γ   δ     σ   β     γ   δ     σ   β     γ   δ     σ   β     γ   δ     [Xe]4	$\begin{array}{l} \frac{8}{5} \cdot 24 \frac{7}{1/2} \cdot 5d\frac{1}{3} \\ k \cdot (eV) \\ \hline 2000 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \\ 1.924 \\ 1.09+0 \\ 5.17-4 \\ 5.655+1 \\ 1.152 \\ 4.09-1 \\ 8.33-2 \\ 1.277+2 \\ 1.277+2 \\ 1.277-1 \\ 4.32-2 \\ \frac{6}{5/2} \cdot 24 \frac{7}{1/2} \cdot 65 \frac{2}{1/2} \\ \frac{k}{(eV)} \\ \hline 2000 \end{array}$	3000 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 2.206+1 1.938 3.97-1 -6.20-4 3.163+1 1.545 1.75-2 4.55-3 6.421+1 1.601 -3.63-2 7.35-3	4000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.394+1 1.948 1.02-1 -8.93-4 1.885+1 1.599 5.29-3 1.40-3 3.629+1 1.667 1.06-2 9.66-3	5000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.957 -5.13-2 -1.04-3 1.209+1 1.596 1.30-1 3.95-3 2.245+1 1.67-1 1.34-2	6000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 1.963 -1.23-1 -1.14-3 8.209+0 1.573 2.93-1 8.23-3 1.484+1 1.660 3.51-1 1.73-2	7000  0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.969 -1.45-1 -1.21-3 5.828+0 1.542 4.60-1 1.35-2 1.031+1 1.636 5.35-1 2.13-2	8000 0.000+0 0.000+0 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2 4.007+0 1.973 -1.33-1 -1.27-3 4.285+0 1.508 6.20-1 1.94-2 7.443+0 1.607 7.11-1 2.56-2	9000 1.242+1 1.930 7.58-1 -1.23-3 2.06341 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2 3.191+0 1.975 -9.77-2 -1.31-3 3.242+0 1.473 7.69-1 2.58-2 5.542+0 1.576 8.74-1 3.00-2	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.499-2 2.594+0 1.977 -4.64-2 -1.35-3 2.511+0 1.437 9.08-1 3.27-2 4.232+0 1.543 1.02+0 3.48-2	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2 2.145+0 1.977 1.60-2 -1.38-3 1.983+0 1.402 1.04+0 3.99-2 3.300+0 1.511 1.16+0 3.99-2	12000 7.648+0 1.965 -8.671.83- 9.638+0 1.376 5.94-1 5.47-2 1.538+1 1.492 1.789-1 6.26-2 1.799+0 1.977 8.61-2 -1.40- 1.593+0 1.593+0 1.474-2 2.620+0 1.478 1.29+0 4.53-2
hell $S_{1/2}$ $= 375.6 \text{ eV}$ $P_{1/2}$ $= 930.3 \text{ eV}$ $P_{3/2}$ $= 242.8 \text{ eV}$ $S_{1/2}$ $= 880.8 \text{ eV}$ $P_{3/2}$ $= 6588.3 \text{ eV}$ $P_{3/2}$ $= 6544.0 \text{ eV}$ $= 65, \text{ Tb:}$ hell $S_{1/2}$ $= 65$	[Xe]4f    σ   β   γ   δ   δ   σ   β   γ   δ   δ   σ   β   γ   δ   δ   σ   σ   δ   δ   σ   σ   σ   δ   σ   σ	$\begin{array}{l} {}^{6}_{5,2} \ 4f_{7/2}^{\prime} \ 5d_{3/}^{\prime} \\ k \ (eV) \\ \hline 2000 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 1.924 \\ 1.09+0 \\ 5.17-4 \\ 5.655+1 \\ 1.152 \\ 4.09-1 \\ 8.33-2 \\ 1.277+2 \\ 1.271 \\ 2.72-1 \\ 4.32-2 \\ \frac{6}{5} \ 4f_{7/2}^{\prime} \ 6s_{1/2}^{\prime} \\ k \ (eV) \\ \hline 2000 \\ 0.000+0 \\ \hline \end{array}$	3000 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 2.206+1 1.938 3.97-1 -6.20-4 3.163+1 1.545 1.75-2 4.55-3 6.421+1 1.601 -3.63-2 7.35-3	4000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.394+1 1.948 1.02-1 -8.93-4 1.885+1 1.599 5.29-3 1.40-3 3.629+1 1.667 1.06-2 9.66-3	5000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.957 -5.13-2 -1.04-3 1.209+1 1.596 1.30-1 3.95-3 2.245+1 1.674 1.67-1 1.34-2	6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.963 -1.23-1 -1.14-3 8.209+0 1.573 2.93-1 8.23-3 1.484+1 1.660 3.51-1 1.73-2	7000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.969 -1.45-1 -1.21-3 5.828+0 1.35-2 1.031+1 1.636 5.35-1 2.13-2	8000 0.000+0 0.000+0 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2 4.007+0 1.973 -1.33-1 -1.27-3 4.285+0 1.508 6.20-1 1.94-2 7.443+0 1.607 7.11-1 2.56-2	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2 3.191+0 1.975 -9.77-2 -1.31-3 3.242+0 1.473 7.69-1 2.58-2 5.542+0 1.576 8.74-1 3.00-2	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.499-2 2.594+0 1.977 -4.64-2 -1.35-3 2.511+0 1.437 9.08-1 3.27-2 4.232+0 1.575+1 1.02+0 3.48-2	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2 2.145+0 1.977 1.60-2 -1.38-3 1.983+0 1.402 1.04+0 3.99-2 3.300+0 1.511 1.16+0 3.99-2	12000 7.648+0 1.965 -8.67 -1.83 9.638+0 1.376 5.94-1 5.47-2 1.538+1 1.492 7.89-1 1.977 8.61-2 -1.40- 1.593+0 1.368 1.15+0 4.74-2 2.620+0 1.478 1.29+0 4.53-2
hell  \$\frac{\$s_{1/2}\$}{b=} = 375.6 eV  \$\frac{p_{1/2}}{b=} = 930.3 eV  \$\frac{p_{3/2}}{b=} = 242.8 eV  \$\frac{\$s_{1/2}}{b=} = 688.3 eV  \$\frac{p_{1/2}}{b=} = 65, Tb:  hell \$\frac{\$s_{1/2}\$}{s_{1/2}} = 65, Tb:	[Xe]4    σ   β   γ   δ   σ   β   γ   δ   σ   β   γ   δ   σ   β   γ   δ   δ   σ   β   γ   δ   δ   σ   σ   δ   δ   η   δ   δ   η   δ   δ   η   δ   δ   δ   δ   δ   δ   δ   δ   δ   δ	$\begin{array}{l} \frac{8}{5/2}  \mathbf{4f}_{7/2}^{\prime}  \mathbf{5d}_{3/}^{\prime} \\ \frac{k  (\text{eV})}{2000} \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.00+0 \\ 3.755+1 \\ 1.924 \\ 1.09+0 \\ 5.17-4 \\ 1.552 \\ 4.09-1 \\ 8.33-2 \\ 1.277+2 \\ 1.271 \\ 2.72-1 \\ 4.32-2 \\ \frac{6}{5/2}  \mathbf{4f}_{7/2}^{\prime}  \mathbf{6s}_{1/2}^{\prime} \\ \frac{k  (\text{eV})}{2000} \\ 0.000+0 \\ 0$	3000 0.000+0 0.000+0 0.000 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 2.206+1 1.938 3.97-1 -6.20-4 3.163+1 1.545 1.75-2 4.55-3 6.421+1 1.601 -3.63-2 7.35-3	4000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.394+1 1.948 1.02-1 -8.93-4 1.885+1 1.599 5.29-3 1.40-3 3.629+1 1.667 1.06-2 9.66-3	5000  0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.957 -5.13-2 -1.04-3 1.209+1 1.596 1.30-1 3.95-3 2.245+1 1.674 1.67-1 1.34-2	6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.963 -1.23-1 -1.14-3 8.209+0 1.573 2.93-1 8.23-3 1.484+1 1.660 3.51-1 1.73-2	7000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.969 -1.45-1 -1.21-3 5.828+0 1.542 4.60-1 1.35-2 1.031+1 1.636 5.35-1 2.13-2  7000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	8000 0.000+0 0.000+0 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2 4.007+0 1.973 -1.33-1 -1.27-3 4.285+0 1.508 6.20-1 1.94-2 7.443+0 1.607 7.11-1 2.56-2	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2 3.191+0 1.975 -9.77-2 -1.31-3 3.242+0 1.473 7.69-1 2.58-2 5.542+0 1.576 8.74-1 3.00-2	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.492 2.88-1 4.99-2 2.594+0 1.977 -4.64-2 -1.35-3 2.511+0 1.437 9.08-1 3.27-2 4.232+0 1.543 1.02+0 3.48-2	11000 8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2 2.145+0 1.977 1.60-2 -1.38-3 1.983+0 1.402 1.04+0 3.99-2 3.300+0 1.511 1.16+0 3.99-2 11000 9.174+0 1.950	12000 7.648+0 1.965 -8.67 -1.83 9.638+0 1.376 5.94-1 5.47-2 1.538+1 1.492 7.89-1 6.26-2 1.799+0 1.977 8.61-2 -1.40- 1.593+0 1.368 1.15+0 4.74-2 2.620+0 1.478 1.29+0 4.53-2
hell  S <sub>1/2</sub> b= 375.6 eV  P <sub>1/2</sub> b= 930.3 eV  P <sub>3/2</sub> b= 242.8 eV  S <sub>1/2</sub> b= 688.3 eV  P <sub>3/2</sub> b= 544.0 eV  = <b>65</b> , <b>Tb</b> :  hell  S <sub>1/2</sub> b=	[Xe]4    σ   β   γ   δ   δ     σ   β   γ   δ   δ     σ   β   γ   δ   δ   δ     σ   β   γ   δ   δ   δ     σ   σ   σ   δ   δ   δ     σ   σ   σ   σ   δ   δ     σ   σ   σ   σ   δ   δ   δ     σ   σ   σ   σ   σ   δ   δ     σ   σ   σ   σ   σ   σ   δ   δ     σ   σ   σ   σ   σ   σ   σ   σ   σ	$\begin{array}{l} {}^{8}_{5/2} \ \mathbf{4f}_{7/2}^{\prime} \ \mathbf{5d}_{3/}^{\prime} \\ k \ (\text{eV}) \\ \hline 2000 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 3.755+1 \\ 1.924 \\ 1.09+0 \\ 5.17-4 \\ 5.655+1 \\ 1.152 \\ 4.09-1 \\ 8.33-2 \\ 1.277+2 \\ 1.271 \\ 2.72-1 \\ 4.32-2 \\ \frac{6}{5/2} \ \mathbf{4f}_{7/2}^{3} \ \mathbf{6s}_{1/2}^{2} \\ k \ (\text{eV}) \\ \hline 2000 \\ 0.000+0$	3000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.938 3.97-1 -6.20-4 3.163+1 1.545 1.75-2 4.55-3 6.421+1 1.601 -3.63-2 7.35-3 2 3000 0.000+0 0.000 0.000+0	4000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.394+1 1.948 1.02-1 -8.93-4 1.885+1 1.599-3 1.40-3 3.629+1 1.667 1.06-2 9.66-3	5000  0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.957 -5.13-2 -1.04-3 1.209+1 1.596 1.30-1 3.95-3 2.245+1 1.674 1.67-1 1.34-2	6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.963 -1.23-1 -1.14-3 8.209+0 1.573 8.293-1 8.23-3 1.484+1 1.660 3.51-1 1.73-2	7000  0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.969 -1.45-1 -1.21-3 5.828+0 1.542 1.031+1 1.636 5.35-1 2.13-2  7000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	8000 0.000+0 0.000+0 0.00+0 0.00+0 2.512+1 0.791 -4.93-1 -4.73-2 4.725+1 1.315 -4.47-1 1.07-2 4.007+0 1.973 -1.33-1 -1.27-3 4.285+0 1.508 6.20-1 1.94-2 7.443+0 1.607 7.11-1 2.56-2	9000 1.242+1 1.930 7.58-1 -1.23-3 2.063+1 1.305 -2.61-1 1.09-2 3.462+1 1.452 -3.72-2 3.88-2 3.191+0 1.975 -9.77-2 -1.31-3 3.242+0 1.473 7.69-1 2.58-2 5.542+0 1.576 8.74-1 3.00-2	10000 1.053+1 1.945 2.31-1 -1.62-3 1.575+1 1.370 8.84-2 3.23-2 2.586+1 1.492 2.88-1 4.99-2 2.594+0 1.977 -4.64-2 -1.35-3 2.511+0 1.437 9.08-1 3.27-2 4.232+0 1.543 1.02+0 3.48-2	11000  8.940+0 1.957 7.90-3 -1.76-3 1.221+1 1.383 3.65-1 4.47-2 1.974+1 1.499 5.58-1 5.69-2 2.145+0 1.977 1.60-2 -1.38-3 1.983+0 1.402 3.300+0 1.511 1.16+0 3.99-2 11000 9.174+0 1.950 8.25-2	12000 7.648+0 1.965 -8.67 -1.83 9.638+0 1.376 5.94-1 5.47-2 1.538+1 1.492 7.89-1 1.977 8.61-2 -1.40- 1.593+0 1.368 1.15+0 4.74-2 2.620+0 1.478 1.29+0 4.53-2

Table 1 (conti	inued)											
8251.6 eV	$_{\delta}^{\gamma}$	0.00+0 0.00+0	0.00+0 0.00+0	0.00+0 0.00+0	0.00+0 0.00+0	0.00+0 0.00+0	0.00+0 0.00+0	0.00+0 0.00+0	-4.21-1 $-3.50-3$	-3.76-2 $2.61-2$	2.57-1 4.04-2	4.99-1 5.09-2
$-2p_{3/2}$	$\sigma$	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	4.954+1	3.674+1	2.752+1	2.104+1	1.641+1
$E_b =$	β	0.000	0.000	0.000	0.000	0.000	0.000	1.210	1.426	1.484	1.500	1.497
7514.0 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-5.91-1	-1.65-1	1.79-1	4.61-1	7.03-1
3s <sub>1/2</sub>	$\frac{\delta}{\sigma}$	0.00+0 3.645+1	0.00+0 2.258+1	0.00+0 1.436+1	0.00+0 9.825+0	0.00+0 7.102+0	0.00+0 5.350+0	-1.04-2 4.160+0	3.38-2 3.318+0	4.76-2 2.700+0	5.53-2 2.235+0	6.12-2 1.876+0
$E_b =$	β	1.917	1.932	1.943	1.952	1.960	1.966	1.970	1.973	1.975	1.976	1.976
1967.5 eV	γ	1.23+0	4.63-1	1.42-1	-2.79-2	-1.13-1	-1.45-1	-1.41-1	-1.14-1	-6.90-2	-1.19-2	5.41-2
20	δ	1.38-3 5.672+1	-6.10-4 3.265+1	-9.38-4 1.965+1	-1.11-3 1.267+1	-1.22-3 8.643+0	-1.30-3 6.157+0	-1.36-3 4.541+0	-1.42-3 3.444+0	-1.46-3 2.673+0	-1.50-3 2.115+0	-1.53-3 1.702+0
$ \begin{array}{c} 3p_{1/2} \\ E_b = \end{array} $	$\frac{\sigma}{eta}$	1.018	1.527	1.596	1.598	1.579	1.551	1.518	1.484	1.449	1.415	1.702+0
1767.7 eV	γ	4.11-1	4.38-2	-6.24 - 3	1.02-1	2.56-1	4.21 - 1	5.81-1	7.33-1	8.74-1	1.00+0	1.12+0
	δ	1.20-1	6.44-3	1.21-3	3.22-3	7.15-3	1.22-2	1.80-2	2.44-2	3.11-2	3.80-2	4.51-2
$3p_{3/2}$ $E_b =$	$\sigma_{\rho}$	1.310+2 1.189	6.686+1 1.585	3.802+1 1.663	2.361+1 1.677	1.566+1 1.667	1.090+1 1.646	7.888+0 1.619	5.885+0 1.589	4.501+0 1.558	3.515+0 1.526	2.794+0 1.493
<i>E<sub>b</sub></i> = 1611.3 eV	$\beta$ $\gamma$	3.17-1	-2.61-2	-7.69-3	1.35-1	3.13-1	4.96-1	6.73-1	8.39—1	9.93–1	1.13+0	1.495
	δ	5.96 - 2	7.87 - 3	9.44-3	1.31-2	1.68-2	2.08 - 2	2.50-2	2.95-2	3.41-2	3.90-2	4.39 - 2
Z = 66, Dy:	[Xe]4f		2									
		k (eV)										
Shell		2000	3000 0.000+0	4000 0.000+0	5000	6000 0.000+0	7000 0.000+0	8000 0.000+0	9000 0.000+0	10000	11000	12000
$2s_{1/2}$ $E_b =$	$\frac{\sigma}{\beta}$	0.000+0 0.000	0.000+0	0.000+0	0.000+0 0.000	0.000	0.000	0.000	0.000	1.096+1 1.928	9.391+0 1.942	8.071+0 1.953
9045.8 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	5.87-1	1.81-1	-6.81-3
	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-1.65 - 3	-1.97 - 3	-2.09-3
$2p_{1/2}$	$\sigma$	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	2.265+1	1.774+1	1.386+1	1.098+1
$E_b = 8580.6 \text{ eV}$	$\beta$ $\gamma$	0.000 0.00+0	0.000 0.00+0	0.000 0.00+0	0.000 0.00+0	0.000 0.00+0	0.000 0.00+0	0.000 0.00+0	1.134 -5.76-1	1.326 -1.73-1	1.371 1.46-1	1.379 4.02-1
0300.0 € 7	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-2.73-2	1.82-2	3.57-2	4.72-2
$2p_{3/2}$	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	5.066+1	3.883+1	2.920+1	2.237+1	1.746+1
$E_b =$	β	0.000	0.000	0.000	0.000	0.000	0.000	1.002	1.390	1.472	1.498	1.501
7790.1 eV	$\gamma \\ \delta$	0.00+0 0.00+0	0.00+0 0.00+0	0.00+0 0.00+0	0.00+0 0.00+0	0.00+0 0.00+0	0.00+0 0.00+0	-6.53-1 $-4.78-2$	-2.99-1 $2.67-2$	6.70-2 4.49-2	3.64-1 5.38-2	6.15-1 $6.00-2$
3s <sub>1/2</sub>	$\sigma$	0.000+0	2.299+1	1.472+1	1.011+1	7.326+0	5.529+0	4.306+0	3.438+0	2.801+0	2.321+0	1.950+0
$E_b =$	β	0.000	1.927	1.938	1.948	1.956	1.962	1.967	1.970	1.972	1.974	1.974
2046.8 eV	γ	0.00+0	5.25-1	1.82-1	-3.88 - 3	-1.01-1	-1.43-1	-1.47 - 1	-1.27 - 1	-8.85 - 2	-3.69-2	2.44-2
3p <sub>1/2</sub>	$\frac{\delta}{\sigma}$	0.00+0 5.625+1	-5.99-4 3.349+1	-9.85-4 2.036+1	-1.18-3 1.321+1	-1.31-3 9.052+0	-1.40-3 6.473+0	-1.47-3 4.789+0	-1.53-3 3.642+0	-1.58-3 2.833+0	-1.62-3 2.246+0	-1.65-3 1.811+0
$E_b =$	β	0.840	1.508	1.591	1.599	1.584	1.558	1.527	1.495	1.461	1.427	1.394
1841.8 eV	γ	3.20 - 1	7.38 - 2	-1.29-2	7.86 - 2	2.25 - 1	3.85 - 1	5.44 - 1	6.96 - 1	8.37 - 1	9.69 - 1	1.09+0
	δ	1.65-1	8.74-3	1.16-3	2.59-3	6.17-3	1.09-2	1.64-2	2.26-2	2.91-2	3.59-2	4.28-2
$3p_{3/2}$ $E_b =$	$\frac{\sigma}{eta}$	1.335+2 1.101	6.924+1 1.568	3.963+1 1.659	2.472+1 1.679	1.644+1 1.672	1.148+1 1.654	8.326+0 1.630	6.224+0 1.601	4.768+0 1.571	3.730+0 1.540	2.969+0 1.509
1675.6 eV	γ	3.41-1	-1.23-2	-2.20-2	1.08-1	2.79-1	4.59-1	6.35-1	8.02-1	9.57-1	1.10+0	1.23+0
	δ	7.92 - 2	8.60 - 3	9.29 - 3	1.29-2	1.65 - 2	2.03-2	2.43 - 2	2.86 - 2	3.31-2	3.78 - 2	4.24-2
Z = 67, Ho:	[Xe]4f		2									
GI 11		k (eV)	2000	1000	=000	2222	<b>=</b> 000			10000	11000	10000
Shell	σ	2000 0.000+0	3000 0.000+0	4000 0.000+0	5000 0.000+0	6000 0.000+0	7000 0.000+0	8000 0.000+0	9000 0.000+0	10000 1.111+1	11000 9.596+0	12000 8.273+0
$ \begin{array}{c} 2s_{1/2} \\ E_b = \end{array} $	$\beta$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.111171	1.933	1.946
9394.2 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	8.77-1	3.15-1	6.05-2
	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-1.50-3	-2.05-3	-2.23-3
$\begin{array}{c} 2p_{1/2} \\ E_b = \end{array}$	$\frac{\sigma}{eta}$	0.000+0 0.000	0.000+0 0.000	0.000+0 0.000	0.000+0 0.000	0.000+0 0.000	0.000+0 0.000	0.000+0 0.000	2.219+1 0.790	1.872+1 1.287	1.471+1 1.357	1.168+1 1.376
8917.8 eV	γ	0.000	0.000	0.000	0.00+0	0.00+0	0.00+0	0.00+0	-5.23-1	-3.21-1	2.56-2	2.99-1
	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-5.16-2	7.25 - 3	3.02-2	4.31-2
$2p_{3/2}$	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	4.091+1	3.092+1	2.374+1	1.856+1
$E_b = 8071.1 \text{ eV}$	β	0.000 0.00+0	0.000 0.00+0	0.000 0.00+0	0.000 0.00+0	0.000 0.00+0	0.000 0.00+0	0.000 0.00+0	1.336 -4.41-1	1.454 -5.24-2	1.493 2.61-1	1.503 5.24-1
807 I.I EV	$_{\delta}^{\gamma}$	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	1.59-2	-3.24-2 4.16-2	5.20-2	5.87-2
3s <sub>1/2</sub>	σ	0.000+0	2.338+1	1.506+1	1.039+1	7.547+0	5.707+0	4.452+0	3.559+0	2.903+0	2.407+0	2.024+0
$E_b =$	$\beta$	0.000	1.921	1.933	1.943	1.951	1.958	1.963	1.967	1.970	1.971	1.972
2128.3 eV	$\gamma \\ \delta$	0.00+0 0.00+0	5.93-1 -5.72-4	2.25-1 $-1.03-3$	2.30-2 -1.25-3	-8.63-2 $-1.40-3$	-1.38-1 $-1.50-3$	-1.51-1 $-1.58-3$	-1.38-1 $-1.65-3$	-1.06-1 $-1.70-3$	-5.99-2 $-1.75-3$	-3.50-3 $-1.79-3$
3p <sub>1/2</sub>	$\sigma$	5.476+1	3.430+1	2.107+1	1.376+1	9.474+0	6.799+0	5.045+0	3.847+0	2.999+0	2.383+0	1.924+0
$E_b =$	β	0.534	1.484	1.584	1.600	1.588	1.564	1.536	1.505	1.473	1.440	1.407
1922.8 eV	γ	1.62-2	1.12-1	-1.58-2	5.68-2	1.94-1	3.49-1	5.06-1	6.57-1	7.99-1	9.33-1	1.06+0
2n	δ	2.15-1 1.356+2	1.20-2 7.160+1	1.27-3 4.126+1	2.03-3 2.585+1	5.23-3 1.725+1	9.65-3 1.208+1	1.49-2 8.776+0	2.08-2 6.572+0	2.71-2 5.044+0	3.37-2 3.952+0	4.05-2 3.150+0
$3p_{3/2} E_b =$	$\frac{\sigma}{eta}$	0.991	1.548	4.126+1 1.653	2.585+1 1.679	1.725+1	1.208+1	8.776+0 1.639	1.613	5.044+0 1.585	3.952+0 1.555	3.150+0 1.525
1741.2 eV	γ	3.39-1	5.95-3	-3.36-2	8.17-2	2.46-1	4.23-1	5.97-1	7.64-1	9.21-1	1.07+0	1.20+0
	δ	1.05-1	9.64-3	9.17-3	1.27-2	1.62-2	1.99-2	2.37-2	2.78-2	3.21-2	3.66-2	4.12-2
Z = 68, Er:	[Xe]4f		2									
		k (eV)										

		2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
$2s_{1/2}$	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	1.112+1	9.782+0	8.468+0
$E_b =$	β	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.907	1.924	1.937
9751.3 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	1.34+0	4.91-1	1.52-1
	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-9.45-4	-2.07-3	-2.35-
$2p_{1/2}$	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	1.965+1	1.557+1	1.241+1
$E_b = 9264.3 \text{ eV}$	β	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000 0.00+0	1.218 -4.85-1	1.337	1.369 1.88-1
9204.3 EV	$\gamma \\ \delta$	0.00+0 0.00+0	0.00+0 0.00+0	0.00+0 0.00+0	0.00+0 0.00+0	0.00+0 0.00+0	0.00+0 0.00+0	0.00+0 0.00+0	0.00+0	-4.83 - 1 -9.41 - 3	-1.06-1 $2.33-2$	3.85-2
$2p_{3/2}$	$\sigma$	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	4.288+1	3.269+1	2.53-2	1.970+1
$E_{b} =$	β	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.251	1.428	1.484	1.502
8357.9 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-5.90-1	-1.81-1	1.52-1	4.28-1
	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-2.17 - 3	3.68-2	5.00-2	5.75-2
3s <sub>1/2</sub>	σ	0.000+0	2.374+1	1.541+1	1.067+1	7.772+0	5.888+0	4.600+0	3.682+0	3.006+0	2.495+0	2.100+0
$E_b =$	β	0.000	1.915	1.927	1.938	1.947	1.954	1.959	1.964	1.967	1.969	1.970
2216.7 eV	γ	0.00+0	6.71 - 1	2.72 - 1	5.36 - 2	-6.88 - 2	-1.31-1	-1.53-1	-1.47 - 1	-1.22 - 1	-8.12 - 2	-2.99-
	δ	0.00+0	-5.19 - 4	-1.07 - 3	-1.33 - 3	-1.50-3	-1.62 - 3	-1.70 - 3	-1.78 - 3	-1.84 - 3	-1.89 - 3	-1.93-
$3p_{1/2}$	σ	0.000+0	3.505+1	2.177+1	1.431+1	9.899+0	7.130+0	5.306+0	4.056+0	3.170+0	2.524+0	2.041+0
$E_b =$	$\beta$	0.000	1.457	1.576	1.599	1.591	1.570	1.544	1.514	1.483	1.452	1.420
2005.8 eV	γ	0.00+0	1.58-1	-1.42-2	3.74-2	1.64-1	3.14-1	4.68-1	6.18-1	7.61-1	8.95-1	1.02+0
2	δ	0.00+0	1.64-2	1.56-3	1.55-3	4.36-3	8.46-3	1.34-2	1.90-2	2.51-2	3.16-2	3.82-2
$3p_{3/2}$ $E_b =$	$\frac{\sigma}{\beta}$	1.368+2 0.840	7.401+1 1.525	4.293+1 1.646	2.701+1 1.679	1.808+1 1.681	1.269+1 1.668	9.243+0 1.648	6.935+0 1.624	5.331+0 1.597	4.183+0 1.569	3.339+0 1.540
$E_b = 1811.8 \text{ eV}$	P γ	0.840 2.81-1	1.525 2.97—2	-4.25-2	5.70-2	2.13-1	3.86-1	5.59-1	7.26—1	8.83-1	1.03+0	1.17+0
	δ	1.42 - 1	1.11 - 2	9.10-3	1.25-2	1.60-2	1.95-2	2.32-2	2.71–2	3.12-2	3.55-2	3.99-2
Z = 69, Tm:	[Xe]4	$\frac{1.12}{f_{5/2}^6 4f_{7/2}^7 6s_{1/2}^2}$	,						<b>_</b>			2
· · ·	. ,	k (eV)	2									
Shell		2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
$2p_{1/2}$	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	2.033+1	1.644+1	1.316+1
$E_b =$	β	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.090	1.305	1.358
9616.9 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-6.37 - 1	-2.50-1	7.01 - 2
	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-3.78 - 2	1.40 - 2	3.32 - 2
$2p_{3/2}$	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	4.435+1	3.447+1	2.661+1	2.087+1
$E_b =$	β	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.101	1.392	1.471	1.499
8648.0 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-7.00-1	-3.17 - 1	3.71-2	3.28-1
	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-3.33-2	2.98-2	4.73-2	5.61-2
3s <sub>1/2</sub>	σ	0.000+0	2.406+1	1.574+1	1.094+1	7.993+0	6.068+0	4.747+0	3.805+0	3.110+0	2.584+0	2.177+0
$E_b = 2306.8 \text{ eV}$	β	0.000 0.00+0	1.908 7.55-1	1.921 3.24-1	1.932 8.73-2	1.941 -4.83-2	1.949 -1.22-1	1.955 1.531	1.960 -1.54-1	1.964 -1.35-1	1.966 -1.01-1	1.968 -5.44-
2300.0 CV	$\gamma \\ \delta$	0.00+0	-4.38-4	-1.10-3	-1.40-3	-1.60-3	-1.73-3	-1.83-1	-1.91-3	-1.98-3	-2.04-3	-2.09-
$3p_{1/2}$	σ	0.000+0	3.572+1	2.243+1	1.485+1	1.032+1	7.463+0	5.571+0	4.269+0	3.344+0	2.668+0	2.162+0
$E_b =$	β	0.000	1.424	1.567	1.597	1.594	1.576	1.551	1.523	1.494	1.463	1.432
2089.8 eV	γ	0.00+0	2.10 - 1	-7.61 - 3	2.09 - 2	1.36 - 1	2.80 - 1	4.31 - 1	5.79 - 1	7.22 - 1	8.56 - 1	9.82 - 1
	δ	0.00+0	2.22 - 2	2.08 - 3	1.15 - 3	3.58 - 3	7.35 - 3	1.20 - 2	1.73 - 2	2.32 - 2	2.94 - 2	3.59 - 2
$3p_{3/2}$	σ	1.367+2	7.640+1	4.462+1	2.820+1	1.893+1	1.332+1	9.723+0	7.308+0	5.627+0	4.422+0	3.534+0
$E_b =$	β	0.606	1.499	1.637	1.678	1.684	1.675	1.657	1.634	1.609	1.582	1.554
1884.5 eV	γ	1.11-1	5.88 - 2		3.41 - 2	1.82 - 1				0 / 5 1		
0.1	δ			-4.81-2			3.50-1	5.21-1	6.87 - 1	8.45-1	9.94-1	1.13+0
3/12/2		1.86-1	1.32-2	9.07 - 3	1.23-2	1.58-2	1.93-2	2.27 - 2	2.65 - 2	3.03-2	3.45 - 2	1.13+0 3.87-2
3d <sub>3/2</sub>	σ	2.763+2	1.32-2 9.187+1	9.07-3 3.922+1	1.23-2 1.969+1	1.58-2 1.101+1	1.93-2 6.655+0	2.27-2 4.263+0	2.65-2 2.859+0	3.03-2 1.989+0	3.45-2 1.426+0	1.13+0 3.87-2 1.049+0
$E_b =$	β	2.763+2 0.787	1.32-2 9.187+1 1.178	9.07-3 3.922+1 1.239	1.23-2 1.969+1 1.223	1.58-2 1.101+1 1.182	1.93-2 6.655+0 1.131	2.27-2 4.263+0 1.077	2.65-2 2.859+0 1.023	3.03-2 1.989+0 0.970	3.45-2 1.426+0 0.919	1.13+0 3.87-2 1.049+0 0.870
	$eta \ \gamma$	2.763+2 0.787 -1.82-1	1.32-2 9.187+1 1.178 6.07-2	9.07-3 3.922+1 1.239 3.88-1	1.23-2 1.969+1 1.223 6.65-1	1.58-2 1.101+1 1.182 8.93-1	1.93-2 6.655+0 1.131 1.08+0	2.27-2 4.263+0 1.077 1.24+0	2.65-2 2.859+0 1.023 1.37+0	3.03-2 1.989+0 0.970 1.48+0	3.45-2 1.426+0 0.919 1.57+0	1.13+0 3.87-2 1.049+0 0.870 1.65+0
E <sub>b</sub> = 1514.6 eV	$eta \ \gamma \ \delta$	2.763+2 0.787 -1.82-1 -1.89-3	1.32-2 9.187+1 1.178 6.07-2 5.39-2	9.07-3 3.922+1 1.239	1.23-2 1.969+1 1.223	1.58-2 1.101+1 1.182	1.93-2 6.655+0 1.131	2.27-2 4.263+0 1.077	2.65-2 2.859+0 1.023	3.03-2 1.989+0 0.970	3.45-2 1.426+0 0.919	1.13+0 3.87-2 1.049+0 0.870
E <sub>b</sub> = 1514.6 eV	$eta \ \gamma \ \delta$	2.763+2 0.787 -1.82-1	1.32-2 9.187+1 1.178 6.07-2 5.39-2	9.07-3 3.922+1 1.239 3.88-1	1.23-2 1.969+1 1.223 6.65-1	1.58-2 1.101+1 1.182 8.93-1	1.93-2 6.655+0 1.131 1.08+0	2.27-2 4.263+0 1.077 1.24+0	2.65-2 2.859+0 1.023 1.37+0	3.03-2 1.989+0 0.970 1.48+0	3.45-2 1.426+0 0.919 1.57+0	1.13+0 3.87-2 1.049+0 0.870 1.65+0
$E_b = 1514.6 \text{ eV}$ <b>Z</b> = <b>70</b> , <b>Yb</b> :	$eta \ \gamma \ \delta$	$ 2.763+2 0.787 -1.82-1 -1.89-3 -6.5/2 4f_{7/2}^8 6s_{1/2}^2 k (eV) $	1.32-2 9.187+1 1.178 6.07-2 5.39-2	9.07 – 3 3.922+1 1.239 3.88 – 1 8.12 – 2	1.23-2 1.969+1 1.223 6.65-1 1.02-1	1.58-2 1.101+1 1.182 8.93-1 1.21-1	1.93-2 6.655+0 1.131 1.08+0 1.40-1	2.27-2 4.263+0 1.077 1.24+0 1.58-1	2.65-2 2.859+0 1.023 1.37+0 1.76-1	3.03-2 1.989+0 0.970 1.48+0 1.94-1	3.45-2 1.426+0 0.919 1.57+0 2.11-1	1.13+0 3.87-2 1.049+0 0.870 1.65+0 2.28-1
$E_b = 1514.6 \text{ eV}$ $Z = 70, Yb:$ Shell	β γ δ [Xe]4f	2.763+2 0.787 -1.82-1 -1.89-3 <sup>6</sup> <sub>5/2</sub> <b>4f</b> <sub>7/2</sub> <sup>8</sup> <b>6s</b> <sub>1/2</sub> <sup>2</sup> <u>k</u> (eV) 2000	1.32-2 9.187+1 1.178 6.07-2 5.39-2 3000	9.07 – 3 3.922+1 1.239 3.88 – 1 8.12 – 2	1.23-2 1.969+1 1.223 6.65-1 1.02-1	1.58-2 1.101+1 1.182 8.93-1 1.21-1	1.93-2 6.655+0 1.131 1.08+0 1.40-1	2.27-2 4.263+0 1.077 1.24+0 1.58-1	2.65-2 2.859+0 1.023 1.37+0 1.76-1	3.03-2 1.989+0 0.970 1.48+0 1.94-1	3.45-2 1.426+0 0.919 1.57+0 2.11-1	1.13+0 3.87-2 1.049+0 0.870 1.65+0 2.28-1
$E_b = 1514.6 \text{ eV}$ $Z = 70, Yb:$ Shell $2p_{1/2}$	$\beta$ $\gamma$ $\delta$ [Xe]4f	2.763+2 0.787 -1.82-1 -1.89-3 <sup>6</sup> <sub>5/2</sub> <b>4f</b> <sup>8</sup> <sub>7/2</sub> <b>6s</b> <sup>2</sup> <sub>1/2</sub> <u>k</u> (eV) 2000 0.000+0	1.32-2 9.187+1 1.178 6.07-2 5.39-2 3000 0.000+0	9.07 – 3 3.922+1 1.239 3.88 – 1 8.12 – 2 4000 0.000+0	1.23-2 1.969+1 1.223 6.65-1 1.02-1 5000 0.000+0	1.58-2 1.101+1 1.182 8.93-1 1.21-1 6000 0.000+0	1.93-2 6.655+0 1.131 1.08+0 1.40-1 7000 0.000+0	2.27-2 4.263+0 1.077 1.24+0 1.58-1 8000 0.000+0	2.65-2 2.859+0 1.023 1.37+0 1.76-1 9000 0.000+0	3.03-2 1.989+0 0.970 1.48+0 1.94-1 10000 1.940+1	3.45-2 1.426+0 0.919 1.57+0 2.11-1 11000 1.728+1	1.13+0 3.87-2 1.049+0 0.870 1.65+0 2.28-1 12000 1.392+1
$E_b = 1514.6 \text{ eV}$ $Z = 70, Yb:$ Shell $2p_{1/2}$ $E_b =$	$\beta$ $\gamma$ $\delta$ [Xe]4f	2.763+2 0.787 -1.82-1 -1.89-3 6 5/2 4f <sub>1/2</sub> 6s <sub>1/2</sub> k (eV) 2000 0.000+0 0.000	1.32-2 9.187+1 1.178 6.07-2 5.39-2 3000 0.000+0 0.000	9.07-3 3.922+1 1.239 3.88-1 8.12-2 4000 0.000+0 0.000	1.23-2 1.969+1 1.223 6.65-1 1.02-1 5000 0.000+0 0.000	1.58-2 1.101+1 1.182 8.93-1 1.21-1 6000 0.000+0 0.000	1.93-2 6.655+0 1.131 1.08+0 1.40-1 7000 0.000+0 0.000	2.27-2 4.263+0 1.077 1.24+0 1.58-1 8000 0.000+0 0.000	2.65-2 2.859+0 1.023 1.37+0 1.76-1 9000 0.000+0 0.000	3.03-2 1.989+0 0.970 1.48+0 1.94-1 10000 1.940+1 0.561	3.45-2 1.426+0 0.919 1.57+0 2.11-1 11000 1.728+1 1.258	1.13+0 3.87-2 1.049+0 0.870 1.65+0 2.28-1 12000 1.392+1 1.341
$E_b = 1514.6 \text{ eV}$ $Z = 70, Yb:$ Shell $2p_{1/2}$	$\beta$ $\gamma$ $\delta$ [Xe]4f	2.763+2 0.787 -1.82-1 -1.89-3 <sup>6</sup> <sub>5/2</sub> <b>4f</b> <sup>8</sup> <sub>7/2</sub> <b>6s</b> <sup>2</sup> <sub>1/2</sub> <u>k</u> (eV) 2000 0.000+0	1.32-2 9.187+1 1.178 6.07-2 5.39-2 3000 0.000+0	9.07 – 3 3.922+1 1.239 3.88 – 1 8.12 – 2 4000 0.000+0	1.23-2 1.969+1 1.223 6.65-1 1.02-1 5000 0.000+0	1.58-2 1.101+1 1.182 8.93-1 1.21-1 6000 0.000+0	1.93-2 6.655+0 1.131 1.08+0 1.40-1 7000 0.000+0	2.27-2 4.263+0 1.077 1.24+0 1.58-1 8000 0.000+0	2.65-2 2.859+0 1.023 1.37+0 1.76-1 9000 0.000+0	3.03-2 1.989+0 0.970 1.48+0 1.94-1 10000 1.940+1	3.45-2 1.426+0 0.919 1.57+0 2.11-1 11000 1.728+1	1.13+0 3.87-2 1.049+0 0.870 1.65+0 2.28-1 12000 1.392+1
$E_b = 1514.6 \text{ eV}$ $Z = 70, Yb:$ Shell $2p_{1/2}$ $E_b = 9978.2 \text{ eV}$	$ \begin{array}{c} \beta \\ \gamma \\ \delta \end{array} $ [Xe]4f	2.763+2 0.787 -1.82-1 -1.89-3 -65/2 4f <sup>8</sup> / <sub>7/2</sub> 6s <sup>2</sup> / <sub>1/2</sub> k (eV) 2000 0.000+0 0.000+0	1.32-2 9.187+1 1.178 6.07-2 5.39-2 3000 0.000+0 0.000 0.000+0	9.07-3 3.922+1 1.239 3.88-1 8.12-2 4000 0.000+0 0.000 0.00+0	1.23-2 1.969+1 1.223 6.65-1 1.02-1 5000 0.000+0 0.000 0.000+0	1.58-2 1.101+1 1.182 8.93-1 1.21-1 6000 0.000+0 0.000 0.000+0	1.93-2 6.655+0 1.131 1.08+0 1.40-1 7000 0.000+0 0.000 0.000+0	2.27-2 4.263+0 1.077 1.24+0 1.58-1 8000 0.000+0 0.000 0.000+0	2.65-2 2.859+0 1.023 1.37+0 1.76-1 9000 0.000+0 0.000 0.00+0	3.03-2 1.989+0 0.970 1.48+0 1.94-1 10000 1.940+1 0.561 -2.57-1	3.45-2 1.426+0 0.919 1.57+0 2.11-1 11000 1.728+1 1.258 -4.07-1	1.13+0 3.87-2 1.049+0 0.870 1.65+0 2.28-1 12000 1.392+1 1.341 -5.80- 2.68-2
$E_b = 1514.6 \text{ eV}$ $Z = 70, Yb:$ Shell $2p_{1/2}$ $E_b = 9978.2 \text{ eV}$ $2p_{3/2}$ $E_b = 600000000000000000000000000000000000$	$\begin{array}{c} \beta \\ \gamma \\ \delta \end{array}$ [Xe]4f	$\begin{array}{c} 2.763+2 \\ 0.787 \\ -1.82-1 \\ -1.89-3 \\ \frac{6}{5/2} \ \mathbf{4f_{7/2}^8 \ 6s_{1/2}^2} \\ k \ (\text{eV}) \\ \hline 2000 \\ 0.000+0 \\ 0.000+0 \\ 0.00+0 \\ 0.00+0 \end{array}$	1.32-2 9.187+1 1.178 6.07-2 5.39-2 3000 0.000+0 0.000+0 0.00+0 0.00+0	9.07-3 3.922+1 1.239 3.88-1 8.12-2 4000 0.000+0 0.000+0 0.000+0 0.000+0	1.23-2 1.969+1 1.223 6.65-1 1.02-1 5000 0.000+0 0.000+0 0.00+0 0.00+0	1.58-2 1.101+1 1.182 8.93-1 1.21-1 6000 0.000+0 0.000+0 0.00+0 0.00+0	1.93-2 6.655+0 1.131 1.08+0 1.40-1 7000 0.000+0 0.000+0 0.000+0 0.00+0	2.27-2 4.263+0 1.077 1.24+0 1.58-1 8000 0.000+0 0.000+0 0.000+0 0.00+0	2.65-2 2.859+0 1.023 1.37+0 1.76-1 9000 0.000+0 0.000+0 0.000+0 0.00+0	3.03-2 1.989+0 0.970 1.48+0 1.94-1 10000 1.940+1 0.561 -2.57-1 4.77-2	3.45-2 1.426+0 0.919 1.57+0 2.11-1 11000 1.728+1 1.258 -4.07-1 5.51-4	1.13+0 3.87-2 1.049+0 0.870 1.65+0 2.28-1 12000 1.392+1 1.341 -5.80- 2.68-2
$E_b = 1514.6 \text{ eV}$ $Z = 70, Yb:$ Shell $2p_{1/2}$ $E_b = 9978.2 \text{ eV}$ $2p_{3/2}$ $E_b = 600000000000000000000000000000000000$	$ \begin{array}{c} \beta \\ \gamma \\ \delta \end{array} $ [Xe]4f	2.763+2 0.787 -1.89-3 -1.89	1.32-2 9.187+1 1.178 6.07-2 5.39-2 3000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0	9.07 - 3 3.922+1 1.239 3.88 - 1 8.12 - 2 4000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	1.23-2 1.969+1 1.223 6.65-1 1.02-1 5000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	1.58-2 1.101+1 1.182 8.93-1 1.21-1 6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	1.93-2 6.655+0 1.131 1.08+0 1.40-1 7000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	2.27-2 4.263+0 1.077 1.24+0 1.58-1 8000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0	2.65-2 2.859+0 1.023 1.37+0 1.76-1 9000 0.000+0 0.000+0 0.00+0 4.302+1 0.634 -4.28-1	3.03-2 1.989+0 0.970 1.48+0 1.94-1 10000 1.940+1 0.561 -2.57-1 4.77-2 3.624+1 1.342 -4.60-1	3.45-2 1.426+0 0.919 1.57+0 2.11-1 11000 1.728+1 1.258 -4.07-1 5.51-4 2.811+1 1.452 -8.51-2	1.13+0 3.87-2 1.049+0 0.870 1.65+0 2.28-1 12000 1.392+1 1.341 -5.80- 2.68-2 2.209+1 1.492 2.21-1
$E_b$ = 1514.6 eV <b>Z</b> = <b>70</b> , <b>Yb</b> :  Shell $2p_{1/2}$ $E_b$ = 9978.2 eV $2p_{3/2}$ $E_b$ = 8943.6 eV	$\begin{array}{c} \beta \\ \gamma \\ \delta \end{array}$ [Xe]4f	2.763+2 0.787 -1.82-1 -1.89-3 6.5/2 46.7/2 65.1/2 k (eV) 2000 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	3000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	9.07-3 3.922+1 1.239 3.88-1 8.12-2  4000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.00+0 0.00+0 0.00+0	1.23-2 1.969+1 1.223 6.65-1 1.02-1 5000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0	1.58-2 1.101+1 1.182 8.93-1 1.21-1 6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	1.93-2 6.655+0 1.131 1.08+0 1.40-1 7000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0	2.27-2 4.263+0 1.077 1.24+0 1.58-1 8000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0	2.65-2 2.859+0 1.023 1.37+0 1.76-1 9000 0.000+0 0.000+0 0.00+0 4.302+1 0.634 -4.28-1 -4.67-2	3.03-2 1.989+0 0.970 1.48+0 1.94-1 10000 1.940+1 0.561 -2.57-1 4.77-2 3.624+1 1.342 -4.60-1 1.90-2	3.45-2 1.426+0 0.919 1.57+0 2.11-1 11000 1.728+1 1.258 -4.07-1 5.51-4 2.811+1 1.452 -8.51-2 4.38-2	1.13+0 3.87-2 1.049+0 0.870 1.65+0 2.28-1 12000 1.392+1 1.341 -5.80- 2.68-2 2.209+1 1.492 2.21-1 5.45-2
$E_b = 1514.6 \text{ eV}$ $\mathbf{Z} = 70, \mathbf{Yb}$ :  Shell $2p_{1/2}$ $E_b = 9978.2 \text{ eV}$ $2p_{3/2}$ $E_b = 8943.6 \text{ eV}$ $3s_{1/2}$	$ \begin{array}{c} \beta \\ \gamma \\ \delta \end{array} $ [Xe]4i $ \begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \end{array} $ $ \begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \end{array} $ $ \begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \end{array} $	2.763+2 0.787 -1.82-1 -1.89-3 -1.89	3000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	9.07-3 3.922+1 1.239 3.88-1 8.12-2  4000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 1.605+1	1.23-2 1.969+1 1.223 6.65-1 1.02-1 5000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 1.120+1	1.58-2 1.101+1 1.182 8.93-1 1.21-1 6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 8.210+0	1.93-2 6.655+0 1.131 1.08+0 1.40-1 7000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	2.27-2 4.263+0 1.077 1.24+0 1.58-1 8000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 4.894+0	2.65-2 2.859+0 1.023 1.37+0 1.76-1 9000 0.000+0 0.000+0 0.00+0 4.302+1 0.634 -4.28-1 -4.67-2 3.928+0	3.03-2 1.989+0 0.970 1.48+0 1.94-1 10000 1.940+1 0.561 -2.57-1 4.77-2 3.624+1 1.342 -4.60-1 1.90-2 3.214+0	3.45-2 1.426+0 0.919 1.57+0 2.11-1 11000 1.728+1 1.258 -4.07-1 5.51-4 2.811+1 1.452 -8.51-2 4.38-2 2.673+0	1.13+0 3.87-2 1.049+0 0.870 1.65+0 2.28-1 12000 1.392+1 1.341 -5.80- 2.68-2 2.209+1 1.492 2.21-1 5.45-2 2.254+0
$E_b$ = 1514.6 eV $\mathbf{Z} = 70$ , Yb: Shell $2p_{1/2}$ $E_b$ = 9978.2 eV $2p_{3/2}$ $E_b$ = 8943.6 eV $3s_{1/2}$ $E_b$ =	$ \begin{array}{c} \beta \\ \gamma \\ \delta \end{array} $ [Xe]4f $ \begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \end{array} $ $ \begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \end{array} $ $ \begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \end{array} $	$\begin{array}{c} 2.763+2 \\ 0.787 \\ -1.82-1 \\ -1.89-3 \\ \frac{6}{5/2} \begin{array}{c} 4f_{7/2}^8 \begin{array}{c} 6s_{1/2}^2 \\ 0.000+0$	3000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.000+0 0.000+0 1.000+0 1.000+0 1.000+0	9.07-3 3.922+1 1.239 3.88-1 8.12-2  4000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.605+1 1.915	1.23-2 1.969+1 1.223 6.65-1 1.02-1 5000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.120+1 1.927	1.58-2 1.101+1 1.182 8.93-1 1.21-1 6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.	1.93-2 6.655+0 1.131 1.08+0 1.40-1 7000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.944	2.27-2 4.263+0 1.077 1.24+0 1.58-1 8000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.00+0 4.894+0 1.950	2.65-2 2.859+0 1.023 1.37+0 1.76-1 9000 0.000+0 0.000+0 0.00+0 4.302+1 0.634 -4.28-1 -4.67-2 3.928+0 1.956	3.03-2 1.989+0 0.970 1.48+0 1.94-1 10000 1.940+1 0.561 -2.57-1 4.77-2 3.624+1 1.342 -4.60-1 1.90-2 3.214+0 1.960	3.45-2 1.426+0 0.919 1.57+0 2.11-1 11000 1.728+1 1.258 -4.07-1 5.51-4 2.811+1 1.452 -8.51-2 4.38-2 2.673+0 1.963	1.13+0 3.87-2 1.049+0 0.870 1.65+0 2.28-1 12000 1.392+1 1.341 -5.80- 2.68-2 2.209+1 1.492 2.21-1 5.45-2 2.254+0 1.965
$E_b = 1514.6 \text{ eV}$ $\mathbf{Z} = 70, \mathbf{Yb}$ :  Shell $2p_{1/2}$ $E_b = 9978.2 \text{ eV}$ $2p_{3/2}$ $E_b = 8943.6 \text{ eV}$ $3s_{1/2}$	$ \begin{array}{c} \beta \\ \gamma \\ \delta \end{array} $ [Xe]4f $ \begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \end{array} $ $ \begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \end{array} $ $ \begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \end{array} $	2.763+2 0.787 -1.82-1 -1.89-3 -1.89	3000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 2.432+1 1.901 8.39-1	9.07-3 3.922+1 1.239 3.88-1 8.12-2  4000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.605+1 1.915 3.79-1	1.23-2 1.969+1 1.223 6.65-1 1.02-1 5000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.120+1 1.927 1.24-1	1.58-2 1.101+1 1.182 8.93-1 1.21-1 6000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 1.0	1.93-2 6.655+0 1.131 1.08+0 1.40-1 7000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.944 -1.09-1	2.27-2 4.263+0 1.077 1.24+0 1.58-1 8000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.950 -1.50-1	2.65-2 2.859+0 1.023 1.37+0 1.76-1 9000 0.000+0 0.000+0 0.00+0 4.302+1 0.634 -4.28-1 -4.67-2 3.928+0 1.956 -1.59-1	3.03-2 1.989+0 0.970 1.48+0 1.94-1 10000 1.940+1 0.561 -2.57-1 4.77-2 3.624+1 1.342 -4.60-1 1.90-2 3.214+0 1.960 -1.46-1	3.45-2 1.426+0 0.919 1.57+0 2.11-1 11000 1.728+1 1.258 -4.07-1 5.51-4 2.811+1 1.452 -8.51-2 4.38-2 2.673+0 1.963 -1.18-1	1.13+0 3.87-2 1.049+0 0.870 1.65+0 2.28-1 12000 1.392+1 1.341 -5.80- 2.68-2 2.209+1 1.492 2.21-1 5.45-2 2.254+0 1.965 -7.68-
$E_b = 1514.6 \text{ eV}$ $\mathbf{Z} = 70, \mathbf{Yb}$ :  Shell $2p_{1/2}$ $E_b = 9978.2 \text{ eV}$ $2p_{3/2}$ $E_b = 8943.6 \text{ eV}$ $3s_{1/2}$ $E_b = 2398.1 \text{ eV}$	β γ δ [ <b>Xe]4i</b> σ β γ δ σ β γ δ σ β γ δ	2.763+2 0.787 -1.82-1 -1.89-3 -1.89	3000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 0.00+0 1.901 8.39-1 -3.33-4	9.07-3 3.922+1 1.239 3.88-1 8.12-2  4000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 1.605+1 1.915 3.79-1 -1.12-3	1.23-2 1.969+1 1.223 6.65-1 1.02-1  5000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 1.120+1 1.927 1.24-1 -1.48-3	1.58-2 1.101+1 1.182 8.93-1 1.21-1 6000 0.000+0 0.000+0 0.00+0 0.000+0 0.00+0 0.00+0 1.936 -2.50-2 -1.70-3	1.93-2 6.655+0 1.131 1.08+0 1.40-1 7000 0.000+0 0.000+0 0.00+0 0.000+0 0.00+0 0.00+0 1.944 -1.09-1 -1.86-3	2.27-2 4.263+0 1.077 1.24+0 1.58-1 8000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.00+0 4.894+0 1.950 -1.50-1 -1.97-3	2.65-2 2.859+0 1.023 1.37+0 1.76-1 9000 0.000+0 0.000+0 0.00+0 4.302+1 0.634 -4.28-1 -4.67-2 3.928+0 1.956 -1.59-1 -2.06-3	3.03-2 1.989+0 0.970 1.48+0 1.94-1 10000 1.940+1 0.561 -2.57-1 4.77-2 3.624+1 1.342 -4.60-1 1.90-2 3.214+0 1.960 -1.46-1 -2.13-3	3.45-2 1.426+0 0.919 1.57+0 2.11-1 11000 1.728+1 1.258 -4.07-1 5.51-4 2.811+1 1.452 -8.51-2 4.38-2 2.673+0 1.963 -1.18-1 -2.20-3	1.13+0 3.87-2 1.049+0 0.870 1.65+0 2.28-1 12000 1.392+1 1.341 -5.80- 2.68-2 2.209+1 1.492 2.21-1 5.45-2 2.254+0 1.965 -7.68- -2.25-
$E_b$ = 1514.6 eV $\mathbf{Z} = 70$ , Yb: Shell $2p_{1/2}$ $E_b$ = 9978.2 eV $2p_{3/2}$ $E_b$ = 8943.6 eV $3s_{1/2}$ $E_b$ = 2398.1 eV $3p_{1/2}$	$\begin{array}{c} \beta \\ \gamma \\ \delta \end{array}$ [Xe]4i	2.763+2 0.787 -1.82-1 -1.89-3 -1.89	3000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 1.901 8.39-1 -3.33-4 3.630+1	9.07-3 3.922+1 1.239 3.88-1 8.12-2  4000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.605+1 1.915 3.79-1 -1.12-3 2.307+1	1.23-2 1.969+1 1.223 6.65-1 1.02-1  5000 0.000+0 0.000+0 0.00+0 0.000+0 0.00+0 1.120+1 1.927 1.24-1 -1.48-3 1.538+1	1.58-2 1.101+1 1.182 8.93-1 1.21-1 6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.936 -2.50-2 -1.70-3 1.074+1	1.93-2 6.655+0 1.131 1.08+0 1.40-1 7000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 1.944 -1.09-1 -1.86-3 7.796+0	2.27-2 4.263+0 1.077 1.24+0 1.58-1 8000 0.000+0 0.000+0 0.00+0 0.000+0 0.00+0 0.00+0 1.950 4.894+0 1.950 -1.50-1 -1.97-3 5.838+0	2.65-2 2.859+0 1.023 1.37+0 1.76-1 9000 0.000+0 0.000+0 0.00+0 4.302+1 0.634 -4.28-1 -4.67-2 3.928+0 1.956 -1.59-1 -2.06-3 4.485+0	3.03-2 1.989+0 0.970 1.48+0 1.94-1 10000 1.940+1 0.561 -2.57-1 4.77-2 3.624+1 1.342 -4.60-1 1.99-2 3.214+0 1.960 -1.46-1 -2.13-3 3.521+0	3.45-2 1.426+0 0.919 1.57+0 2.11-1 11000 1.728+1 1.258 -4.07-1 5.51-4 2.811+1 1.452 -8.51-2 4.38-2 2.673+0 1.963 -1.18-1 -2.20-3 2.815+0	1.13+0 3.87-2 1.049+( 0.870 1.65+0 2.28-1 12000 1.392+1 1.341 -5.80- 2.68-2 2.209+1 1.492 2.21-1 5.45-2 2.254+( 1.965 -7.68- -2.25- 2.285+(
$E_b$ = 1514.6 eV $\mathbf{Z} = 70$ , Yb: Shell $2p_{1/2}$ $E_b$ = 9978.2 eV $2p_{3/2}$ $E_b$ = 8943.6 eV $3s_{1/2}$ $E_b$ = 2398.1 eV $3p_{1/2}$ $E_b$ =	$\begin{array}{c} \beta \\ \gamma \\ \delta \end{array}$ [Xe]4f $\begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \end{array}$ $\begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \end{array}$ $\begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \end{array}$ $\begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \end{array}$ $\begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \end{array}$ $\begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \end{array}$	2.763+2 0.787 -1.89-3 -1.89	3000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 1.00+0 0.00+0 3.32+1 1.901 8.39-1 -3.33-4 3.630+1 1.386	9.07-3 3.922+1 1.239 3.88-1 8.12-2  4000 0.000+0 0.000+0 0.00+0 0.00+0 1.605+1 1.915 3.79-1 -1.12-3 2.307+1 1.555	1.23-2 1.969+1 1.223 6.65-1 1.02-1 5000 0.000+0 0.000+0 0.00+0 0.00+0 1.120+1 1.927 1.24-1 -1.48-3 1.538+1 1.595	1.58-2 1.101+1 1.182 8.93-1 1.21-1 6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.936 -2.50-2 -1.70-3 1.074+1 1.595	1.93-2 6.655+0 1.131 1.08+0 1.40-1 7000 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 0.00+0 1.944 -1.09-1 -1.86-3 7.796+0 1.580	2.27-2 4.263+0 1.077 1.24+0 1.58-1 8000 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 1.950 -1.550-1 -1.97-3 5.838+0 1.558	2.65-2 2.859+0 1.023 1.37+0 1.76-1 9000 0.000+0 0.000+0 0.00+0 4.302+1 0.634 -4.28-1 -4.67-2 3.928+0 1.956 -1.59-1 -2.06-3 4.485+0 1.532	3.03-2 1.989+0 0.970 1.48+0 1.94-1 10000 1.940+1 0.561 -2.57-1 4.77-2 3.624+1 1.342 -4.60-1 1.90-2 3.214+0 1.960 -1.46-1 -2.13-3 3.521+0 1.503	3.45-2 1.426+0 0.919 1.57+0 2.11-1 11000 1.728+1 1.258 -4.07-1 5.51-4 2.811+1 1.452 -8.51-2 4.38-2 2.673+0 1.963 -1.18-1 -2.20-3 2.815+0 1.474	1.13+0 3.87-2 1.049+0 0.870 1.65+0 2.28-1 12000 1.392+1 1.341 -5.80- 2.68-2 2.209+1 1.492 2.21-1 5.45-2 2.254+0 1.965 -7.68- -2.25- 2.285+0 1.444
$E_b$ = 1514.6 eV $\mathbf{Z} = 70$ , Yb: Shell $2p_{1/2}$ $E_b$ = 9978.2 eV $2p_{3/2}$ $E_b$ = 8943.6 eV $3s_{1/2}$ $E_b$ = 2398.1 eV $3p_{1/2}$	$ \begin{array}{c} \beta \\ \gamma \\ \delta \end{array} \\ [\textbf{Xe}] \textbf{4f} \\ \hline \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \delta \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \delta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \delta \\ \phi \\ \sigma \\ \sigma \\ \delta \\ \phi \\ \sigma \\ \sigma \\ \delta \\ \phi \\ \sigma \\ \sigma$	2.763+2 0.787 -1.82-1 -1.89-3 -1.89	3000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 1.901 2.432+1 1.901 8.39-1 -3.33-4 3.630+1 1.386 2.67-1	9.07-3 3.922+1 1.239 3.88-1 8.12-2  4000 0.000+0 0.000+0 0.00+0 0.00+0 1.605+1 1.915 3.79-1 -1.12-3 2.307+1 1.555 4.01-3	1.23-2 1.969+1 1.223 6.65-1 1.02-1  5000 0.000+0 0.000+0 0.00+0 0.00+0 1.120+1 1.927 1.24-1 -1.48-3 1.538+1 1.595 7.63-3	1.58-2 1.101+1 1.182 8.93-1 1.21-1 6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.936 -2.50-2 -1.70-3 1.074+1 1.595 1.10-1	1.93-2 6.655+0 1.131 1.08+0 1.40-1  7000 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 1.944 -1.09-1 -1.86-3 7.796+0 1.580 2.48-1	2.27-2 4.263+0 1.077 1.24+0 1.58-1 8000 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 0.00+0 1.950 -1.50-1 -1.97-3 5.838+0 1.558 3.95-1	2.65-2 2.859+0 1.023 1.37+0 1.76-1 9000 0.000+0 0.000+0 0.00+0 4.302+1 0.634 -4.28-1 -4.67-2 3.928+0 1.956 -1.59-1 -2.06-3 4.485+0 1.532 5.41-1	3.03-2 1.989+0 0.970 1.48+0 1.94-1 10000 1.940+1 0.561 -2.57-1 4.77-2 3.624+1 1.342 -4.60-1 1.90-2 3.214+0 1.960 -1.46-1 -2.13-3 3.521+0 1.503 6.83-1	3.45-2 1.426+0 0.919 1.57+0 2.11-1 11000 1.728+1 1.258 -4.07-1 5.51-4 2.811+1 1.452 -8.51-2 4.38-2 2.673+0 1.963 -1.18-1 -2.20-3 2.815+0 1.474 8.17-1	1.13+0 3.87-2 1.049+( 0.870 1.65+0 2.28-1 12000 1.392+1 1.341 -5.80- 2.68-2 2.29+1 1.492 2.21-1 5.45-2 2.254+( 1.965 -7.68- -2.25- 2.285+( 1.444 9.44-1
$E_b = 1514.6 \text{ eV}$ $\mathbf{Z} = 70, \mathbf{Yb}$ :  Shell $2p_{1/2}$ $E_b = 9978.2 \text{ eV}$ $2p_{3/2}$ $E_b = 8943.6 \text{ eV}$ $3s_{1/2}$ $E_b = 2398.1 \text{ eV}$ $3p_{1/2}$ $E_b = 2173.0 \text{ eV}$	$\begin{array}{c} \beta\\ \gamma\\ \delta\\ [\textbf{Xe}] \textbf{4l} \end{array}$	2.763+2 0.787 -1.82-1 -1.89-3	3000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 3.39-1 1.901 8.39-1 -3.33-4 3.630+1 1.386 2.67-1 2.97-2	9.07-3 3.922+1 1.239 3.88-1 8.12-2  4000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.605+1 1.915 3.79-1 -1.12-3 2.307+1 1.555 4.01-3 2.85-3	1.23-2 1.969+1 1.223 6.65-1 1.02-1  5000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 1.120+1 1.927 1.24-1 -1.48-3 1.538+1 1.595 7.63-3 8.51-4	1.58-2 1.101+1 1.182 8.93-1 1.21-1 6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.936 -2.50-2 -1.70-3 1.074+1 1.595 1.10-1 2.85-3	1.93-2 6.655+0 1.131 1.08+0 1.40-1  7000 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.944 -1.09-1 -1.86-3 7.796+0 1.580 2.48-1 6.32-3	2.27-2 4.263+0 1.077 1.24+0 1.58-1 8000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.950 -1.50-1 -1.97-3 5.838+0 1.558 3.95-1 1.07-2	2.65-2 2.859+0 1.023 1.37+0 1.76-1 9000 0.000+0 0.000+0 0.00+0 4.302+1 0.634 -4.28-1 -4.67-2 3.928+0 1.956 -1.59-1 -2.06-3 4.485+0 1.532 5.41-1 1.57-2	3.03-2 1.989+0 0.970 1.48+0 1.94-1 10000 1.940+1 0.561 -2.57-1 4.77-2 3.624+1 1.342 -4.60-1 1.90-2 3.214+0 1.960 -1.46-1 -2.13-3 3.521+0 1.503 6.83-1 2.14-2	3.45-2 1.426+0 0.919 1.57+0 2.11-1 11000 1.728+1 1.258 -4.07-1 5.51-4 2.811+1 1.452 -8.51-2 4.38-2 2.673+0 1.963 -1.18-1 -2.20-3 2.815+0 1.474 8.17-1 2.73-2	1.13+0 3.87-2 1.049+0 0.870 1.65+0 2.28-1 12000 1.392+1 1.341 -5.80- 2.68-2 2.209+1 1.492 2.21-1 5.45-2 2.254+0 1.965 -7.68- -2.25- 2.285+0 1.444 9.44-1 3.37-2
$E_b$ = 1514.6 eV $\mathbf{Z} = 70$ , Yb: Shell $2p_{1/2}$ $E_b$ = 9978.2 eV $2p_{3/2}$ $E_b$ = 8943.6 eV $3s_{1/2}$ $E_b$ = 2398.1 eV $3p_{1/2}$ $E_b$ = 2173.0 eV $3p_{3/2}$	$ \begin{array}{c} \beta \\ \gamma \\ \delta \\ \hline (\mathbf{Xe})\mathbf{4i} \\ \hline \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \delta \\ \sigma \\ \sigma \\ \delta \\ \sigma \\ \sigma \\ \sigma$	2.763+2 0.787 -1.82-1 -1.89-3 -1.89	3000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 1.901 2.432+1 1.901 8.39-1 -3.33-4 3.630+1 1.386 2.67-1 2.97-2 7.858+1	9.07-3 3.922+1 1.239 3.88-1 8.12-2  4000 0.000+0 0.000+0 0.000+0 0.000+0 1.605+1 1.915 3.79-1 -1.12-3 2.307+1 1.555 4.01-3 2.85-3 4.622+1	1.23-2 1.969+1 1.223 6.65-1 1.02-1  5000 0.000+0 0.000+0 0.000+0 0.000+0 1.120+1 1.927 1.24-1 -1.48-3 1.538+1 1.595 7.63-3 8.51-4 2.934+1	1.58-2 1.101+1 1.182 8.93-1 1.21-1 6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.936 -2.50-2 -1.70-3 1.074+1 1.595 1.10-1 2.85-3 1.977+1	1.93-2 6.655+0 1.131 1.08+0 1.40-1  7000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.944 -1.09-1 -1.86-3 7.796+0 1.580 1.580 1.395+1	2.27-2 4.263+0 1.077 1.24+0 1.58-1  8000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.950 -1.50-1 -1.97-3 5.838+0 1.558 3.95-1 1.07-2 1.020+1	2.65-2 2.859+0 1.023 1.37+0 1.76-1  9000 0.000+0 0.000+0 0.00+0 4.302+1 0.634 -4.28-1 -4.67-2 3.928+0 1.956 -1.59-1 -2.06-3 4.485+0 1.532 5.41-1 1.57-2 7.681+0	3.03-2 1.989+0 0.970 1.48+0 1.94-1 10000 1.940+1 0.561 -2.57-1 4.77-2 3.624+1 1.342 -4.60-1 1.90-2 3.214+0 1.960 -1.46-1 -2.13-3 3.521+0 1.503 6.83-1 2.14-2 5.924+0	3.45-2 1.426+0 0.919 1.57+0 2.11-1 11000 1.728+1 1.258 -4.07-1 5.51-4 2.811+1 1.452 -8.51-2 4.38-2 2.673+0 1.963 -1.18-1 -2.20-3 2.815+0 1.474 8.17-1 2.73-2 4.662+0	1.13+0 3.87-2 1.049+0 0.870 1.65+0 2.28-1 12000 1.392+1 1.341 -5.80- 2.68-2 2.209+1 1.492 2.21-1 5.45-2 2.254-0 1.965 -7.68- -2.25- 2.285+0 1.444-1 3.37-2 3.731+0
$E_b = 1514.6 \text{ eV}$ $\mathbf{Z} = 70, \mathbf{Yb}$ :  Shell $2p_{1/2}$ $E_b = 9978.2 \text{ eV}$ $2p_{3/2}$ $E_b = 8943.6 \text{ eV}$ $3s_{1/2}$ $E_b = 2398.1 \text{ eV}$ $3p_{1/2}$ $E_b = 2173.0 \text{ eV}$	$\begin{array}{c} \beta\\ \gamma\\ \delta\\ [\textbf{Xe}] \textbf{4l} \end{array}$	2.763+2 0.787 -1.82-1 -1.89-3	3000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 3.39-1 1.901 8.39-1 -3.33-4 3.630+1 1.386 2.67-1 2.97-2	9.07-3 3.922+1 1.239 3.88-1 8.12-2  4000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.605+1 1.915 3.79-1 -1.12-3 2.307+1 1.555 4.01-3 2.85-3	1.23-2 1.969+1 1.223 6.65-1 1.02-1  5000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 1.120+1 1.927 1.24-1 -1.48-3 1.538+1 1.595 7.63-3 8.51-4	1.58-2 1.101+1 1.182 8.93-1 1.21-1 6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.936 -2.50-2 -1.70-3 1.074+1 1.595 1.10-1 2.85-3	1.93-2 6.655+0 1.131 1.08+0 1.40-1  7000 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.944 -1.09-1 -1.86-3 7.796+0 1.580 2.48-1 6.32-3	2.27-2 4.263+0 1.077 1.24+0 1.58-1 8000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.950 -1.50-1 -1.97-3 5.838+0 1.558 3.95-1 1.07-2	2.65-2 2.859+0 1.023 1.37+0 1.76-1 9000 0.000+0 0.000+0 0.00+0 4.302+1 0.634 -4.28-1 -4.67-2 3.928+0 1.956 -1.59-1 -2.06-3 4.485+0 1.532 5.41-1 1.57-2	3.03-2 1.989+0 0.970 1.48+0 1.94-1 10000 1.940+1 0.561 -2.57-1 4.77-2 3.624+1 1.342 -4.60-1 1.90-2 3.214+0 1.960 -1.46-1 -2.13-3 3.521+0 1.503 6.83-1 2.14-2	3.45-2 1.426+0 0.919 1.57+0 2.11-1 11000 1.728+1 1.258 -4.07-1 5.51-4 2.811+1 1.452 -8.51-2 4.38-2 2.673+0 1.963 -1.18-1 -2.20-3 2.815+0 1.474 8.17-1 2.73-2	1.13+0 3.87-2 1.049+0 0.870 1.65+0 2.28-1 12000 1.392+1 1.341 -5.80- 2.68-2 2.209+1 1.492 2.21-1 5.45-2 2.254+0 1.965 -7.68- -2.25- 2.285+0 1.444 9.44-1

Table 1 (conti	nued)											
$3d_{3/2}$	σ	2.919+2	9.861+1	4.230+1	2.131+1	1.195+1	7.241+0	4.649+0	3.123+0	2.176+0	1.563+0	1.151+0
$E_b =$	β	0.718	1.160	1.237	1.229	1.192	1.144	1.092	1.040	0.988	0.938	0.889
1576.3 eV	γ	-1.80-1	2.15-2	3.47-1	6.29-1	8.63-1	1.06+0	1.22+0	1.35+0	1.47+0	1.56+0	1.65+0
3d <sub>5/2</sub>	$\frac{\delta}{\sigma}$	-8.40-3 4.194+2	5.04-2 1.376+2	7.89-2 5.831+1	9.97-2 2.910+1	1.18-1 1.620+1	1.37-1 9.746+0	1.55-1 6.219+0	1.73-1 4.154+0	1.90-1 2.880+0	2.07-1 2.058+0	2.23-1 1.509+0
$E_b =$	β	0.837	1.183	1.217	1.185	1.134	1.079	1.023	0.969	0.917	0.868	0.822
1527.8 eV	γ	-1.85 - 1	6.82-2	3.97-1	6.69-1	8.89-1	1.07+0	1.22+0	1.34+0	1.44+0	1.53+0	1.61+0
	δ	-5.70 - 3	4.87-2	7.81-2	1.02 - 1	1.24-1	1.46 - 1	1.67 - 1	1.88-1	2.08 - 1	2.27 - 1	2.46 - 1
Z = 71, Lu:	[Xe]4f		6s <sub>1/2</sub>									
Shell		k (eV)	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
$\frac{311611}{2p_{3/2}}$	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	3.788+1	2.961+1	2.332+1
$E_b =$	β	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.265	1.425	1.482
9244.1 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-6.04-1	-2.13-1	1.12 - 1
	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	2.56-3	3.91-2	5.25-2
$3s_{1/2}$	σ	0.000+0	2.450+1	1.631+1	1.145+1	8.413+0	6.415+0	5.036+0	4.047+0	3.316+0	2.760+0	2.329+0
$E_b = 2491.2 \text{ eV}$	$\beta$ $\gamma$	0.000 0.00+0	1.894 9.29-1	1.908 4.35-1	1.920 1.63-1	1.931 7.80-4	1.939 -9.39-2	1.946 -1.43-1	1.951 -1.61-1	1.956 1.56 1	1.959 1.33 1	1.961 -9.74-2
2431.2 CV	δ	0.00+0	-1.92-4	-1.14-3	-1.56-3	-1.81-3	-3.53-2 -1.98-3	-2.11-3	-2.21-3	-2.30-1	-2.37-3	-3.74-2 $-2.43-3$
3p <sub>1/2</sub>	σ	0.000+0	3.674+1	2.365+1	1.588+1	1.115+1	8.125+0	6.104+0	4.702+0	3.700+0	2.963+0	2.410+0
$E_b =$	$\beta$	0.000	1.342	1.542	1.591	1.596	1.584	1.564	1.539	1.512	1.484	1.455
2263.5 eV	γ	0.00+0	3.26-1	2.07-2	-2.23-3	8.65-2	2.17-1	3.60-1	5.05-1	6.47 - 1	7.81-1	9.08-1
	δ	0.00+0	3.96-2	3.95-3	6.60-4	2.24-3	5.47-3	9.62-3	1.45-2	1.98-2	2.55-2	3.15-2
$ \begin{array}{c} 3p_{3/2} \\ E_b = \end{array} $	$\frac{\sigma}{\beta}$	0.000+0 0.000	8.067+1 1.439	4.779+1 1.615	3.048+1 1.672	2.061+1 1.687	1.458+1 1.684	1.069+1 1.671	8.062+0 1.653	6.228+0 1.630	4.908+0 1.606	3.933+0 1.580
2023.6 eV	γ	0.000	1.24-1	-4.92-2	-3.52 - 3	1.25-1	2.83-1	4.49-1	6.13-1	7.71-1	9.21-1	1.06+0
	δ	0.00+0	1.91 - 2	9.24 - 3	1.20 - 2	1.56 - 2	1.90 - 2	2.23 - 2	2.57 - 2	2.93 - 2	3.29 - 2	3.66 - 2
3d <sub>3/2</sub>	σ	3.046+2	1.050+2	4.532+1	2.293+1	1.290+1	7.838+0	5.043+0	3.395+0	2.370+0	1.705+0	1.258+0
$E_b =$	β	0.642	1.141	1.234	1.234	1.201	1.155	1.105	1.054	1.003	0.953	0.906
1639.4 eV	$\gamma \\ \delta$	-1.70-1 $-1.36-2$	-1.44-2 $4.69-2$	3.10-1 7.71-2	5.96-1 9.83-2	8.35-1 1.17-1	1.03+0 1.35-1	1.20+0 1.52-1	1.34+0 1.69-1	1.45+0 1.86-1	1.55+0 2.02-1	1.64+0 2.18-1
3d <sub>5/2</sub>	$\sigma$	4.393+2	1.465+2	6.242+1	3.128+1	1.746+1	1.053+1	6.736+0	4.508+0	3.130+0	2.240+0	1.645+0
$E_b =$	β	0.780	1.171	1.217	1.191	1.144	1.090	1.034	0.981	0.929	0.880	0.835
1588.5 eV	γ	-1.83 - 1	3.24 - 2	3.63 - 1	6.41 - 1	8.66 - 1	1.05+0	1.20+0	1.33+0	1.43+0	1.52+0	1.60+0
	δ	-1.12-2	4.52-2	7.60-2	1.00-1	1.22-1	1.43-1	1.64-1	1.84-1	2.03-1	2.22-1	2.40-1
Z = 72, Hf:	[Xe]4f		6s <sub>1/2</sub>									
ClII		k (eV)	2000	4000	5000	C000	7000	0000	0000	10000	11000	12000
Shell	σ	2000 0.000+0	3000 0.000+0	4000 0.000+0	5000 0.000+0	6000 0.000+0	7000 0.000+0	8000 0.000+0	9000 0.000+0	10000 3.927+1	11000 3.115+1	12000 2.461+1
$2p_{3/2} E_b =$	$\beta$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.133	1.388	1.467
9560.7 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-7.32 - 1	-3.53-1	-7.98-3
	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-2.81-2	3.17 - 2	4.97 - 2
$3s_{1/2}$	σ	0.000+0	2.464+1	1.659+1	1.170+1	8.624+0	6.591+0	5.183+0	4.171+0	3.421+0	2.851+0	2.408+0
$E_b =$	β	0.000	1.885	1.901	1.914	1.924	1.933	1.941	1.947	1.951	1.955	1.958
2600.9 eV	$\gamma \\ \delta$	0.00+0 0.00+0	1.05+0 3.65-5	5.01-1 -1.14-3	2.08-1 $-1.63-3$	3.10-2 -1.92-3	-7.56-2 $-2.11-3$	-1.35-1 $-2.26-3$	-1.61-1 $-2.38-3$	-1.63-1 $-2.48-3$	-1.47-1 $-2.56-3$	-1.17-1 $-2.63-3$
$3p_{1/2}$	$\sigma$	0.000+0	3.711+1	2.422+1	1.640+1	1.157+1	8.465+0	6.379+0	4.928+0	3.886+0	3.118+0	2.540+0
$E_b =$	β	0.000	1.282	1.526	1.585	1.596	1.588	1.570	1.547	1.521	1.493	1.465
2365.4 eV	γ	0.00+0	3.92 - 1	4.46 - 2	-8.85 - 3	6.43 - 2	1.86 - 1	3.26 - 1	4.69 - 1	6.09 - 1	7.43 - 1	8.70 - 1
	δ	0.00+0	5.44-2	5.59-3	5.90-4	1.65-3	4.58-3	8.49-3	1.31-2	1.81-2	2.36-2	2.92-2
$3p_{3/2}$	$\sigma_{\rho}$	0.000+0	8.285+1	4.945+1	3.168+1	2.149+1	1.524+1	1.120+1	8.461+0	6.547+0	5.166+0	4.145+0
$E_b = 2107.6 \text{ eV}$	$\beta$ $\gamma$	0.000 0.00+0	1.400 1.65-1	1.601 -4.42-2	1.667 -1.98-2	1.688 9.72-2	1.688 2.49-1	1.678 4.13-1	1.661 5.76-1	1.640 7.33-1	1.617 8.83-1	1.592 1.02+0
2107.0 0	δ	0.00+0	2.40-2	9.48-3	1.19-2	1.55-2	1.89-2	2.22-2	2.55-2	2.88-2	3.21-2	3.56-2
3d <sub>3/2</sub>	σ	3.176+2	1.124+2	4.876+1	2.475+1	1.396+1	8.501+0	5.480+0	3.695+0	2.584+0	1.861+0	1.375+0
$E_b =$	$\beta$	0.543	1.116	1.229	1.237	1.209	1.167	1.119	1.068	1.019	0.970	0.924
1716.4 eV	γ	-1.48 - 1	-5.31-2	2.67-1	5.59-1	8.03-1	1.01+0	1.18+0	1.32+0	1.44+0	1.54+0	1.63+0
24	δ	-1.70-2 4.612+2	4.27-2 1.568+2	7.47-2 6.708+1	9.64-2 3.371+1	1.15-1 1.887+1	1.32-1 1.140+1	1.49-1 7.305+0	1.65-1 4.897+0	1.81-1 3.405+0	1.97-1 2.440+0	2.13-1 1.794+0
$3d_{5/2}$ $E_b =$	$rac{\sigma}{eta}$	4.612+2 0.698	1.368+2	1.217	1.197	1.887+1	1.140+1	1.046	0.993	0.942	0.894	0.849
1661.7 eV	γ	-1.71-1	-6.68 - 3	3.24-1	6.08-1	8.39-1	1.03+0	1.18+0	1.31+0	1.42+0	1.52+0	1.60+0
	δ	-1.63-2	4.12 - 2	7.32 - 2	9.76 - 2	1.20 - 1	1.41 - 1	1.61 - 1	1.80-1	1.99 - 1	2.17 - 1	2.36 - 1
Z = 73, Ta:	[Xe]4f		6s <sub>1/2</sub>									
Chall		k (eV)	2000	4000	5000	6000	7000	9000	0000	10000	11000	12000
Shell 2n2 (2	~	2000 0.000+0	3000 0.000+0	4000 0.000+0	5000 0.000+0	6000 0.000+0	7000 0.000+0	8000 0.000+0	9000 0.000+0	10000 3.910+1	11000 3.268+1	12000 2.593+1
$2p_{3/2} E_b =$	$\frac{\sigma}{\beta}$	0.000+0	0.000	0.000+0	0.000+0	0.000	0.000	0.000	0.000	0.790	1.334	2.593+1 1.446
9881.1 eV	γ	0.000	0.000	0.000	0.000	0.00+0	0.00+0	0.00+0	0.00+0	-6.28-1	-5.01-1	-1.35-1
	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	-7.39-2	2.04-2	4.57-2
3s <sub>1/2</sub>	σ	0.000+0	2.465+1	1.683+1	1.193+1	8.823+0	6.759+0	5.325+0	4.291+0	3.524+0	2.940+0	2.485+0
$E_b =$	β	0.000	1.876	1.893	1.907	1.918	1.927	1.935	1.941	1.946	1.951	1.954
2708.0 eV	$_{\delta}^{\gamma}$	0.00+0 0.00+0	1.17+0 3.47-4	5.68-1 -1.13-3	2.55-1 $-1.70-3$	6.39-2 $-2.02-3$	-5.44-2 $-2.25-3$	-1.24-1 $-2.42-3$	-1.58-1 $-2.55-3$	-1.68-1 $-2.66-3$	-1.58-1 $-2.75-3$	-1.33-1 $-2.83-3$
$-3p_{1/2}$	$\sigma$	0.000+0	3.731+1	2.476+1	1.689+1	1.198+1	8.802+0	6.655+0	5.154+0	4.074+0	3.276+0	2.673+0
-r 1/2				1.507	1.579	1.595	1.590	1.575	1.553	1.529	1.503	
$E_b =$	β	0.000	1.218	1.507	1.575	1.595	1.590	1.575	1.555	1.525	1.505	1.476

Table 1 (conti	nued)											
2468.7 eV	γ	0.00+0	4.53 - 1	7.50-2	-1.12-2	4.44 - 2	1.57 - 1	2.91 - 1	4.32 - 1	5.70 - 1	7.04 - 1	8.30 - 1
_	δ	0.00+0	7.40-2	7.79-3	6.75-4	1.13-3	3.72-3	7.38-3	1.17-2	1.65-2	2.16-2	2.71-2
3p <sub>3/2</sub>	σ	0.000+0	8.496+1	5.110+1	3.289+1	2.238+1	1.591+1	1.172+1	8.870+0	6.873+0	5.431+0	4.363+0
$E_b = 2194.0 \text{ eV}$	β	0.000 0.00+0	1.355 2.10-1	1.585 -3.51-2	1.661 -3.36-2	1.687 7.09-2	1.691 2.16-1	1.683 3.76-1	1.669 5.38-1	1.650 6.95-1	1.628 8.45-1	1.605 9.86-1
2134.0 CV	$_{\delta}^{\gamma}$	0.00+0	3.05-2	9.87 - 3	1.18-2	1.54-2	1.88-2	2.21-2	2.53-2	2.84-2	3.15-2	3.48-2
3d <sub>3/2</sub>	σ	3.262+2	1.200+2	5.230+1	2.664+1	1.507+1	9.197+0	5.941+0	4.013+0	2.810+0	2.027+0	1.500+0
$E_b =$	β	0.446	1.089	1.223	1.240	1.217	1.178	1.132	1.083	1.035	0.988	0.942
1793.2 eV	γ	-1.16 - 1	-8.96 - 2	2.23 - 1	5.19 - 1	7.69 - 1	9.78 - 1	1.15+0	1.30+0	1.42+0	1.53+0	1.63+0
0.1	δ	-1.58-2	3.80-2	7.21-2	9.44-2	1.13-1	1.30-1	1.46-1	1.62-1	1.77-1	1.93-1	2.08-1
3d <sub>5/2</sub>	$\sigma$	4.798+2 0.608	1.673+2 1.139	7.190+1 1.216	3.625+1 1.203	2.034+1	1.232+1 1.111	7.905+0 1.058	5.308+0 1.006	3.696+0 0.956	2.653+0 0.908	1.953+0 0.864
$E_b = 1735.1 \text{ eV}$	$\beta$ $\gamma$	-1.48-1	-4.45-2	2.83-1	5.73–1	1.161 8.10-1	1.111	1.16+0	1.30+0	0.956 1.41+0	0.908 1.51+0	0.864 1.59+0
1755.1 CV	δ	-1.48-1	3.68-2	7.02-2	9.49-2	1.17-1	1.38-1	1.57-1	1.76-1	1.95-1	2.13-1	2.31-1
Z = 74, W :	[Xe]4	$f_{5/2}^{6} 4f_{7/2}^{8} 5d_{3/2}^{4}$	2 6s <sub>1/2</sub>									
		k (eV)										
Shell		2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
$3s_{1/2}$	σ	0.000+0	2.453+1	1.705+1	1.215+1	9.017+0	6.924+0	5.465+0	4.411+0	3.627+0	3.029+0	2.562+0
$E_b = 2819.6 \text{ eV}$	β	0.000	1.865 1.32+0	1.885	1.899	1.911	1.920 -2.99-2	1.929	1.936	1.941	1.946	1.949
28 19.6 eV	$_{\delta}^{\gamma}$	0.00+0 0.00+0	8.68-4	6.41-1 $-1.10-3$	3.06-1 $-1.76-3$	1.00-1 -2.13-3	-2.99-2 $-2.39-3$	-1.09-1 $-2.58-3$	-1.53-1 $-2.73-3$	-1.70-1 $-2.85-3$	-1.67-1 $-2.96-3$	-1.48-1 $-3.05-3$
3p <sub>1/2</sub>	$\sigma$	0.000+0	3.736+1	2.524+1	1.736+1	1.239+1	9.137+0	6.931+0	5.383+0	4.264+0	3.436+0	2.809+0
$E_{b} =$	β	0.000	1.128	1.486	1.571	1.594	1.592	1.579	1.560	1.537	1.512	1.486
2574.9 eV	γ	0.000	4.95-1	1.12-1	-9.08 - 3	2.74-2	1.29-1	2.58-1	3.95-1	5.32-1	6.64-1	7.90-1
	δ	0.00+0	1.01-1	1.07-2	9.46-4	6.84-4	2.93-3	6.33-3	1.04-2	1.50-2	1.99-2	2.50-2
$3p_{3/2}$	σ	0.000+0	8.695+1	5.272+1	3.409+1	2.328+1	1.659+1	1.224+1	9.285+0	7.206+0	5.701+0	4.585+0
$E_b =$	$\beta$	0.000	1.304	1.567	1.653	1.685	1.693	1.688	1.676	1.659	1.638	1.616
2281.0 eV	γ	0.00+0	2.55-1	-2.20-2	-4.45-2	4.65-2	1.84-1	3.40-1	4.99-1	6.56-1	8.05 - 1	9.47 - 1
2.1	δ	0.00+0	3.89-2	1.05-2	1.17-2	1.53-2	1.88-2	2.20-2	2.51-2	2.81-2	3.11-2	3.41-2
3d <sub>3/2</sub>	σ	3.262+2	1.278+2	5.601+1	2.862+1	1.624+1	9.933+0	6.429+0	4.350+0	3.051+0	2.204+0	1.633+0
$E_b = 1871.6 \text{ eV}$	β	0.365 -7.58-2	1.059 -1.24-1	1.214 1.79-1	1.241 4.77-1	1.224 7.33-1	1.188 9.48-1	1.144 1.13+0	1.098 1.28+0	1.051 1.41+0	1.005 1.52+0	0.960 1.62+0
1071.0 EV	$_{\delta}^{\gamma}$	-7.38-2 $-7.88-3$	3.29-2	6.93-2	9.22-2	1.11-1	1.28-1	1.43-1	1.59-1	1.74-1	1.89-1	2.04-1
3d <sub>5/2</sub>	$\sigma$	4.928+2	1.781+2	7.690+1	3.889+1	2.188+1	1.328+1	8.538+0	5.742+0	4.004+0	2.878+0	2.121+0
$E_b =$	β	0.506	1.119	1.213	1.207	1.170	1.122	1.070	1.018	0.969	0.922	0.878
1809.2 eV	γ	-1.13 - 1	-8.06 - 2	2.43 - 1	5.36 - 1	7.80 - 1	9.78 - 1	1.14+0	1.28+0	1.40+0	1.50+0	1.58+0
	δ	-1.64-2	3.21 - 2	6.71 - 2	9.22 - 2	1.14 - 1	1.35 - 1	1.54 - 1	1.73 - 1	1.91 - 1	2.09 - 1	2.27 - 1
Z = 75, Re:	[Xe]4f	6 2 4f8 2 5d4 2	5d <sup>1</sup> 6s <sup>2</sup>									
	r .1		345/2 031/2									
	,	k (eV)		4000	5000	C000	7000	9000	0000	10000	11000	12000
Shell		k (eV) 2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
Shell 3s <sub>1/2</sub>	σ	k (eV) 2000 0.000+0	3000 2.397+1	1.724+1	1.235+1	9.200+0	7.083+0	5.602+0	4.529+0	3.728+0	3.117+0	2.639+0
Shell $3s_{1/2}$ $E_b =$	σ β	k (eV) 2000 0.000+0 0.000	3000 2.397+1 1.853	1.724+1 1.876	1.235+1 1.891	9.200+0 1.903	7.083+0 1.914	5.602+0 1.922	4.529+0 1.930	3.728+0 1.936	3.117+0 1.941	2.639+0 1.945
Shell 3s <sub>1/2</sub>	σ	k (eV) 2000 0.000+0	3000 2.397+1	1.724+1	1.235+1	9.200+0	7.083+0	5.602+0	4.529+0	3.728+0	3.117+0	2.639+0
Shell 3s <sub>1/2</sub> E <sub>b</sub> = 2931.7 eV	σ β γ	k (eV) 2000 0.000+0 0.000 0.00+0	3000 2.397+1 1.853 1.48+0	1.724+1 1.876 7.19-1	1.235+1 1.891 3.61-1	9.200+0 1.903 1.40-1	7.083+0 1.914 -2.53-3	5.602+0 1.922 -9.21-2	4.529+0 1.930 -1.45-1	3.728+0 1.936 -1.69-1	3.117+0 1.941 -1.73-1	2.639+0 1.945 -1.60-1
Shell $3s_{1/2}$ $E_b =$	σ β γ δ	k (eV) 2000 0.000+0 0.000 0.00+0 0.00+0	3000 2.397+1 1.853 1.48+0 2.14-3	1.724+1 1.876 7.19-1 -1.04-3	1.235+1 1.891 3.61-1 -1.82-3	9.200+0 1.903 1.40-1 -2.24-3	7.083+0 1.914 -2.53-3 -2.53-3	5.602+0 1.922 -9.21-2 -2.74-3	4.529+0 1.930 -1.45-1 -2.92-3	3.728+0 1.936 -1.69-1 -3.06-3	3.117+0 1.941 -1.73-1 -3.17-3	2.639+0 1.945 -1.60-1 -3.27-3
Shell $3s_{1/2}$ $E_b$ = 2931.7 eV $3p_{1/2}$	σ β γ δ σ β	k (eV) 2000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1
Shell $3s_{1/2}$ $E_b$ = 2931.7 eV $3p_{1/2}$ $E_b$ = 2681.6 eV	$\sigma$ $\beta$ $\gamma$ $\delta$ $\sigma$ $\beta$ $\gamma$ $\delta$	k (eV) 2000 0.000+0 0.000 0.00+0 0.000+0 0.000+0 0.000+0 0.00+0	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1 2.20-3	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2
Shell $3s_{1/2}$ $E_b$ = 2931.7 eV $3p_{1/2}$ $E_b$ = 2681.6 eV $3p_{3/2}$	$\sigma$ $\beta$ $\gamma$ $\delta$ $\sigma$ $\beta$ $\gamma$ $\delta$ $\sigma$ $\delta$ $\sigma$	k (eV) 2000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.00+0 0.00+0 0.000+0	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0
Shell $3s_{1/2}$ $E_b$ = $2931.7 \text{ eV}$ $3p_{1/2}$ $E_b$ = $2681.6 \text{ eV}$ $3p_{3/2}$ $E_b$ =	$\sigma$ $\beta$ $\gamma$ $\delta$ $\sigma$ $\beta$ $\gamma$ $\delta$ $\sigma$ $\delta$ $\delta$	k (eV) 2000 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0 1.682	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627
Shell $3s_{1/2}$ $E_b$ = 2931.7 eV $3p_{1/2}$ $E_b$ = 2681.6 eV $3p_{3/2}$	$\sigma$ $\beta$ $\gamma$ $\delta$ $\sigma$ $\beta$ $\gamma$ $\delta$ $\sigma$ $\delta$ $\gamma$ $\delta$ $\sigma$ $\delta$ $\gamma$	k (eV) 2000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241 2.96-1	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547 -5.19-3	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692 3.05-1	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0 1.682 4.62-1	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667 6.17-1	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1
Shell $3s_{1/2}$ $E_b = 2931.7 \text{ eV}$ $3p_{1/2}$ $E_b = 2681.6 \text{ eV}$ $3p_{3/2}$ $E_b = 2367.3 \text{ eV}$	σ β γ δ σ β γ δ σ β γ δ	k (eV) 2000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241 2.96-1 4.98-2	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547 -5.19-3 1.13-2	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2 1.16-2	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2 1.51-2	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1 1.87-2	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692 3.05-1 2.20-2	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0 1.682 4.62-1 2.50-2	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667 6.17-1 2.79-2	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1 3.07-2	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1 3.36-2
Shell $3s_{1/2}$ $E_b = 2931.7 \text{ eV}$ $3p_{1/2}$ $E_b = 2681.6 \text{ eV}$ $3p_{3/2}$ $E_b = 2367.3 \text{ eV}$ $3d_{3/2}$	σ β γ δ σ β γ δ σ β γ δ	k (eV) 2000 0.000+0	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241 2.96-1 4.98-2 1.355+2	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547 1.549-1 1.549-1 1.549-1 1.549-1	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2 1.16-2 3.066+1	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2 1.51-2	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1 1.87-2	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692 3.05-1 2.20-2 6.937+0	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0 1.682 4.62-1 2.50-2	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667 6.17-1 2.79-2 3.304+0	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1 3.07-2 2.391+0	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1 3.36-2 1.773+0
Shell $3s_{1/2}$ $E_b = 2931.7 \text{ eV}$ $3p_{1/2}$ $E_b = 2681.6 \text{ eV}$ $3p_{3/2}$ $E_b = 2367.3 \text{ eV}$	σ β γ δ σ β γ δ σ β γ δ	k (eV) 2000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241 2.96-1 4.98-2	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547 -5.19-3 1.13-2	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2 1.16-2	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2 1.51-2	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1 1.87-2	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692 3.05-1 2.20-2	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0 1.682 4.62-1 2.50-2	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667 6.17-1 2.79-2	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1 3.07-2	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1 3.36-2
Shell $3s_{1/2}$ $E_b = 2931.7 \text{ eV}$ $3p_{1/2}$ $E_b = 2681.6 \text{ eV}$ $3p_{3/2}$ $E_b = 2367.3 \text{ eV}$ $3d_{3/2}$ $E_b = 1948.9 \text{ eV}$	$ \begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \rho \end{array} $	k (eV) 2000 0.000+0 0.000+0 0.00+0 0.0	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241 2.96-1 4.98-2 1.355+2 1.025	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547 -5.19-3 1.13-2 5.977+1 1.204	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2 1.16-2 3.066+1 1.241	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2 1.51-2 1.745+1 1.230	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1 1.87-2 1.070+1 1.198	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692 3.05-1 2.20-2 6.937+0 1.157	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0 1.682 4.62-1 2.50-2 4.703+0 1.112	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667 6.17-1 2.79-2 3.304+0 1.066	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1 3.07-2 2.391+0 1.021	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1 3.36-2 1.773+0 0.977
Shell $3s_{1/2}$ $E_b$ = 2931.7 eV $3p_{1/2}$ $E_b$ = 2681.6 eV $3p_{3/2}$ $E_b$ = 2367.3 eV $3d_{3/2}$ $E_b$ =	σ β γ δ σ β γ δ σ β γ δ	k (eV) 2000 0.000+0 0.000+0 0.00+0 0.0	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241 2.96-1 4.98-2 1.355+2 1.025 -1.54-1	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.46-1 1.46-2 5.429+1 1.547 -5.19-3 1.13-2 5.977+1 1.204 1.37-1	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2 1.16-2 3.066+1 1.241 4.35-1	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2 1.51-2 1.745+1 1.230 6.96-1	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1 1.87-2 1.070+1 1.198 9.16-1	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692 3.05-1 2.20-2 6.937+0 1.157 1.10+0	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0 1.682 4.62-1 2.50-2 4.703+0 1.112 1.26+0	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667 6.17-1 2.79-2 3.304+0 1.066 1.39+0	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1 3.07-2 2.391+0 1.021 1.51+0	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1 3.36-2 1.773+0 0.977 1.61+0
Shell $\frac{3s_{1/2}}{2s_{1/2}}$ $\frac{3s_{1/2}}{2s_{1/2}}$ $\frac{3p_{1/2}}{2s_{1/2}}$ $\frac{3p_{1/2}}{2s_{1/2}}$ $\frac{3p_{3/2}}{2s_{1/2}}$ $\frac{3d_{3/2}}{2s_{1/2}}$	σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β σ σ σ σ σ σ σ σ σ σ σ σ σ	k (eV) 2000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 2.979+2 0.509 -1.97-2 -1.15-3 4.930+2 0.419	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241 4.98-2 1.355+2 1.025 -1.54-1 2.74-2 1.890+2 1.097	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547 -5.19-3 1.13-2 5.977+1 1.204 1.37-1 6.65-2 8.202+1 1.209	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2 1.16-2 3.066+1 1.241 4.35-1 9.01-2 4.162+1 1.211	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2 1.51-2 1.745+1 1.230 6.96-1 1.09-1 2.348+1 1.178	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1 1.87-2 1.070+1 1.198 9.16-1 1.26-1 1.428+1 1.132	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692 3.05-1 2.20-2 6.937+0 1.157 1.10+0 1.41-1 9.199+0 1.081	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 9.20-3 9.704+0 1.682 4.62-1 2.50-2 4.703+0 1.112 1.26+0 1.56-1 6.197+0 1.031	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667 6.17-1 2.79-2 3.304+0 1.066 1.39+0 1.70-1 4.328+0 0.982	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1 3.07-2 2.391+0 1.021 1.51+0 1.85-1 3.115+0 0.936	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1 3.36-2 1.773+0 0.977 1.61+0 2.00-1 2.298+0 0.892
Shell $3s_{1/2}$ $E_b = 2931.7 \text{ eV}$ $3p_{1/2}$ $E_b = 2681.6 \text{ eV}$ $3p_{3/2}$ $E_b = 2367.3 \text{ eV}$ $3d_{3/2}$ $E_b = 1948.9 \text{ eV}$ $3d_{5/2}$	σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ σ β γ δ σ σ σ σ σ σ σ σ σ σ σ σ σ	k (eV) 2000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.00+0 2.979+2 0.509 -1.97-2 -1.15-3 4.930+2 0.419 -6.97-2	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241 2.96-1 4.98-2 1.355+2 1.025 -1.54-1 2.74-2 1.890+2 1.097 -1.14-1	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547 -5.19-3 1.13-2 5.977+1 1.204 1.37-1 6.65-2 8.202+1 1.209 2.02-1	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2 1.16-2 3.066+1 1.241 4.35-1 9.01-2 4.162+1 1.211 4.99-1	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2 1.51-2 1.745+1 1.230 6.96-1 1.09-1 2.348+1 1.178 7.48-1	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1 1.87-2 1.070+1 1.198 9.16-1 1.26-1 1.428+1 1.132 9.52-1	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692 3.05-1 2.20-2 6.937+0 1.157 1.10+0 1.41-1 9.199+0 1.081 1.12+0	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0 1.682 4.62-1 2.50-2 4.703+0 1.112 1.26+0 1.031 1.031	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667 6.17-1 2.79-2 3.304+0 1.066 1.39+0 1.70-1 4.328+0 0.982 1.38+0	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1 3.07-2 2.391+0 1.021 1.51+0 1.85-1 3.115+0 0.936 1.49+0	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1 3.36-2 1.773+0 0.977 1.61+0 2.00-1 2.298+0 0.892 1.58+0
Shell $3s_{1/2}$ $E_b$ = 2931.7 eV $3p_{1/2}$ $E_b$ = 2681.6 eV $3p_{3/2}$ $E_b$ = 2367.3 eV $3d_{3/2}$ $E_b$ = 1948.9 eV $3d_{5/2}$ $E_b$ = 1882.9 eV	σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ σ β γ δ σ σ σ σ σ σ σ σ σ σ σ σ σ	k (eV) 2000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 2.979+2 0.509 -1.97-2 -1.15-3 4.930+2 0.419 -6.97-2 -7.85-3	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241 2.96-1 4.98-2 1.355+2 1.025 -1.54-1 2.74-2 1.890+2 1.091	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547 -5.19-3 1.13-2 5.977+1 1.204 1.37-1 6.65-2 8.202+1 1.209	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2 1.16-2 3.066+1 1.241 4.35-1 9.01-2 4.162+1 1.211	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2 1.51-2 1.745+1 1.230 6.96-1 1.09-1 2.348+1 1.178	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1 1.87-2 1.070+1 1.198 9.16-1 1.26-1 1.428+1 1.132	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692 3.05-1 2.20-2 6.937+0 1.157 1.10+0 1.41-1 9.199+0 1.081	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 9.20-3 9.704+0 1.682 4.62-1 2.50-2 4.703+0 1.112 1.26+0 1.56-1 6.197+0 1.031	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667 6.17-1 2.79-2 3.304+0 1.066 1.39+0 1.70-1 4.328+0 0.982	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1 3.07-2 2.391+0 1.021 1.51+0 1.85-1 3.115+0 0.936	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1 3.36-2 1.773+0 0.977 1.61+0 2.00-1 2.298+0 0.892
Shell $3s_{1/2}$ $E_b$ = $2931.7 \text{ eV}$ $3p_{1/2}$ $E_b$ = $2681.6 \text{ eV}$ $3p_{3/2}$ $E_b$ = $2367.3 \text{ eV}$ $3d_{3/2}$ $E_b$ = $1948.9 \text{ eV}$ $3d_{5/2}$ $E_b$ =	σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ σ β γ δ σ σ σ σ σ σ σ σ σ σ σ σ σ	$\begin{array}{c} k \ (\mathrm{eV}) \\ \hline 2000 \\ \hline 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.00+0 \\ 2.979+2 \\ 0.509 \\ -1.97-2 \\ -1.15-3 \\ 4.930+2 \\ 0.419 \\ -6.97-2 \\ -7.85-3 \\ \frac{6}{57} 2 \ 4 \mathbf{f}_{7/2}^8 \ 5 \mathbf{d}_{3/2}^4 \end{array}$	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241 2.96-1 4.98-2 1.355+2 1.025 -1.54-1 2.74-2 1.890+2 1.091	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547 -5.19-3 1.13-2 5.977+1 1.204 1.37-1 6.65-2 8.202+1 1.209 2.02-1	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2 1.16-2 3.066+1 1.241 4.35-1 9.01-2 4.162+1 1.211 4.99-1	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2 1.51-2 1.745+1 1.230 6.96-1 1.09-1 2.348+1 1.178 7.48-1	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1 1.87-2 1.070+1 1.198 9.16-1 1.26-1 1.428+1 1.132 9.52-1	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692 3.05-1 2.20-2 6.937+0 1.157 1.10+0 1.41-1 9.199+0 1.081 1.12+0	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0 1.682 4.62-1 2.50-2 4.703+0 1.112 1.26+0 1.031 1.031	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667 6.17-1 2.79-2 3.304+0 1.066 1.39+0 1.70-1 4.328+0 0.982 1.38+0	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1 3.07-2 2.391+0 1.021 1.51+0 1.85-1 3.115+0 0.936 1.49+0	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1 3.36-2 1.773+0 0.977 1.61+0 2.00-1 2.298+0 0.892 1.58+0
Shell $\frac{3s_{1/2}}{2s_{1/2}}$ $\frac{3s_{1/2}}{2s_{1/2}}$ $\frac{3p_{1/2}}{2s_{1/2}}$ $\frac{3p_{1/2}}{2s_{1/2}}$ $\frac{3p_{3/2}}{2s_{1/2}}$ $\frac{3d_{3/2}}{2s_{1/2}}$ $\frac{3d_{3/2}}{2s_{1/2}}$ $\frac{3d_{5/2}}{2s_{1/2}}$	σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ σ β γ δ σ σ σ σ σ σ σ σ σ σ σ σ σ	$\begin{array}{c} k\ (\mathrm{eV})\\ \hline 2000\\ \hline 0.000+0\\ 0$	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241 2.96-1 4.98-2 1.355+2 1.025 -1.54-1 2.74-2 1.890+2 1.097 -1.14-1 2.71-2 5d <sup>2</sup> <sub>5/2</sub> 6s <sup>2</sup> <sub>1/2</sub>	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547 -5.19-3 1.13-2 5.977+1 1.204 1.37-1 6.65-2 8.202+1 1.209 2.02-1 6.40-2	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2 1.16-2 3.066+1 1.241 4.35-1 9.01-2 4.162+1 1.211 4.99-1 8.94-2	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2 1.51-2 1.745+1 1.230 6.96-1 1.09-1 2.348+1 1.178 7.48-1 1.12-1	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1 1.87-2 1.070+1 1.198 9.16-1 1.26-1 1.428+1 1.132 9.52-1 1.32-1	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692 3.05-1 2.20-2 6.937+0 1.157 1.10+0 1.41-1 9.199+0 1.081 1.12+0 1.51-1	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0 1.682 4.62-1 2.50-2 4.703+0 1.112 1.26+0 1.031 1.26+0 1.69-1	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667 6.17-1 2.79-2 3.304+0 1.066 1.39+0 1.70-1 4.328+0 0.982 1.38+0 1.87-1	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1 3.07-2 2.391+0 1.021 1.51+0 1.85-1 3.115+0 0.936 1.49+0 2.05-1	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1 3.36-2 1.773+0 0.977 1.61+0 2.00-1 2.298+0 0.892 1.58+0 2.23-1
Shell $\frac{3s_{1/2}}{2s_{1/2}}$ $\frac{2s_{1/2}}{2s_{1/2}}$ $\frac{3p_{1/2}}{2s_{1/2}}$ $\frac{3p_{1/2}}{2s_{1/2}}$ $\frac{3p_{3/2}}{2s_{1/2}}$ $\frac{3d_{3/2}}{2s_{1/2}}$ $\frac{3d_{3/2}}{2s_{1/2}}$ $\frac{3d_{5/2}}{2s_{1/2}}$	σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ σ β γ δ σ σ σ σ σ σ σ σ σ σ σ σ σ	$\begin{array}{c} k \ (\mathrm{eV}) \\ \hline 2000 \\ \hline 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.00+0 \\ 2.979+2 \\ 0.509 \\ -1.97-2 \\ -1.15-3 \\ 4.930+2 \\ 0.419 \\ -6.97-2 \\ -7.85-3 \\ \frac{6}{57} 2 \ 4 \mathbf{f}_{7/2}^8 \ 5 \mathbf{d}_{3/2}^4 \end{array}$	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241 2.96-1 4.98-2 1.355+2 1.025 -1.54-1 2.74-2 1.890+2 1.091	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547 -5.19-3 1.13-2 5.977+1 1.204 1.37-1 6.65-2 8.202+1 1.209 2.02-1	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2 1.16-2 3.066+1 1.241 4.35-1 9.01-2 4.162+1 1.211 4.99-1	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2 1.51-2 1.745+1 1.230 6.96-1 1.09-1 2.348+1 1.178 7.48-1	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1 1.87-2 1.070+1 1.198 9.16-1 1.26-1 1.428+1 1.132 9.52-1	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692 3.05-1 2.20-2 6.937+0 1.157 1.10+0 1.41-1 9.199+0 1.081 1.12+0	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0 1.682 4.62-1 2.50-2 4.703+0 1.112 1.26+0 1.031 1.031	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667 6.17-1 2.79-2 3.304+0 1.066 1.39+0 1.70-1 4.328+0 0.982 1.38+0	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1 3.07-2 2.391+0 1.021 1.51+0 1.85-1 3.115+0 0.936 1.49+0	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1 3.36-2 1.773+0 0.977 1.61+0 2.00-1 2.298+0 0.892 1.58+0
Shell $\frac{3s_{1/2}}{2s_{1/2}}$ $\frac{3s_{1/2}}{2s_{1/2}}$ $\frac{3p_{1/2}}{2s_{1/2}}$ $\frac{3p_{1/2}}{2s_{1/2}}$ $\frac{3p_{3/2}}{2s_{1/2}}$ $\frac{3d_{3/2}}{2s_{1/2}}$ $\frac{3d_{3/2}}{2s_{1/2}}$ $\frac{3d_{5/2}}{2s_{1/2}}$	σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ δ σ β γ δ δ σ β δ σ σ β δ σ σ β δ σ σ β δ σ σ δ σ δ σ δ σ δ σ δ σ σ σ σ σ σ σ σ σ σ σ σ σ	$\begin{array}{c} k \ (\mathrm{eV}) \\ \hline 2000 \\ \hline 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.00+0 \\ 2.979+2 \\ 0.509 \\ -1.97-2 \\ -1.15-3 \\ 4.930+2 \\ 0.419 \\ -6.97-2 \\ -7.85-3 \\ \frac{6}{5/2} \ 4f_{7/2}^8 \ 5d_{3/2}^4 \\ k \ (\mathrm{eV}) \\ \hline 2000 \end{array}$	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241 2.96-1 4.98-2 1.355+2 1.025 -1.54-1 2.74-2 1.890+2 1.097 -1.14-1 2.71-2 5d <sup>2</sup> <sub>5/2</sub> 6s <sup>2</sup> <sub>1/2</sub> 3000	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547 -5.19-3 1.13-2 5.977+1 1.204 1.37-1 6.65-2 8.202+1 1.209 2.02-1 6.40-2	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2 1.16-2 3.066+1 1.241 4.35-1 9.01-2 4.162+1 1.211 4.99-1 8.94-2	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2 1.51-2 1.745+1 1.230 6.96-1 1.09-1 2.348+1 1.178 7.48-1 1.12-1	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1 1.87-2 1.070+1 1.198 9.16-1 1.26-1 1.428+1 1.132 9.52-1 1.32-1	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692 3.05-1 2.20-2 6.937+0 1.157 1.10+0 1.41-1 9.199+0 1.081 1.12+0 1.51-1	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0 1.682 4.62-1 2.50-2 4.703+0 1.112 1.26+0 1.031 1.26+0 1.09-1	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667 6.17-1 2.79-2 3.304+0 1.066 1.39+0 1.70-1 4.328+0 0.982 1.38+0 1.87-1	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1 3.07-2 2.391+0 1.021 1.51+0 1.85-1 3.115+0 0.936 1.49+0 2.05-1	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1 3.36-2 1.773+0 0.977 1.61+0 2.00-1 2.298+0 0.892 1.58+0 2.23-1
Shell $\frac{3s_{1/2}}{2s_{1/2}}$ $E_b = 2931.7 \text{ eV}$ $\frac{3p_{1/2}}{2b_b = 2681.6 \text{ eV}}$ $\frac{3p_{3/2}}{2s_{1/2}}$ $E_b = 2367.3 \text{ eV}$ $\frac{3d_{3/2}}{2s_{1/2}}$ $E_b = 1882.9 \text{ eV}$ $\frac{3d_{5/2}}{2s_{1/2}}$ $E_b = 1882.9 \text{ eV}$ $\frac{3d_{5/2}}{2s_{1/2}}$	σ         β           γ         δ           σ         β           γ         δ           σ         β           γ         δ           σ         β           γ         δ           σ         β           γ         δ           β         γ           δ         γ	$\begin{array}{c} k\ (\mathrm{eV})\\ \hline 2000\\ \hline 0.000+0\\ 0.000+0\\ 0.000+0\\ 0.000+0\\ 0.000+0\\ 0.000+0\\ 0.000+0\\ 0.000+0\\ 0.000+0\\ 0.000+0\\ 2.979+2\\ 0.509\\ -1.97-2\\ -1.15-3\\ 4.930+2\\ 0.419\\ -6.97-2\\ -7.85-3\\ \frac{6}{5}_{2}\ 4f_{7/2}^{8}\ 5d_{3/2}^{4}\\ k\ (\mathrm{eV})\\ \hline 2000\\ 0.000+0\\ 0.000+0\\ \hline \end{array}$	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241 2.96-1 4.98-2 1.355+2 1.025 -1.54-1 2.74-2 1.890+2 1.095 -1.14-1 2.71-2 5d <sup>2</sup> <sub>5/2</sub> 6s <sup>2</sup> <sub>1/2</sub> 3000 0.000+0	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547 -5.19-3 1.13-2 5.977+1 1.204 1.37-1 6.65-2 8.202+1 1.209 2.02-1 6.40-2	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2 1.16-2 3.066+1 1.241 4.35-1 9.01-2 4.162+1 1.211 4.99-1 8.94-2	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2 1.51-2 1.745+1 1.230 6.96-1 1.09-1 2.348+1 1.178 7.48-1 1.12-1	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1 1.87-2 1.070+1 1.198 9.16-1 1.26-1 1.428+1 1.132 9.52-1 1.32-1 7000 7.239+0	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692 3.05-1 2.20-2 6.937+0 1.157 1.10+0 1.41-1 9.199+0 1.081 1.12+0 1.51-1	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0 1.682 4.62-1 2.50-2 4.703+0 1.112 1.26+0 1.031 1.26+0 1.09-1	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667 6.17-1 2.79-2 3.304+0 1.066 1.39+0 1.70-1 4.328+0 0.982 1.38+0 1.87-1	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1 3.07-2 2.391+0 1.021 1.51+0 1.85-1 3.115+0 0.936 1.49+0 2.05-1	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1 3.36-2 1.773+0 0.977 1.61+0 2.00-1 2.298+0 0.892 1.58+0 2.23-1
Shell $\frac{3s_{1/2}}{2s_{b}}$ $\frac{3p_{1/2}}{2s_{b}}$ $\frac{3p_{1/2}}{2s_{b}}$ $\frac{3p_{3/2}}{2s_{b}}$ $\frac{3p_{3/2}}{2s_{b}}$ $\frac{3d_{3/2}}{2s_{b}}$ $\frac{3d_{5/2}}{2s_{b}}$ $\frac{3d_{5/2}}{2s_{b}}$ $\frac{3d_{5/2}}{2s_{b}}$ $\frac{3d_{5/2}}{2s_{b}}$ $\frac{3d_{5/2}}{2s_{b}}$ $\frac{3d_{5/2}}{2s_{b}}$ $\frac{3d_{5/2}}{2s_{b}}$ $\frac{3d_{5/2}}{2s_{b}}$ $\frac{3d_{5/2}}{2s_{b}}$ $\frac{3s_{5/2}}{2s_{b}}$ $\frac{3s_{5/2}}{2s_{b}}$	σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ δ σ β β γ δ δ σ β δ δ δ δ δ δ δ δ δ δ δ δ δ	k (eV)  2000  0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 2.979+2 0.509 -1.97-2 -1.15-3 4.930+2 0.419 -6.97-2 -7.85-3 6 6 5/2 4f <sup>8</sup> <sub>7/2</sub> 5d <sup>4</sup> <sub>3/2</sub> k (eV) 2000 0.000+0 0.000+0 0.000+0 0.000+0	$\begin{array}{c} 3000 \\ 2.397+1 \\ 1.853 \\ 1.48+0 \\ 2.14-3 \\ 3.718+1 \\ 1.010 \\ 4.91-1 \\ 1.40-1 \\ 8.878+1 \\ 1.241 \\ 2.96-1 \\ 4.98-2 \\ 1.355+2 \\ 1.025 \\ -1.54-1 \\ 2.74-2 \\ 1.890+2 \\ 1.095 \\ -1.14-1 \\ 2.71-2 \\ \hline {\bf 5d}_{5/2}^2 {\bf 6s}_{1/2}^2 \\ \hline 3000 \\ 0.000+0 \\ 0.000 \\ \end{array}$	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547 -5.19-3 1.13-2 5.977+1 1.204 1.37-1 6.65-2 8.202+1 1.209 2.02-1 6.40-2 4000 1.740+1 1.866 8.05-1 -9.39-4	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2 1.16-2 3.066+1 1.241 4.35-1 9.01-2 4.162+1 1.211 4.99-1 8.94-2 5000 1.254+1 1.882 4.20-1 -1.86-3	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2 1.51-2 1.745+1 1.230 6.96-1 1.09-1 2.348+1 1.178 7.48-1 1.12-1	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1 1.87-2 1.070+1 1.198 9.16-1 1.26-1 1.428+1 1.132 9.52-1 1.32-1 7000 7.239+0 1.906 2.82-2 -2.67-3	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692 3.05-1 2.20-2 6.937+0 1.157 1.10+0 1.41-1 9.199+0 1.081 1.12+0 1.51-1	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0 1.682 4.62-1 2.50-2 4.703+0 1.112 1.26+0 1.56-1 6.197+0 1.031 1.26+0 1.69-1	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.666 1.39+0 1.70-1 4.328+0 0.982 1.38+0 1.87-1 10000 3.829+0 1.930 -1.65-1 -3.26-3	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1 3.07-2 2.391+0 1.021 1.51+0 1.85-1 3.115+0 0.936 1.49+0 2.05-1	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1 3.36-2 1.773+0 0.977 1.61+0 2.00-1 2.298+0 0.892 1.58+0 2.23-1
Shell $\frac{3s_{1/2}}{2s_{b}}$ $\frac{3p_{1/2}}{2s_{b}}$ $\frac{3p_{1/2}}{2s_{b}}$ $\frac{3p_{3/2}}{2s_{b}}$ $\frac{3p_{3/2}}{2s_{b}}$ $\frac{3d_{3/2}}{2s_{b}}$ $\frac{3d_{5/2}}{2s_{b}}$ $\frac{3d_{5/2}}{2s_{b}}$ $\frac{3d_{5/2}}{2s_{b}}$ $\frac{3d_{5/2}}{2s_{b}}$ $\frac{3d_{5/2}}{2s_{b}}$ $\frac{3d_{5/2}}{2s_{b}}$ $\frac{3d_{5/2}}{2s_{b}}$ $\frac{3d_{5/2}}{2s_{b}}$ $\frac{3d_{5/2}}{2s_{b}}$ $\frac{3s_{5/2}}{2s_{b}}$ $\frac{3s_{5/2}}{2s_{b}}$	$ \begin{array}{c c} \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \end{array} $	k (eV)  2000  0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 2.979+2 0.509 -1.97-2 -1.15-3 4.930+2 0.419 -6.97-2 -7.85-3 6 <sub>5/2</sub> 4t <sup>8</sup> <sub>7/2</sub> 5d <sup>4</sup> <sub>3/2</sub> k (eV) 2000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241 2.96-1 4.98-2 1.355+2 1.025 -1.54-1 2.74-2 1.890+2 1.097 -1.14-1 2.71-2 5d <sup>2</sup> <sub>5/2</sub> 6s <sup>2</sup> <sub>1/2</sub> 3000 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 3.666+1	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547 1.13-2 5.977+1 1.204 1.37-1 6.65-2 8.202+1 1.209 2.02-1 6.40-2 4000 1.740+1 1.866 8.05-1 -9.39-4 2.605+1	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2 1.16-2 3.066+1 1.241 4.35-1 9.01-2 4.162+1 1.211 4.99-1 8.94-2  5000 1.254+1 1.882 4.20-1 -1.86-3 1.823+1	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2 1.51-2 1.745+1 1.230 6.96-1 1.09-1 2.348+1 1.178 7.48-1 1.12-1 6000 9.378+0 1.895 1.83-1 -2.35-3 1.316+1	7.083+0 1.914 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1 1.87-2 1.070+1 1.198 9.16-1 1.26-1 1.428+1 1.132 9.52-1 1.32-1  7000 7.239+0 1.906 2.82-2 -2.67-3 9.792+0	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692 3.05-1 2.20-2 6.937+0 1.157 1.10+0 1.41-1 9.199+0 1.081 1.12+0 1.51-1  8000 5.737+0 1.915 -7.17-2 -2.91-3 7.479+0	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0 1.682 4.62-1 2.50-2 4.703+0 1.112 1.26+0 1.031 1.26+0 1.69-1 9000 4.645+0 1.923 -1.33-1 -3.10-3 5.842+0	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667 6.17-1 2.79-2 3.304+0 1.066 1.39+0 1.70-1 4.328+0 0.982 1.38+0 1.87-1 10000 3.829+0 1.930 1.930 -1.65-1 -3.26-3 4.650+0	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1 3.07-2 2.391+0 1.021 1.51+0 1.85-1 3.115+0 0.936 1.49+0 2.05-1  11000 3.204+0 1.935 -1.76-1 -3.39-3 3.762+0	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1 3.36-2 1.773+0 0.977 1.61+0 2.00-1 2.298+0 0.892 1.58+0 2.23-1 12000 2.716+0 1.93 1.69-1 -3.50-3 3.087+0
Shell $\frac{3s_{1/2}}{2s_{b}=2931.7}$ eV $\frac{3p_{1/2}}{2s_{b}=2681.6}$ eV $\frac{3p_{3/2}}{2s_{b}=2367.3}$ eV $\frac{3d_{3/2}}{2s_{b}=1948.9}$ eV $\frac{3d_{5/2}}{2s_{b}=1882.9}$ eV $\frac{3d_{5/2}}{2s_{b}=1882.9}$ eV $\frac{3d_{5/2}}{2s_{b}=3048.5}$ eV $\frac{3p_{1/2}}{2s_{b}=3048.5}$ eV $\frac{3p_{1/2}}{2s_{b}=3048.5}$ eV	σ         β           γ         δ           σ         β           γ         δ           σ         β           γ         δ           σ         β           γ         δ           δ         γ	k (eV)   2000   0.000+0	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241 2.96-1 4.98-2 1.355+2 1.025 -1.54-1 2.74-2 1.890+2 1.097 -1.14-1 2.71-2 5d <sup>2</sup> <sub>5,2</sub> 6s <sup>2</sup> <sub>1/2</sub> 3000 0.000+0 0.000+0 0.00+0 0.00+0 3.666+1 0.828	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547 -5.19-3 1.13-2 5.977+1 1.204 1.37-1 6.65-2 8.202+1 1.209 2.02-1 6.40-2 4000 1.740+1 1.866 8.05-1 -9.39-4 2.605+1 1.432	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2 1.16-2 3.066+1 1.241 4.35-1 9.01-2 4.162+1 1.211 4.99-1 8.94-2  5000 1.254+1 1.882 4.20-1 -1.86-3 1.823+1 1.550	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2 1.51-2 1.745+1 1.230 6.96-1 1.09-1 2.348+1 1.178 7.48-1 1.12-1 6000 9.378+0 1.895 1.83-1 -2.35-3 1.316+1 1.587	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1 1.87-2 1.070+1 1.198 9.16-1 1.26-1 1.428+1 1.132 9.52-1 1.32-1 7000 7.239+0 1.906 2.82-2 -2.67-3 9.792+0 1.593	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692 3.05-1 2.20-2 6.937+0 1.157 1.10+0 1.41-1 9.199+0 1.081 1.12+0 1.51-1  8000 5.737+0 1.915 -7.17-2 -2.91-3 7.479+0 1.586	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0 1.682 4.62-1 2.50-2 4.703+0 1.112 1.26+0 1.56-1 6.197+0 1.031 1.26+0 1.69-1 9000 4.645+0 1.923 -1.33-1 -3.10-3 5.842+0 1.571	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667 6.17-1 2.79-2 3.304+0 1.066 1.39+0 1.70-1 4.328+0 0.982 1.38+0 1.87-1 10000 3.829+0 1.930 -1.65-1 -3.26-3 4.650+0 1.551	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1 3.07-2 2.391+0 1.021 1.51+0 1.85-1 3.115+0 0.936 1.49+0 2.05-1 11000 3.204+0 1.935 -1.76-1 -3.39-3 3.762+0 1.529	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1 3.36-2 1.773+0 0.977 1.61+0 2.09-1 2.298+0 0.892 1.58+0 2.23-1 12000 2.716+0 1.939 -1.69-1 -3.50-3 3.087+0 1.505
Shell $\frac{3s_{1/2}}{2s_{1/2}}$ $\frac{3s_{1/2}}{2s_{1/2}}$ $\frac{3p_{1/2}}{2s_{1/2}}$ $\frac{3p_{1/2}}{2s_{1/2}}$ $\frac{3p_{3/2}}{2s_{1/2}}$ $\frac{3d_{3/2}}{2s_{1/2}}$ $\frac{3d_{3/2}}{2s_{1/2}}$ $\frac{3d_{5/2}}{2s_{1/2}}$	σ   β   γ   δ   σ   β   γ   δ   σ   β   γ   δ   σ   β   γ   δ   σ   β   γ   δ   σ   β   γ   δ   σ   σ   β   γ   δ   σ   σ   σ   δ   σ   σ   σ   σ   σ	k (eV)   2000   0.000+0	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241 2.96-1 4.98-2 1.355+2 1.025 -1.54-1 2.74-2 1.890+2 1.097 -1.14-1 2.71-2 5d <sup>2</sup> <sub>2</sub> 6s <sup>2</sup> <sub>1/2</sub> 3000 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 0.00+0 0.0028 3.666+1 0.828 3.84-1	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547 -5.19-3 1.13-2 5.977+1 1.204 1.37-1 6.65-2 8.202+1 1.209 2.02-1 6.40-2 4000 1.740+1 1.866 8.05-1 -9.39-4 2.605+1 1.432 2.08-1	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2 1.16-2 3.066+1 1.241 4.35-1 9.01-2 4.162+1 1.211 4.99-1 8.94-2  5000 1.254+1 1.882 4.20-1 -1.86-3 1.823+1 1.550 1.01-2	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2 1.51-2 1.745+1 1.230 6.96-1 1.09-1 2.348+1 1.178 7.48-1 1.12-1  6000 9.378+0 1.895 1.83-1 -2.35-3 1.316+1 1.587 3.26-3	7.083+0 1.914 -2.53-3 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1 1.87-2 1.070+1 1.198 9.16-1 1.26-1 1.428+1 1.132 9.52-1 1.32-1  7000 7.239+0 1.906 2.82-2 -2.67-3 9.792+0 1.593 8.00-2	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692 3.05-1 2.20-2 6.937+0 1.157 1.10+0 1.41-1 9.199+0 1.081 1.12+0 1.51-1  8000 5.737+0 1.915 -7.17-2 -2.91-3 7.479+0 1.586 1.94-1	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0 1.682 4.62-1 2.50-2 4.703+0 1.112 1.26+0 1.56-1 6.197+0 1.031 1.26+0 1.69-1 9000 4.645+0 1.923 -1.33-1 -3.10-3 5.842+0 1.571 3.22-1	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667 6.17-1 2.79-2 3.304+0 1.066 1.39+0 1.70-1 4.328+0 0.982 1.38+0 1.87-1 10000 3.829+0 1.930 -1.65-1 -3.26-3 4.650+0 1.551 4.55-1	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1 3.07-2 2.391+0 1.021 1.51+0 1.85-1 3.115+0 0.936 1.49+0 2.05-1  11000 3.204+0 1.935 -1.76-1 -3.39-3 3.762+0 1.529 5.85-1	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1 3.36-2 1.773+0 0.977 1.61+0 2.00-1 2.298+0 0.892 1.58+0 2.23-1 12000 2.716+0 1.939 -1.69-1 -3.50-3 3.087+0 1.505 7.10-1
Shell $3s_{1/2}$ $E_b$ $=$ $2931.7 \text{ eV}$ $3p_{1/2}$ $E_b$ $=$ $2681.6 \text{ eV}$ $3p_{3/2}$ $E_b$ $=$ $2367.3 \text{ eV}$ $3d_{3/2}$ $E_b$ $=$ $1948.9 \text{ eV}$ $3d_{5/2}$ $E_b$ $=$ $1882.9 \text{ eV}$ $\mathbf{Z} = 76$ , $\mathbf{Os}$ : Shell $3s_{1/2}$ $E_b$ $=$ $3048.5 \text{ eV}$ $3p_{1/2}$ $E_b$ $=$ $2792.2 \text{ eV}$	σ         β           γ         δ           σ         β           γ         δ           σ         β           γ         δ           δ         γ	k (eV)   2000   0.000+0	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241 2.96-1 4.98-2 1.355+2 1.025 -1.54-1 2.74-2 1.890+2 1.095 -1.14-1 2.71-2 5d <sup>2</sup> <sub>5/2</sub> 6s <sup>2</sup> <sub>1/2</sub> 3000 0.000+0 0.000+0 0.00+0 0	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547 -5.19-3 1.13-2 5.977+1 1.204 1.37-1 6.65-2 8.202+1 1.202-1 6.40-2 4000 1.740+1 1.866 8.05-1 -9.39-4 2.605+1 1.432 2.08-1 1.98-2	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2 1.16-2 3.066+1 1.241 4.35-1 9.01-2 4.162+1 1.211 4.99-1 8.94-2  5000 1.254+1 1.882 4.20-1 -1.86-3 1.823+1 1.550 1.01-2 2.17-3	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2 1.51-2 1.745+1 1.230 6.96-1 1.09-1 2.348+1 1.178 7.48-1 1.12-1  6000 9.378+0 1.895 1.83-1 -2.35-3 1.316+1 1.587 3.26-3 8.15-5	7.083+0 1.914 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1 1.87-2 1.070+1 1.198 9.16-1 1.26-1 1.428+1 1.132 9.52-1 1.32-1  7000 7.239+0 1.906 2.82-2 -2.67-3 9.792+0 1.593 8.00-2 1.53-3	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692 3.05-1 2.20-2 6.937+0 1.157 1.10+0 1.41-1 9.199+0 1.081 1.12+0 1.51-1  8000 5.737+0 1.915 -7.17-2 -2.91-3 7.479+0 1.586 1.94-1 4.39-3	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0 1.682 4.62-1 2.50-2 4.703+0 1.112 1.26+0 1.56-1 6.197+0 1.031 1.26+0 1.69-1 9000 4.645+0 1.923 -1.33-1 -3.10-3 5.842+0 1.571 3.22-1 8.04-3	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667 6.17-1 2.79-2 3.304+0 1.066 1.39+0 1.70-1 4.328+0 0.982 1.38+0 1.87-1  10000 3.829+0 1.930 -1.65-1 -3.26-3 4.650+0 1.551 1.55-1 1.22-2	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1 3.07-2 2.391+0 1.021 1.51+0 1.85-1 3.115+0 0.936 1.49+0 2.05-1  11000 3.204+0 1.935 -1.76-1 -3.39-3 3.762+0 1.529 5.85-1 1.67-2	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1 3.36-2 1.773+0 0.977 1.61+0 2.00-1 2.298+0 0.892 1.58+0 2.23-1 12000 2.716+0 1.939 -1.69-1 -3.50-3 3.087+0 1.505 1.510-1 2.14-2
Shell $\frac{3s_{1/2}}{2s_{1/2}}$ $\frac{3p_{1/2}}{2s_{1/2}}$ $\frac{3p_{1/2}}{2s_{1/2}}$ $\frac{3p_{1/2}}{2s_{1/2}}$ $\frac{3p_{3/2}}{2s_{1/2}}$ $\frac{3d_{3/2}}{2s_{1/2}}$ $\frac{3d_{3/2}}{2s_{1/2}}$ $\frac{3d_{3/2}}{2s_{1/2}}$ $\frac{3d_{3/2}}{2s_{1/2}}$ $\frac{3d_{3/2}}{2s_{1/2}}$ $\frac{3d_{3/2}}{2s_{1/2}}$ $\frac{3d_{3/2}}{2s_{1/2}}$ $\frac{3d_{3/2}}{2s_{1/2}}$ $\frac{3p_{1/2}}{2s_{1/2}}$ $\frac{3p_{1/2}}{2s_{1/2}}$ $\frac{3p_{1/2}}{2s_{1/2}}$ $\frac{3p_{1/2}}{2s_{1/2}}$ $\frac{3p_{1/2}}{2s_{1/2}}$ $\frac{3p_{1/2}}{2s_{1/2}}$ $\frac{3p_{1/2}}{2s_{1/2}}$	$ \begin{array}{c c} \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \delta \\ \gamma \\ \delta \\ \hline \sigma \\ \delta \\ \gamma \\ \delta \\ \hline \sigma \\ \delta \\ \gamma \\ \delta \\ \hline \sigma \\ \delta \\ \gamma \\ \delta \\ \hline \sigma \\ \delta \\ \gamma \\ \delta \\ \hline \sigma \\ \delta \\ \gamma \\ \delta \\ \hline \sigma \\ \delta \\ \gamma \\ \delta \\ \hline \sigma \\ \delta \\ \gamma \\ \delta \\ \hline \sigma \\ \delta \\ \gamma \\ \delta \\ \hline \sigma \\ \delta \\ \gamma \\ \delta \\ \hline \sigma \\ \delta \\ \gamma \\ \delta \\ \hline \sigma \\ \delta \\ \gamma \\ \delta \\ \overline \sigma \\ \delta \\ \delta \\ \gamma \\ \delta \\ \overline \sigma \\ \delta \\ \delta \\ \gamma \\ \delta \\ \overline \sigma \\ \delta \\ \delta \\ \gamma \\ \delta \\ \overline \sigma \\ \overline \sigma \\ \delta \\ \overline \sigma $	k (eV)   2000   0.000+0	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241 2.96-1 4.98-2 1.355+2 1.025 -1.54-1 2.74-2 1.890+2 1.097 -1.14-1 2.71-2 5d <sup>2</sup> <sub>5/2</sub> 6s <sup>2</sup> <sub>1/2</sub> 3000 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 3.666+1 0.828 3.84-1 1.93-1	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547 -5.19-3 1.13-2 5.977+1 1.204 1.37-1 6.65-2 8.202+1 1.209 2.02-1 6.40-2 4000 1.740+1 1.866 8.05-1 -9.39-4 2.605+1 1.432 2.08-1 1.98-2 5.586+1	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2 1.16-2 3.066+1 1.241 4.35-1 9.01-2 4.162+1 1.211 4.99-1 8.94-2  5000 1.254+1 1.882 4.20-1 -1.86-3 1.823+1 1.550 1.01-2 2.17-3 3.647+1	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2 1.51-2 1.745+1 1.230 6.96-1 1.09-1 2.348+1 1.178 7.48-1 1.12-1  6000 9.378+0 1.895 1.83-1 -2.35-3 1.316+1 1.587 3.26-3 8.15-5 2.507+1	7.083+0 1.914 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1 1.87-2 1.070+1 1.198 9.16-1 1.26-1 1.428+1 1.132 9.52-1 1.32-1  7000 7.239+0 1.906 2.82-2 -2.67-3 9.792+0 1.593 8.00-2 1.53-3 1.797+1	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 1.277+1 1.692 3.05-1 2.20-2 6.937+0 1.157 1.10+0 1.41-1 9.199+0 1.081 1.12+0 1.51-1  8000 5.737+0 1.915 -7.17-2 -2.91-3 7.479+0 1.584 1.94-1 4.39-3 1.331+1	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0 1.682 4.62-1 2.50-2 4.703+0 1.112 1.26+0 1.56-1 6.197+0 1.031 1.26+0 1.69-1  9000 4.645+0 1.923 -1.33-1 -3.10-3 5.842+0 1.57 1.22-1 1.22-1 1.23-1 1.22-1 1.23-1 1.23-1 1.23-1	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667 6.17-1 2.79-2 3.304+0 1.066 1.39+0 1.70-1 4.328+0 0.982 1.38+0 1.87-1 10000 3.829+0 1.930 -1.65-1 -3.26-3 4.650+0 1.551 1.22-2 7.889+0	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1 3.07-2 2.391+0 1.021 1.51+0 1.85-1 3.115+0 0.936 1.49+0 2.05-1  11000 3.204+0 1.935 -1.76-1 -3.39-3 3.762+0 1.529 5.85-1 1.67-2 6.259+0	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1 3.36-2 1.773+0 0.977 1.61+0 2.00-1 2.298+0 0.892 1.58+0 2.23-1 12000 2.716+0 1.939 -1.69-1 -3.50-3 3.087+0 1.505 7.10-1 2.14-2 5.046+0
Shell $3s_{1/2}$ $E_b$ $=$ $2931.7 \text{ eV}$ $3p_{1/2}$ $E_b$ $=$ $2681.6 \text{ eV}$ $3p_{3/2}$ $E_b$ $=$ $2367.3 \text{ eV}$ $3d_{3/2}$ $E_b$ $=$ $1948.9 \text{ eV}$ $3d_{5/2}$ $E_b$ $=$ $1882.9 \text{ eV}$ $\mathbf{Z} = 76$ , $\mathbf{Os}$ : Shell $3s_{1/2}$ $E_b$ $=$ $3048.5 \text{ eV}$ $3p_{1/2}$ $E_b$ $=$ $2792.2 \text{ eV}$	σ         β           γ         δ           σ         β           γ         δ           σ         β           γ         δ           δ         γ	k (eV)   2000   0.000+0	3000 2.397+1 1.853 1.48+0 2.14-3 3.718+1 1.010 4.91-1 1.40-1 8.878+1 1.241 2.96-1 4.98-2 1.355+2 1.025 -1.54-1 2.74-2 1.890+2 1.095 -1.14-1 2.71-2 5d <sup>2</sup> <sub>5/2</sub> 6s <sup>2</sup> <sub>1/2</sub> 3000 0.000+0 0.000+0 0.00+0 0	1.724+1 1.876 7.19-1 -1.04-3 2.567+1 1.461 1.56-1 1.46-2 5.429+1 1.547 -5.19-3 1.13-2 5.977+1 1.204 1.37-1 6.65-2 8.202+1 1.202-1 6.40-2 4000 1.740+1 1.866 8.05-1 -9.39-4 2.605+1 1.432 2.08-1 1.98-2	1.235+1 1.891 3.61-1 -1.82-3 1.781+1 1.561 -2.13-3 1.43-3 3.527+1 1.644 -5.23-2 1.16-2 3.066+1 1.241 4.35-1 9.01-2 4.162+1 1.211 4.99-1 8.94-2  5000 1.254+1 1.882 4.20-1 -1.86-3 1.823+1 1.550 1.01-2 2.17-3	9.200+0 1.903 1.40-1 -2.24-3 1.278+1 1.591 1.37-2 3.35-4 2.417+1 1.682 2.43-2 1.51-2 1.745+1 1.230 6.96-1 1.09-1 2.348+1 1.178 7.48-1 1.12-1  6000 9.378+0 1.895 1.83-1 -2.35-3 1.316+1 1.587 3.26-3 8.15-5	7.083+0 1.914 -2.53-3 9.466+0 1.593 1.04-1 2.20-3 1.727+1 1.694 1.54-1 1.87-2 1.070+1 1.198 9.16-1 1.26-1 1.428+1 1.132 9.52-1 1.32-1  7000 7.239+0 1.906 2.82-2 -2.67-3 9.792+0 1.593 8.00-2 1.53-3	5.602+0 1.922 -9.21-2 -2.74-3 7.205+0 1.583 2.25-1 5.33-3 1.277+1 1.692 3.05-1 2.20-2 6.937+0 1.157 1.10+0 1.41-1 9.199+0 1.081 1.12+0 1.51-1  8000 5.737+0 1.915 -7.17-2 -2.91-3 7.479+0 1.586 1.94-1 4.39-3	4.529+0 1.930 -1.45-1 -2.92-3 5.611+0 1.566 3.58-1 9.20-3 9.704+0 1.682 4.62-1 2.50-2 4.703+0 1.112 1.26+0 1.56-1 6.197+0 1.031 1.26+0 1.69-1 9000 4.645+0 1.923 -1.33-1 -3.10-3 5.842+0 1.571 3.22-1 8.04-3	3.728+0 1.936 -1.69-1 -3.06-3 4.456+0 1.544 4.93-1 1.36-2 7.543+0 1.667 6.17-1 2.79-2 3.304+0 1.066 1.39+0 1.70-1 4.328+0 0.982 1.38+0 1.87-1  10000 3.829+0 1.930 -1.65-1 -3.26-3 4.650+0 1.551 1.55-1 1.22-2	3.117+0 1.941 -1.73-1 -3.17-3 3.598+0 1.521 6.25-1 1.82-2 5.976+0 1.648 7.66-1 3.07-2 2.391+0 1.021 1.51+0 1.85-1 3.115+0 0.936 1.49+0 2.05-1  11000 3.204+0 1.935 -1.76-1 -3.39-3 3.762+0 1.529 5.85-1 1.67-2	2.639+0 1.945 -1.60-1 -3.27-3 2.947+0 1.496 7.50-1 2.32-2 4.812+0 1.627 9.07-1 3.36-2 1.773+0 0.977 1.61+0 2.00-1 2.298+0 0.892 1.58+0 2.23-1 12000 2.716+0 1.939 -1.69-1 -3.50-3 3.087+0 1.505 1.510-1 2.14-2

	δ	0.00+0	6.52-2	1.25-2	1.15-2	1.50-2	1.86-2	2.19-2	2.50-2	2.78-2	3.06-2	3.33-2
3/2	σ	0.000+0	1.437+2	6.377+1	3.283+1	1.873+1	1.151+1	7.481+0	5.080+0	3.574+0	2.590+0	1.923+0
= 30.8 eV	β	0.000 0.00+0	0.985 -1.83-1	1.191 9.40-2	1.240 3.92-1	1.234 6.56-1	1.207 8.82-1	1.168 1.07+0	1.125 1.23+0	1.081 1.37+0	1.037 1.49+0	0.994 1.60+0
50.8 EV	$\gamma \\ \delta$	0.00+0	2.12-2	6.35-2	8.78-2	1.07-1	1.24-1	1.39-1	1.53-1	1.67-1	1.49+0	1.96-1
5/2	σ	4.271+2	2.005+2	8.744+1	4.451+1	2.517+1	1.535+1	9.903+0	6.681+0	4.673+0	3.367+0	2.488+0
=	β	0.613	1.071	1.204	1.213	1.185	1.141	1.093	1.043	0.995	0.949	0.906
060.1 eV	γ	-2.90 - 3	-1.46-1	1.62 - 1	4.60 - 1	7.14 - 1	9.25 - 1	1.10+0	1.24+0	1.37+0	1.47+0	1.57+0
	δ	-2.49 - 3	2.18 - 2	6.08 - 2	8.66 - 2	1.09 - 1	1.29 - 1	1.48 - 1	1.66 - 1	1.84 - 1	2.01 - 1	2.19 - 1
= 77, Ir: [	[Xe]4f <sub>5</sub>	/2 <b>4f</b> <sup>8</sup> <sub>7/2</sub> <b>5d</b> <sup>4</sup> <sub>3/2</sub> k (eV)	5d <sub>5/2</sub> 6s <sub>1/2</sub>									
hell		3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	14000
S <sub>1/2</sub>	σ	0.000+0	1.754+1	1.273+1	9.553+0	7.394+0	5.871+0	4.762+0	3.931+0	3.293+0	2.794+0	2.076+0
_	β	0.000	1.856	1.873	1.887	1.898	1.908	1.916	1.923	1.929	1.934	1.941
173.7 eV	γ	0.00+0	9.05-1	4.87-1	2.31-1	6.29-2	-4.76-2	-1.18-1	-1.59-1	-1.77-1	-1.77-1	-1.37-
<u> </u>	δ	0.00+0 3.536+1	-7.71-4 2.639+1	-1.88-3 1.864+1	-2.45-3 1.354+1	-2.82-3 1.012+1	-3.09-3 7.755+0	-3.30-3 6.075+0	-3.48-3 4.848+0	-3.63-3 3.931+0	-3.75-3 3.231+0	-3.94- 2.262+
p <sub>1/2</sub> =	$\frac{\sigma}{eta}$	0.503	1.397	1.535	1.534+1	1.593	1.588	1.576	1.558	1.537	1.514	1.466
908.7 eV	γ	-6.27 - 3	2.67-1	2.83-2	-3.52 - 3	5.87-2	1.63-1	2.87-1	4.17-1	5.46-1	6.70-1	9.03-1
	δ	2.54-1	2.69-2	3.28-3	-6.67 - 5	9.20-4	3.48-3	6.92-3	1.09-2	1.52-2	1.98-2	2.97-2
p <sub>3/2</sub>	σ	9.201+1	5.744+1	3.768+1	2.599+1	1.867+1	1.386+1	1.057+1	8.244+0	6.549+0	5.287+0	3.585+0
, =	β	1.082	1.497	1.621	1.673	1.694	1.698	1.693	1.682	1.666	1.648	1.608
550.7 eV	γ	3.59-1	4.21-2	-5.90-2	-1.41-2	9.57-2	2.35-1	3.86-1	5.38-1	6.86-1	8.28-1	1.09+0
,	δ	8.58-2	1.42-2	1.15-2	1.49-2	1.85-2	2.19-2	2.50-2	2.78-2	3.05-2	3.30-2	3.84-2
$d_{3/2}$	σ	1.521+2	6.799+1	3.512+1	2.009+1	1.238+1	8.058+0	5.481+0	3.862+0	2.802+0	2.084+0	1.223+
5= 116.1 eV	$\beta$ $\gamma$	0.939 -2.07-1	1.176 5.14-2	1.237 3.48-1	1.238 6.15-1	1.215 8.46-1	1.179 1.04+0	1.138 1.21+0	1.095 1.35+0	1.052 1.47+0	1.011 1.58+0	0.930 1.76+0
110.1 CV	δ	1.42-2	6.05-2	8.57-2	1.05-1	1.22-1	1.37-1	1.51-1	1.65-1	1.78-1	1.93-1	2.21-1
d <sub>5/2</sub>	$\sigma$	2.124+2	9.315+1	4.756+1	2.696+1	1.647+1	1.065+1	7.195+0	5.040+0	3.636+0	2.689+0	1.563+
5/2 b=	β	1.041	1.197	1.215	1.191	1.151	1.104	1.055	1.008	0.962	0.919	0.839
040.4 eV	γ	-1.76-1	1.21 - 1	4.21 - 1	6.78 - 1	8.95 - 1	1.07+0	1.22+0	1.35+0	1.46+0	1.56+0	1.72+0
	δ	1.59 - 2	5.77 - 2	8.38 - 2	1.06 - 1	1.26 - 1	1.45 - 1	1.63 - 1	1.81 - 1	1.98 - 1	2.15 - 1	2.49 - 1
= 78, Pt:	[Xe]4f	k (eV)	5d <sub>5/2</sub> 6s <sub>1/2</sub>									
aall		3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	14000
hell s <sub>1/2</sub>	σ	0.000+0	1.764+1	1.290+1	9.721+0	7.543+0	6.001+0	4.874+0	4.029+0	3.380+0	2.871+0	2.137+0
P1/2 b=	β	0.000	1.845	1.862	1.877	1.889	1.900	1.909	1.917	1.923	1.928	1.936
297.2 eV	γ	0.00+0	1.01+0	5.58-1	2.84-1	1.01-1	-2.11-2	-1.00-1	-1.48 - 1	-1.74-1	-1.80-1	-1.53-
	δ	0.00+0	-5.38 - 4	-1.87 - 3	-2.55 - 3	-2.98 - 3	-3.28 - 3	-3.50 - 3	-3.68 - 3	-3.85 - 3	-4.00 - 3	-4.23-
p <sub>1/2</sub>	σ	0.000+0	2.666+1	1.904+1	1.391+1	1.044+1	8.028+0	6.307+0	5.047+0	4.101+0	3.379+0	2.372+0
b=	β	0.000	1.354	1.518	1.574	1.591	1.590	1.580	1.564	1.544	1.523	1.477
026.7 eV	γ	0.00+0	3.34-1	5.35-2	-6.30 - 3	4.06-2	1.35-1	2.51-1	3.77-1	5.05-1	6.30-1	8.64-1
	δ	0.00+0	3.67-2	4.88-3 3.892+1	-1.02-4	3.45-4	2.59-3	5.77-3	9.59-3	1.39-2	1.84-2	2.78-2
$p_{3/2} =$	$\frac{\sigma}{eta}$	9.324+1 0.968	5.903+1 1.464	1.606	2.693+1 1.666	1.939+1 1.692	1.443+1 1.700	1.102+1 1.697	8.609+0 1.688	6.849+0 1.674	5.536+0 1.658	3.762+0 1.619
ь— 645.7 eV	γ	3.59-1	7.32-2	-5.73-2	-3.01-2	6.94-2	2.01-1	3.46-1	4.96-1	6.45-1	7.89-1	1.06+0
0.017 0.	δ	1.14-1	1.66-2	1.16-2	1.48-2	1.85-2	2.18-2	2.49-2	2.78-2	3.06-2	3.32-2	3.82-2
$d_{3/2}$	σ	1.608+2	7.246+1	3.754+1	2.153+1	1.329+1	8.670+0	5.908+0	4.169+0	3.029+0	2.254+0	1.326+0
b=	$\beta$	0.887	1.158	1.232	1.241	1.222	1.190	1.152	1.110	1.067	1.025	0.945
201.7 eV	γ	-2.27 - 1	8.84 - 3	3.07 - 1	5.74 - 1	8.05 - 1	1.01+0	1.18+0	1.33+0	1.46+0	1.57+0	1.75+0
	δ	6.36-3	5.72-2	8.42-2	1.03-1	1.19-1	1.34-1	1.49-1	1.63-1	1.76-1	1.89-1	2.16-1
$d_{5/2}$	σ	2.250+2	9.926+1	5.081+1	2.885+1	1.766+1	1.144+1	7.744+0	5.431+0	3.923+0	2.904+0	1.691+0
<sub>b</sub> = 121.4 eV	β γ	1.006 -2.03-1	1.189 8.02-2	1.216 3.85-1	1.196 6.44-1	1.159 8.61-1	1.116 1.05+0	1.069 1.20+0	1.021 1.34+0	0.975 1.45+0	0.931 1.55+0	0.852 1.71+0
121.4 6	δ	9.29-3	5.02-2 $5.44-2$	8.17-2	1.03-1	1.23-1	1.42-1	1.61-1	1.78-1	1.95-1	2.11-1	2.44-1
= <b>79</b> , <b>Au</b> :		6 5/2 4f <sup>8</sup> <sub>7/2</sub> 5d <sup>4</sup> <sub>3/2</sub>	2 5d <sub>5/2</sub> 6s <sub>1/2</sub>	0.17 2		1,23				1.00		2,,,,
		k (eV)										
			4000	5000	6000	7000	8000	9000	10000	11000	12000	14000
hell		3000	4000	4.5		7.686+0	6.127+0	4.985+0	4.126+0	3.466+0	2.947+0	2.197+0
S <sub>1/2</sub>	σ	0.000+0	1.770+1	1.305+1	9.876+0		1.001	1.001	1 000			
S <sub>1/2</sub> b=	β	0.000+0 0.000	1.770+1 1.832	1.852	1.867	1.880	1.891	1.901	1.909	1.916	1.922	1.930
S <sub>1/2</sub> =	$\beta$ $\gamma$	0.000+0 0.000 0.00+0	1.770+1 1.832 1.12+0	1.852 6.32-1	1.867 3.39-1	1.880 1.43-1	9.02 - 3	-7.99-2	-1.36-1	-1.68-1	-1.82 - 1	-1.66
S <sub>1/2</sub> 5= 424.9 eV	$eta \ eta \ \delta$	0.000+0 0.000 0.00+0 0.00+0	1.770+1 1.832 1.12+0 -1.98-4	1.852 6.32-1 -1.84-3	1.867 3.39-1 -2.63-3	1.880 1.43-1 -3.13-3	9.02-3 -3.47-3	-7.99-2 $-3.72-3$	-1.36-1 $-3.92-3$	-1.68-1 $-4.10-3$	-1.82-1 $-4.26-3$	-1.66- -4.52-
S <sub>1/2</sub> = 424.9 eV	$\beta$ $\gamma$ $\delta$ $\sigma$	0.000+0 0.000 0.00+0	1.770+1 1.832 1.12+0	1.852 6.32-1	1.867 3.39-1	1.880 1.43-1	9.02-3 -3.47-3 8.298+0	-7.99-2	-1.36-1	-1.68-1	-1.82 - 1	-1.66- -4.52-
$\hat{S}_{1/2}$ = 424.9 eV $\hat{D}_{1/2}$ = $\hat{D}_{1/2}$ =	$eta \ eta \ \delta$	0.000+0 0.000 0.00+0 0.00+0 0.000+0	1.770+1 1.832 1.12+0 -1.98-4 2.686+1	1.852 6.32-1 -1.84-3 1.939+1	1.867 3.39-1 -2.63-3 1.426+1	1.880 1.43-1 -3.13-3 1.075+1	9.02-3 -3.47-3	-7.99-2 -3.72-3 6.538+0	-1.36-1 -3.92-3 5.245+0	-1.68-1 -4.10-3 4.272+0	-1.82-1 -4.26-3 3.526+0	-1.66- -4.52- 2.484+ 1.487
$\hat{S}_{1/2}$ = 424.9 eV $\hat{D}_{1/2}$ = $\hat{D}_{1/2}$ =	$\begin{array}{c} \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \end{array}$	0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0	1.770+1 1.832 1.12+0 -1.98-4 2.686+1 1.304	1.852 6.32-1 -1.84-3 1.939+1 1.500	1.867 3.39-1 -2.63-3 1.426+1 1.566	1.880 1.43-1 -3.13-3 1.075+1 1.588	9.02-3 -3.47-3 8.298+0 1.591	-7.99-2 -3.72-3 6.538+0 1.583	-1.36-1 -3.92-3 5.245+0 1.569	-1.68-1 -4.10-3 4.272+0 1.551	-1.82-1 -4.26-3 3.526+0 1.531	-1.66- -4.52- 2.484+ 1.487 8.24-1
S <sub>1/2</sub> 5= 424.9 eV D <sub>1/2</sub> 5= 147.8 eV	β γ δ σ β γ	0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000 0.000+0	1.770+1 1.832 1.12+0 -1.98-4 2.686+1 1.304 4.03-1	1.852 6.32-1 -1.84-3 1.939+1 1.500 8.51-2	1.867 3.39-1 -2.63-3 1.426+1 1.566 -4.36-3	1.880 1.43-1 -3.13-3 1.075+1 1.588 2.51-2	9.02-3 -3.47-3 8.298+0 1.591 1.10-1	-7.99-2 -3.72-3 6.538+0 1.583 2.19-1	-1.36-1 -3.92-3 5.245+0 1.569 3.40-1	-1.68-1 -4.10-3 4.272+0 1.551 4.65-1	-1.82-1 -4.26-3 3.526+0 1.531 5.89-1	-1.66- -4.52- 2.484+ 1.487 8.24-1 2.60-2
S <sub>1/2</sub> 5= 424.9 eV P <sub>1/2</sub> 5= 147.8 eV P <sub>3/2</sub> 5=	$\beta$ $\gamma$ $\delta$ $\sigma$ $\beta$ $\gamma$ $\delta$	0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000 0.00+0 0.00+0 9.399+1 0.814	1.770+1 1.832 1.12+0 -1.98-4 2.686+1 1.304 4.03-1 4.93-2 6.056+1 1.430	1.852 6.32-1 -1.84-3 1.939+1 1.500 8.51-2 7.02-3 4.013+1 1.591	1.867 3.39-1 -2.63-3 1.426+1 1.566 -4.36-3 7.61-5 2.787+1 1.659	1.880 1.43-1 -3.13-3 1.075+1 1.588 2.51-2 -1.26-4 2.012+1 1.689	9.02-3 -3.47-3 8.298+0 1.591 1.10-1 1.80-3 1.499+1 1.701	-7.99-2 -3.72-3 6.538+0 1.583 2.19-1 4.72-3 1.148+1 1.701	-1.36-1 -3.92-3 5.245+0 1.569 3.40-1 8.34-3 8.977+0 1.693	-1.68-1 -4.10-3 4.272+0 1.551 4.65-1 1.24-2 7.153+0 1.682	-1.82-1 -4.26-3 3.526+0 1.531 5.89-1 1.68-2 5.789+0 1.666	-1.66 -4.52 2.484+ 1.487 8.24- 2.60-2 3.942+ 1.630
S <sub>1/2</sub> 5= 424.9 eV P <sub>1/2</sub> 5= 147.8 eV P <sub>3/2</sub> 5=	$ \beta $ $ \gamma $ $ \delta $ $ \sigma $ $ \beta $ $ \gamma $ $ \delta $ $ \sigma $ $ \beta $ $ \gamma $ $ \delta $ $ \gamma $	0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.00+0 9.399+1 0.814 3.02-1	1.770+1 1.832 1.12+0 -1.98-4 2.686+1 1.304 4.03-1 4.93-2 6.056+1 1.430 1.08-1	1.852 6.32-1 -1.84-3 1.939+1 1.500 8.51-2 7.02-3 4.013+1 1.591 -5.16-2	1.867 3.39-1 -2.63-3 1.426+1 1.566 -4.36-3 7.61-5 2.787+1 1.659 -4.35-2	1.880 1.43-1 -3.13-3 1.075+1 1.588 2.51-2 -1.26-4 2.012+1 1.689 4.48-2	9.02-3 -3.47-3 8.298+0 1.591 1.10-1 1.80-3 1.499+1 1.701 1.69-1	-7.99-2 -3.72-3 6.538+0 1.583 2.19-1 4.72-3 1.148+1 1.701 3.09-1	-1.36-1 -3.92-3 5.245+0 1.569 3.40-1 8.34-3 8.977+0 1.693 4.56-1	-1.68-1 -4.10-3 4.272+0 1.551 4.65-1 1.24-2 7.153+0 1.682 6.04-1	-1.82-1 -4.26-3 3.526+0 1.531 5.89-1 1.68-2 5.789+0 1.666 7.48-1	-1.66- -4.52- 2.484+ 1.487 8.24- 2.60-2 3.942+ 1.630 1.02+0
S <sub>1/2</sub> b= 424.9 eV P <sub>1/2</sub> b= 147.8 eV P <sub>3/2</sub> b= 743.0 eV	β γ δ σ β γ δ σ β γ δ σ	0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.00+0 9.399+1 0.814 3.02-1 1.52-1	1.770+1 1.832 1.12+0 -1.98-4 2.686+1 1.304 4.03-1 4.93-2 6.056+1 1.430 1.08-1 1.98-2	1.852 6.32-1 -1.84-3 1.939+1 1.500 8.51-2 7.02-3 4.013+1 1.591 -5.16-2 1.18-2	1.867 3.39-1 -2.63-3 1.426+1 1.566 -4.36-3 7.61-5 2.787+1 1.659 -4.35-2 1.47-2	1.880 1.43-1 -3.13-3 1.075+1 1.588 2.51-2 -1.26-4 2.012+1 1.689 4.48-2 1.85-2	9.02-3 -3.47-3 8.298+0 1.591 1.10-1 1.80-3 1.499+1 1.701 1.69-1 2.18-2	-7.99-2 -3.72-3 6.538+0 1.583 2.19-1 4.72-3 1.148+1 1.701 3.09-1 2.49-2	-1.36-1 -3.92-3 5.245+0 1.569 3.40-1 8.34-3 8.977+0 1.693 4.56-1 2.78-2	-1.68-1 -4.10-3 4.272+0 1.551 4.65-1 1.24-2 7.153+0 1.682 6.04-1 3.06-2	-1.82-1 -4.26-3 3.526+0 1.531 5.89-1 1.68-2 5.789+0 1.666 7.48-1 3.32-2	-1.66- -4.52- 2.484+ 1.487 8.24-3 2.60-2 3.942+ 1.630 1.02+0 3.80-2
$S_{1/2}$ $b = 424.9 \text{ eV}$ $P_{1/2}$ $b = 147.8 \text{ eV}$ $P_{3/2}$ $b = 743.0 \text{ eV}$	β γ δ σ β γ δ σ β γ δ σ σ σ σ σ σ σ σ σ σ σ σ σ σ σ σ σ σ	0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.00+0 9.399+1 0.814 3.02-1 1.52-1	1.770+1 1.832 1.12+0 -1.98-4 2.686+1 1.304 4.03-1 4.93-2 6.056+1 1.430 1.08-1 1.98-2 7.705+1	1.852 6.32-1 -1.84-3 1.939+1 1.500 8.51-2 7.02-3 4.013+1 1.591 -5.16-2 1.18-2 4.007+1	1.867 3.39-1 -2.63-3 1.426+1 1.566 -4.36-3 7.61-5 2.787+1 1.659 -4.35-2 1.47-2 2.303+1	1.880 1.43-1 -3.13-3 1.075+1 1.588 2.51-2 -1.26-4 2.012+1 1.689 4.48-2 1.85-2	9.02-3 -3.47-3 8.298+0 1.591 1.10-1 1.80-3 1.499+1 1.701 1.69-1 2.18-2 9.310+0	-7.99-2 -3.72-3 6.538+0 1.583 2.19-1 4.72-3 1.148+1 1.701 3.09-1 2.49-2 6.356+0	-1.36-1 -3.92-3 5.245+0 1.569 3.40-1 8.34-3 8.977+0 1.693 4.56-1 2.78-2 4.492+0	-1.68-1 -4.10-3 4.272+0 1.551 4.65-1 1.24-2 7.153+0 1.682 6.04-1 3.06-2 3.267+0	-1.82-1 -4.26-3 3.526+0 1.531 5.89-1 1.68-2 5.789+0 1.666 7.48-1 3.32-2 2.435+0	-1.66- -4.52- 2.484+ 1.487 8.24-1 2.60-2 3.942+ 1.630 1.02+0 3.80-2 1.435+
$S_{1/2}$ $S_{1$	β γ δ σ β γ δ σ β γ δ σ β ρ γ δ σ β	0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.00+0 9.399+1 0.814 3.02-1 1.52-1 1.695+2 0.825	1.770+1 1.832 1.12+0 -1.98-4 2.686+1 1.304 4.03-1 4.93-2 6.056+1 1.430 1.08-1 1.98-2 7.705+1 1.138	1.852 6.32-1 -1.84-3 1.939+1 1.500 8.51-2 7.02-3 4.013+1 1.591 -5.16-2 1.18-2 4.007+1 1.226	1.867 3.39-1 -2.63-3 1.426+1 1.566 -4.36-3 7.61-5 2.787+1 1.659 -4.35-2 1.47-2 2.303+1 1.242	1.880 1.43-1 -3.13-3 1.075+1 1.588 2.51-2 -1.26-4 2.012+1 1.689 4.48-2 1.85-2 1.424+1 1.228	9.02-3 -3.47-3 8.298+0 1.591 1.10-1 1.80-3 1.499+1 1.701 1.69-1 2.18-2 9.310+0 1.200	-7.99-2 -3.72-3 6.538+0 1.583 2.19-1 4.72-3 1.148+1 1.701 3.09-1 2.49-2 6.356+0 1.164	-1.36-1 -3.92-3 5.245+0 1.569 3.40-1 8.34-3 8.977+0 1.693 4.56-1 2.78-2 4.492+0 1.124	-1.68-1 -4.10-3 4.272+0 1.551 4.65-1 1.24-2 7.153+0 1.682 6.04-1 3.06-2 3.267+0 1.082	-1.82-1 -4.26-3 3.526+0 1.531 5.89-1 1.68-2 5.789+0 1.666 7.48-1 3.32-2 2.435+0 1.041	-1.66- -4.52- 2.484+ 1.487 8.24-1 2.60-2 3.942+ 1.630 1.02+0 3.80-2 1.435+ 0.962
$ \frac{51/2}{9} = 424.9 \text{ eV} $ $ \frac{91/2}{9} = 147.8 \text{ eV} $ $ \frac{91/2}{9} = 147.8 \text{ eV} $ $ \frac{93/2}{9} = 743.0 \text{ eV} $	β γ δ σ β γ δ σ β γ δ σ σ σ σ σ σ σ σ σ σ σ σ σ σ σ σ σ σ	0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.00+0 9.399+1 0.814 3.02-1 1.52-1	1.770+1 1.832 1.12+0 -1.98-4 2.686+1 1.304 4.03-1 4.93-2 6.056+1 1.430 1.08-1 1.98-2 7.705+1	1.852 6.32-1 -1.84-3 1.939+1 1.500 8.51-2 7.02-3 4.013+1 1.591 -5.16-2 1.18-2 4.007+1	1.867 3.39-1 -2.63-3 1.426+1 1.566 -4.36-3 7.61-5 2.787+1 1.659 -4.35-2 1.47-2 2.303+1	1.880 1.43-1 -3.13-3 1.075+1 1.588 2.51-2 -1.26-4 2.012+1 1.689 4.48-2 1.85-2	9.02-3 -3.47-3 8.298+0 1.591 1.10-1 1.80-3 1.499+1 1.701 1.69-1 2.18-2 9.310+0	-7.99-2 -3.72-3 6.538+0 1.583 2.19-1 4.72-3 1.148+1 1.701 3.09-1 2.49-2 6.356+0	-1.36-1 -3.92-3 5.245+0 1.569 3.40-1 8.34-3 8.977+0 1.693 4.56-1 2.78-2 4.492+0	-1.68-1 -4.10-3 4.272+0 1.551 4.65-1 1.24-2 7.153+0 1.682 6.04-1 3.06-2 3.267+0	-1.82-1 -4.26-3 3.526+0 1.531 5.89-1 1.68-2 5.789+0 1.666 7.48-1 3.32-2 2.435+0	-1.66- -4.52- 2.484+( 1.487 8.24-1 2.60-2 3.942+( 1.630 1.02+0 3.80-2 1.435+(

<b>Table 1</b> (cont $E_b =$	inued) β	0.965	1.178	1.216	1.201	1.167	1.126	1.080	1.034	0.988	0.944	0.864
2205.7 eV	γ	-2.26-1	3.78-2	3.44-1	6.09-1	8.29-1	1.02+0	1.18+0	1.32+0	1.43+0	1.53+0	1.70+0
	δ	2.14 - 3	5.04 - 2	7.91 - 2	1.01 - 1	1.20 - 1	1.39 - 1	1.58 - 1	1.75 - 1	1.92 - 1	2.08 - 1	2.39 - 1
Z = 80, Hg:	[Xe]4f		2 5d <sub>5/2</sub> 6s <sub>1/2</sub>									
		k (eV)										
Shell		3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	14000
3s <sub>1/2</sub>	σ	0.000+0	1.770+1	1.318+1	1.002+1	7.821+0	6.250+0	5.094+0	4.223+0	3.551+0	3.023+0	2.257+0
$E_b = 3561.6 \text{ eV}$	β	0.000 0.00+0	1.821 1.25+0	1.840 7.15-1	1.856 4.00-1	1.870 1.89-1	1.882 4.34-2	1.892 -5.54-2	1.901 -1.21-1	1.908 -1.61-1	1.914 -1.82-1	1.924 -1.77-1
3301.0 EV	$\gamma \\ \delta$	0.00+0	2.29-4	-1.78 - 3	-2.70-3	-3.27 - 3	-3.65-3	-3.94-2 -3.93-3	-4.17-3	-4.38 - 3	-4.56-3	-4.84-3
$3p_{1/2}$	σ	0.000+0	2.697+1	1.971+1	1.459+1	1.106+1	8.567+0	6.772+0	5.446+0	4.445+0	3.676+0	2.598+0
$E_b =$	β	0.000	1.238	1.477	1.555	1.584	1.591	1.585	1.573	1.557	1.538	1.496
3278.5 eV	γ	0.00+0	4.73-1	1.25-1	2.71-3	1.27-2	8.51-2	1.87-1	3.04-1	4.27 - 1	5.49-1	7.81-1
2	δ	0.00+0 9.377+1	6.81-2 6.204+1	1.00-2 4.134+1	4.60-4	-4.96-4 2.085+1	1.08-3 1.558+1	3.78-3 1.194+1	7.20-3 9.356+0	1.11-2 7.464+0	1.52-2 6.047+0	2.40-2 4.126+0
$3p_{3/2}$ $E_b =$	$\frac{\sigma}{\beta}$	0.588	1.393	1.572	2.880+1 1.649	1.686	1.700	1.703	1.698	1.688	1.675	1.641
2847.1 eV	γ	1.32-1	1.47-1	-4.23-2	-5.42-2	2.14-2	1.38-1	2.74-1	4.19-1	5.65-1	7.07-1	9.73-1
	δ	2.03 - 1	2.40 - 2	1.21 - 2	1.45 - 2	1.83 - 2	2.18 - 2	2.50 - 2	2.80 - 2	3.07 - 2	3.31 - 2	3.76 - 2
$3d_{3/2}$	σ	1.778+2	8.176+1	4.267+1	2.459+1	1.524+1	9.985+0	6.826+0	4.831+0	3.519+0	2.626+0	1.551+0
$E_b = 2384.9 \text{ eV}$	β	0.762 $-2.47-1$	1.114 -7.48-2	1.218 2.15-1	1.242 4.87-1	1.233 7.28-1	1.208 9.39-1	1.174 1.12+0	1.136 1.28+0	1.096 1.41+0	1.056 1.53+0	0.980 1.73+0
2364.9 EV	$\gamma \\ \delta$	-2.47-1 -1.17-2	4.88-2	7.94–2	9.91-2	1.15-1	1.31-1	1.45-1	1.58-1	1.70-1	1.82-1	2.08-1
3d <sub>5/2</sub>	σ	2.501+2	1.120+2	5.765+1	3.289+1	2.021+1	1.314+1	8.918+0	6.271+0	4.540+0	3.369+0	1.970+0
$E_b =$	β	0.915	1.166	1.215	1.206	1.175	1.135	1.091	1.045	1.000	0.957	0.879
2294.9 eV	γ	-2.44-1	-3.44 - 3	3.02 - 1	5.69 - 1	7.97 - 1	9.92 - 1	1.16+0	1.30+0	1.42+0	1.52+0	1.69+0
7 01 71.	δ	-5.89-3	4.64-2	7.60-2	9.78-2	1.17-1	1.37-1	1.55-1	1.72-1	1.88-1	2.03-1	2.35-1
Z = 81, T1:	[Xe]41 <sub>5</sub>	k (eV)	5d <sub>5/2</sub> 6s <sub>1/2</sub> 6p	1/2								
Chall			4000	F000	C000	7000	9000	0000	10000	11000	12000	14000
Shell 3s <sub>1/2</sub>	σ	3000 0.000+0	4000 1.763+1	5000 1.329+1	6000 1.015+1	7000 7.950+0	8000 6.369+0	9000 5.202+0	10000 4.319+0	11000 3.636+0	12000 3.097+0	14000 2.316+0
$E_b =$	β	0.000	1.806	1.829	1.846	1.860	1.873	1.883	1.892	1.900	1.906	1.918
3704.1 eV	γ	0.00+0	1.41+0	7.97-1	4.63-1	2.38-1	8.16-2	-2.77-2	-1.03-1	-1.51-1	-1.78 - 1	-1.85 - 1
	δ	0.00+0	9.75-4	-1.68 - 3	-2.75 - 3	-3.38 - 3	-3.82 - 3	-4.17 - 3	-4.45 - 3	-4.68 - 3	-4.87 - 3	-5.15 - 3
$3p_{1/2}$	σ	0.000+0	2.698+1	1.998+1	1.491+1	1.136+1	8.835+0	7.006+0	5.647+0	4.619+0	3.827+0	2.714+0
$E_b = 3415.7 \text{ eV}$	β	0.000 0.00+0	1.156 5.32-1	1.453 1.72-1	1.544 1.56-2	1.579 3.90-3	1.590 6.33-2	1.587 1.58-1	1.577 2.71-1	1.563 3.89-1	1.545 5.08-1	1.506 7.37-1
3413.7 EV	$_{\delta}^{\gamma}$	0.00+0	9.39-2	1.40-2	1.17-3	-7.32-4	4.34-4	2.88-3	6.05 - 3	9.63-3	1.35-2	2.21-2
3p <sub>3/2</sub>	σ	8.979+1	6.352+1	4.253+1	2.975+1	2.160+1	1.617+1	1.242+1	9.743+0	7.781+0	6.310+0	4.315+0
$E_b =$	β	0.125	1.349	1.553	1.639	1.681	1.699	1.705	1.702	1.694	1.682	1.651
2956.6 eV	γ	-3.22-1	1.89-1	-2.84-2	-6.17-2	8.16-6	1.09-1	2.40-1	3.82-1	5.24-1	6.64-1	9.30-1
3d <sub>3/2</sub>	$\frac{\delta}{\sigma}$	1.87-1 1.861+2	2.95-2 8.670+1	1.25-2 4.542+1	1.43-2 2.626+1	1.81-2 1.631+1	2.19-2 1.070+1	2.52-2 7.324+0	2.82-2 5.191+0	3.07-2 3.786+0	3.30-2 2.829+0	3.75-2 1.675+0
$E_b =$	β	0.683	1.089	1.209	1.241	1.237	1.215	1.184	1.148	1.110	1.072	0.997
2485.1 eV	γ	-2.42 - 1	-1.15-1	1.66-1	4.42 - 1	6.90-1	9.06-1	1.09+0	1.25+0	1.39+0	1.51+0	1.72+0
	δ	-2.18-2	4.34-2	7.61-2	9.73-2	1.14 - 1	1.29 - 1	1.42 - 1	1.55 - 1	1.67 - 1	1.80 - 1	2.05-1
3d <sub>5/2</sub>	σ	2.627+2	1.187+2	6.131+1	3.507+1	2.159+1	1.405+1	9.552+0	6.725+0	4.875+0	3.622+0	2.122+0
$E_b = 2389.3 \text{ eV}$	β	0.860 -2.54-1	1.152 -4.57-2	1.213 2.56-1	1.210 5.30-1	1.182 7.66-1	1.143 9.65-1	1.100 1.13+0	1.056 1.27+0	1.013 1.40+0	0.972 1.51+0	0.893 1.69+0
2303.3 EV	$\gamma \delta$	-2.34-1 -1.44-2	4.16-2	7.23-2	9.53-2	1.16-1	1.34-1	1.51-1	1.68-1	1.84-1	2.00-1	2.33-1
Z = 82, Pb:	[Xe]4f		$\frac{5d_{5/2}^{6} 6s_{1/2}^{2} 6}{5}$									
		k (eV)	3/2 1/2	- 1/2								
Shell		3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	14000
3s <sub>1/2</sub>	σ	0.000+0	1.738+1	1.338+1	1.027+1	8.075+0	6.485+0	5.306+0	4.411+0	3.718+0	3.171+0	2.376+0
$E_b = 3850.7 \text{ eV}$	β	0.000	1.791	1.815	1.834	1.849	1.862	1.873	1.882	1.891	1.898	1.911
3850.7 ev	$\gamma \\ \delta$	0.00+0 0.00+0	1.60+0 2.19-3	8.94-1 $-1.51-3$	5.32-1 -2.77-3	2.92-1 -3.51-3	1.24-1 $-4.02-3$	3.19-3 -4.42-3	-8.11-2 $-4.73-3$	-1.37-1 $-4.97-3$	-1.71-1 -5.17-3	-1.89-1 $-5.48-3$
$3p_{1/2}$	$\frac{\sigma}{\sigma}$	0.000+0	2.683+1	2.023+1	1.520+1	1.164+1	9.094+0	7.233+0	5.845+0	4.791+0	3.978+0	2.831+0
$E_b =$	β	0.000	1.056	1.422	1.530	1.573	1.588	1.588	1.581	1.568	1.552	1.515
3554.2 eV	γ	0.00+0	5.63 - 1	2.27 - 1	3.44 - 2	-4.52 - 4	4.50 - 2	1.31 - 1	2.37 - 1	3.51 - 1	4.67 - 1	6.94 - 1
	δ	0.00+0	1.30-1	1.92-2	2.17-3	-8.93-4	-2.01-4	1.97-3	4.89-3	8.27-3	1.20-2	2.05-2
$3p_{3/2} E_b =$	$\frac{\sigma}{\beta}$	0.000+0 0.000	6.492+1 1.295	4.373+1 1.531	3.069+1 1.627	2.235+1 1.674	1.677+1 1.697	1.290+1 1.706	1.013+1 1.705	8.101+0 1.699	6.578+0 1.689	4.508+0 1.661
3066.4 eV	γ	0.000	2.33-1	-1.06-2	-6.61-2	-1.86-2	8.14-2	2.07-1	3.44-1	4.82-1	6.21-1	8.88-1
	δ	0.00+0	3.73-2	1.33-2	1.41-2	1.81-2	2.20-2	2.54-2	2.83-2	3.08-2	3.31-2	3.77-2
$3d_{3/2}$	σ	1.934+2	9.176+1	4.827+1	2.798+1	1.741+1	1.144+1	7.845+0	5.568+0	4.067+0	3.042+0	1.805+0
$E_b =$	β	0.594	1.059	1.197	1.239	1.240	1.222	1.194	1.160	1.125	1.088	1.012
2585.6 eV	γ	-2.24-1	-1.53-1	1.20-1	3.99-1	6.50-1	8.67-1	1.05+0	1.22+0	1.36+0	1.49+0	1.71+0
3d <sub>5/2</sub>	$\frac{\delta}{\sigma}$	-3.07-2 2.747+2	3.79-2 1.256+2	7.33-2 6.510+1	9.58-2 3.732+1	1.13-1 2.302+1	1.27-1 1.500+1	1.40-1 1.021+1	1.52-1 7.201+0	1.65-1 5.227+0	1.77-1 3.888+0	2.03-1 2.282+0
$E_b =$	β	0.798	1.135	1.210	1.213	1.188	1.151	1.110	1.068	1.026	0.986	0.906
2484.0 eV	γ	-2.55-1	-8.61-2	2.13 - 1	4.92 - 1	7.33 - 1	9.34 - 1	1.10+0	1.25+0	1.38+0	1.49+0	1.68+0
	δ	-2.36-2	3.66-2	6.92-2	9.32-2	1.13-1	1.31-1	1.48-1	1.64-1	1.81-1	1.97 - 1	2.29 - 1
Z = 83, Bi:	[Xe]4f <sub>5</sub>		$5d_{5/2}^6 6s_{1/2}^2 6p$	o <sub>1/2</sub> 6p <sub>3/2</sub>								
		k (eV)										

hell		3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	14000
S <sub>1/2</sub>	σ	0.000+0	1.644+1	1.345+1	1.038+1	8.188+0	6.592+0	5.404+0	4.499+0	3.797+0	3.242+0	2.434+
=	β	0.000	1.743	1.800	1.821	1.837	1.850	1.862	1.872	1.882	1.890	1.903
999.1 eV	γ	0.00+0	2.69 - 1	1.00+0	6.08 - 1	3.51 - 1	1.69 - 1	3.77 - 2	-5.54-2	-1.19-1	-1.60-1	-1.91
	δ	0.00+0	1.55-2	-1.25 - 3	-2.77 - 3	-3.64-3	-4.23-3	-4.66-3	-4.99 - 3	-5.25 - 3	-5.47 - 3	-5.82
1/2	σ	0.000+0	2.649+1	2.042+1	1.547+1	1.191+1	9.342+0	7.453+0	6.040+0	4.964+0	4.130+0	2.950+
=	β	0.000	0.899	1.385	1.513	1.564	1.584	1.588	1.583	1.573	1.558	1.523
96.3 eV	γ	0.00+0	5.12-1	2.89-1	5.98-2	-2.29-4	2.97-2	1.06-1	2.04-1	3.13-1	4.26-1	6.53—
	δ	0.00+0	1.83-1	2.64-2	3.59-3	-9.38 - 4	-7.80-4	1.10-3	3.81-3	7.05-3	1.07-2	1.91-
3/2	σ	0.000+0	6.621+1	4.491+1	3.163+1	2.309+1	1.736+1	1.337+1	1.052+1	8.425+0	6.851+0	4.705
=	β	0.000	1.241	1.504	1.612	1.666	1.693	1.705	1.708	1.704	1.695	1.670
76.9 eV	γ	0.00+0	2.77-1	1.08-2	-6.77-2	-3.49-2	5.53-2	1.73-1	3.05-1	4.41-1	5.78-1	8.48-
	δ	0.00+0	4.72 - 2	1.44-2	1.41-2	1.79-2	2.19-2	2.54-2	2.83-2	3.09-2	3.34-2	3.81-
3/2	σ	1.993+2	9.692+1	5.121+1	2.975+1	1.855+1	1.221+1	8.389+0	5.964+0	4.362+0	3.267+0	1.942
=	β	0.497	1.024	1.183	1.235	1.242	1.228	1.203	1.172	1.138	1.101	1.027
87.6 eV	γ	-1.90-1	-1.89 - 1	7.51-2	3.54-1	6.05 - 1	8.24-1	1.02+0	1.19+0	1.34+0	1.47+0	1.69+
	δ	-3.59-2	3.18-2	7.05-2	9.41-2	1.11-1	1.25-1	1.38-1	1.51-1	1.63-1	1.76-1	1.99-
l <sub>5/2</sub>	σ	2.855+2	1.327+2	6.900+1	3.964+1	2.449+1	1.599+1	1.090+1	7.698+0	5.595+0	4.166+0	2.450
=	$\beta$	0.722	1.116	1.205	1.215	1.194	1.160	1.121	1.080	1.039	0.998	0.918
79.6 eV	γ	-2.43-1	-1.25-1	1.71-1	4.54-1	6.95-1	8.99-1	1.07+0	1.23+0	1.36+0	1.48+0	1.67+
	δ	-3.21-2	3.15-2	6.63-2	9.06-2	1.10-1	1.28 - 1	1.45-1	1.62-1	1.79-1	1.95 - 1	2.25-
= <b>84</b> , <b>Po</b> :	[Xe]41	f <sub>5/2</sub> 4f <sub>7/2</sub> 5d <sub>3/2</sub>	5d <sub>5/2</sub> 6s <sub>1/2</sub> 6 <sub>1</sub>	$p_{1/2}^2 6 p_{3/2}^2$								
		k (eV)										
ell		3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	14000
1/2	σ	0.000+0	0.000+0	1.348+1	1.048+1	8.293+0	6.693+0	5.498+0	4.585+0	3.875+0	3.313+0	2.493
=	β	0.000	0.000	1.786	1.807	1.824	1.838	1.851	1.862	1.872	1.881	1.895
53.5 eV	γ	0.00+0	0.00+0	1.11+0	6.89-1	4.15-1	2.19-1	7.66-2	-2.55-2	-9.72-2	-1.46-1	-1.9
	δ	0.00+0	0.00+0	-9.14-4	-2.73-3	-3.74-3	-4.41-3	-4.88-3	-5.24-3	-5.54-3	-5.79-3	-6.2
1/2	σ	0.000+0	2.572+1	2.056+1	1.572+1	1.217+1	9.583+0	7.672+0	6.236+0	5.137+0	4.283+0	3.070
=	$\beta$	0.000	0.646	1.342	1.493	1.554	1.580	1.588	1.585	1.576	1.564	1.531
844.3 eV	γ	0.00+0	2.59-1	3.60-1	9.26-2	5.03-3	1.75-2	8.16-2	1.72-1	2.76-1	3.87-1	6.13-
	δ	0.00+0	2.63-1	3.62-2	5.60-3	-7.71-4	-1.25-3	3.18-4	2.84-3	5.94-3	9.51-3	1.75-
3/2	σ	0.000+0	6.746+1	4.609+1	3.258+1	2.384+1	1.796+1	1.386+1	1.092+1	8.762+0	7.134+0	4.909
=	$\beta$	0.000	1.174	1.475	1.595	1.657	1.689	1.704	1.709	1.707	1.700	1.678
.93.4 eV	γ	0.00+0	3.19-1	3.70-2	-6.57 - 2	-4.89-2	3.02-2	1.41-1	2.68-1	4.02-1	5.39-1	8.08-
	δ	0.00+0	6.03-2	1.60-2	1.40-2	1.77-2	2.18-2	2.54-2	2.85-2	3.13-2	3.38-2	3.84-
l <sub>3/2</sub>	σ	2.036+2	1.023+2	5.429+1	3.162+1	1.976+1	1.303+1	8.967+0	6.384+0	4.675+0	3.505+0	2.088
=	β	0.394	0.985	1.167	1.229	1.243	1.233	1.211	1.182	1.149	1.114	1.041
793.6 eV	γ	-1.37 - 1	-2.21-1	2.90-2	3.06-1	5.57-1	7.81-1	9.80-1	1.16+0	1.31+0	1.45+0	1.67+
	δ	-2.95-2	2.48-2	6.71-2	9.18-2	1.09-1	1.23-1	1.37-1	1.49-1	1.62-1	1.73-1	1.95-
d <sub>5/2</sub>	σ	2.949+2	1.400+2	7.308+1	4.207+1	2.604+1	1.703+1	1.163+1	8.224+0	5.984+0	4.460+0	2.627
=	β	0.629	1.094	1.199	1.216	1.199	1.168	1.131	1.091	1.050	1.009	0.929
579.2 eV	γ	-2.13-1	-1.62-1	1.28-1	4.11-1	6.55-1	8.65-1	1.05+0	1.21+0	1.34+0	1.46+0	1.65+
= 85, At:	δ	-3.81-2 6 468 5.44	2.57-2	6.28-2	8.77-2	1.07-1	1.25-1	1.43-1	1.60-1	1.76-1	1.92-1	2.21-
= 85, At:	[Xe]4i	5/2 41 <sub>7/2</sub> 50 <sub>3/2</sub> k (eV)	5d <sub>5/2</sub> 6s <sub>1/2</sub> 6p	$p_{1/2}^2 6 p_{3/2}^3$								
11			4000	5000	C000	7000	0000	0000	10000	11000	12000	1.400/
iell		3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	14000
1/2	σ	0.000+0	0.000+0	1.350+1	1.056+1	8.388+0	6.788+0	5.588+0	4.669+0	3.952+0	3.383+0	2.550
=	β	0.000	0.000	1.770	1.792	1.810	1.826	1.839	1.852	1.862	1.871	1.885
311.7 eV	γ	0.00+0	0.00+0	1.23+0	7.75-1	4.83-1	2.73-1	1.19-1	7.91-3	-7.26-2	-1.29 - 1	-1.89
	δ	0.00+0	0.00+0	-4.53-4	-2.64-3	-3.81-3	-4.57-3	-5.11-3	-5.51-3	-5.85-3	-6.14-3	-6.63
1/2	σ	0.000+0	2.513+1	2.065+1	1.593+1	1.241+1	9.814+0	7.885+0	6.429+0	5.310+0	4.437+0	3.191
=	β	0.000	0.072	1.289	1.471	1.542	1.574	1.586	1.586	1.579	1.568	1.538
95.8 eV	γ	0.00+0	-6.72 - 1	4.35-1	1.33-1	1.58-2	9.17-3	6.07-2	1.43-1	2.43-1	3.51-1	5.73-
	δ	0.00+0	-4.85-2	4.96-2	8.37-3	-3.58-4	-1.62-3	-4.00-4	1.90-3	4.85-3	8.24-3	1.58-
3/2	σ	0.000+0	6.860+1	4.724+1	3.352+1	2.459+1	1.857+1	1.436+1	1.133+1	9.103+0	7.419+0	5.115
=	β	0.000	1.086	1.443	1.577	1.646	1.683	1.702	1.710	1.710	1.705	1.685
110.5 eV	γ	0.00+0	3.49-1	6.70-2	-6.00-2	-6.02-2	7.52-3	1.11-1	2.33-1	3.65-1	5.00-1	7.66-
1	δ	0.00+0	7.91-2	1.81-2	1.41-2	1.75-2	2.16-2	2.54-2	2.87-2	3.16-2	3.42-2	3.87-
l <sub>3/2</sub>	σ	2.081+2	1.077+2	5.747+1	3.356+1	2.102+1	1.389+1	9.572+0	6.824+0	5.003+0	3.755+0	2.241
=	β	0.369	0.941	1.148	1.222	1.242	1.237	1.218	1.191	1.160	1.126	1.056
01.8 eV	γ	-6.27-2	-2.50-1	-1.68-2	2.57-1	5.10-1	7.39-1	9.44-1	1.12+0	1.28+0	1.42+0	1.65+
1	δ	-5.13-4	1.68-2	6.33-2	8.95-2	1.07-1	1.22-1	1.36-1	1.48-1	1.60-1	1.71-1	1.91-
l <sub>5/2</sub>	σ	3.016+2	1.476+2	7.732+1	4.461+1	2.766+1	1.812+1	1.240+1	8.775+0	6.391+0	4.768+0	2.813
=	β	0.521	1.068	1.192	1.216	1.204	1.176	1.140	1.101	1.060	1.019	0.941
'80.7 eV	γ	-1.59 - 1	-1.98-1	8.33-2	3.68-1	6.16-1	8.31-1	1.02+0	1.18+0	1.32+0	1.44+0	1.64+
	δ	-3.51-2	1.94-2	5.90-2	8.47-2	1.04-1	1.23-1	1.41-1	1.57-1	1.73-1	1.88-1	2.16-
	: [Xe]4i		5d <sub>5/2</sub> 6s <sub>1/2</sub> 6	p <sub>1/2</sub> 6p <sub>3/2</sub>								
= 86, Rn:		k (eV)										
		3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	14000
nell										4.00= 0		
iell	σ	0.000+0	0.000+0	1.347+1	1.062+1	8.475+0	6.878+0	5.674+0	4.750+0	4.027+0	3.451+0	2.607
nell 1/2 =	$\frac{\sigma}{\beta}$	0.000+0 0.000	0.000	1.752	1.777	1.795	1.812	1.827	1.839	1.850	3.451+0 1.859	1.874
= <b>86</b> , <b>Rn</b> :  nell $S_{1/2}$ =  474.3 eV		0.000+0										2.607 1.874 -1.83

Table 1 (conti	inued)											
$3p_{1/2}$	σ	0.000+0	0.000+0	2.067+1	1.612+1	1.263+1	1.004+1	8.093+0	6.619+0	5.480+0	4.589+0	3.312+0
$E_b = 4151.5 \text{ eV}$	β	0.000 0.00+0	0.000 0.00+0	1.226 5.10-1	1.445 1.81-1	1.529 3.28-2	1.567 5.18-3	1.583 4.31-2	1.586 1.17-1	1.582 2.11-1	1.572 3.14-1	1.545 5.31-1
4131.3 60	$\gamma \\ \delta$	0.00+0	0.00+0	6.83-2	1.21-2	3.28-2 $3.54-4$	-1.88 - 3	-1.08-3	9.77-4	3.74-3	6.95-3	1.41-2
$3p_{3/2}$	σ	0.000+0	6.955+1	4.837+1	3.447+1	2.535+1	1.918+1	1.486+1	1.175+1	9.449+0	7.710+0	5.325+0
$E_b =$	β	0.000	0.986	1.408	1.557	1.634	1.677	1.699	1.709	1.712	1.709	1.692
3530.5 eV	$\gamma \\ \delta$	0.00+0 0.00+0	3.62-1 1.04-1	1.01-1 2.10-2	-5.04-2 $1.42-2$	-6.85-2 $1.72-2$	-1.29-2 2.14-2	8.22-2 2.54-2	1.99-1 2.89-2	3.28-1 3.20-2	4.60-1 3.46-2	7.23-1 3.89-2
3d <sub>3/2</sub>	σ	0.000+0	1.132+2	6.077+1	3.559+1	2.233+1	1.478+1	1.021+1	7.285+0	5.347+0	4.017+0	2.402+0
$E_b =$	$\beta$	0.000	0.891	1.127	1.213	1.241	1.240	1.225	1.200	1.170	1.138	1.071
3012.3 eV	$\gamma \\ \delta$	0.00+0 0.00+0	-2.74-1 7.70-3	-6.21-2 $5.88-2$	2.09-1 8.71-2	4.63-1 1.05-1	6.96-1 1.21-1	9.05-1 1.34-1	1.09+0 1.46-1	1.25+0 1.57-1	1.39+0 1.68-1	1.63+0 1.88-1
3d <sub>5/2</sub>	σ	3.064+2	1.553+2	8.171+1	4.725+1	2.935+1	1.926+1	1.319+1	9.350+0	6.817+0	5.090+0	3.009+0
$E_b =$	β	0.423	1.039	1.183	1.216	1.208	1.183	1.149	1.110	1.070	1.030	0.954
2884.2 eV	γ	-7.84-2	-2.32-1	3.85-2	3.24-1	5.76-1	7.97-1	9.89-1	1.15+0	1.30+0	1.42+0	1.62+0
Z = 87, Fr:	δ [ <b>Y</b> 0]7s	-9.12-3	1.23-2	5.48-2	8.17-2	1.02-1	1.21-1	1.38-1	1.54-1	1.70-1	1.84-1	2.12-1
L = 07, 11.	[AC]/3	k (eV)										
Shell		3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	14000
3s <sub>1/2</sub>	σ	0.000+0	0.000+0	1.337+1	1.067+1	8.549+0	6.962+0	5.758+0	4.829+0	4.099+0	3.517+0	2.661+0
$E_b =$	β	0.000	0.000	1.733	1.759	1.781	1.798	1.812	1.825	1.836	1.847	1.864
4645.7 eV	$\gamma \\ \delta$	0.00+0 0.00+0	0.00+0 0.00+0	1.54+0 1.29-3	9.69-1 $-2.26-3$	6.30-1 $-3.86-3$	3.93-1 -4.85-3	2.18-1 -5.57-3	8.57-2 $-6.13-3$	-1.36-2 $-6.57-3$	-8.65-2 $-6.93-3$	-1.72-1 $-7.47-3$
$3p_{1/2}$	σ	0.000+0	0.000+0	2.061+1	1.626+1	1.283+1	1.025+1	8.297+0	6.804+0	5.647+0	4.738+0	3.432+0
$E_b =$	β	0.000	0.000	1.147	1.416	1.514	1.559	1.579	1.585	1.583	1.576	1.551
4316.0 eV	γ	0.00+0	0.00+0	5.76-1	2.38-1	5.64-2	5.91-3	2.92-2	9.36-2	1.80-1	2.78-1	4.86-1
3p <sub>3/2</sub>	$\frac{\delta}{\sigma}$	0.00+0 0.000+0	0.00+0 7.021+1	9.43-2 4.947+1	1.71-2 3.539+1	1.50-3 2.611+1	-1.99-3 1.981+1	-1.74-3 1.537+1	3.23-5 1.217+1	2.56-3 9.797+0	5.56-3 8.002+0	1.25-2 5.538+0
$E_b =$	β	0.000	0.856	1.366	1.538	1.621	1.668	1.694	1.708	1.713	1.712	1.698
3657.3 eV	γ	0.00+0	3.39 - 1	1.39 - 1	-3.67 - 2	-7.36-2	-3.09-2	5.63-2	1.67 - 1	2.90 - 1	4.18 - 1	6.75 - 1
24	δ	0.00+0	1.38-1 1.187+2	2.50-2 6.415+1	1.44-2 3.769+1	1.69-2 2.371+1	2.13-2 1.572+1	2.56-2 1.086+1	2.92-2 7.765+0	3.22-2 5.706+0	3.48-2 4.293+0	3.91-2 2.573+0
$ 3d_{3/2}  E_b = $	$\frac{\sigma}{eta}$	0.000+0	0.836	1.104	1.203	1.238	1.572+1	1.086+1	1.208	1.181	4.293+0 1.151	2.573+0 1.087
3129.7 eV	γ	0.00+0	-2.93-1	-1.06-1	1.58-1	4.19-1	6.56-1	8.63-1	1.05+0	1.21+0	1.36+0	1.61+0
	δ	0.00+0	-2.88-3	5.37-2	8.39-2	1.04-1	1.20-1	1.32-1	1.44-1	1.55-1	1.65-1	1.87-1
$3d_{5/2}$ $E_b =$	$\frac{\sigma}{\beta}$	4.405+2 1.103	1.632+2 1.002	8.624+1 1.172	5.000+1 1.214	3.113+1 1.211	2.046+1 1.188	1.402+1 1.156	9.949+0 1.120	7.262+0 1.082	5.429+0 1.044	3.216+0 0.969
2994.9 eV	γ	2.33-2	-2.63-1	-6.82 - 3	2.78-1	5.39-1	7.65-1	9.56-1	1.12+0	1.27+0	1.39+0	1.61+0
	δ	6.24-4	4.33-3	5.02-2	7.82 - 2	1.00-1	1.19-1	1.35 - 1	1.50-1	1.65 - 1	1.80-1	2.10 - 1
Z = 88, Ra:	[Rn]79	S <sub>1/2</sub>										
,	. ,											
		k (eV)	5000	C000	7000	9000	0000	10000	11000	12000	14000	10000
Shell		k (eV) 4000	5000 1 317+1	6000 1 070+1	7000 8 614+0	8000 7.036+0	9000 5.832+0	10000 4 900+0	11000 4 166+0	12000 3 579+0	14000 2.715+0	16000 2.121+0
Shell $3s_{1/2}$ $E_b =$	σ β	k (eV)	5000 1.317+1 1.712	6000 1.070+1 1.742	7000 8.614+0 1.763	8000 7.036+0 1.782	5.832+0 1.798	10000 4.900+0 1.812	4.166+0 1.825	12000 3.579+0 1.836	14000 2.715+0 1.854	16000 2.121+0 1.868
Shell 3s <sub>1/2</sub>	σ β γ	k (eV) 4000 0.000+0 0.000 0.00+0	1.317+1 1.712 1.74+0	1.070+1 1.742 1.07+0	8.614+0 1.763 7.18-1	7.036+0 1.782 4.63-1	5.832+0 1.798 2.74-1	4.900+0 1.812 1.31-1	4.166+0 1.825 2.30-2	3.579+0 1.836 -5.73-2	2.715+0 1.854 -1.57-1	2.121+0 1.868 -1.99-1
Shell 3s <sub>1/2</sub> E <sub>b</sub> = 4822.0 eV	σ β γ δ	k (eV) 4000 0.000+0 0.000 0.00+0 0.00+0	1.317+1 1.712 1.74+0 3.08-3	1.070+1 1.742 1.07+0 -1.94-3	8.614+0 1.763 7.18-1 -3.82-3	7.036+0 1.782 4.63-1 -4.99-3	5.832+0 1.798 2.74-1 -5.79-3	4.900+0 1.812 1.31-1 -6.39-3	4.166+0 1.825 2.30-2 -6.86-3	3.579+0 1.836 -5.73-2 -7.25-3	2.715+0 1.854 -1.57-1 -7.88-3	2.121+0 1.868 -1.99-1 -8.38-3
Shell $3s_{1/2}$ $E_b =$	$\sigma$ $\beta$ $\gamma$ $\delta$ $\sigma$	k (eV) 4000 0.000+0 0.000 0.00+0	1.317+1 1.712 1.74+0	1.070+1 1.742 1.07+0	8.614+0 1.763 7.18-1	7.036+0 1.782 4.63-1	5.832+0 1.798 2.74-1	4.900+0 1.812 1.31-1	4.166+0 1.825 2.30-2	3.579+0 1.836 -5.73-2	2.715+0 1.854 -1.57-1	2.121+0 1.868 -1.99-1
Shell $3s_{1/2}$ $E_b = 4822.0 \text{ eV}$ $3p_{1/2}$	σ β γ δ σ β	k (eV) 4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 6.53-1
Shell $3s_{1/2}$ $E_b$ = 4822.0 eV $3p_{1/2}$ $E_b$ = 4485.0 eV	$ \begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta \end{array} $	k (eV) 4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.00+0 0.00+0 0.00+0	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1 1.32-1	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1 2.42-2	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2 3.08-3	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2 -1.98-3	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2 -2.30-3	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2 -8.20-4	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1 1.53-3	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1 4.40-3	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1 1.12-2	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 6.53-1 1.90-2
Shell $3s_{1/2}$ $E_b$ = $4822.0 \text{ eV}$ $3p_{1/2}$ $E_b$ = $4485.0 \text{ eV}$ $3p_{3/2}$	$\sigma$ $\beta$ $\gamma$ $\delta$ $\sigma$ $\beta$ $\gamma$ $\delta$ $\sigma$ $\delta$ $\sigma$	k (eV) 4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 7.035+1	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1 1.32-1 5.054+1	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1 2.42-2 3.632+1	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2 3.08-3 2.688+1	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2 -1.98-3 2.042+1	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2 -2.30-3 1.588+1	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2 -8.20-4 1.259+1	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1 1.53-3 1.015+1	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1 4.40-3 8.300+0	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1 1.12-2 5.757+0	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 6.53-1 1.90-2 4.153+0
Shell $3s_{1/2}$ $E_b$ = 4822.0 eV $3p_{1/2}$ $E_b$ = 4485.0 eV	$ \begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta \end{array} $	k (eV) 4000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.00+0 7.035+1 0.656 2.32-1	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1 1.32-1 5.054+1 1.323 1.80-1	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1 2.42-2	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2 3.08-3	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2 -1.98-3	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2 -2.30-3 1.588+1 1.689 3.05-2	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2 -8.20-4 1.259+1 1.705 1.34-1	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1 1.53-3 1.015+1 1.713 2.52-1	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1 4.40-3 8.300+0 1.714 3.77-1	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1 1.12-2 5.757+0 1.703 6.34-1	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 6.53-1 1.90-2 4.153+0 1.682 8.85-1
Shell $3s_{1/2}$ $E_b$ = $4822.0 \text{ eV}$ $3p_{1/2}$ $E_b$ = $4485.0 \text{ eV}$ $3p_{3/2}$ $E_b$ = $3786.6 \text{ eV}$	σ β γ δ σ β γ δ σ β γ δ	k (eV) 4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 7.035+1 0.656 2.32-1 1.89-1	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1 1.32-1 5.054+1 1.323 1.80-1 3.03-2	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1 2.42-2 3.632+1 1.510 -1.98-2 1.51-2	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2 3.08-3 2.688+1 1.605 -7.61-2 1.67-2	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2 -1.98-3 2.042+1 1.658 -4.67-2 2.11-2	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2 -2.30-3 1.588+1 1.689 3.05-2 2.54-2	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2 -8.20-4 1.259+1 1.705 1.34-1 2.91-2	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1 1.53-3 1.015+1 1.713 2.52-1 3.23-2	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1 4.40-3 8.300+0 1.714 3.77-1 3.51-2	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1 1.12-2 5.757+0 1.703 6.34-1 3.98-2	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 6.53-1 1.90-2 4.153+0 1.682 8.85-1 4.38-2
Shell $3s_{1/2}$ $E_b$ = $4822.0 \text{ eV}$ $3p_{1/2}$ $E_b$ = $4485.0 \text{ eV}$ $3p_{3/2}$ $E_b$ = $3786.6 \text{ eV}$ $3d_{3/2}$	$ \begin{array}{c} \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \end{array} $	k (eV) 4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 7.035+1 0.656 2.32-1 1.89-1	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1 1.32-1 5.054+1 1.323 1.80-1 3.03-2 6.765+1	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1 2.42-2 3.632+1 1.510 -1.98-2 1.51-2 3.986+1	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2 3.08-3 2.688+1 1.605 -7.61-2 1.67-2 2.512+1	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2 -1.98-3 2.042+1 1.658 -4.67-2 2.11-2	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2 -2.30-3 1.588+1 1.689 3.05-2 2.54-2 1.155+1	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2 -8.20-4 1.259+1 1.705 1.34-1 2.91-2 8.269+0	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1 1.53-3 1.015+1 1.713 2.52-1 3.23-2 6.086+0	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1 4.40-3 8.300+0 1.714 3.77-1 3.51-2 4.584+0	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1 1.12-2 5.757+0 1.703 6.34-1 3.98-2 2.752+0	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 6.53-1 1.90-2 4.153+0 1.682 8.85-1 4.38-2 1.755+0
Shell $3s_{1/2}$ $E_b$ = $4822.0 \text{ eV}$ $3p_{1/2}$ $E_b$ = $4485.0 \text{ eV}$ $3p_{3/2}$ $E_b$ = $3786.6 \text{ eV}$	σ β γ δ σ β γ δ σ β γ δ	k (eV) 4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 7.035+1 0.656 2.32-1 1.89-1	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1 1.32-1 5.054+1 1.323 1.80-1 3.03-2	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1 2.42-2 3.632+1 1.510 -1.98-2 1.51-2	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2 3.08-3 2.688+1 1.605 -7.61-2 1.67-2	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2 -1.98-3 2.042+1 1.658 -4.67-2 2.11-2	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2 -2.30-3 1.588+1 1.689 3.05-2 2.54-2	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2 -8.20-4 1.259+1 1.705 1.34-1 2.91-2	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1 1.53-3 1.015+1 1.713 2.52-1 3.23-2	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1 4.40-3 8.300+0 1.714 3.77-1 3.51-2	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1 1.12-2 5.757+0 1.703 6.34-1 3.98-2	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 6.53-1 1.90-2 4.153+0 1.682 8.85-1 4.38-2
Shell $3s_{1/2}$ $E_b$ = $4822.0 \text{ eV}$ $3p_{1/2}$ $E_b$ = $4485.0 \text{ eV}$ $3p_{3/2}$ $E_b$ = $3786.6 \text{ eV}$ $3d_{3/2}$ $E_b$ = $3248.4 \text{ eV}$	σ β γ δ σ β γ δ σ β γ δ σ β γ δ	k (eV) 4000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 7.035+1 0.656 2.32-1 1.89-1 1.242+2 0.769 -3.03-1 -1.45-2	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1 1.32-1 5.054+1 1.323 1.80-1 3.03-2 6.765+1 1.075 -1.48-1 4.86-2	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1 2.42-2 3.632+1 1.510 -1.98-2 1.51-2 3.986+1 1.189 1.10-1 8.13-2	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2 3.08-3 2.688+1 1.605 -7.61-2 1.67-2 2.512+1 1.233 3.68-1 1.02-1	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2 -1.98-3 2.042+1 1.658 -4.67-2 2.11-2 1.669+1 1.243 6.04-1 1.17-1	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2 -2.30-3 1.588+1 1.689 3.05-2 2.54-2 1.155+1 1.234 8.16-1 1.31-1	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2 -8.20-4 1.259+1 1.705 1.34-1 2.91-2 8.269+0 1.216 1.01+0 1.43-1	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1 1.53-3 1.015+1 1.713 2.52-1 3.23-2 6.086+0 1.191 1.18+0 1.54-1	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1 4.40-3 8.300+0 1.714 3.77-1 3.51-2 4.584+0 1.162 1.33+0 1.65-1	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1 1.12-2 5.757+0 1.703 6.34-1 3.98-2 2.752+0 1.099 1.58+0 1.85-1	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 6.53-1 1.90-2 4.153+0 1.682 8.85-1 4.38-2 1.755+0 1.033 1.79+0 2.04-1
Shell $3s_{1/2}$ $E_b$ = $4822.0 \text{ eV}$ $3p_{1/2}$ $E_b$ = $4485.0 \text{ eV}$ $3p_{3/2}$ $E_b$ = $3786.6 \text{ eV}$ $3d_{3/2}$ $E_b$ = $3248.4 \text{ eV}$ $3d_{5/2}$	σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ σ β σ σ σ σ σ σ σ σ σ σ σ σ σ	k (eV) 4000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.00+0 7.035+1 0.656 2.32-1 1.89-1 1.242+2 0.769 -3.03-1 -1.45-2 1.710+2	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1 1.32-1 5.054+1 1.323 1.80-1 3.03-2 6.765+1 1.075 -1.48-1 4.86-2 9.087+1	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1 2.42-2 3.632+1 1.510 -1.98-2 1.51-2 3.986+1 1.189 1.10-1 8.13-2 5.281+1	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2 3.08-3 2.688+1 1.605 -7.61-2 1.67-2 2.512+1 1.233 3.68-1 1.02-1 3.293+1	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2 -1.98-3 2.042+1 1.658 -4.67-2 2.11-2 1.669+1 1.243 6.04-1 1.17-1 2.167+1	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2 -2.30-3 1.588+1 1.689 3.05-2 2.54-2 1.155+1 1.234 8.16-1 1.31-1	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2 -8.20-4 1.259+1 1.705 1.34-1 2.91-2 8.269+0 1.216 1.01+0 1.43-1 1.057+1	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1 1.53-3 1.015+1 1.713 2.52-1 3.23-2 6.086+0 1.191 1.18+0 1.54-1 7.729+0	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1 4.40-3 8.300+0 1.714 3.77-1 3.57-2 4.584+0 1.162 1.33+0 1.65-1 5.784+0	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1 1.12-2 5.757+0 1.703 6.34-1 3.98-2 2.752+0 1.099 1.58+0 1.85-1 3.432+0	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 1.90-2 4.153+0 1.682 8.85-1 4.38-2 1.755+0 1.033 1.79+0 2.04-1 2.166+0
Shell $3s_{1/2}$ $E_b$ = $4822.0 \text{ eV}$ $3p_{1/2}$ $E_b$ = $4485.0 \text{ eV}$ $3p_{3/2}$ $E_b$ = $3786.6 \text{ eV}$ $3d_{3/2}$ $E_b$ = $3248.4 \text{ eV}$	σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β σ σ β σ σ σ σ σ σ σ σ σ σ σ σ σ	k (eV) 4000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 7.035+1 0.656 2.32-1 1.89-1 1.242+2 0.769 -3.03-1 -1.45-2	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1 1.32-1 5.054+1 1.323 1.80-1 3.03-2 6.765+1 1.075 -1.48-1 4.86-2	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1 2.42-2 3.632+1 1.510 -1.98-2 1.51-2 3.986+1 1.189 1.10-1 8.13-2	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2 3.08-3 2.688+1 1.605 -7.61-2 1.67-2 2.512+1 1.233 3.68-1 1.02-1	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2 -1.98-3 2.042+1 1.658 -4.67-2 2.11-2 1.669+1 1.243 6.04-1 1.17-1	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2 -2.30-3 1.588+1 1.689 3.05-2 2.54-2 1.155+1 1.234 8.16-1 1.31-1	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2 -8.20-4 1.259+1 1.705 1.34-1 2.91-2 8.269+0 1.216 1.01+0 1.43-1	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1 1.53-3 1.015+1 1.713 2.52-1 3.23-2 6.086+0 1.191 1.18+0 1.54-1	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1 4.40-3 8.300+0 1.714 3.77-1 3.51-2 4.584+0 1.162 1.33+0 1.65-1	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1 1.12-2 5.757+0 1.703 6.34-1 3.98-2 2.752+0 1.099 1.58+0 1.85-1	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 6.53-1 1.90-2 4.153+0 1.682 8.85-1 4.38-2 1.755+0 1.033 1.79+0 2.04-1
Shell $3s_{1/2}$ $E_b$ = $4822.0 \text{ eV}$ $3p_{1/2}$ $E_b$ = $4485.0 \text{ eV}$ $3p_{3/2}$ $E_b$ = $3786.6 \text{ eV}$ $3d_{3/2}$ $E_b$ = $3248.4 \text{ eV}$ $3d_{5/2}$ $E_b$ = $3104.9 \text{ eV}$	σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ σ β γ δ σ σ σ σ σ σ σ σ σ σ σ σ σ	k (eV) 4000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 7.035+1 0.656 2.32-1 1.89-1 1.242+2 0.769 -3.03-1 -1.45-2 1.710+2 0.965 -2.88-1 -4.41-3	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1 1.32-1 5.054+1 1.323 1.80-1 3.03-2 6.765+1 1.075 -1.48-1 4.86-2 9.087+1 1.159	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1 2.42-2 3.632+1 1.510 -1.98-2 1.51-2 3.986+1 1.189 1.10-1 8.13-2 5.281+1 1.211	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2 3.08-3 2.688+1 1.605 -7.61-2 1.67-2 2.512+1 1.233 3.68-1 1.02-1 3.293+1 1.213	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2 -1.98-3 2.042+1 1.658 -4.67-2 2.11-2 1.669+1 1.243 6.04-1 1.17-1 2.167+1 1.194	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2 -2.30-3 1.588+1 1.689 3.05-2 2.54-2 1.155+1 1.234 8.16-1 1.31-1 1.488+1 1.165	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2 -8.20-4 1.259+1 1.705 1.34-1 2.91-2 8.269+0 1.216 1.01+0 1.43-1 1.057+1 1.130	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1 1.53-3 1.015+1 1.713 2.52-1 3.23-2 6.086+0 1.191 1.18+0 1.54-1 7.729+0 1.093	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1 4.40-3 8.300+0 1.714 3.77-1 3.51-2 4.584+0 1.162 1.33+0 1.65-1 5.784+0 1.055	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1 1.12-2 5.757+0 1.703 6.34-1 3.98-2 2.752+0 1.099 1.58+0 1.85-1 3.432+0 0.979	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 6.53-1 1.90-2 4.153+0 1.682 8.85-1 4.38-2 1.755+0 1.033 1.79+0 2.04-1 2.166+0 0.907
Shell $3s_{1/2}$ $E_b$ = $4822.0 \text{ eV}$ $3p_{1/2}$ $E_b$ = $4485.0 \text{ eV}$ $3p_{3/2}$ $E_b$ = $3786.6 \text{ eV}$ $3d_{3/2}$ $E_b$ = $3248.4 \text{ eV}$ $3d_{5/2}$ $E_b$ =	σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ σ β γ δ σ σ σ σ σ σ σ σ σ σ σ σ σ	$\begin{array}{c} k \ (\mathrm{eV}) \\ \hline 4000 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \\ 1.035+1 \\ 0.656 \\ 2.32-1 \\ 1.89-1 \\ 1.242+2 \\ 0.769 \\ -3.03-1 \\ -1.45-2 \\ 1.710+2 \\ 0.965 \\ -2.88-1 \\ -4.41-3 \\ 1_{3/2}^{1} \mathbf{7s}_{1/2}^{2} \end{array}$	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1 1.32-1 5.054+1 1.323 1.80-1 3.03-2 6.765+1 1.075 -1.48-1 4.86-2 9.087+1 1.159 -4.93-2	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1 2.42-2 3.632+1 1.510 -1.98-2 1.51-2 3.986+1 1.189 1.10-1 8.13-2 5.281+1 1.211 2.35-1	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2 3.08-3 2.688+1 1.605 -7.61-2 1.67-2 2.512+1 1.233 3.68-1 1.02-1 3.293+1 1.213 4.95-1	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2 -1.98-3 2.042+1 1.658 -4.67-2 2.11-2 1.669+1 1.243 6.04-1 1.17-1 2.167+1 1.194 7.22-1	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2 -2.30-3 1.588+1 1.689 3.05-2 2.54-2 1.155+1 1.234 8.16-1 1.31-1 1.488+1 1.165 9.20-1	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2 -8.20-4 1.259+1 1.705 1.34-1 2.91-2 8.269+0 1.216 1.01+0 1.43-1 1.057+1 1.130 1.09+0	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1 1.53-3 1.015+1 1.713 2.52-1 3.23-2 6.086+0 1.191 1.18+0 1.54-1 7.729+0 1.093 1.24+0	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1 4.40-3 8.300+0 1.714 3.77-1 3.51-2 4.584+0 1.162 1.33+0 1.65-1 5.784+0 1.055 1.38+0	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1 1.12-2 5.757+0 1.703 6.34-1 3.98-2 2.752+0 1.099 1.58+0 1.85-1 3.432+0 0.979 1.59+0	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 6.53-1 1.90-2 4.153+0 1.682 8.85-1 4.38-2 1.755+0 1.033 1.79+0 2.04-1 2.166+0 0.907 1.77+0
Shell $3s_{1/2}$ $E_b$ = $4822.0 \text{ eV}$ $3p_{1/2}$ $E_b$ = $4485.0 \text{ eV}$ $3p_{3/2}$ $E_b$ = $3786.6 \text{ eV}$ $3d_{3/2}$ $E_b$ = $3248.4 \text{ eV}$ $3d_{5/2}$ $E_b$ = $3104.9 \text{ eV}$ $Z$ = <b>89</b> , Ac:	σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ σ β γ δ σ σ σ σ σ σ σ σ σ σ σ σ σ	$\begin{array}{c} k \ (\mathrm{eV}) \\ \hline 4000 \\ \hline 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.00+0 \\ 0.00+0 \\ 0.35+1 \\ 0.656 \\ 2.32-1 \\ 1.89-1 \\ 1.242+2 \\ 0.769 \\ -3.03-1 \\ -1.45-2 \\ 1.710+2 \\ 0.965 \\ -2.88-1 \\ -4.41-3 \\ \hline 1_{\frac{1}{3}} 75_{\frac{1}{2}}^2 \\ k \ (\mathrm{eV}) \end{array}$	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1 1.32-1 5.054+1 1.323 1.80-1 3.03-2 6.765+1 1.075 -1.48-1 4.86-2 9.087+1 1.159 -4.93-2 4.60-2	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1 2.42-2 3.632+1 1.510 -1.98-2 1.51-2 3.986+1 1.189 1.10-1 8.13-2 5.281+1 1.211 2.35-1 7.53-2	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2 3.08-3 2.688+1 1.605 -7.61-2 1.67-2 2.512+1 1.233 3.68-1 1.02-1 3.293+1 1.213 4.95-1 9.67-2	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2 -1.98-3 2.042+1 1.658 -4.67-2 2.11-2 1.669+1 1.243 6.04-1 1.17-1 2.167+1 1.194 7.22-1 1.15-1	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2 -2.30-3 1.588+1 1.689 3.05-2 2.54-2 1.155+1 1.234 8.16-1 1.31-1 1.488+1 1.165 9.20-1 1.32-1	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2 -8.20-4 1.259+1 1.705 1.34-1 2.91-2 8.269+0 1.216 1.01+0 1.43-1 1.057+1 1.130 1.09+0 1.48-1	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1 1.53-3 1.015+1 1.713 2.52-1 3.23-2 6.086+0 1.191 1.18+0 1.54-1 7.729+0 1.093 1.24+0 1.64-1	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1 4.40-3 8.300+0 1.714 3.77-1 3.51-2 4.584+0 1.162 1.33+0 1.65-1 5.784+0 1.055 1.38+0 1.79-1	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1 1.12-2 5.757+0 1.703 6.34-1 3.98-2 2.752+0 1.099 1.58+0 1.85-1 3.432+0 0.979 1.59+0 2.08-1	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 6.53-1 1.90-2 4.153+0 1.682 8.85-1 4.38-2 1.755+0 1.033 1.79+0 2.04-1 2.166+0 0.907 1.77+0 2.34-1
Shell $3s_{1/2}$ $E_b$ $=$ $4822.0 \text{ eV}$ $3p_{1/2}$ $E_b$ $=$ $4485.0 \text{ eV}$ $3p_{3/2}$ $E_b$ $=$ $3786.6 \text{ eV}$ $3d_{3/2}$ $E_b$ $=$ $3248.4 \text{ eV}$ $3d_{5/2}$ $E_b$ $=$ $3104.9 \text{ eV}$ $\mathbf{Z} = 89, \mathbf{Ac}$ :	σ β γ δ σ β γ δ δ β γ δ δ β γ δ δ β γ δ δ β γ δ δ β γ δ δ δ δ δ δ δ δ δ δ δ δ δ	$\begin{array}{c} k \ (\mathrm{eV}) \\ \hline 4000 \\ \hline 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \\ 0.35+1 \\ 0.656 \\ 2.32-1 \\ 1.89-1 \\ 1.242+2 \\ 0.769 \\ -3.03-1 \\ -1.45-2 \\ 1.710+2 \\ 0.965 \\ -2.88-1 \\ -4.41-3 \\ \hline 1 \frac{1}{3}_{1/2} \ 7 \frac{2}{1/2}_{1/2} \\ k \ (\mathrm{eV}) \\ \hline 4000 \end{array}$	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1 1.32-1 5.054+1 1.323 1.80-1 3.03-2 6.765+1 1.075 -1.48-1 4.86-2 9.087+1 1.159 -4.93-2 4.60-2	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1 2.42-2 3.632+1 1.510 -1.98-2 1.51-2 3.986+1 1.189 1.10-1 8.13-2 5.281+1 1.211 2.35-1 7.53-2	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2 3.08-3 2.688+1 1.605 -7.61-2 1.67-2 2.512+1 1.233 3.68-1 1.02-1 3.293+1 1.213 4.95-1 9.67-2	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2 -1.98-3 2.042+1 1.658 -4.67-2 2.11-2 1.669+1 1.243 6.04-1 1.17-1 2.167+1 1.194 7.22-1 1.15-1	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2 -2.30-3 1.588+1 1.689 3.05-2 2.54-2 1.155+1 1.234 8.16-1 1.31-1 1.488+1 1.165 9.20-1 1.32-1	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2 -8.20-4 1.259+1 1.705 1.34-1 2.91-2 8.269+0 1.216 1.01+0 1.43-1 1.057+1 1.130 1.09+0 1.48-1	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1 1.53-3 1.015+1 1.713 2.52-1 3.23-2 6.086+0 1.191 1.18+0 1.54-1 7.729+0 1.093 1.24+0 1.64-1	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1 4.40-3 8.300+0 1.714 3.77-1 3.51-2 4.584+0 1.162 1.33+0 1.65-1 5.784+0 1.055 1.38+0 1.79-1	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1 1.12-2 5.757+0 1.703 6.34-1 3.98-2 2.752+0 1.099 1.58+0 1.85-1 3.432+0 0.979 1.59+0 2.08-1	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 6.53-1 1.90-2 4.153+0 1.682 8.85-1 4.38-2 1.755+0 1.033 1.79+0 2.04-1 2.166+0 0.907 1.77+0 2.34-1
Shell $3s_{1/2}$ $E_b$ = $4822.0 \text{ eV}$ $3p_{1/2}$ $E_b$ = $4485.0 \text{ eV}$ $3p_{3/2}$ $E_b$ = $3786.6 \text{ eV}$ $3d_{3/2}$ $E_b$ = $3248.4 \text{ eV}$ $3d_{5/2}$ $E_b$ = $3104.9 \text{ eV}$ $Z$ = <b>89</b> , Ac:	σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ δ σ β β γ δ δ σ δ δ δ δ δ δ δ δ δ δ δ δ δ	$\begin{array}{c} k \ (\mathrm{eV}) \\ \hline 4000 \\ \hline 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.00+0 \\ 0.00+0 \\ 0.35+1 \\ 0.656 \\ 2.32-1 \\ 1.89-1 \\ 1.242+2 \\ 0.769 \\ -3.03-1 \\ -1.45-2 \\ 1.710+2 \\ 0.965 \\ -2.88-1 \\ -4.41-3 \\ \hline 1_{\frac{1}{3}} 75_{\frac{1}{2}}^2 \\ k \ (\mathrm{eV}) \end{array}$	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1 1.32-1 5.054+1 1.323 1.80-1 3.03-2 6.765+1 1.075 -1.48-1 4.86-2 9.087+1 1.159 -4.93-2 4.60-2	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1 2.42-2 3.632+1 1.510 -1.98-2 1.51-2 3.986+1 1.189 1.10-1 8.13-2 5.281+1 1.211 2.35-1 7.53-2	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2 3.08-3 2.688+1 1.605 -7.61-2 1.67-2 2.512+1 1.233 3.68-1 1.02-1 3.293+1 1.213 4.95-1 9.67-2	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2 -1.98-3 2.042+1 1.658 -4.67-2 2.11-2 1.669+1 1.243 6.04-1 1.17-1 2.167+1 1.194 7.22-1 1.15-1	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2 -2.30-3 1.588+1 1.689 3.05-2 2.54-2 1.155+1 1.234 8.16-1 1.31-1 1.488+1 1.165 9.20-1 1.32-1	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2 -8.20-4 1.259+1 1.705 1.34-1 2.91-2 8.269+0 1.216 1.01+0 1.43-1 1.057+1 1.130 1.09+0 1.48-1	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1 1.53-3 1.015+1 1.713 2.52-1 3.23-2 6.086+0 1.191 1.18+0 1.54-1 7.729+0 1.093 1.24+0 1.64-1	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1 4.40-3 8.300+0 1.714 3.77-1 3.51-2 4.584+0 1.162 1.33+0 1.65-1 5.784+0 1.055 1.38+0 1.79-1	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1 1.12-2 5.757+0 1.703 6.34-1 3.98-2 2.752+0 1.099 1.58+0 1.85-1 3.432+0 0.979 1.59+0 2.08-1	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 6.53-1 1.90-2 4.153+0 1.682 8.85-1 4.38-2 1.755+0 1.033 1.79+0 2.04-1 2.166+0 0.907 1.77+0 2.34-1
Shell $3s_{1/2}$ $E_b$ = $4822.0 \text{ eV}$ $3p_{1/2}$ $E_b$ = $4485.0 \text{ eV}$ $3p_{3/2}$ $E_b$ = $3786.6 \text{ eV}$ $3d_{3/2}$ $E_b$ = $3248.4 \text{ eV}$ $3d_{5/2}$ $E_b$ = $3104.9 \text{ eV}$ $Z = 89, Ac$ :	σ β γ δ σ β γ δ δ σ β γ δ δ γ δ δ γ δ δ β γ γ δ δ δ β γ δ δ δ δ δ δ δ δ δ δ δ δ δ	$\begin{array}{c} k\ (\mathrm{eV})\\ \hline 4000\\ \hline 0.000+0\\ 0.000+0\\ 0.000+0\\ 0.000+0\\ 0.000+0\\ 0.000+0\\ 0.000+0\\ 0.00+0\\ \hline 0.035+1\\ 0.656\\ 2.32-1\\ 1.89-1\\ 1.242+2\\ 0.769\\ -3.03-1\\ -1.45-2\\ 1.710+2\\ 0.965\\ -2.88-1\\ -4.41-3\\ \hline 1_{3/2}\ 7s_{1/2}^2\\ k\ (\mathrm{eV})\\ \hline 4000\\ 0.000+0\\ 0.000\\ 0.00+0\\ \end{array}$	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1 1.32-1 5.054+1 1.323 1.80-1 3.03-2 6.765+1 1.075 -1.48-1 4.86-2 9.087+1 1.159 -4.93-2 4.60-2	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1 2.42-2 3.632+1 1.510 -1.98-2 1.51-2 3.986+1 1.189 1.10-1 8.13-2 5.281+1 1.211 2.35-1 7.53-2	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2 3.08-3 2.688+1 1.605 -7.61-2 1.67-2 2.512+1 1.233 3.68-1 1.02-1 3.293+1 1.213 4.95-1 9.67-2 7000 8.665+0 1.746 8.04-1	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2 -1.98-3 2.042+1 1.658 -4.67-2 2.11-2 1.669+1 1.243 6.04-1 1.17-1 2.167+1 1.194 7.22-1 1.15-1	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2 -2.30-3 1.588+1 1.689 3.05-2 2.54-2 1.155+1 1.234 8.16-1 1.31-1 1.488+1 1.165 9.20-1 1.32-1	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2 -8.20-4 1.259+1 1.705 1.34-1 2.91-2 8.269+0 1.216 1.01+0 1.43-1 1.057+1 1.130 1.09+0 1.48-1	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1 1.53-3 1.015+1 1.713 2.52-1 3.23-2 6.086+0 1.191 1.18+0 1.54-1 7.729+0 1.093 1.24+0 1.64-1	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1 4.40-3 8.300+0 1.714 3.77-1 3.51-2 4.584+0 1.162 1.33+0 1.65-1 5.784+0 1.055 1.38+0 1.79-1 12000 3.641+0 1.822 -2.55-2	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1 1.12-2 5.757+0 1.703 6.34-1 3.98-2 2.752+0 1.099 1.58+0 1.85-1 3.432+0 0.979 1.59+0 2.08-1	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 6.53-1 1.90-2 4.153+0 1.682 8.85-1 4.38-2 1.755+0 1.033 1.79+0 2.04-1 2.166+0 0.907 1.77+0 2.34-1
Shell $3s_{1/2}$ $E_b$ = $4822.0 \text{ eV}$ $3p_{1/2}$ $E_b$ = $4485.0 \text{ eV}$ $3p_{3/2}$ $E_b$ = $3786.6 \text{ eV}$ $3d_{3/2}$ $E_b$ = $3248.4 \text{ eV}$ $3d_{5/2}$ $E_b$ = $3104.9 \text{ eV}$ $\mathbf{Z} = 89, \mathbf{Ac}$ : Shell $3s_{1/2}$ $E_b$ = $5000.6 \text{ eV}$	σ β γ δ σ β γ δ δ σ β γ γ δ δ σ β γ γ δ δ β γ γ δ δ δ β γ γ δ δ δ δ δ δ δ δ δ δ δ δ δ	$\begin{array}{c} k \ (\mathrm{eV}) \\ \hline 4000 \\ \hline 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \\ 0.0566 \\ 2.32-1 \\ 1.89-1 \\ 1.242+2 \\ 0.769 \\ -3.03-1 \\ -1.45-2 \\ 1.710+2 \\ 0.965 \\ -2.88-1 \\ -4.41-3 \\ \hline 1_{3/2}^{1} 7 5_{1/2}^{2} \\ k \ (\mathrm{eV}) \\ \hline 4000 \\ 0.000+0 \\ 0.000+0 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \end{array}$	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1 1.32-1 5.054+1 1.32-1 3.03-2 6.765+1 1.075 -1.48-1 4.86-2 9.087+1 1.159 -4.93-2 4.60-2 5000 0.000+0 0.000+0 0.000+0	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1 2.42-2 3.632+1 1.510 -1.98-2 1.51-2 3.986+1 1.189 1.10-1 8.13-2 5.281+1 1.211 2.35-1 7.53-2 6000 1.071+1 1.722 1.19+0 -1.46-3	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2 3.08-3 2.688+1 1.605 -7.61-2 1.67-2 2.512+1 1.233 3.68-1 1.02-1 3.293+1 1.213 4.95-1 9.67-2 7000 8.665+0 1.746 8.04-1 -3.73-3	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2 -1.98-3 2.042+1 1.658 -4.67-2 2.11-2 1.669+1 1.243 6.04-1 1.17-1 2.167+1 1.194 7.22-1 1.15-1 8000 7.101+0 1.766 5.34-1 -5.07-3	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2 -2.30-3 1.588+1 1.689 3.05-2 2.54-2 1.155+1 1.234 8.16-1 1.31-1 1.488+1 1.165 9.20-1 1.32-1 9000 5.901+0 1.783 3.33-1 -5.97-3	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2 -8.20-4 1.259+1 1.705 1.34-1 2.91-2 8.269+0 1.216 1.01+0 1.43-1 1.057+1 1.130 1.09+0 1.48-1 10000 4.968+0 1.798 1.80-1 -6.65-3	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1 1.53-3 1.015+1 1.713 2.52-1 3.23-2 6.086+0 1.191 1.18+0 1.54-1 7.729+0 1.093 1.24+0 1.64-1 11000 4.231+0 1.811 6.34-2 -7.19-3	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1 4.40-3 8.300+0 1.714 3.57-1 3.51-2 4.584+0 1.162 1.33+0 1.65-1 5.784+0 1.055 1.38+0 1.79-1 12000 3.641+0 1.822 -2.55-2 -7.65-3	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1 1.12-2 5.757+0 1.703 6.34-1 3.98-2 2.752+0 1.099 1.58+0 1.85-1 3.432+0 0.979 1.59+0 2.08-1 14000 2.768+0 1.841 -1.41-1 -8.38-3	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 6.53-1 1.90-2 4.153+0 1.682 8.85-1 4.38-2 1.755+0 1.033 1.79+0 2.04-1 2.166+0 0.907 1.77+0 2.34-1 16000 2.166+0 1.856 -1.95-1 -8.95-3
Shell $3s_{1/2}$ $E_b$ = $4822.0 \text{ eV}$ $3p_{1/2}$ $E_b$ = $4485.0 \text{ eV}$ $3p_{3/2}$ $E_b$ = $3786.6 \text{ eV}$ $3d_{3/2}$ $E_b$ = $3248.4 \text{ eV}$ $3d_{5/2}$ $E_b$ = $3104.9 \text{ eV}$ $\mathbf{Z} = 89, \mathbf{Ac}$ : Shell $3s_{1/2}$ $E_b$ = $5000.6 \text{ eV}$	σ β γ δ σ β γ δ δ σ β γ δ δ γ δ δ β γ δ δ β γ δ δ β γ δ δ β β γ δ δ δ δ δ δ δ δ δ δ δ δ δ	k (eV)   4000   0.000+0   0.000+0   0.000+0   0.000+0   0.00+0   0.00+0   0.00+0   0.00+0   0.00+0   0.00+0   0.00+0   0.00+0   0.00+0   0.00+0   0.00+0   0.00+0   0.000+0	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1 1.32-1 5.054+1 1.323 1.80-1 3.03-2 6.765+1 1.075 -1.48-1 4.86-2 9.087+1 1.159 -4.93-2 4.60-2 5000 0.000+0 0.000+0 0.00+0 0.00+0 2.013+1	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1 2.42-2 3.632+1 1.510 -1.98-2 1.51-2 3.986+1 1.189 1.10-1 8.13-2 5.281+1 1.211 2.35-1 7.53-2 6000 1.071+1 1.722 1.19+0 -1.46-3 1.644+1	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2 3.08-3 2.688+1 1.605 -7.61-2 1.67-2 2.512+1 1.233 3.68-1 1.02-1 3.293+1 1.213 4.95-1 9.67-2 7000 8.665+0 1.746 8.04-1 -3.73-3 1.317+1	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2 -1.98-3 2.042+1 1.658 -4.67-2 2.11-2 1.669+1 1.243 6.04-1 1.17-1 2.167+1 1.194 7.22-1 1.15-1 8000 7.101+0 1.766 5.34-1 -5.07-3 1.062+1	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2 -2.30-3 1.588+1 1.689 3.05-2 2.54-2 1.155+1 1.234 8.16-1 1.31-1 1.488+1 1.165 9.20-1 1.32-1 9000 5.901+0 1.783 3.33-1 -5.97-3 8.666+0	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2 -8.20-4 1.259+1 1.705 1.34-1 2.91-2 8.269+0 1.216 1.01+0 1.43-1 1.057+1 1.130 1.09+0 1.48-1  10000 4.968+0 1.798 1.80-1 -6.65-3 7.154+0	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1 1.53-3 1.015+1 1.713 2.52-1 3.23-2 6.086+0 1.191 1.18+0 1.54-1 7.729+0 1.093 1.24+0 1.64-1 11000 4.231+0 1.811 6.34-2 -7.19-3 5.971+0	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1 4.40-3 8.300+0 1.714 3.51-2 4.584+0 1.162 1.33+0 1.65-1 5.784+0 1.055 1.38+0 1.79-1 12000 3.641+0 1.822 -2.55-2 -7.65-3 5.034+0	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1 1.12-2 5.757+0 1.703 6.34-1 3.98-2 2.752+0 1.099 1.58+0 1.85-1 3.432+0 0.979 1.59+0 2.08-1 14000 2.768+0 1.841 -1.41-1 -8.38-3 3.676+0	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 6.53-1 1.90-2 4.153+0 1.682 8.85-1 4.38-2 1.755+0 1.033 1.79+0 2.04-1 2.166+0 0.907 1.77+0 2.34-1 16000 2.166+0 1.856 -1.95-1 -8.95-3 2.767+0
Shell $3s_{1/2}$ $E_b$ = $4822.0 \text{ eV}$ $3p_{1/2}$ $E_b$ = $4485.0 \text{ eV}$ $3p_{3/2}$ $E_b$ = $3786.6 \text{ eV}$ $3d_{3/2}$ $E_b$ = $3248.4 \text{ eV}$ $3d_{5/2}$ $E_b$ = $3104.9 \text{ eV}$ $\mathbf{Z} = 89, \mathbf{Ac}$ : Shell $3s_{1/2}$ $E_b$ = $5000.6 \text{ eV}$	σ β γ δ σ β γ δ δ σ β γ γ δ δ σ β γ γ δ δ β γ γ δ δ δ β γ γ δ δ δ δ δ δ δ δ δ δ δ δ δ	$\begin{array}{c} k \ (\mathrm{eV}) \\ \hline 4000 \\ \hline 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \\ 0.0566 \\ 2.32-1 \\ 1.89-1 \\ 1.242+2 \\ 0.769 \\ -3.03-1 \\ -1.45-2 \\ 1.710+2 \\ 0.965 \\ -2.88-1 \\ -4.41-3 \\ \hline 1_{3/2}^{1} 7 5_{1/2}^{2} \\ k \ (\mathrm{eV}) \\ \hline 4000 \\ 0.000+0 \\ 0.000+0 \\ 0.00+0 \\ 0.00+0 \\ 0.00+0 \end{array}$	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1 1.32-1 5.054+1 1.32-1 3.03-2 6.765+1 1.075 -1.48-1 4.86-2 9.087+1 1.159 -4.93-2 4.60-2 5000 0.000+0 0.000+0 0.000+0	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1 2.42-2 3.632+1 1.510 -1.98-2 1.51-2 3.986+1 1.189 1.10-1 8.13-2 5.281+1 1.211 2.35-1 7.53-2 6000 1.071+1 1.722 1.19+0 -1.46-3 1.644+1 1.339 3.78-1	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2 3.08-3 2.688+1 1.605 -7.61-2 1.67-2 2.512+1 1.233 3.68-1 1.02-1 3.293+1 1.213 4.95-1 9.67-2 7000 8.665+0 1.746 8.04-1 -3.73-3	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2 -1.98-3 2.042+1 1.658 -4.67-2 2.11-2 1.669+1 1.243 6.04-1 1.17-1 2.167+1 1.194 7.22-1 1.15-1 8000 7.101+0 1.766 5.34-1 -5.07-3	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2 -2.30-3 1.588+1 1.689 3.05-2 2.54-2 1.155+1 1.234 8.16-1 1.31-1 1.488+1 1.165 9.20-1 1.32-1 9000 5.901+0 1.783 3.33-1 -5.97-3	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2 -8.20-4 1.259+1 1.705 1.34-1 2.91-2 8.269+0 1.216 1.01+0 1.43-1 1.057+1 1.130 1.09+0 1.48-1 10000 4.968+0 1.798 1.80-1 -6.65-3	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1 1.53-3 1.015+1 1.713 2.52-1 3.23-2 6.086+0 1.191 1.18+0 1.54-1 7.729+0 1.093 1.24+0 1.64-1 11000 4.231+0 1.811 6.34-2 -7.19-3	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1 4.40-3 8.300+0 1.714 3.57-1 3.51-2 4.584+0 1.162 1.33+0 1.65-1 5.784+0 1.055 1.38+0 1.79-1 12000 3.641+0 1.822 -2.55-2 -7.65-3	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1 1.12-2 5.757+0 1.703 6.34-1 3.98-2 2.752+0 1.099 1.58+0 1.85-1 3.432+0 0.979 1.59+0 2.08-1 14000 2.768+0 1.841 -1.41-1 -8.38-3	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 6.53-1 1.90-2 4.153+0 1.682 8.85-1 4.38-2 1.755+0 1.033 1.79+0 2.04-1 2.166+0 0.907 1.77+0 2.34-1 16000 2.166+0 1.856 -1.95-1 -8.95-3
Shell $3s_{1/2}$ $E_b$ = $4822.0 \text{ eV}$ $3p_{1/2}$ $E_b$ = $4485.0 \text{ eV}$ $3p_{3/2}$ $E_b$ = $3786.6 \text{ eV}$ $3d_{5/2}$ $E_b$ = $3104.9 \text{ eV}$ $\mathbf{Z} = 89, \mathbf{Ac}$ : Shell $3s_{1/2}$ $E_b$ = $5000.6 \text{ eV}$ $3p_{1/2}$ $E_b$ = $4656.8 \text{ eV}$	σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ δ σ β β γ δ δ δ δ δ δ δ δ δ δ δ δ δ	k (eV)	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1 1.32-1 5.054+1 1.323 1.80-1 3.03-2 6.765+1 1.075 -1.48-1 4.86-2 9.087+1 1.159 -4.93-2 4.60-2  5000 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 1.0899 5.84-1 1.90-1	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1 2.42-2 3.632+1 1.510 -1.98-2 1.51-2 3.986+1 1.189 1.10-1 8.13-2 5.281+1 1.211 2.35-1 7.53-2  6000 1.071+1 1.722 1.19+0 -1.46-3 1.644+1 1.339 3.78-1 3.35-2	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2 3.08-3 2.688+1 1.605 -7.61-2 1.67-2 2.512+1 1.233 3.68-1 1.02-1 3.293+1 1.213 4.95-1 9.67-2 7000 8.665+0 1.746 8.04-1 -3.73-3 1.317+1 1.474 1.26-1 5.34-3	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2 -1.98-3 2.042+1 1.658 -4.67-2 2.11-2 1.669+1 1.243 6.04-1 1.17-1 2.167+1 1.194 7.22-1 1.15-1  8000 7.101+0 1.766 5.34-1 -5.07-3 1.062+1 1.536 2.39-2 -1.67-3	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2 -2.30-3 1.588+1 1.689 3.05-2 2.54-2 1.155+1 1.234 8.16-1 1.31-1 1.488+1 1.165 9.20-1 1.32-1 9000 5.901+0 1.783 3.33-1 -5.97-3 8.666+0 1.567 1.25-2 -2.73-3	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2 -8.20-4 1.259+1 1.705 1.34-1 2.91-2 8.269+0 1.216 1.01+0 1.43-1 1.057+1 1.130 1.09+0 1.48-1 10000 4.968+0 1.798 1.80-1 -6.65-3 7.154+0 1.581 5.25-2 -1.61-3	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1 1.53-3 1.015+1 1.713 2.52-1 3.23-2 6.086+0 1.191 1.18+0 1.54-1 7.729+0 1.093 1.24+0 1.64-1 11000 4.231+0 1.811 6.34-2 -7.19-3 5.971+0 1.584 1.22-1 5.32-4	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1 4.40-3 8.300+0 1.714 3.77-1 3.51-2 4.584+0 1.162 1.33+0 1.65-1 5.784+0 1.055 1.38+0 1.79-1 12000 3.641+0 1.822 -2.55-2 -7.65-3 5.034+0 1.581 2.09-1 3.26-3	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1 1.12-2 5.757+0 1.703 6.34-1 3.98-2 2.752+0 1.099 1.58+0 1.85-1 3.432+0 0.979 1.59+0 2.08-1  14000 2.768+0 1.841 -1.41-1 -8.38-3 3.676+0 1.562 4.07-1 9.78-3	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 6.53-1 1.90-2 4.153+0 1.682 8.85-1 4.38-2 1.755+0 1.033 1.79+0 2.04-1 2.166+0 0.907 1.77+0 2.34-1  16000 2.166+0 1.856 -1.95-1 -8.95-3 2.767+0 1.535 6.11-1 1.71-2
Shell $3s_{1/2}$ $E_b$ = $4822.0 \text{ eV}$ $3p_{1/2}$ $E_b$ = $4485.0 \text{ eV}$ $3p_{3/2}$ $E_b$ = $3786.6 \text{ eV}$ $3d_{3/2}$ $E_b$ = $3248.4 \text{ eV}$ $3d_{5/2}$ $E_b$ = $3104.9 \text{ eV}$ $\mathbf{Z} = 89$ , $\mathbf{Ac}$ : Shell $3s_{1/2}$ $E_b$ = $5000.6 \text{ eV}$ $3p_{1/2}$ $E_b$ = $5000.6 \text{ eV}$	σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ δ σ β γ δ δ σ β δ σ δ δ δ δ δ δ δ δ δ δ δ δ δ	k (eV)           4000           0.000+0           0.000+0           0.000+0           0.000+0           0.000+0           0.000+0           0.00+0           0.00+0           0.00+0           0.00+0           1.045-1           1.242+2           0.769           -3.03-1           -1.45-2           1.710+2           0.965           -2.88-1           -4.41-3           13/2 75/1/2           k (eV)           4000           0.000+0           0.000+0           0.000+0           0.000+0           0.000+0           0.000+0           0.000+0	1.317+1 1.712 1.74+0 3.08-3 2.044+1 1.042 6.15-1 1.32-1 5.054+1 1.323 1.80-1 3.03-2 6.765+1 1.075 -1.48-1 4.86-2 9.087+1 1.159 -4.93-2 4.60-2  5000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.009+0 0.0099 5.84-1	1.070+1 1.742 1.07+0 -1.94-3 1.637+1 1.380 3.04-1 2.42-2 3.632+1 1.510 -1.98-2 1.51-2 3.986+1 1.189 1.10-1 8.13-2 5.281+1 1.211 2.35-1 7.53-2 6000 1.071+1 1.722 1.19+0 -1.46-3 1.644+1 1.339 3.78-1	8.614+0 1.763 7.18-1 -3.82-3 1.301+1 1.494 8.73-2 3.08-3 2.688+1 1.605 -7.61-2 1.67-2 2.512+1 1.233 3.68-1 1.02-1 3.293+1 1.213 4.95-1 9.67-2 7000 8.665+0 1.746 8.04-1 -3.73-3 1.317+1 1.474 1.26-1	7.036+0 1.782 4.63-1 -4.99-3 1.044+1 1.548 1.20-2 -1.98-3 2.042+1 1.658 -4.67-2 2.11-2 1.669+1 1.243 6.04-1 1.17-1 2.167+1 1.194 7.22-1 1.15-1  8000 7.101+0 1.766 5.34-1 -5.07-3 1.062+1 1.536 2.39-2	5.832+0 1.798 2.74-1 -5.79-3 8.486+0 1.573 1.88-2 -2.30-3 1.588+1 1.689 3.05-2 2.54-2 1.155+1 1.234 8.16-1 1.31-1 1.488+1 1.165 9.20-1 1.32-1 9000 5.901+0 1.783 3.33-1 -5.97-3 8.666+0 1.567 1.25-2	4.900+0 1.812 1.31-1 -6.39-3 6.981+0 1.583 7.14-2 -8.20-4 1.259+1 1.705 1.34-1 2.91-2 8.269+0 1.216 1.01+0 1.43-1 1.057+1 1.130 1.09+0 1.48-1  10000 4.968+0 1.798 1.80-1 -6.65-3 7.154+0 1.581 5.25-2	4.166+0 1.825 2.30-2 -6.86-3 5.810+0 1.584 1.49-1 1.53-3 1.015+1 1.713 2.52-1 3.23-2 6.086+0 1.191 1.18+0 1.54-1 7.729+0 1.093 1.24+0 1.64-1 11000 4.231+0 1.811 6.34-2 -7.19-3 5.971+0 1.584 1.22-1	3.579+0 1.836 -5.73-2 -7.25-3 4.887+0 1.579 2.42-1 4.40-3 8.300+0 1.714 3.77-1 3.51-2 4.584+0 1.62 1.33+0 1.65-1 5.784+0 1.055 1.38+0 1.79-1 12000 3.641+0 1.822 -2.55-2 -7.65-3 5.034+0 1.581 2.09-1	2.715+0 1.854 -1.57-1 -7.88-3 3.554+0 1.557 4.45-1 1.12-2 5.757+0 1.703 6.34-1 3.98-2 2.752+0 1.099 1.58+0 1.85-1 3.432+0 0.979 1.59+0 2.08-1  14000 2.768+0 1.841 -1.41-1 -8.38-3 3.676+0 1.562 4.07-1	2.121+0 1.868 -1.99-1 -8.38-3 2.667+0 1.527 6.53-1 1.90-2 4.153+0 1.682 8.85-1 4.38-2 1.755+0 1.033 1.79+0 2.04-1 2.166+0 0.907 1.77+0 2.34-1  16000 2.166+0 1.856 -1.95-1 -8.95-3 2.767+0 1.535 6.11-1

Table 1 (conti	,	C 00 3	1 11 1	1.67 3	7.40	E 07 3	714 3	104 1	2 10 1	2.41 1	E 0.4 1	0.42 4
3916.7 eV	$_{\delta}^{\gamma}$	-6.89-2 $2.51-1$	2.22-1 3.75-2	1.67-3 1.59-2	-7.46-2 $1.64-2$	-5.97-2 2.07-2	7.14-3 2.52-2	1.04-1 2.92-2	2.18-1 3.27-2	3.41-1 3.57-2	5.94-1 4.05-2	8.42-1 4.43-2
$3d_{3/2}$	σ	1.296+2	7.128+1	4.213+1	2.661+1	1.771+1	1.228+1	8.802+0	6.485+0	4.889+0	2.941+0	1.878+0
$E_b =$	β	0.695	1.045	1.175	1.227	1.242	1.238	1.222	1.199	1.172	1.111	1.048
3370.1 eV	γ	-3.04 - 1	-1.88 - 1	6.02 - 2	3.16 - 1	5.56 - 1	7.75 - 1	9.70 - 1	1.14+0	1.30+0	1.56+0	1.77+0
	δ	-2.78-2	4.23-2	7.77-2	9.97-2	1.16-1	1.30-1	1.42-1	1.53-1	1.63-1	1.82-1	2.00-1
3d <sub>5/2</sub>	σ	1.791+2	9.577+1	5.578+1	3.485+1	2.297+1	1.580+1	1.124+1	8.222+0	6.158+0	3.660+0	2.313+0
E <sub>b</sub> = 3219.7 eV	β	0.917 -3.09-1	1.144 -9.37-2	1.207 1.88-1	1.215 4.50-1	1.199	1.172	1.139 1.07+0	1.102	1.064	0.990 1.57+0	0.918
32 19.7 EV	$\gamma \\ \delta$	-3.09-1 -1.46-2	$\frac{-9.57-2}{4.06-2}$	7.15–2	9.37—2	6.83-1 1.13-1	8.88-1 1.30-1	1.46-1	1.22+0 1.62-1	1.35+0 1.76-1	2.03-1	1.75+0 2.29-1
Z = 90, Th:			2	71.0 2	0.0.		1.50		1,02 1		2.03	2,20 1
· · ·	. ,	k (eV)										
Shell		4000	5000	6000	7000	8000	9000	10000	11000	12000	14000	16000
3s <sub>1/2</sub>	σ	0.000+0	0.000+0	1.070+1	8.706+0	7.159+0	5.965+0	5.032+0	4.293+0	3.700+0	2.818+0	2.209+0
$E_b =$	β	0.000	0.000	1.700	1.727	1.748	1.766	1.782	1.795	1.807	1.827	1.843
5182.3 eV	γ	0.00+0	0.00+0	1.32+0	9.00-1	6.11-1	3.97-1	2.34-1	1.08-1	9.95-3	-1.21-1	-1.87-
n	δ	0.00+0	0.00+0	-8.01-4	-3.56-3	-5.11-3	-6.15-3	-6.93-3	-7.55-3	-8.08-3	-8.90-3	-9.51-
$ 3p_{1/2}  E_b = $	$\sigma$	0.000+0 0.000	1.950+1 0.641	1.647+1 1.289	1.329+1 1.449	1.078+1 1.522	8.836+0 1.559	7.319+0 1.576	6.127+0 1.583	5.178+0 1.582	3.795+0 1.567	2.865+0 1.542
иь— 4830.4 eV	$\beta$ $\gamma$	0.000	3.36-1	4.57-1	1.73-1	4.20-2	1.09-2	3.76-2	9.84-2	1.79-1	3.69-1	5.67-1
1050.1 CV	δ	0.00+0	2.80-1	4.64-2	8.43-3	-1.11-3	-3.08-3	-2.38-3	-4.80-4	2.08-3	8.25-3	1.52-2
$3p_{3/2}$	σ	0.000+0	5.256+1	3.813+1	2.838+1	2.166+1	1.691+1	1.345+1	1.087+1	8.913+0	6.205+0	4.490+0
$E_b =$	β	0.000	1.213	1.454	1.570	1.636	1.674	1.697	1.710	1.715	1.711	1.696
4046.1 eV	γ	0.00+0	2.64 - 1	2.65 - 2	-7.01-2	-6.99-2	-1.36-2	7.58-2	1.85 - 1	3.04 - 1	5.52 - 1	7.96 - 1
0.1	δ	0.00+0	4.69-2	1.72-2	1.63-2	2.03-2	2.50-2	2.93-2	3.30-2	3.61-2	4.10-2	4.47-2
$3d_{3/2}$	σ	1.344+2	7.495+1	4.445+1	2.814+1	1.876+1	1.303+1	9.351+0	6.897+0	5.206+0	3.137+0	2.007+0
E <sub>b</sub> = 3490.8 eV	β	0.616 $-2.92-1$	1.010 -2.26-1	1.158 1.23-2	1.219 2.67-1	1.240 5.09-1	1.240 7.31-1	1.227 9.29-1	1.207 1.10+0	1.182 1.26+0	1.124 1.52+0	1.064 1.74+0
J-13U.0 EV	$_{\delta}^{\gamma}$	-2.92-1 -4.16-2	-2.26-1 3.54-2	7.41–2	2.67—1 9.76—2	5.09-1 1.15-1	7.31-1 1.29-1	9.29-1 1.41-1	1.10+0 1.51-1	1.26+0 1.61-1	1.52+0 1.79-1	1.74+0 1.97-1
$3d_{5/2}$	σ	1.867+2	1.007+2	5.880+1	3.680+1	2.430+1	1.673+1	1.192+1	8.728+0	6.543+0	3.896+0	2.465+0
$E_b =$	β	0.862	1.127	1.202	1.216	1.204	1.179	1.146	1.111	1.074	1.001	0.932
3332.0 eV	γ	-3.21-1	-1.36-1	1.42-1	4.07-1	6.45-1	8.54-1	1.03+0	1.19+0	1.33+0	1.55+0	1.74+0
	δ	-2.58-2	3.52 - 2	6.78 - 2	9.09 - 2	1.10 - 1	1.28 - 1	1.44 - 1	1.58 - 1	1.72 - 1	1.99 - 1	2.25 - 1
Z = 91, Pa:	[Rn]5f	${ m f}_{5/2}^2~6{ m d}_{3/2}^1~7{ m s}_{1/2}^2$	2									
		k (eV)										
Shell		4000	5000	6000	7000	8000	9000	10000	11000	12000	14000	16000
3s <sub>1/2</sub>	σ	0.000+0	0.000+0	1.066+1	8.738+0	7.213+0	6.025+0	5.093+0	4.352+0	3.756+0	2.868+0	2.252+0
$E_b = 5366.9 \text{ eV}$	β	0.000	0.000	1.676	1.705	1.727	1.747	1.764	1.779	1.792	1.814	1.831
5366.9 ev	$\gamma \\ \delta$	0.00+0 0.00+0	0.00+0 0.00+0	1.48+0 2.49-4	1.01+0 -3.27-3	7.00-1 -5.11-3	4.70 - 1 $-6.33 - 3$	2.94-1 -7.21-3	1.57-1 -7.88-3	5.07-2 -8.44-3	-9.43-2 $-9.34-3$	-1.74- -1.00-
$3p_{1/2}$	σ	0.000+0	0.000+0	1.645+1	1.340+1	1.093+1	8.997+0	7.477+0	6.276+0	5.318+0	3.915+0	2.966+0
$E_b =$	β	0.000	0.000	1.228	1.418	1.504	1.549	1.571	1.581	1.582	1.571	1.548
5002.7 eV	γ	0.00+0	0.00+0	5.40 - 1	2.29 - 1	6.74 - 2	1.46 - 2	2.65 - 2	7.62 - 2	1.49 - 1	3.28 - 1	5.24-1
	δ	0.00+0	0.00+0	6.42 - 2	1.28 - 2	-2.23-4	-3.36 - 3	-3.13 - 3	-1.48 - 3	9.02 - 4	6.89 - 3	1.38 - 2
$3p_{3/2}$	σ	0.000+0	5.354+1	3.906+1	2.916+1	2.230+1	1.744+1	1.389+1	1.124+1	9.226+0	6.438+0	4.667+0
$E_b =$	β	0.000	1.141	1.418	1.547	1.620	1.665	1.691	1.707	1.714	1.714	1.701
4173.8 eV	γ	0.00+0	3.05-1	5.62-2	-6.21-2	-7.78-2	-3.26-2	4.81-2	1.50-1	2.64-1	5.09-1	7.53-1
2.1	δ	0.00+0	5.99-2	1.92-2	1.62-2	2.00-2	2.48-2	2.91-2	3.29-2	3.63-2	4.16-2	4.56-2
3d <sub>3/2</sub>	σ	1.388+2	7.875+1 0.970	4.689+1	2.975+1	1.986+1	1.381+1	9.928+0	7.333+0	5.542+0	3.346+0	2.144+0
E <sub>b</sub> = 3606.4 eV	β	0.522 $-2.62-1$	-2.61-1	1.138 -3.46-2	1.210 2.18-1	1.237 4.58-1	1.241 6.79-1	1.232 8.81-1	1.214 1.06+0	1.191 1.23+0	1.136 1.50+0	1.077 1.72+0
5500. <del>1</del> €V	$_{\delta}^{\gamma}$	-2.02-1 -5.38-2	2.75-2	-3.40-2 $7.06-2$	9.57—2	1.13-1	1.27-1	1.39-1	1.51-1	1.61-1	1.79-1	1.72+0
3d <sub>5/2</sub>	σ	1.945+2	1.059+2	6.202+1	3.888+1	2.570+1	1.772+1	1.264+1	9.265+0	6.954+0	4.147+0	2.628+0
$E_b =$	β	0.796	1.107	1.196	1.216	1.208	1.185	1.155	1.122	1.086	1.013	0.943
3439.4 eV	γ	-3.23 - 1	-1.78 - 1	9.75 - 2	3.64 - 1	6.02 - 1	8.12 - 1	9.98 - 1	1.16+0	1.30+0	1.54+0	1.72+0
	δ	-3.82-2	2.92-2	6.44-2	8.81-2	1.07-1	1.24-1	1.41-1	1.56-1	1.71-1	1.97-1	2.22-1
Z = 92, U:	[Rn]5f	$\frac{3}{5/2}$ 6d $\frac{1}{3/2}$ 7s $\frac{2}{1/2}$	2									
		k (eV)										
		4000	5000	6000	7000	8000	9000	10000	11000	12000	14000	16000
$3s_{1/2}$	σ	4000 0.000+0	0.000+0	1.059+1	8.751+0	7.252+0	6.075+0	5.146+0	4.405+0	3.807+0	2.914+0	2.293+0
$3s_{1/2}$ $E_b =$	β	4000 0.000+0 0.000	0.000+0 0.000	1.059+1 1.651	8.751+0 1.683	7.252+0 1.707	6.075+0 1.727	5.146+0 1.745	4.405+0 1.761	3.807+0 1.776	2.914+0 1.799	2.293+ 1.817
$3s_{1/2}$ $E_b =$	$\beta$ $\gamma$	4000 0.000+0 0.000 0.00+0	0.000+0 0.000 0.00+0	1.059+1 1.651 1.65+0	8.751+0 1.683 1.12+0	7.252+0 1.707 7.88-1	6.075+0 1.727 5.45-1	5.146+0 1.745 3.57-1	4.405+0 1.761 2.09-1	3.807+0 1.776 9.44-2	2.914+0 1.799 -6.54-2	2.293+0 1.817 -1.58-
3s <sub>1/2</sub> E <sub>b</sub> = 5548.0 eV	$eta \ eta \ \delta$	4000 0.000+0 0.000 0.00+0 0.00+0	0.000+0 0.000 0.00+0 0.00+0	1.059+1 1.651 1.65+0 1.62-3	8.751+0 1.683 1.12+0 -2.88-3	7.252+0 1.707 7.88-1 -5.04-3	6.075+0 1.727 5.45-1 -6.46-3	5.146+0 1.745 3.57-1 -7.47-3	4.405+0 1.761 2.09-1 -8.23-3	3.807+0 1.776 9.44-2 -8.85-3	2.914+0 1.799 -6.54-2 -9.82-3	2.293+0 1.817 -1.58- -1.06-
$3s_{1/2}$ $E_b = 5548.0 \text{ eV}$ $3p_{1/2}$	$\beta$ $\gamma$ $\delta$ $\sigma$	4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0	0.000+0 0.000 0.00+0 0.00+0 0.000+0	1.059+1 1.651 1.65+0 1.62-3 1.636+1	8.751+0 1.683 1.12+0 -2.88-3 1.347+1	7.252+0 1.707 7.88-1 -5.04-3 1.106+1	6.075+0 1.727 5.45-1 -6.46-3 9.144+0	5.146+0 1.745 3.57-1 -7.47-3 7.626+0	4.405+0 1.761 2.09-1 -8.23-3 6.420+0	3.807+0 1.776 9.44-2 -8.85-3 5.453+0	2.914+0 1.799 -6.54-2 -9.82-3 4.032+0	2.293+ 1.817 -1.58- -1.06- 3.065+
$3s_{1/2}$ $E_b = 5548.0 \text{ eV}$ $3p_{1/2}$ $E_b = 6$	$\beta$ $\gamma$ $\delta$ $\sigma$ $\beta$	4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000	0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000	1.059+1 1.651 1.65+0 1.62-3 1.636+1 1.151	8.751+0 1.683 1.12+0 -2.88-3 1.347+1 1.383	7.252+0 1.707 7.88-1 -5.04-3 1.106+1 1.484	6.075+0 1.727 5.45-1 -6.46-3 9.144+0 1.536	5.146+0 1.745 3.57-1 -7.47-3 7.626+0 1.564	4.405+0 1.761 2.09-1 -8.23-3 6.420+0 1.577	3.807+0 1.776 9.44-2 -8.85-3 5.453+0 1.581	2.914+0 1.799 -6.54-2 -9.82-3 4.032+0 1.574	2.293+ 1.817 -1.58- -1.06- 3.065+ 1.554
$3s_{1/2}$ $E_b = 5548.0 \text{ eV}$ $3p_{1/2}$ $E_b = 6$	$\beta$ $\gamma$ $\delta$ $\sigma$	4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0	0.000+0 0.000 0.00+0 0.00+0 0.000+0	1.059+1 1.651 1.65+0 1.62-3 1.636+1	8.751+0 1.683 1.12+0 -2.88-3 1.347+1	7.252+0 1.707 7.88-1 -5.04-3 1.106+1	6.075+0 1.727 5.45-1 -6.46-3 9.144+0	5.146+0 1.745 3.57-1 -7.47-3 7.626+0	4.405+0 1.761 2.09-1 -8.23-3 6.420+0	3.807+0 1.776 9.44-2 -8.85-3 5.453+0	2.914+0 1.799 -6.54-2 -9.82-3 4.032+0	2.293+ 1.817 -1.58- -1.06- 3.065+ 1.554 4.81-1
$3s_{1/2}$ $E_b =$ $5548.0 \text{ eV}$ $3p_{1/2}$ $E_b =$ $5182.2 \text{ eV}$	$\begin{array}{c} \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \end{array}$	4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000 0.00+0	0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000 0.000+0	1.059+1 1.651 1.65+0 1.62-3 1.636+1 1.151 6.16-1	8.751+0 1.683 1.12+0 -2.88-3 1.347+1 1.383 2.95-1	7.252+0 1.707 7.88-1 -5.04-3 1.106+1 1.484 1.01-1	6.075+0 1.727 5.45-1 -6.46-3 9.144+0 1.536 2.40-2	5.146+0 1.745 3.57-1 -7.47-3 7.626+0 1.564 1.95-2	4.405+0 1.761 2.09-1 -8.23-3 6.420+0 1.577 5.79-2	3.807+0 1.776 9.44-2 -8.85-3 5.453+0 1.581 1.22-1	2.914+0 1.799 -6.54-2 -9.82-3 4.032+0 1.574 2.91-1	2.293+( 1.817 -1.58- -1.06- 3.065+( 1.554 4.81-1 1.22-2
$3s_{1/2}$ $E_b =$ $5548.0 \text{ eV}$ $3p_{1/2}$ $E_b =$ $5182.2 \text{ eV}$	$\begin{array}{c} \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \end{array}$	4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0	0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000 0.00+0 0.00+0	1.059+1 1.651 1.65+0 1.62-3 1.636+1 1.151 6.16-1 8.93-2	8.751+0 1.683 1.12+0 -2.88-3 1.347+1 1.383 2.95-1 1.87-2 2.991+1 1.523	7.252+0 1.707 7.88-1 -5.04-3 1.106+1 1.484 1.01-1 1.19-3 2.293+1 1.604	6.075+0 1.727 5.45-1 -6.46-3 9.144+0 1.536 2.40-2 -3.44-3 1.796+1 1.653	5.146+0 1.745 3.57-1 -7.47-3 7.626+0 1.564 1.95-2 -3.81-3 1.433+1 1.684	4.405+0 1.761 2.09-1 -8.23-3 6.420+0 1.577 5.79-2 -2.45-3	3.807+0 1.776 9.44-2 -8.85-3 5.453+0 1.581 1.22-1 -2.62-4 9.540+0 1.712	2.914+0 1.799 -6.54-2 -9.82-3 4.032+0 1.574 2.91-1 5.46-3	2.293+( 1.817 -1.58- -1.06- 3.065+( 1.554 4.81-1 1.22-2
$3s_{1/2}$ $E_b =$ 5548.0  eV $3p_{1/2}$ $E_b =$ 5182.2  eV $3p_{3/2}$ $E_b =$	$\begin{array}{c} \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \end{array}$	4000 0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.00+0	0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000 0.00+0 0.00+0 5.442+1	1.059+1 1.651 1.65+0 1.62-3 1.636+1 1.151 6.16-1 8.93-2 3.994+1	8.751+0 1.683 1.12+0 -2.88-3 1.347+1 1.383 2.95-1 1.87-2 2.991+1	7.252+0 1.707 7.88-1 -5.04-3 1.106+1 1.484 1.01-1 1.19-3 2.293+1	6.075+0 1.727 5.45-1 -6.46-3 9.144+0 1.536 2.40-2 -3.44-3 1.796+1	5.146+0 1.745 3.57-1 -7.47-3 7.626+0 1.564 1.95-2 -3.81-3 1.433+1	4.405+0 1.761 2.09-1 -8.23-3 6.420+0 1.577 5.79-2 -2.45-3 1.161+1	3.807+0 1.776 9.44-2 -8.85-3 5.453+0 1.581 1.22-1 -2.62-4 9.540+0	2.914+0 1.799 -6.54-2 -9.82-3 4.032+0 1.574 2.91-1 5.46-3 6.670+0	2.293+( 1.817 -1.58- -1.06- 3.065+( 1.554 4.81-1 1.22-2 4.843+( 1.706
$3s_{1/2}$ $E_b$ = 5548.0 eV $3p_{1/2}$ $E_b$ = 5182.2 eV $3p_{3/2}$ $E_b$ = 4303.4 eV	$\begin{array}{c} \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \end{array}$	0.000+0 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0	0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 5.442+1 1.057 3.35-1 7.72-2	1.059+1 1.651 1.65+0 1.62-3 1.636+1 1.151 6.16-1 8.93-2 3.994+1 1.380 8.88-2 2.18-2	8.751+0 1.683 1.12+0 -2.88-3 1.347+1 1.383 2.95-1 1.87-2 2.991+1 1.523 -5.03-2 1.63-2	7.252+0 1.707 7.88-1 -5.04-3 1.106+1 1.484 1.01-1 1.19-3 2.293+1 1.604 -8.24-2 1.96-2	6.075+0 1.727 5.45-1 -6.46-3 9.144+0 1.536 2.40-2 -3.44-3 1.796+1 1.653 -4.89-2 2.45-2	5.146+0 1.745 3.57-1 -7.47-3 7.626+0 1.564 1.95-2 -3.81-3 1.433+1 1.684 2.33-2 2.90-2	4.405+0 1.761 2.09-1 -8.23-3 6.420+0 1.577 5.79-2 -2.45-3 1.161+1 1.702 1.18-1 3.30-2	3.807+0 1.776 9.44-2 -8.85-3 5.453+0 1.581 1.22-1 -2.62-4 9.540+0 1.712 2.27-1 3.65-2	2.914+0 1.799 -6.54-2 -9.82-3 4.032+0 1.574 2.91-1 5.46-3 6.670+0 1.716 4.66-1 4.21-2	2.293+0 1.817 -1.58- -1.06- 3.065+0 1.554 4.81-1 1.22-2 4.843+0 1.706 7.09-1 4.63-2
$3s_{1/2}$ $E_b$ = 5548.0 eV $3p_{1/2}$ $E_b$ = 5182.2 eV $3p_{3/2}$ $E_b$ = 4303.4 eV $3d_{3/2}$	$ \begin{array}{c} \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \end{array} $	0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.423+2	0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 0.00+0 5.442+1 1.057 3.35-1 7.72-2 8.261+1	1.059+1 1.651 1.65+0 1.62-3 1.636+1 1.151 6.16-1 8.93-2 3.994+1 1.380 8.88-2 2.18-2 4.940+1	8.751+0 1.683 1.12+0 -2.88-3 1.347+1 1.383 2.95-1 1.87-2 2.991+1 1.523 -5.03-2 1.63-2 3.141+1	7.252+0 1.707 7.88-1 -5.04-3 1.106+1 1.484 1.01-1 1.19-3 2.293+1 1.604 -8.24-2 1.96-2 2.101+1	6.075+0 1.727 5.45-1 -6.46-3 9.144+0 1.536 2.40-2 -3.44-3 1.796+1 1.653 -4.89-2 2.45-2 1.463+1	5.146+0 1.745 3.57-1 -7.47-3 7.626+0 1.564 1.95-2 -3.81-3 1.433+1 1.684 2.33-2 2.90-2 1.053+1	4.405+0 1.761 2.09-1 -8.23-3 6.420+0 1.577 5.79-2 -2.45-3 1.161+1 1.702 1.18-1 3.30-2 7.787+0	3.807+0 1.776 9.44-2 -8.85-3 5.453+0 1.581 1.22-1 -2.62-4 9.540+0 1.712 2.27-1 3.65-2 5.891+0	2.914+0 1.799 -6.54-2 -9.82-3 4.032+0 1.574 2.91-1 5.46-3 6.670+0 1.716 4.66-1 4.21-2 3.565+0	2.293+0 1.817 -1.58- -1.06- 3.065+0 1.554 4.81-1 1.22-2 4.843+0 7.09-1 4.63-2 2.288+0
Shell $3s_{1/2}$ $E_b$ = $5548.0 \text{ eV}$ $3p_{1/2}$ $E_b$ = $5182.2 \text{ eV}$ $3p_{3/2}$ $E_b$ = $4303.4 \text{ eV}$ $3d_{3/2}$ $E_b$ = $3727.6 \text{ eV}$	$ \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \beta \\ \gamma \\ \delta $	0.000+0 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0	0.000+0 0.000 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0 5.442+1 1.057 3.35-1 7.72-2	1.059+1 1.651 1.65+0 1.62-3 1.636+1 1.151 6.16-1 8.93-2 3.994+1 1.380 8.88-2 2.18-2	8.751+0 1.683 1.12+0 -2.88-3 1.347+1 1.383 2.95-1 1.87-2 2.991+1 1.523 -5.03-2 1.63-2	7.252+0 1.707 7.88-1 -5.04-3 1.106+1 1.484 1.01-1 1.19-3 2.293+1 1.604 -8.24-2 1.96-2	6.075+0 1.727 5.45-1 -6.46-3 9.144+0 1.536 2.40-2 -3.44-3 1.796+1 1.653 -4.89-2 2.45-2	5.146+0 1.745 3.57-1 -7.47-3 7.626+0 1.564 1.95-2 -3.81-3 1.433+1 1.684 2.33-2 2.90-2	4.405+0 1.761 2.09-1 -8.23-3 6.420+0 1.577 5.79-2 -2.45-3 1.161+1 1.702 1.18-1 3.30-2	3.807+0 1.776 9.44-2 -8.85-3 5.453+0 1.581 1.22-1 -2.62-4 9.540+0 1.712 2.27-1 3.65-2	2.914+0 1.799 -6.54-2 -9.82-3 4.032+0 1.574 2.91-1 5.46-3 6.670+0 1.716 4.66-1 4.21-2	2.293+0 1.817 -1.58- -1.06- 3.065+0 1.554 4.81-1 1.22-2 4.843+0

1869	·	δ	-5.81-2	1.85-2	6.61-2	9.35-2	1.12-1	1.26-1	1.38-1	1.49-1	1.60-1	1.77-1	1.94-
		σ	2.015+2	1.112+2	6.531+1	4.102+1	2.715+1	1.874+1	1.338+1	9.822+0	7.379+0	4.409+0	2.798+
		β											0.955
193   196	551.7 eV												1.71+0
Rest   1	02 N				6.04-2	8.53-2	1.05-1	1.21-1	1.38-1	1.53-1	1.68-1	1.95-1	2.19-
	= 93, Np:	[Kn]51		2									
12	iell			3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
		σ											3.856+
336 e	=	β	0.000	0.000	0.000	0.000		1.659	1.684		1.725	1.742	1.757
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		γ					1.84+0	1.24+0					1.43-
Section   Sec													-9.27
1667   Y   0.00+0													5.585
1													1.580
	866.7 eV												9.79-
													-1.41
334 eV   y   0,000+0   0,000+0   0,000+0   0,354-1   1,24-1   -3,48-2   -8,38-2   -2,7-2   5,24-3   3,30-2     y   x   0,000+0   0,000+0   0,000+0   1,01-1   2,54-2   1,65-2   1,93-2   2,41-2   2,83-2   3,31-2     y   x   0,000+0   0,000+0   0,000+0   0,000+0   1,01-1   1,25-1   1,085   1,226     y   0,000+0   0,000+0   0,000+0   -3,31-1   -1,27-1   1,18-1   3,59-1   5,82-1   7,86-1   9,73-1     y   x   0,000+0   0,000+0   0,000+0   -3,31-2   0,000+2   1,01-1   1,25-1   1,37-1   1,48-1     y   y   0,000+0   0,000+0   0,000+0   2,077-2   1,166+2   6,87+1   4,223+1   2,866+1   1,981+1   1,415+1   1,040+1     y   y   0,000+0   0,000+0   -2,70-1   -2,56-1   4,64-3   2,75-1   5,20-1   7,35-1   9,26-1   1,10-0     y   0,000+0   0,000+0   -2,70-1   -2,56-1   4,64-3   2,75-1   5,20-1   7,35-1   9,26-1   1,10-0     y   y   0,000+0   0,000+0   -2,70-1   -2,56-1   4,64-3   2,75-1   5,20-1   7,35-1   9,26-1   1,10-0     y   y   3,81-1   3,40-1   6,56-1   4,87-1   3,40-1   2,16-1   1,12-1   1,19-1   1,75-1   1,75-1     y   y   y   y   y   y   y   y   y													9.856 1.710
1													1.710
192	133.4 EV	γ S											3.67-
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1, ,,												6.256
Mas   P   0,000+0   0,000+0   -1,30-1   -3,19-1   1,127-1   1,18-1   3,59-1   5,82-1   7,86-1   9,73-1													1.207
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$													1.14+
5/2         σ         0.000+0         0.000+0         2.077+2         1.166+2         6.87+1         4.32+1         2.866+1         1.981+1         1.415+1         1.00+0           65.2         γ         0.000+0         0.000+0         -2.07-1         -2.56-1         4.64-3         2.75-1         5.20-1         7.35-1         9.26-1         1.10+0           65.2         γ         0.00+0         0.00+0         0.06-02         1.49-2         5.59-2         8.23-2         1.02-1         1.19-1         1.35-1         1.50-1           1/2         σ         1.852+1         1.121+1         7.409+0         5.247+0         3.907+0         3.019+0         2.400+0         1.93-0         1.618+0         1.53-1           0.1         γ         3.89-1         8.40-1         6.56-1         4.87-1         3.40-1         2.16-1         1.12-1         2.79-2         -4.04-2         -9.99-2           54. P.U.         R.1815**         7.00-1         4.50-2         -8.74-3         -5.74-3         -6.57-3         -7.42-3         -8.04-3         -8.59-3         -9.09-3           54. P.U.         R.1815**         7.00-1         6.000         0.00-0         0.00-0         0.00-0         0.00-0         0.00-0													1.58-
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	5/2												7.822
565.2 eV         y         0.00+0         0.00+0         -2.70-1         -2.56-1         4.64-3         2.75-1         5.20-1         7.35-1         9.26-1         1.10+0           1/2         σ         1.862+1         1.121+1         7.409+0         5.247+0         3.907+0         3.019+0         2.40+0         1.952+0         1.618+0         1.561-1           1/2         σ         1.532         1.1640         1.858         1.713         1.733         1.749         1.764         1.776         1.776         1.776         1.787         1.796           500.1 eV         γ         9.88-1         8.40-1         6.56-1         4.87-1         3.40-1         2.16-1         1.12-1         2.79-2         -4.04-2         -9.49-2           94 P.W.         R.1815%         2.73*         -4.54-8         -5.74-3         -6.67-3         -7.42-3         -8.04-3         -8.59-3         -9.99-3           94 P.W.         R.1815%         2.73*         -4.54-3         -5.04-1         3.83*         -7.42-3         -8.04-3         -8.59-3         -9.99-3           94 P.W.         R.1815         2.000         0.000+0         0.000+0         0.000+0         1.000+1         1.000+1         1.000+1         1.000+1													1.106
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $													1.25+
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$													1.65-
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1/2	σ										1.361+0	1.160
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		β	1.532	1.640	1.685	1.713	1.733	1.749	1.764	1.776	1.787	1.796	1.804
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	500.1 eV	γ	9.89 - 1	8.40 - 1	6.56 - 1	4.87 - 1	3.40 - 1	2.16 - 1	1.12 - 1	2.79 - 2	-4.04-2	-9.49 - 2	-1.37
ell				-4.22 - 4	-2.91 - 3	-4.54 - 3	-5.74 - 3	-6.67 - 3	-7.42 - 3	-8.04 - 3	-8.59 - 3	-9.09 - 3	-9.54
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	= 94, Pu:	[Rn]5f	$^{6}_{5/2}$ 7s $^{2}_{1/2}$										
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			k (eV)										
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$													12000
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$													3.904
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$													1.736
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	132.9 eV												1.98-
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$													-9.72
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$													5.709 1.577
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$													7.79-
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	041.2 CV												-2.57
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1												1.018
$\begin{array}{cccccccccccccccccccccccccccccccccccc$													1.705
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$													1.61-
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	750.0 CV												3.71-
$\begin{array}{c}                                      $	12/2												6.639
$\begin{array}{cccccccccccccccccccccccccccccccccccc$													1.213
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$													1.10+
$\begin{array}{cccccccccccccccccccccccccccccccccccc$													1.56-
$\begin{array}{c} \mathbf{p} = & \beta & 0.000 & 0.000 & 0.514 & 1.027 & 1.168 & 1.211 & 1.215 & 1.201 & 1.176 & 1.147 \\ 778.1 \text{ eV} & \gamma & 0.00+0 & 0.00+0 & -1.97-1 & -2.91-1 & -4.30-2 & 2.27-1 & 4.77-1 & 7.00-1 & 8.93-1 & 1.06+0 \\ \delta & 0.00+0 & 0.00+0 & -5.80-2 & 6.41-3 & 5.08-2 & 7.85-2 & 9.98-2 & 1.17-1 & 1.33-1 & 1.47-1 \\ 81/2 & \sigma & 1.853+1 & 1.126+1 & 7.478+0 & 5.313+0 & 3.966+0 & 3.070+0 & 2.445+0 & 1.991+0 & 1.651+0 & 1.390+0 \\ 1.681 & \beta & 1.488 & 1.610 & 1.663 & 1.693 & 1.714 & 1.730 & 1.745 & 1.758 & 1.770 & 1.781 \\ 559.3 \text{ eV} & \gamma & 1.02+0 & 8.79-1 & 6.96-1 & 5.28-1 & 3.81-1 & 2.54-1 & 1.46-1 & 5.69-2 & -1.60-2 & -7.43-2 \\ \delta & 5.87-3 & -2.90-5 & -2.83-3 & -4.60-3 & -5.91-3 & -6.95-3 & -7.80-3 & -8.50-3 & -9.09-3 & -9.59-3 \\ \hline = 95. \text{ Am: } [\mathbf{Rn}] 57_{5/2}^{6} 57_{1/2}^{7} 73_{1/2}^{2} \\ \hline \mathbf{etcl} & 2000 & 3000 & 4000 & 5000 & 6000 & 7000 & 8000 & 9000 & 10000 & 11000 \\ \hline 31_{1/2} & \sigma & 0.000+0 & 0.000+0 & 0.000+0 & 0.000+0 & 0.000+0 & 8.704+0 & 7.317+0 & 6.186+0 & 5.278+0 & 4.545+0 \\ 32_{1/2} & \sigma & 0.000+0 & 0.000+0 & 0.000+0 & 0.000+0 & 0.000+0 & 1.605 & 1.635 & 1.661 & 1.682 & 1.700 \\ \hline 31_{2.6} \text{ eV} & \gamma & 0.00+0 & 0.00+0 & 0.00+0 & 0.00+0 & 0.00+0 & 1.50+0 & 1.09+0 & 8.00-1 & 5.78-1 & 4.01-1 \\ \delta & 0.00+0 & 0.00+0 & 0.00+0 & 0.00+0 & 0.00+0 & -5.01-4 & -4.26-3 & -6.48-3 & -8.00-3 & -9.16-3 \\ \hline 27_{1/2} & \sigma & 0.000+0 & 0.000+0 & 0.000+0 & 0.00+0 & -5.01-4 & -4.26-3 & -6.48-3 & -8.00-3 & -9.16-3 \\ \hline 27_{1/2} & \sigma & 0.000+0 & 0.000+0 & 0.000+0 & 0.000+0 & 1.552+1 & 1.348+1 & 1.130+1 & 9.490+0 & 8.012+0 & 6.813+0 \\ 27_{1/2} & \sigma & 0.000+0 & 0.000+0 & 0.000+0 & 0.000+0 & 0.000+0 & 1.50-1 & 4.26-3 & -6.48-3 & -8.00-3 & -9.16-3 \\ \hline 27_{1/2} & \sigma & 0.000+0 & 0.000+0 & 0.000+0 & 0.000+0 & 0.000+0 & 1.50-1 & 1.488+1 & 1.130+1 & 9.490+0 & 8.012+0 & 6.813+0 \\ 27_{1/2} & \sigma & 0.000+0 & 0.000+0 & 0.000+0 & 0.000+0 & 0.000+0 & 1.50-1 & 1.548+1 & 1.130+1 & 9.490+0 & 8.012+0 & 6.813+0 \\ 27_{1/2} & \sigma & 0.000+0 & 0.000+0 & 0.000+0 & 0.000+0 & 0.000+0 & 2.71-1 & 5.36-2 & 1.03-2 & -1.81-3 & -5.14-3 & $	15/2	σ	0.000+0	0.000+0									8.288
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$			0.000									1.147	1.115
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			0.00+0	0.00+0	-1.97 - 1		-4.30-2			7.00 - 1	8.93 - 1		1.21+
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$													1.61-
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1/2												1.186
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		β											1.790
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	559.3 eV	γ											-1.20
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		δ	5.87-3	-2.90-5	-2.83-3	-4.60-3	-5.91-3	-6.95 - 3	-7.80-3	-8.50-3	-9.09-3	-9.59-3	-1.0
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	= 95, Am	. [KN]5		2									
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	noll			2000	4000	E000	6000	7000	9000	0000	10000	11000	12000
$\begin{array}{cccccccccccccccccccccccccccccccccccc$													12000
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$													3.946
$\begin{array}{cccccccccccccccccccccccccccccccccccc$													1.716
$\begin{array}{llllllllllllllllllllllllllllllllllll$	132.0 eV												2.58-
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$													-1.01
747.0 eV $\gamma$ 0.00+0 0.00+0 0.00+0 0.00+0 4.96-1 5.40-1 2.52-1 9.34-2 2.92-2 2.52-2 $\delta$ 0.00+0 0.00+0 0.00+0 0.00+0 2.71-1 5.36-2 1.03-2 -1.81-3 -5.14-3 -5.17-3 $\rho_{3/2}$ $\sigma$ 0.000+0 0.000+0 0.000+0 5.618+1 4.253+1 3.217+1 2.484+1 1.956+1 1.568+1 1.276+1 $\rho_{3/2}$													5.834
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$													1.572
$\sigma_{3/2}$ $\sigma$ 0.000+0 0.000+0 0.000+0 5.618+1 4.253+1 3.217+1 2.484+1 1.956+1 1.568+1 1.276+1 ,= $\beta$ 0.000 0.000 0.000 0.673 1.237 1.439 1.546 1.611 1.654 1.682	41.0 eV	γ s											5.93- -3.72
$\beta$ 0.000 0.000 0.000 0.673 1.237 1.439 1.546 1.611 1.654 1.682	1 <sub>2 (2</sub>												1.052
													1.700
NOW BY Y MANUAL													1.700
δ 0.00+0 0.00+0 0.00+0 1.79-1 3.70-2 1.78-2 1.84-2 2.31-2 2.84-2 3.32-2	50.0 CV												3.73-
$\frac{1}{3/2}$ $\sigma$ 0.000+0 0.000+0 0.000+0 9.413+1 5.728+1 3.671+1 2.470+1 1.728+1 1.249+1 9.263+0	2/2												7.029

Table 1 (conti	inued)											
$E_b =$	$\beta$	0.000	0.000	0.000	0.765	1.034	1.153	1.210	1.234	1.239	1.233	1.219
4092.1 eV	γ	0.00+0	0.00+0	0.00+0	-3.52 - 1	-2.12 - 1	1.67 - 2	2.57 - 1	4.86 - 1	6.96 - 1	8.84 - 1	1.06+0
	δ	0.00+0	0.00+0	0.00+0	-1.69-2	4.85-2	8.35-2	1.06-1	1.23-1	1.36-1	1.46-1	1.55-1
$3d_{5/2}$	σ	0.000+0	0.000+0	2.159+2	1.275+2	7.568+1	4.782+1	3.181+1	2.204+1	1.579+1	1.162+1	8.755+0
$E_b =$	β	0.000	0.000	0.420	0.994	1.156	1.207	1.216	1.205	1.183	1.154	1.124
3886.9 eV	$\gamma \\ \delta$	0.00+0 0.00+0	0.00+0 0.00+0	-7.72-2 $-5.59-3$	-3.21-1 $-2.49-3$	-8.64-2 $4.58-2$	1.80-1 7.48-2	4.33-1 9.68-2	6.60-1 1.15-1	8.58-1 1.31-1	1.03+0 1.45-1	1.18+0 1.58-1
4s <sub>1/2</sub>	σ	1.840+1	1.129+1	7.532+0	5.369+0	4.017+0	3.116+0	2.485+0	2.027+0	1.683+0	1.418+0	1.211+0
$E_b =$	β	1.439	1.579	1.638	1.671	1.694	1.711	1.726	1.740	1.753	1.764	1.774
1619.2 eV	γ	1.04+0	9.16-1	7.37-1	5.70-1	4.21-1	2.92-1	1.82-1	8.84-2	1.13-2	-5.13-2	-1.01-1
	δ	7.21 - 3	4.18 - 4	-2.71 - 3	-4.66 - 3	-6.08 - 3	-7.22 - 3	-8.15 - 3	-8.92 - 3	-9.57 - 3	-1.01-2	-1.06-2
Z = 96, Cm	: [Rn]5		$\frac{1}{3/2}$ 7s $\frac{2}{1/2}$									
		k (eV)										
Shell		2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
$3s_{1/2}$	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	8.649+0	7.315+0	6.206+0	5.309+0	4.580+0	3.984+0
$E_b = 6342.5 \text{ eV}$	$eta \gamma$	0.000 0.00+0	0.000 0.00+0	0.000 0.00+0	0.000 0.00+0	0.000 0.00+0	1.571 1.67+0	1.606 1.21+0	1.634 8.99-1	1.657 6.63-1	1.677 4.75-1	1.694 3.22-1
0342.3 EV	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	1.14-3	-3.69-3	-6.32 - 3	-8.09-3	-9.42 - 3	-1.05-2
$3p_{1/2}$	σ	0.000+0	0.000+0	0.000+0	0.000+0	1.463+1	1.339+1	1.133+1	9.564+0	8.110+0	6.920+0	5.943+0
$E_b =$	β	0.000	0.000	0.000	0.000	0.215	1.172	1.370	1.466	1.519	1.550	1.567
5943.3 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	-2.42 - 1	6.25 - 1	3.20 - 1	1.32 - 1	4.44 - 2	2.37 - 2	4.55 - 2
	δ	0.00+0	0.00+0	0.00+0	0.00+0	3.56 - 1	7.48 - 2	1.59 - 2	-4.48 - 4	-5.29 - 3	-5.96 - 3	-4.80 - 3
$3p_{3/2}$	σ	0.000+0	0.000+0	0.000+0	5.589+1	4.329+1	3.287+1	2.545+1	2.008+1	1.612+1	1.313+1	1.084+1
$E_b =$	β	0.000	0.000	0.000	0.424	1.180	1.403	1.521	1.593	1.641	1.673	1.694
4841.5 eV	γ	0.00+0	0.00+0	0.00+0	8.34-2	2.44-1	3.48-2	-6.74-2	-8.79-2	-5.53-2	1.08-2	9.73-2
0.1	δ	0.00+0	0.00+0	0.00+0	2.40-1	4.53-2	1.92-2	1.81-2	2.26-2	2.80-2	3.30-2	3.73-2
3d <sub>3/2</sub>	$\sigma_{\rho}$	0.000+0	0.000+0	0.000+0	9.800+1	6.014+1	3.866+1	2.605+1	1.825+1	1.320+1	9.806+0	7.449+0
$E_b = 4229.4 \text{ eV}$	β	0.000 0.00+0	0.000 0.00+0	0.000 0.00+0	0.695 -3.56-1	0.997 -2.53-1	1.133 -3.34-2	1.199 2.04-1	1.229 4.33-1	1.238 6.43-1	1.235 8.34-1	1.224 1.01+0
4225.4 EV	$\gamma \\ \delta$	0.00+0	0.00+0	0.00+0	-3.30-1 -3.27-2	4.11-2	-3.34-2 7.97-2	1.04-1	1.22-1	1.34-1	1.45-1	1.55-1
3d <sub>5/2</sub>	σ	0.000+0	0.000+0	0.000+0	1.333+2	7.952+1	5.033+1	3.353+1	2.326+1	1.667+1	1.229+1	9.264+0
$E_b =$	β	0.000	0.000	0.000	0.952	1.140	1.202	1.217	1.209	1.189	1.162	1.133
4014.9 eV	γ	0.00+0	0.00+0	0.00+0	-3.49 - 1	-1.33-1	1.33-1	3.88-1	6.17-1	8.17-1	9.93-1	1.15+0
	δ	0.00+0	0.00+0	0.00+0	-1.36-2	4.01 - 2	7.12 - 2	9.39 - 2	1.12 - 1	1.28 - 1	1.42 - 1	1.55 - 1
4s <sub>1/2</sub>	σ	1.823+1	1.131+1	7.583+0	5.423+0	4.067+0	3.161+0	2.525+0	2.061+0	1.714+0	1.446+0	1.235+0
$E_b =$	β	1.388	1.544	1.609	1.646	1.671	1.691	1.707	1.722	1.735	1.747	1.758
1688.6 eV	γ	1.06+0	9.55 - 1	7.82 - 1	6.15 - 1	4.65 - 1	3.33-1	2.19 - 1	1.22 - 1	4.15 - 2	-2.49-2	-7.91-2
Z = 97, Bk:	δ	8.80-3	9.71-4	-2.51-3	-4.67-3	-6.25-3	-7.49-3	-8.50-3	-9.33-3	-1.00-2	-1.06-2	-1.12-2
L = 97, DK.	ICIII	k (eV)	/2 /51/2									
Shell		2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
3s <sub>1/2</sub>	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	8.559+0	7.300+0	6.216+0	5.331+0	4.610+0	4.017+0
$E_b =$	β	0.000	0.000	0.000	0.000	0.000	1.538	1.576	1.607	1.632	1.652	1.671
6547.6 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	1.85+0	1.33+0	1.00+0	7.51 - 1	5.52 - 1	3.90 - 1
	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	3.42-3	-2.93-3	-6.07 - 3	-8.11-3	-9.61-3	-1.08-2
$3p_{1/2}$	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	1.325+1	1.132+1	9.618+0	8.193+0	7.017+0	6.045+0
$E_b =$	β	0.000	0.000	0.000	0.000	0.000	1.093	1.330	1.441	1.503	1.539	1.560
6139.9 eV	γ	0.00+0 0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	7.02 - 1	3.97-1	1.78-1	6.65-2	2.75-2	3.58-2
3p <sub>3/2</sub>	δ	0.000+0	0.00+0 0.000+0	0.00+0 0.000+0	0.00+0 5.419+1	0.00+0 4.403+1	1.04-1 3.357+1	2.35-2 2.605+1	1.62-3 2.059+1	-5.14-3 1.656+1	-6.61-3 1.351+1	-5.88-3
$E_b =$	$\frac{\sigma}{\beta}$	0.000	0.000	0.000	053	4.403+1 1.117	1.367	1.497	1.575	1.627	1.662	1.116+1 1.686
4975.3 eV	γ	0.000	0.00+0	0.00+0	-2.82-1	2.82-1	6.39-2	-5.53-2	-9.00-2	-6.87 - 2	-1.11-2	6.92-2
.5.0.5 61	δ	0.00+0	0.00+0	0.00+0	1.58-1	5.62-2	2.10-2	1.79-2	2.19-2	2.74-2	3.27-2	3.74-2
3d <sub>3/2</sub>	σ	0.000+0	0.000+0	0.000+0	1.014+2	6.287+1	4.055+1	2.738+1	1.922+1	1.392+1	1.035+1	7.873+0
$E_b =$	β	0.000	0.000	0.000	0.619	0.960	1.112	1.186	1.222	1.236	1.236	1.227
4353.4 eV	γ	0.00+0	0.00+0	0.00+0	-3.46 - 1	-2.87 - 1	-8.05 - 2	1.53 - 1	3.82 - 1	5.95 - 1	7.88 - 1	9.64 - 1
	δ	0.00+0	0.00+0	0.00+0	-4.84-2	3.29-2	7.52 - 2	1.02 - 1	1.20 - 1	1.34-1	1.45 - 1	1.54 - 1
3d <sub>5/2</sub>	σ	0.000+0	0.000+0	0.000+0	1.386+2	8.316+1	5.276+1	3.520+1	2.446+1	1.755+1	1.295+1	9.773+0
$E_b =$	β	0.000	0.000	0.000	0.908	1.124	1.196	1.216	1.212	1.194	1.169	1.141
4128.8 eV	γ	0.00+0	0.00+0	0.00+0	-3.69 - 1	-1.75-1	8.65-2	3.42-1	5.75-1	7.80-1	9.59-1	1.12+0
4-	δ	0.00+0	0.00+0	0.00+0	-2.52-2	3.42-2	6.71-2	9.07-2	1.10-1	1.25-1	1.39-1	1.53-1
4s <sub>1/2</sub>	σ	1.803+1	1.131+1	7.618+0	5.466+0	4.109+0	3.200+0	2.561+0	2.094+0	1.742+0	1.472+0	1.259+0
$E_b = 1748.3 \text{ eV}$	β	1.330 1.07+0	1.507 9.89-1	1.580 8.24-1	1.621 6.59-1	1.648 5.08-1	1.669 3.75-1	1.686 2.58-1	1.702 1.58-1	1.716 7.34-2	1.728 2.79-3	1.740 -5.51-2
1/40.3 EV	$\gamma \\ \delta$	1.07+0 1.06-2	9.89-1 1.60-3	-2.28-3	-4.67 - 3	-6.39-3	3.75-1 -7.74-3	-8.85-3	-9.76-3	-1.05-2	2.79-3 -1.12-2	-5.51-2 -1.18-2
$4p_{1/2}$	σ	1.704+1	1.289+1	9.452+0	7.078+0	5.439+0	4.279+0	3.435+0	2.806+0	2.325+0	1.952+0	1.657+0
$E_{b}=$	$\beta$	0.619	1.209+1	1.508	1.593	1.635	1.657	1.667	1.670	1.668	1.662	1.653
1554.5 eV	γ	5.53-1	7.29-1	4.24-1	2.04-1	7.79–2	2.14-2	1.28-2	3.64-2	8.13-2	1.40-1	2.09-1
	δ	1.31 - 1	4.59 - 3	-1.38-2	-1.66-2	-1.63-2	-1.54-2	-1.41-2	-1.27-2	-1.11-2	-9.29 - 3	-7.34-3
Z = 98, Cf:	[Rn]5f		2									
		k (eV)				-						
Shell		2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
$3s_{1/2}$	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	8.417+0	7.277+0	6.220+0	5.349+0	4.636+0	4.047+0
$E_b =$	β	0.000	0.000	0.000	0.000	0.000	1.504	1.543	1.578	1.605	1.628	1.647
6764.0 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	2.05+0	1.47+0	1.11+0	8.46-1	6.35 - 1	4.64 - 1

able 1 (contin												
	nued) $\delta$	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	7.23-3	-1.83-3	-5.67-3	-8.03-3	-9.73-3	-1.11-
$3p_{1/2}$	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	1.305+1	1.129+1	9.653+0	8.262+0	7.104+0	6.142+0
$E_b =$	β	0.000	0.000	0.000	0.000	0.000	0.973	1.282	1.414	1.485	1.527	1.552
6347.5 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	7.44-1	4.86-1	2.36-1	9.70-2	3.76-2	3.04-2
2	δ	0.00+0 0.000+0	0.00+0	0.00+0 0.000+0	0.00+0	0.00+0 4.477+1	1.50-1 3.430+1	3.45-2 2.668+1	4.79-3	-4.56-3 1.702+1	-7.07-3	-6.84- 1.151+1
3p <sub>3/2</sub>	$\sigma_{\rho}$	0.000+0	0.000+0	0.000+0	0.000+0	4.477+1 1.045	3.430+1 1.328	2.668+1 1.470	2.113+1 1.556	1.702+1	1.390+1 1.651	1.151+1
E <sub>b</sub> = 5117.1 eV	$\beta$ $\gamma$	0.000	0.000	0.000	0.000	3.18-1	9.84-2	-3.89-2	-8.88-2	-7.96-2	-3.18-2	4.15-2
3117.1 CV	δ	0.00+0	0.00+0	0.00+0	0.00+0	7.14-2	2.37-2	1.79-2	2.12-2	2.66-2	3.21-2	3.72-2
$3d_{3/2}$	σ	0.000+0	0.000+0	0.000+0	1.050+2	6.588+1	4.262+1	2.884+1	2.027+1	1.471+1	1.095+1	8.335+0
$E_b =$	β	0.000	0.000	0.000	0.532	0.918	1.088	1.172	1.214	1.232	1.236	1.230
4485.3 eV	γ	0.00+0	0.00+0	0.00+0	-3.20 - 1	-3.20 - 1	-1.28 - 1	9.78 - 2	3.24 - 1	5.41 - 1	7.41 - 1	9.22 - 1
	δ	0.00+0	0.00+0	0.00+0	-6.58 - 2	2.31 - 2	6.99 - 2	9.80 - 2	1.18 - 1	1.33 - 1	1.45 - 1	1.55 - 1
3d <sub>5/2</sub>	σ	0.000+0	0.000+0	0.000+0	1.442+2	8.716+1	5.542+1	3.702+1	2.576+1	1.851+1	1.367+1	1.033+1
$E_b =$	β	0.000	0.000	0.000	0.855	1.105	1.189	1.215	1.214	1.199	1.176	1.148
4249.9 eV	γ	0.00+0	0.00+0	0.00+0	-3.82 - 1	-2.19-1	3.75-2	2.91-1	5.26-1	7.38 - 1	9.26-1	1.09+0
	δ	0.00+0	0.00+0	0.00+0	-3.90-2	2.73-2	6.26-2	8.66-2	1.06-1	1.23-1	1.38-1	1.52-1
$4s_{1/2}$	σ	1.780+1	1.130+1	7.653+0	5.508+0	4.151+0	3.239+0	2.597+0	2.126+0	1.772+0	1.498+0	1.282+0
$E_b =$	β	1.265	1.465	1.549	1.594	1.625	1.647	1.665	1.680	1.694	1.707	1.719
1816.0 eV	γ	1.07+0	1.03+0	8.68-1	7.05-1	5.53-1	4.19-1	3.01-1	1.98-1	1.09-1	3.41-2	-2.87-
4	δ	1.30-2	2.43-3	-1.99-3	-4.63-3	-6.50-3	-7.95-3	-9.15-3	-1.02-2	-1.11-2	-1.18-2	-1.25-
$4p_{1/2}$	σ	1.633+1 0.473	1.266+1 1.265	9.403+0 1.487	7.097+0 1.580	5.485+0 1.627	4.335+0 1.652	3.494+0 1.664	2.862+0 1.669	2.379+0 1.668	2.001+0 1.664	1.702+0 1.656
E <sub>b</sub> = 1616.5 eV	β	0.473 4.42-1	7.82-1	4.77—1	2.41-1	1.027	3.25-2	1.32-2	2.83-2	6.71–2	1.004	1.86-1
1010.5 CV	$\delta ^{\gamma }$	1.62-1	7.58-3	-1.42-2	-1.77-2	-1.74-2	-1.64-2	-1.52-2	-1.38-2	-1.22-2	-1.05-2	-8.58-
Z = 99, Es:				1.12 2	1.,, 2	1.7 1 2	1.01 2	1.52 2	1.50 2	1,22 2	1.05 2	0.50
2 — 00, E3. [	[KII]JI	k (eV)										
Shell		2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
$3s_{1/2}$	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	7.794+0	7.237+0	6.215+0	5.360+0	4.655+0	4.072+0
$E_b =$	β	0.000	0.000	0.000	0.000	0.000	1.464	1.508	1.546	1.575	1.600	1.621
6985.4 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	1.96+0	1.62+0	1.23+0	9.48 - 1	7.25 - 1	5.43 - 1
	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	2.12 - 2	-3.79 - 4	-5.07 - 3	-7.85 - 3	-9.81 - 3	-1.13-
$3p_{1/2}$	σ	0.000+0	0.000+0	0.000+0	0.000+0	0.000+0	1.276+1	1.122+1	9.663+0	8.314+0	7.177+0	6.226+0
$E_b =$	β	0.000	0.000	0.000	0.000	0.000	0.820	1.223	1.380	1.463	1.512	1.542
6560.7 eV	γ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	7.03-1	5.80-1	3.04 - 1	1.36-1	5.46-2	3.09-2
	δ	0.00+0	0.00+0	0.00+0	0.00+0	0.00+0	2.21-1	4.98-2	9.25-3	-3.60-3	-7.45-3	-7.80-
$3p_{3/2}$	σ	0.000+0	0.000+0	0.000+0	0.000+0	4.543+1	3.499+1	2.729+1	2.166+1	1.747+1	1.429+1	1.184+1
E <sub>b</sub> = 5260.8 eV	β	0.000	0.000	0.000	0.000	0.957	1.283	1.439	1.533	1.596	1.638	1.667
5260.8 ev	$\frac{\gamma}{\delta}$	0.00+0 0.00+0	0.00+0 0.00+0	0.00+0 0.00+0	0.00+0 0.00+0	3.42-1 9.10-2	1.35-1 2.74-2	-1.95-2 1.81-2	-8.47-2 $2.06-2$	-8.76-2 $2.59-2$	-4.95-2 3.16-2	1.61-2 3.69-2
3d <sub>3/2</sub>	σ	0.000+0	0.000+0	0.000+0	1.078+2	6.882+1	4.470+1	3.030+1	2.133+1	1.550+1	1.155+1	8.804+0
$E_b =$	β	0.000	0.000	0.000	0.437	0.871	1.061	1.155	1.204	1.227	1.235	1.232
4619.1 eV	γ	0.00+0	0.00+0	0.00+0	-2.73-1	-3.48 - 1	-1.74-1	4.66-2	2.70-1	4.86-1	6.89-1	8.74-1
	δ	0.00+0	0.00+0	0.00+0	-7.83 - 2	1.21 - 2	6.42 - 2	9.48 - 2	1.16 - 1	1.31 - 1	1.44 - 1	1.54 - 1
$3d_{5/2}$	σ	0.000+0	0.000+0	0.000+0	1.495+2	9.113+1	5.809+1	3.887+1	2.707+1	1.948+1	1.440+1	1.089+1
$E_b =$	β	0.000	0.000	0.000	0.789	1.082	1.180	1.213	1.216	1.204	1.183	1.156
4372.7 eV	γ	0.00+0	0.00.0		0.04.4	-2.60-1	-9.54 - 3	0 11 1		C OF 1		
	δ	0.00.0	0.00+0	0.00+0	-3.81 - 1	2.00 1	3.34 3	2.44 - 1	4.80 - 1	6.95 - 1	8.87 - 1	1.06+0
		0.00+0	0.00+0 0.00+0	0.00+0 0.00+0	-3.81-1 -5.36-2	1.99-2	5.81-2	2.44-1 8.33-2	4.80-1 1.03-1	1.20-1	8.87-1 1.36-1	
4s <sub>1/2</sub>	σ	1.749+1	0.00+0 1.128+1	0.00+0 7.676+0	-5.36-2 5.543+0	1.99-2 4.188+0	5.81-2 3.274+0	8.33-2 2.629+0	1.03-1 2.156+0	1.20-1 1.799+0	1.36-1 1.522+0	1.06+0 1.49-1 1.304+0
$4s_{1/2}$ $E_b =$	$\frac{\sigma}{\beta}$	1.749+1 1.195	0.00+0 1.128+1 1.421	0.00+0 7.676+0 1.514	-5.36-2 5.543+0 1.564	1.99-2 4.188+0 1.597	5.81-2 3.274+0 1.622	8.33-2 2.629+0 1.642	1.03-1 2.156+0 1.658	1.20-1 1.799+0 1.672	1.36-1 1.522+0 1.685	1.06+0 1.49-1 1.304+0 1.698
4s <sub>1/2</sub> E <sub>b</sub> = 1884.0 eV	$\beta$ $\gamma$	1.749+1 1.195 1.06+0	0.00+0 1.128+1 1.421 1.06+0	0.00+0 7.676+0 1.514 9.12-1	-5.36-2 5.543+0 1.564 7.53-1	1.99-2 4.188+0 1.597 6.01-1	5.81-2 3.274+0 1.622 4.65-1	8.33-2 2.629+0 1.642 3.44-1	1.03-1 2.156+0 1.658 2.39-1	1.20-1 1.799+0 1.672 1.47-1	1.36-1 1.522+0 1.685 6.83-2	1.06+0 1.49-1 1.304+0 1.698 1.37-3
Ε <sub>b</sub> = 1884.0 eV	$eta \ \gamma \ \delta$	1.749+1 1.195 1.06+0 1.60-2	0.00+0 1.128+1 1.421 1.06+0 3.36-3	0.00+0 7.676+0 1.514 9.12-1 -1.60-3	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3	1.99-2 4.188+0 1.597 6.01-1 -6.58-3	5.81-2 3.274+0 1.622 4.65-1 -8.17-3	8.33-2 2.629+0 1.642 3.44-1 -9.47-3	1.03-1 2.156+0 1.658 2.39-1 -1.06-2	1.20-1 1.799+0 1.672 1.47-1 -1.16-2	1.36-1 1.522+0 1.685 6.83-2 -1.24-2	1.06+0 1.49-1 1.304+0 1.698 1.37-3 -1.31-
$E_b = 1884.0 \text{ eV}$ $4p_{1/2}$	$\beta$ $\gamma$ $\delta$ $\sigma$	1.749+1 1.195 1.06+0 1.60-2 1.559+1	0.00+0 1.128+1 1.421 1.06+0 3.36-3 1.239+1	0.00+0 7.676+0 1.514 9.12-1 -1.60-3 9.329+0	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3 7.101+0	1.99-2 4.188+0 1.597 6.01-1 -6.58-3 5.520+0	5.81-2 3.274+0 1.622 4.65-1 -8.17-3 4.383+0	8.33-2 2.629+0 1.642 3.44-1 -9.47-3 3.545+0	1.03-1 2.156+0 1.658 2.39-1 -1.06-2 2.914+0	1.20-1 1.799+0 1.672 1.47-1 -1.16-2 2.428+0	1.36-1 1.522+0 1.685 6.83-2 -1.24-2 2.048+0	1.06+0 1.49-1 1.304+0 1.698 1.37-3 -1.31- 1.745+0
$E_b = 1884.0 \text{ eV}$ $4p_{1/2}$ $E_b = $	$\beta$ $\gamma$ $\delta$ $\sigma$ $\beta$	1.749+1 1.195 1.06+0 1.60-2 1.559+1 0.314	0.00+0 1.128+1 1.421 1.06+0 3.36-3 1.239+1 1.216	0.00+0 7.676+0 1.514 9.12-1 -1.60-3 9.329+0 1.462	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3 7.101+0 1.564	1.99-2 4.188+0 1.597 6.01-1 -6.58-3 5.520+0 1.617	5.81-2 3.274+0 1.622 4.65-1 -8.17-3 4.383+0 1.645	8.33-2 2.629+0 1.642 3.44-1 -9.47-3 3.545+0 1.660	1.03-1 2.156+0 1.658 2.39-1 -1.06-2 2.914+0 1.667	1.20-1 1.799+0 1.672 1.47-1 -1.16-2 2.428+0 1.668	1.36-1 1.522+0 1.685 6.83-2 -1.24-2 2.048+0 1.665	1.06+0 1.49-1 1.304+0 1.698 1.37-3 -1.31- 1.745+0 1.659
$E_b = 1884.0 \text{ eV}$ $1884.0 \text{ eV}$ $E_b = 1884.0 \text{ eV}$	$\beta$ $\gamma$ $\delta$ $\sigma$ $\beta$ $\gamma$	1.749+1 1.195 1.06+0 1.60-2 1.559+1 0.314 2.89-1	0.00+0 1.128+1 1.421 1.06+0 3.36-3 1.239+1 1.216 8.31-1	0.00+0 7.676+0 1.514 9.12-1 -1.60-3 9.329+0 1.462 5.31-1	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3 7.101+0 1.564 2.81-1	1.99-2 4.188+0 1.597 6.01-1 -6.58-3 5.520+0 1.617 1.27-1	5.81-2 3.274+0 1.622 4.65-1 -8.17-3 4.383+0 1.645 4.62-2	8.33-2 2.629+0 1.642 3.44-1 -9.47-3 3.545+0 1.660 1.66-2	1.03-1 2.156+0 1.658 2.39-1 -1.06-2 2.914+0 1.667 2.30-2	1.20-1 1.799+0 1.672 1.47-1 -1.16-2 2.428+0 1.668 5.46-2	1.36-1 1.522+0 1.685 6.83-2 -1.24-2 2.048+0 1.665 1.04-1	1.06+0 1.49-1 1.304+0 1.698 1.37-3 -1.31- 1.745+0 1.659 1.64-1
$E_b = 1884.0 \text{ eV}$ $4p_{1/2}$ $E_b = 1680.1 \text{ eV}$	$\begin{array}{c} \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \end{array}$	1.749+1 1.195 1.06+0 1.60-2 1.559+1 0.314 2.89-1 1.98-1	0.00+0 1.128+1 1.421 1.06+0 3.36-3 1.239+1 1.216 8.31-1 1.14-2	0.00+0 7.676+0 1.514 9.12-1 -1.60-3 9.329+0 1.462	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3 7.101+0 1.564	1.99-2 4.188+0 1.597 6.01-1 -6.58-3 5.520+0 1.617	5.81-2 3.274+0 1.622 4.65-1 -8.17-3 4.383+0 1.645	8.33-2 2.629+0 1.642 3.44-1 -9.47-3 3.545+0 1.660	1.03-1 2.156+0 1.658 2.39-1 -1.06-2 2.914+0 1.667	1.20-1 1.799+0 1.672 1.47-1 -1.16-2 2.428+0 1.668	1.36-1 1.522+0 1.685 6.83-2 -1.24-2 2.048+0 1.665	1.06+0 1.49-1 1.304+0 1.698 1.37-3 -1.31- 1.745+0
$E_b = 1884.0 \text{ eV}$ $4p_{1/2}$ $E_b = 1680.1 \text{ eV}$	$\begin{array}{c} \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \end{array}$	1.749+1 1.195 1.06+0 1.60-2 1.559+1 0.314 2.89-1 1.98-1	0.00+0 1.128+1 1.421 1.06+0 3.36-3 1.239+1 1.216 8.31-1 1.14-2	0.00+0 7.676+0 1.514 9.12-1 -1.60-3 9.329+0 1.462 5.31-1	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3 7.101+0 1.564 2.81-1	1.99-2 4.188+0 1.597 6.01-1 -6.58-3 5.520+0 1.617 1.27-1	5.81-2 3.274+0 1.622 4.65-1 -8.17-3 4.383+0 1.645 4.62-2	8.33-2 2.629+0 1.642 3.44-1 -9.47-3 3.545+0 1.660 1.66-2	1.03-1 2.156+0 1.658 2.39-1 -1.06-2 2.914+0 1.667 2.30-2	1.20-1 1.799+0 1.672 1.47-1 -1.16-2 2.428+0 1.668 5.46-2	1.36-1 1.522+0 1.685 6.83-2 -1.24-2 2.048+0 1.665 1.04-1	1.06+0 1.49-1 1.304+0 1.698 1.37-3 -1.31- 1.745+0 1.659 1.64-1
$E_b = 1884.0 \text{ eV}$ $4p_{1/2}$ $E_b = 1680.1 \text{ eV}$ <b>Z=100, Fm:</b>	$\begin{array}{c} \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \end{array}$	1.749+1 1.195 1.06+0 1.60-2 1.559+1 0.314 2.89-1 1.98-1 $\frac{6}{5}$ , $\mathbf{5f_{0/2}^6 7s_{1/2}^2}$	0.00+0 1.128+1 1.421 1.06+0 3.36-3 1.239+1 1.216 8.31-1 1.14-2	0.00+0 7.676+0 1.514 9.12-1 -1.60-3 9.329+0 1.462 5.31-1	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3 7.101+0 1.564 2.81-1	1.99-2 4.188+0 1.597 6.01-1 -6.58-3 5.520+0 1.617 1.27-1	5.81-2 3.274+0 1.622 4.65-1 -8.17-3 4.383+0 1.645 4.62-2	8.33-2 2.629+0 1.642 3.44-1 -9.47-3 3.545+0 1.660 1.66-2	1.03-1 2.156+0 1.658 2.39-1 -1.06-2 2.914+0 1.667 2.30-2	1.20-1 1.799+0 1.672 1.47-1 -1.16-2 2.428+0 1.668 5.46-2	1.36-1 1.522+0 1.685 6.83-2 -1.24-2 2.048+0 1.665 1.04-1	1.06+0 1.49-1 1.304+0 1.698 1.37-3 -1.31- 1.745+0 1.659 1.64-1
$E_b = 1884.0 \text{ eV}$ $4p_{1/2}$ $E_b = $	$\begin{array}{c} \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \end{array}$	1.749+1 1.195 1.06+0 1.60-2 1.559+1 0.314 2.89-1 1.98-1 5/2 5f <sup>7</sup> / <sub>7/2</sub> 7s <sup>2</sup> <sub>1/2</sub> k (eV)	0.00+0 1.128+1 1.421 1.06+0 3.36-3 1.239+1 1.216 8.31-1 1.14-2	0.00+0 7.676+0 1.514 9.12-1 -1.60-3 9.329+0 1.462 5.31-1 -1.46-2	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3 7.101+0 1.564 2.81-1 -1.89-2	1.99-2 4.188+0 1.597 6.01-1 -6.58-3 5.520+0 1.617 1.27-1 -1.87-2	5.81-2 3.274+0 1.622 4.65-1 -8.17-3 4.383+0 1.645 4.62-2 -1.76-2	8.33-2 2.629+0 1.642 3.44-1 -9.47-3 3.545+0 1.660 1.66-2 -1.63-2	1.03-1 2.156+0 1.658 2.39-1 -1.06-2 2.914+0 1.667 2.30-2 -1.49-2	1.20-1 1.799+0 1.672 1.47-1 -1.16-2 2.428+0 1.668 5.46-2 -1.33-2	1.36-1 1.522+0 1.685 6.83-2 -1.24-2 2.048+0 1.665 1.04-1 -1.16-2	1.06+0 1.49-1 1.304+1 1.698 1.37-3 -1.31- 1.745+1 1.659 1.64-1 -9.75-
$E_b$ = 1884.0 eV $4p_{1/2}$ $E_b$ = 1680.1 eV $Z$ =100, Fm: [ $3s_{1/2}$ $E_b$ =	β γ δ σ β γ δ [Rn]5f <sub>s</sub>	$\begin{array}{c} 1.749+1 \\ 1.195 \\ 1.06+0 \\ 1.60-2 \\ 1.559+1 \\ 0.314 \\ 2.89-1 \\ 1.98-1 \\ \hline k \ (eV) \\ \hline 2000 \\ 0.000+0 \\ 0.000 \end{array}$	0.00+0 1.128+1 1.421 1.06+0 3.36-3 1.239+1 1.216 8.31-1 1.14-2 3000 0.000+0 0.000	0.00+0 7.676+0 1.514 9.12-1 -1.60-3 9.329+0 1.462 5.31-1 -1.46-2 4000 0.000+0 0.000	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3 7.101+0 1.564 2.81-1 -1.89-2 5000 0.000+0 0.000	1.99-2 4.188+0 1.597 6.01-1 -6.58-3 5.520+0 1.617 -1.27-1 -1.87-2	5.81-2 3.274+0 1.622 4.65-1 -8.17-3 4.383+0 1.645 4.62-2 -1.76-2 7000 0.000+0 0.000	8.33-2 2.629+0 1.642 3.44-1 -9.47-3 3.545+0 1.660 1.66-2 -1.63-2 8000 7.181+0 1.472	1.03-1 2.156+0 1.658 2.39-1 -1.06-2 2.914+0 1.667 2.30-2 -1.49-2 9000 6.200+0 1.511	1.20-1 1.799+0 1.672 1.47-1 -1.16-2 2.428+0 1.668 5.46-2 -1.33-2 10000 5.363+0 1.542	1.36-1 1.522+0 1.685 6.83-2 -1.24-2 2.048+0 1.665 1.04-1 -1.16-2 11000 4.669+0 1.569	1.06+0 1.49-1 1.304+( 1.698 1.37-3 -1.31- 1.745+( 1.659 1.64-1 -9.75- 12000 4.092+( 1.592
$E_b$ = 1884.0 eV $4p_{1/2}$ $E_b$ = 1680.1 eV $Z$ =100, Fm: [ $3s_{1/2}$ $E_b$ =	$\beta$ $\gamma$ $\delta$ $\sigma$ $\beta$ $\gamma$ $\delta$ [Rn]5f $\frac{c}{s}$	$1.749+1$ $1.195$ $1.06+0$ $1.60-2$ $1.559+1$ $0.314$ $2.89-1$ $1.98-1$ $\frac{5}{6}$ $\frac{7}{2}$ $\frac{5f_{7/2}^2}{2000}$ $\frac{75_{1/2}^2}{0.000+0}$	0.00+0 1.128+1 1.421 1.06+0 3.36-3 1.239+1 1.216 8.31-1 1.14-2 3000 0.000+0 0.000+0 0.000+0	0.00+0 7.676+0 1.514 9.12-1 -1.60-3 9.329+0 1.462 5.31-1 -1.46-2 4000 0.000+0 0.000+0 0.000+0	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3 7.101+0 1.564 2.81-1 -1.89-2 5000 0.000+0 0.000+0 0.000+0	1.99-2 4.188+0 1.597 6.01-1 -6.58-3 5.520+0 1.617 1.27-1 -1.87-2 6000 0.000+0 0.000	5.81-2 3.274+0 1.622 4.65-1 -8.17-3 4.383+0 1.645 4.62-2 -1.76-2 7000 0.000+0 0.000+0 0.000+0	8.33-2 2.629+0 1.642 3.44-1 -9.47-3 3.545+0 1.660-2 -1.63-2 8000 7.181+0 1.472 1.77+0	1.03-1 2.156+0 1.658 2.39-1 -1.06-2 2.914+0 1.667 2.30-2 -1.49-2 9000 6.200+0 1.511 1.35+0	1.20-1 1.799+0 1.672 1.47-1 -1.16-2 2.428+0 1.668 5.46-2 -1.33-2 10000 5.363+0 1.542 1.06+0	1.36-1 1.522+0 1.685 6.83-2 -1.24-2 2.048+0 1.665 1.04-1 -1.16-2 11000 4.669+0 1.569 8.22-1	1.06+0 1.49-1 1.304+1 1.698 1.37-3 -1.31- 1.745+1 1.659 1.64-1 -9.75- 12000 4.092+6 1.592 6.29-1
E <sub>b</sub> = 1884.0 eV  1p <sub>1/2</sub> E <sub>b</sub> = 1680.1 eV  2=100, Fm: [ Shell 181/2 E <sub>b</sub> = 17212.6 eV	β γ δ σ β γ δ [Rn]5f <sub>s</sub>	$1.749+1$ $1.195$ $1.06+0$ $1.60-2$ $1.559+1$ $0.314$ $2.89-1$ $1.98-1$ $\frac{1}{5}$ $\frac{1}{2}$ $\frac{51}{7}$ $\frac{7}{7}$ $\frac{7}{7}$ $\frac{1}{2}$ $\frac$	0.00+0 1.128+1 1.421 1.06+0 3.36-3 1.239+1 1.216 8.31-1 1.14-2 3000 0.000+0 0.000+0 0.000+0 0.000+0	0.00+0 7.676+0 1.514 9.12-1 -1.60-3 9.329+0 1.462 5.31-1 -1.46-2 4000 0.000+0 0.000+0 0.000+0 0.000+0	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3 7.101+0 1.564 2.81-1 -1.89-2 5000 0.000+0 0.000+0 0.000+0 0.00+0	1.99-2 4.188+0 1.597 6.01-1 -6.58-3 5.520+0 1.617 1.27-1 -1.87-2 6000 0.000+0 0.000+0 0.000+0 0.000+0	5.81-2 3.274+0 1.622 4.65-1 -8.17-3 4.383+0 1.645 4.62-2 -1.76-2 7000 0.000+0 0.000+0 0.000+0 0.000+0	8.33-2 2.629+0 1.642 3.44-1 -9.47-3 3.545+0 1.660 1.66-2 -1.63-2 8000 7.181+0 1.472 1.77+0 1.47-3	1.03-1 2.156+0 1.658 2.39-1 -1.06-2 2.914+0 1.667 2.30-2 -1.49-2 9000 6.200+0 1.511 1.35+0 -4.23-3	1.20-1 1.799+0 1.672 1.47-1 -1.16-2 2.428+0 1.668 5.46-2 -1.33-2 10000 5.363+0 1.542 1.06+0 -7.52-3	1.36-1 1.522+0 1.685 6.83-2 -1.24-2 2.048+0 1.665 1.04-1 -1.16-2 11000 4.669+0 1.569 8.22-1 -9.80-3	1.06+0 1.49-1 1.304+1 1.698 1.37-3 -1.31- 1.745+1 1.659 1.64-1 -9.75- 12000 4.092+1 1.592 6.29-1 -1.15-
$\bar{b}_b = 1884.0 \text{ eV}$ $4p_{1/2}$ $b_b = 1680.1 \text{ eV}$ $2=100, \text{ Fm}$ : [ $3s_{1/2}$ $5b = 7212.6 \text{ eV}$ $3p_{1/2}$	β γ δ σ β γ δ δ [Rn]5f s	$\begin{array}{c} 1.749+1 \\ 1.195 \\ 1.06+0 \\ 1.60-2 \\ 1.559+1 \\ 0.314 \\ 2.89-1 \\ 1.98-1 \\ \frac{k}{5/2} \mathbf{5f_{7/2}^2 7s_{1/2}^2} \\ \frac{k}{2000} \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ 0.000+0 \\ \end{array}$	0.00+0 1.128+1 1.421 1.06+0 3.36-3 1.239+1 1.216 8.31-1 1.14-2 3000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	0.00+0 7.676+0 1.514 9.12-1 -1.60-3 9.329+0 1.462 5.31-1 -1.46-2  4000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3 7.101+0 1.564 2.81-1 -1.89-2 5000 0.000+0 0.000 0.000+0 0.00+0 0.000+0	1.99-2 4.188+0 1.597 6.01-1 -6.58-3 5.520+0 1.617 1.27-1 -1.87-2 6000 0.000+0 0.000 0.000+0 0.00+0 0.00+0	5.81-2 3.274+0 1.622 4.65-1 -8.17-3 4.383+0 1.645 4.62-2 -1.76-2 7000 0.000+0 0.000+0 0.000+0 0.000+0	8.33-2 2.629+0 1.642 3.44-1 -9.47-3 3.545+0 1.660 1.66-2 -1.63-2 8000 7.181+0 1.472 1.77+0 1.47-3 1.112+1	1.03-1 2.156+0 1.658 2.39-1 -1.06-2 2.914+0 1.667 2.30-2 -1.49-2 9000 6.200+0 1.511 1.35+0 -4.23-3 9.648+0	1.20-1 1.799+0 1.672 1.47-1 -1.16-2 2.428+0 1.668 5.46-2 -1.33-2 10000 5.363+0 1.542 1.06+0 -7.52-3 8.346+0	1.36-1 1.522+0 1.685 6.83-2 -1.24-2 2.048+0 1.665 1.04-1 -1.16-2 11000 4.669+0 1.569 8.22-1 -9.80-3 7.236+0	1.06+0 1.49-1 1.304+1 1.698 1.37-3 -1.31-1.745+1 1.659 1.64-1 -9.75-1 12000 4.092+1 1.592 6.29-1 -1.15-6.299+1
$E_{b}$ = 1884.0 eV $4p_{1/2}$ $E_{b}$ = 1680.1 eV $2$ =100, Fm: [  Shell $2$ =12.6 eV $2$ =12.6 eV	β γ δ β γ δ [Rn]5f <sub>s</sub> σ β γ δ	1.749+1 1.195 1.06+0 1.60-2 1.559+1 0.314 2.89-1 1.98-1 5/2 5f <sub>7/2</sub> 7s <sub>1/2</sub> k (eV) 2000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	0.00+0 1.128+1 1.421 1.06+0 3.36-3 1.239+1 1.216 8.31-1 1.14-2 3000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	0.00+0 7.676+0 1.514 9.12-1 -1.60-3 9.329+0 1.462 5.31-1 -1.46-2  4000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3 7.101+0 1.564 2.81-1 -1.89-2 5000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0	1.99-2 4.188+0 1.597 6.01-1 -6.58-3 5.520+0 1.617 1.27-1 -1.87-2 6000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0	5.81-2 3.274+0 1.622 4.65-1 -8.17-3 4.383+0 1.645 4.62-2 -1.76-2 7000 0.000+0 0.000+0 0.000+0 1.231+1 0.554	8.33-2 2.629+0 1.642 3.44-1 -9.47-3 3.545+0 1.660 1.66-2 -1.63-2 8000 7.181+0 1.472 1.77+0 1.47-3 1.112+1 1.152	1.03-1 2.156+0 1.658 2.39-1 -1.06-2 2.914+0 1.667 2.30-2 -1.49-2 9000 6.200+0 1.511 1.35+0 -4.23-3 9.648+0 1.341	1.20-1 1.799+0 1.672 1.47-1 -1.16-2 2.428+0 1.668 5.46-2 -1.33-2 10000 5.363+0 1.542 1.06+0 -7.52-3 8.346+0 1.437	1.36-1 1.522+0 1.685 6.83-2 -1.24-2 2.048+0 1.665 1.04-1 -1.16-2 11000 4.669+0 1.569 8.22-1 -9.80-3 7.236+0 1.495	1.06+0 1.49-1 1.304+1 1.698 1.37-3 -1.31 1.745+1 1.659 1.64-1 -9.75- 12000 4.092+1 1.592 6.29-1 1.15- 6.299+1 1.530
$\bar{b}_b = 1884.0 \text{ eV}$ $\frac{4p_{1/2}}{b_b} = 1680.1 \text{ eV}$ $\frac{2}{b_b} = 100, \text{ Fm}$ : [Shell $\frac{3}{b_b} = \frac{3}{2}$ $\frac{1}{2}$	β γ δ β γ δ [Rn]5f <sup>c</sup> <sub>s</sub>	$1.749+1$ $1.195$ $1.06+0$ $1.60-2$ $1.559+1$ $0.314$ $2.89-1$ $1.98-1$ $\frac{k}{6/2} \mathbf{5f_{7/2}^{6} 7s_{1/2}^{2}}$ $\frac{k}{6} (eV)$ $0.000+0$ $0.00+0$ $0.000+0$ $0.000+0$ $0.000+0$ $0.000+0$	0.00+0  1.128+1 1.421 1.06+0 3.36-3 1.239+1 1.216 8.31-1 1.14-2  3000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	0.00+0 7.676+0 1.514 9.12-1 -1.60-3 9.329+0 1.462 5.31-1 -1.46-2  4000 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 0.000+0 0.000+0 0.00+0	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3 7.101+0 1.564 2.81-1 -1.89-2 5000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0	1.99-2 4.188+0 1.597 6.01-1 -6.58-3 5.520+0 1.617 1.27-1 -1.87-2 6000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0	5.81-2 3.274+0 1.622 4.65-1 -8.17-3 4.383+0 1.645 4.62-2 -1.76-2 7000 0.000+0 0.000 0.00+0 1.231+1 0.554 4.08-1	8.33-2 2.629+0 1.642 3.44-1 -9.47-3 3.545+0 1.660 1.66-2 -1.63-2 8000 7.181+0 1.472 1.77+0 1.47-3 1.112+1 1.152 6.75-1	1.03-1 2.156+0 1.658 2.39-1 -1.06-2 2.914+0 1.667 2.30-2 -1.49-2 9000 6.200+0 1.511 1.35+0 -4.23-3 9.648+0 1.341 3.82-1	1.20-1 1.799+0 1.672 1.47-1 -1.16-2 2.428+0 1.668 5.46-2 -1.33-2 10000 5.363+0 1.542 1.06+0 -7.52-3 8.346+0 1.437 1.85-1	1.36-1 1.522+0 1.685 6.83-2 -1.24-2 2.048+0 1.665 1.04-1 -1.16-2 11000 4.669+0 1.569 8.22-1 -9.80-3 7.236+0 1.495 7.91-2	1.06+0 1.49-1 1.304+ 1.698 1.37-3 -1.31- 1.745+ 1.659 1.64-1 -9.75- 12000 4.092+ 1.592 6.29-1 -1.15- 6.299+ 1.530 3.74-2
$E_{b}$ = 1884.0 eV $\frac{4p_{1/2}}{5b}$ = 1680.1 eV $\frac{2}{5}$ = 100, Fm: [Shell $\frac{3s_{1/2}}{5b}$ = $\frac{3p_{1/2}}{5b}$ = $\frac{3p_{1/2}}{5b}$ = $\frac{3p_{1/2}}{5}$	β γ δ σ β γ δ [Rn]5f <sub>s</sub> <sup>s</sup>	$1.749+1$ $1.195$ $1.06+0$ $1.60-2$ $1.559+1$ $0.314$ $2.89-1$ $1.98-1$ $\frac{5}{6/2}$ $\frac{5f_{7/2}^2}{7s_{1/2}^2}$ $\frac{k}{(eV)}$ $\frac{2000}{0.000+0}$ $0.00+0$ $0.00+0$ $0.00+0$ $0.00+0$ $0.00+0$ $0.00+0$ $0.00+0$	0.00+0  1.128+1 1.421 1.06+0 3.36-3 1.239+1 1.216 8.31-1 1.14-2  3000 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 0.00+0 0.000+0 0.00+0 0.00+0 0.00+0 0.00+0	0.00+0 7.676+0 1.514 9.12-1 -1.60-3 9.329+0 1.462 5.31-1 -1.46-2  4000 0.000+0 0.000+0 0.00+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3 7.101+0 1.564 2.81-1 -1.89-2 5000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	1.99-2 4.188+0 1.597 6.01-1 -6.58-3 5.520+0 1.617 1.27-1 -1.87-2 6000 0.000+0 0.000+0 0.00+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	5.81-2 3.274+0 1.622 4.65-1 -8.17-3 4.383+0 1.645 4.62-2 -1.76-2 7000 0.000+0 0.000+0 0.00+0 1.231+1 0.554 4.08-1 3.35-1	8.33-2 2.629+0 1.642 3.44-1 -9.47-3 3.545+0 1.660 1.66-2 -1.63-2 8000 7.181+0 1.472 1.77+0 1.47-3 1.112+1 1.152 6.75-1 7.17-2	9000 6.200+0 1.35+0 1.658 2.39-1 -1.06-2 2.914+0 1.667 2.30-2 -1.49-2 9000 6.200+0 1.511 1.35+0 -4.23-3 9.648+0 1.341 3.82-1 1.55-2	1.20-1 1.799+0 1.672 1.47-1 -1.16-2 2.428+0 1.668 5.46-2 -1.33-2 10000 5.363+0 1.542 1.06+0 -7.52-3 8.346+0 1.437 1.85-1 -1.97-3	1.36-1 1.522+0 1.685 6.83-2 -1.24-2 2.048+0 1.665 1.04-1 -1.16-2 11000 4.669+0 1.569 8.22-1 -9.80-3 7.236+0 1.495 7.91-2 -7.60-3	1.06+0 1.49-1 1.304+ 1.698 1.37-3 -1.31- 1.745+ 1.659 1.64-1 -9.75- 12000 4.092+ 1.592 6.29-1 -1.15- 6.299+ 1.530 3.74-2 -8.70-
$E_b$ = 1884.0 eV $\frac{4p_{1/2}}{E_b}$ = 1680.1 eV $\frac{2}{E_b}$ = 1680.1 eV $\frac{2}{E_b}$ = 1680.2 eV $\frac{3p_{1/2}}{E_b}$ = 1680.2 eV $\frac{3p_{1/2}}{E_b}$ = 1680.2 eV $\frac{3p_{1/2}}{E_b}$ = 1680.2 eV $\frac{3p_{1/2}}{E_b}$ = 1680.2 eV	β γ δ σ β γ δ δ [Rn]5f <sub>s</sub> σ β γ γ δ δ σ β γ γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ σ σ δ γ γ δ δ σ σ σ σ σ σ σ	$1.749+1$ $1.195$ $1.06+0$ $1.60-2$ $1.559+1$ $0.314$ $2.89-1$ $1.98-1$ $\frac{5}{2}$ $\frac{5}{1}$ $\frac{6}{1}$ $\frac{7}{2}$ $\frac{5}{1}$ $\frac{7}{2}$ $$	0.00+0 1.128+1 1.421 1.06+0 3.36-3 1.239+1 1.216 8.31-1 1.14-2  3000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	0.00+0 7.676+0 1.514 9.12-1 -1.60-3 9.329+0 1.462 5.31-1 -1.46-2  4000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3 7.101+0 1.564 2.81-1 -1.89-2 5000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	1.99-2 4.188+0 1.597 6.01-1 -6.58-3 5.520+0 1.617 1.27-1 -1.87-2 6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	5.81-2 3.274+0 1.622 4.65-1 -8.17-3 4.383+0 1.645 4.62-2 -1.76-2 7000 0.000+0 0.000+0 0.00+0 1.231+1 0.554 4.08-1 3.35-1 3.569+1	8.33-2 2.629+0 1.642 3.44-1 -9.47-3 3.545+0 1.660 1.66-2 -1.63-2 8000 7.181+0 1.472 1.77+0 1.47-3 1.112+1 1.152 6.75-1 7.17-2 2.791+1	1.03-1 2.156+0 1.658 2.39-1 -1.06-2 2.914+0 1.667 2.30-2 -1.49-2 9000 6.200+0 1.511 1.35+0 -4.23-3 9.648+0 1.341 3.82-1 1.55-2 2.219+1	1.20-1 1.799+0 1.672 1.47-1 -1.16-2 2.428+0 1.668 5.46-2 -1.33-2 10000 5.363+0 1.542 1.06+0 -7.52-3 8.346+0 1.437 1.85-1 -1.97-3 1.793+1	1.36-1 1.522+0 1.685 6.83-2 -1.24-2 2.048+0 1.665 1.04-1 -1.16-2 11000 4.669+0 1.569 8.22-1 -9.80-3 7.236+0 1.495 7.91-2 -7.60-3 1.468+1	1.06+0 1.49-1 1.304+ 1.698 1.37-3 -1.31- 1.745+ 1.659 1.64-1 -9.75- 12000 4.092+ 1.592 6.29-1 -1.15- 6.299+ 1.530 3.74-2 -8.70- 1.218+
$E_{b}$ = 1884.0 eV $Ap_{1/2}$ $E_{b}$ = 1680.1 eV $Ap_{1/2}$	β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ σ β γ δ δ σ β γ δ δ σ β γ δ δ σ β β γ δ δ σ δ β β γ δ δ σ δ β β γ δ δ σ δ β β γ δ δ σ δ β β γ δ δ σ δ δ δ δ δ δ δ δ δ δ δ δ δ δ δ δ	$1.749+1$ $1.195$ $1.06+0$ $1.60-2$ $1.559+1$ $0.314$ $2.89-1$ $1.98-1$ $\frac{6}{1.2}$ $\frac{5f_{7/2}^2}{75_{1/2}^2}$ $\frac{5}{1.2}$ $\frac{6}{1.2}$ $\frac{1}{1.2}$	0.00+0 1.128+1 1.421 1.06+0 3.36-3 1.239+1 1.216 8.31-1 1.14-2  3000 0.000+0	0.00+0 7.676+0 1.514 9.12-1 -1.60-3 9.329+0 1.462 5.31-1 -1.46-2  4000 0.000+0	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3 7.101+0 1.564 2.81-1 -1.89-2 5000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	1.99-2 4.188+0 1.597 6.01-1 -6.58-3 5.520+0 1.617 1.27-1 -1.87-2 6000 0.000+0 0.0000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.0	5.81-2 3.274+0 1.622 4.65-1 -8.17-3 4.383+0 1.645 4.62-2 -1.76-2 7000 0.000+0 0.000+0 0.00+0 1.231+1 0.554 4.08-1 3.35-1 3.569+1 1.232	8.33-2 2.629+0 1.642 3.44-1 -9.47-3 3.545+0 1.660 1.66-2 -1.63-2 8000 7.181+0 1.472 1.77+0 1.47-3 1.112+1 1.152 6.75-1 7.17-2 2.791+1 1.405	1.03-1 2.156+0 1.658 2.39-1 -1.06-2 2.914+0 1.667 2.30-2 -1.49-2 9000 6.200+0 1.511 1.35+0 -4.23-3 9.648+0 1.341 3.82-1 1.55-2 2.219+1 1.508	1.20-1 1.799+0 1.672 1.47-1 -1.16-2 2.428+0 1.668 5.46-2 -1.33-2 10000 5.363+0 1.542 1.06+0 -7.52-3 8.346+0 1.437 1.85-1 -1.97-3 1.793+1 1.576	1.36-1 1.522+0 1.685 6.83-2 -1.24-2 2.048+0 1.665 1.04-1 -1.16-2 11000 4.669+0 1.569 8.22-1 -9.80-3 7.236+0 1.495 7.91-2 -7.60-3 1.468+1 1.623	1.06+0 1.49-1 1.304+ 1.698 1.37-3 -1.31- 1.745+ 1.659 1.64-1 -9.75- 12000 4.092+ 1.592 6.29-1 -1.15- 6.299+ 1.530 3.74-2 -8.70- 1.218+ 1.656
$\bar{c}_{b}$ = 1884.0 eV $\frac{4p_{1/2}}{c_{b}}$ = 1680.1 eV $Z$ =100, Fm: [ $\frac{3s_{1/2}}{c_{b}}$ = 2212.6 eV $\frac{3p_{1/2}}{c_{b}}$ = 57779.0 eV $\frac{3p_{3/2}}{c_{b}}$ = $\frac{3p_{3/2}}{c_{b}}$ =	$\begin{array}{c} \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \gamma \\ \delta \\ \hline (\mathbf{Rn})\mathbf{5f}_{\underline{s}}^{\underline{s}} \\ \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \delta \\ \gamma \\ \delta \\ \hline \sigma \\ \delta \\ \gamma \\ \delta \\ \hline \sigma \\ \delta \\ \gamma \\ \delta \\ \hline \sigma \\ \delta \\ \gamma \\ \delta \\ \hline \sigma \\ \delta \\ \gamma \\ \delta \\ \hline \sigma \\ \delta \\ \gamma \\ \delta \\ \delta \\ \sigma \\ \delta \\ \gamma \\ \delta \\ \delta \\ \sigma \\ \delta \\ \gamma \\ \delta \\ \delta \\ \delta \\ \delta \\ \gamma \\ \delta \\ \delta \\ \delta$	1.749+1 1.195 1.06+0 1.60-2 1.559+1 0.314 2.89-1 1.98-1 5/2 5f <sub>7/2</sub> 7s <sub>1/2</sub> k (eV) 2000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	0.00+0 1.128+1 1.421 1.06+0 3.36-3 1.239+1 1.216 8.31-1 1.14-2  3000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	0.00+0 7.676+0 1.514 9.12-1 -1.60-3 9.329+0 1.462 5.31-1 -1.46-2  4000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3 7.101+0 1.564 2.81-1 -1.89-2 5000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	1.99-2 4.188+0 1.597 6.01-1 -6.58-3 5.520+0 1.617 1.27-1 -1.87-2 6000 0.000+0 0.0000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.0	5.81-2 3.274+0 1.622 4.65-1 -8.17-3 4.383+0 1.645 4.62-2 -1.76-2 7000 0.000+0 0.000+0 0.00+0 1.231+1 0.554 4.08-1 3.35-69+1 1.232 1.73-1	8.33-2 2.629+0 1.642 3.44-1 -9.47-3 3.545+0 1.660 1.66-2 -1.63-2 8000 7.181+0 1.472 1.77+0 1.47-3 1.112+1 1.152 6.75-1 7.17-2 2.791+1 1.405 3.77-3	1.03-1 2.156+0 1.658 2.39-1 -1.06-2 2.914+0 1.667 2.30-2 -1.49-2 9000 6.200+0 1.511 1.35+0 -4.23-3 9.648+0 1.341 3.82-1 1.55-2 2.219+1 1.508 -7.73-2	1.20-1 1.799+0 1.672 1.47-1 -1.16-2 2.428+0 1.668 5.46-2 -1.33-2 10000 5.363+0 1.542 1.06+0 -7.52-3 8.346+0 1.437 1.85-1 -1.97-3 1.793+1 1.576 -9.28-2	1.36-1 1.522+0 1.685 6.83-2 -1.24-2 2.048+0 1.665 1.04-1 -1.16-2 11000 4.669+0 1.569 8.22-1 -9.80-3 7.236+0 1.495 7.91-2 -7.60-3 1.468+1 1.623 -6.47-2	1.06+0 1.49—1 1.304+ 1.698 1.37—2 1.31- 1.745+ 1.659 1.64—1 -9.75- 12000 4.092+ 1.592 -1.15- 6.299+ 1.530 3.74—2 -8.70- 1.218+ 1.656 -7.29-
$E_{b}$ = 1884.0 eV $Ap_{1/2}$ $E_{b}$ = 1680.1 eV $Ap_{1/2}$ $Ap$	β γ δ σ β γ γ δ δ σ β γ γ δ σ β γ γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ σ σ σ σ σ σ σ σ σ σ σ σ σ σ	1.749+1 1.195 1.06+0 1.60-2 1.559+1 0.314 2.89-1 1.98-1 5/2 <b>5f</b> <sub>7/2</sub> <b>7s</b> <sub>1/2</sub> k (eV) 2000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	0.00+0 1.128+1 1.421 1.06+0 3.36-3 1.239+1 1.216 8.31-1 1.14-2  3000 0.000+0	0.00+0 7.676+0 1.514 9.12-1 -1.60-3 9.329+0 1.462 5.31-1 -1.46-2  4000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3 7.101+0 1.564 2.81-1 -1.89-2 5000 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0	1.99-2 4.188+0 1.597 6.01-1 -6.58-3 5.520+0 1.617 1.27-1 -1.87-2 6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 1.617 1.27-1 -1.87-2	7000 0.000+0 0.000+0 0.000+0 1.231+1 0.554 4.08-1 3.35-1 3.26-2	8.33-2 2.629+0 1.642 3.44-1 -9.47-3 3.545+0 1.660 1.66-2 -1.63-2 8000 7.181+0 1.472 1.77+0 1.47-3 1.112+1 1.152 6.75-1 7.17-2 2.791+1 1.405 3.77-3 1.88-2	9000 6.200+0 1.55-2 2.15-1 1.667 2.30-2 -1.49-2 9000 6.200+0 1.511 1.35+0 -4.23-3 9.648+0 1.341 3.82-1 1.55-2 2.219+1 1.508 -7.73-2 2.00-2	1.20-1 1.799+0 1.672 1.47-1 -1.16-2 2.428+0 1.668 5.46-2 -1.33-2 10000 5.363+0 1.542 1.06+0 -7.52-3 8.346+0 1.437 1.85-1 -1.97-3 1.793+1 1.576 -9.28-2 2.51-2	1.36-1 1.522+0 1.685 6.83-2 -1.24-2 2.048+0 1.665 1.04-1 -1.16-2 11000 4.669+0 1.569 8.22-1 -9.80-3 7.236+0 1.495 7.91-2 -7.60-3 1.468+1 1.623 -6.47-2 3.09-2	1.06+0 1.49-1 1.304+1 1.698 1.37-3 1.745+1 1.659 1.64-1 -9.75- 12000 4.092+1 1.592 6.29-1 -1.15- 6.299+1 1.530 3.74-2 -8.70- 1.218+ 1.656 -7.29- 3.64-2
$E_{b}$ = $E$	$\begin{array}{c c} \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \gamma \\ \delta \\ \hline \hline \kappa \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \beta \\ \gamma \\ \delta \\ \hline \sigma \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma \\ \beta \\ \gamma \\ \delta \\ \sigma \\ \sigma$	1.749+1 1.195 1.06+0 1.60-2 1.559+1 0.314 2.89-1 1.98-1 5/2 <b>Sf</b> <sub>7/2</sub> <b>7s</b> <sub>1/2</sub> k (eV) 2000 0.000+0	0.00+0 1.128+1 1.421 1.06+0 3.36-3 1.239+1 1.216 8.31-1 1.14-2  3000 0.000+0	0.00+0 7.676+0 1.514 9.12-1 -1.60-3 9.329+0 1.462 5.31-1 -1.46-2  4000 0.000+0	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3 7.101+0 1.564 2.81-1 -1.89-2 5000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 1.000+0 1.099+2	1.99-2 4.188+0 1.597 6.01-1 -6.58-3 5.520+0 1.617 1.27-1 -1.87-2  6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 1.617 1.27-1 -1.87-2	5.81-2 3.274+0 1.622 4.65-1 -8.17-3 4.383+0 1.645 4.62-2 -1.76-2  7000 0.000+0 0.000+0 0.000+0 1.231+1 0.554 4.08-1 3.35-1 3.569+1 1.232 1.73-1 3.26-2 4.683+1	8.33-2 2.629+0 1.642 3.44-1 -9.47-3 3.545+0 1.660 1.66-2 -1.63-2 8000 7.181+0 1.47-2 1.77+0 1.47-3 1.112+1 1.152 6.75-1 7.17-2 2.791+1 1.405 3.77-3 1.88-2 3.182+1	1.03-1 2.156+0 1.658 2.39-1 -1.06-2 2.914+0 1.667 2.30-2 -1.49-2 9000 6.200+0 1.511 1.35+0 -4.23-3 9.648+0 1.341 3.82-1 1.55-2 2.219+1 1.50-2 2.219+1 2.00-2 2.243+1	1.20-1 1.799+0 1.672 1.47-1 -1.16-2 2.428+0 1.668 5.46-2 -1.33-2 10000 5.363+0 1.542 1.06+0 -7.52-3 8.346+0 1.437 1.85-1 -1.97-3 1.793+1 1.576 -9.28-2 2.51-2 1.632+1	1.36-1 1.522+0 1.685 6.83-2 -1.24-2 2.048+0 1.665 1.04-1 -1.16-2 11000 4.669+0 1.569 8.22-1 -9.80-3 7.236+0 1.495 7.91-2 -7.60-3 1.468+1 1.623 -6.47-2 3.09-2 1.218+1	1.06+0 1.49-1 1.304+1 1.698 1.37-3 -1.31- 1.745+1 1.659 1.64-1 -9.75- 12000 4.092+1 1.592 6.29-1 1.530 3.74-2 -8.70- 1.218+ 1.656 -7.29- 3.64-2 9.292+1
$E_{b}$ = 1884.0 eV $Ap_{1/2}$ $E_{b}$ = 1680.1 eV $Ap_{1/2}$ $Ap$	β γ δ σ β γ γ δ δ σ β γ γ δ σ β γ γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ σ β γ γ δ δ σ σ β γ γ δ δ σ σ σ σ σ σ σ σ σ σ σ σ σ σ σ σ	1.749+1 1.195 1.06+0 1.60-2 1.559+1 0.314 2.89-1 1.98-1 5/2 <b>5f</b> <sub>7/2</sub> <b>7s</b> <sub>1/2</sub> k (eV) 2000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	0.00+0 1.128+1 1.421 1.06+0 3.36-3 1.239+1 1.216 8.31-1 1.14-2  3000 0.000+0	0.00+0 7.676+0 1.514 9.12-1 -1.60-3 9.329+0 1.462 5.31-1 -1.46-2  4000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0	-5.36-2 5.543+0 1.564 7.53-1 -4.52-3 7.101+0 1.564 2.81-1 -1.89-2 5000 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0	1.99-2 4.188+0 1.597 6.01-1 -6.58-3 5.520+0 1.617 1.27-1 -1.87-2 6000 0.000+0 0.000+0 0.000+0 0.000+0 0.000+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 0.00+0 1.617 1.27-1 -1.87-2	7000 0.000+0 0.000+0 0.000+0 1.231+1 0.554 4.08-1 3.35-1 3.26-2	8.33-2 2.629+0 1.642 3.44-1 -9.47-3 3.545+0 1.660 1.66-2 -1.63-2 8000 7.181+0 1.472 1.77+0 1.47-3 1.112+1 1.152 6.75-1 7.17-2 2.791+1 1.405 3.77-3 1.88-2	9000 6.200+0 1.55-2 2.15-1 1.667 2.30-2 -1.49-2 9000 6.200+0 1.511 1.35+0 -4.23-3 9.648+0 1.341 3.82-1 1.55-2 2.219+1 1.508 -7.73-2 2.00-2	1.20-1 1.799+0 1.672 1.47-1 -1.16-2 2.428+0 1.668 5.46-2 -1.33-2 10000 5.363+0 1.542 1.06+0 -7.52-3 8.346+0 1.437 1.85-1 -1.97-3 1.793+1 1.576 -9.28-2 2.51-2	1.36-1 1.522+0 1.685 6.83-2 -1.24-2 2.048+0 1.665 1.04-1 -1.16-2 11000 4.669+0 1.569 8.22-1 -9.80-3 7.236+0 1.495 7.91-2 -7.60-3 1.468+1 1.623 -6.47-2 3.09-2	1.06+0 1.49-1 1.304+1 1.698 1.37-3 -1.31- 1.745+1 1.659 1.64-1 -9.75- 12000 4.092+( 1.592 6.29-1 -1.15- 6.299+1 1.530 3.74-2 -8.70- 1.218+

Table 1	(continued)

Table I (conn	пиеа)											
$3d_{5/2}$	σ	0.000+0	0.000+0	0.000+0	1.543+2	9.517+1	6.084+1	4.077+1	2.843+1	2.048+1	1.516+1	1.147+1
$E_b =$	β	0.000	0.000	0.000	0.714	1.057	1.169	1.209	1.217	1.208	1.189	1.164
4496.7 eV	γ	0.00+0	0.00+0	0.00+0	-3.63 - 1	-2.99-1	-5.63 - 2	1.98 - 1	4.34 - 1	6.50 - 1	8.46 - 1	1.02+0
	δ	0.00+0	0.00+0	0.00+0	-6.94 - 2	1.17 - 2	5.33 - 2	7.98 - 2	9.99 - 2	1.17 - 1	1.33 - 1	1.47 - 1
4s <sub>1/2</sub>	σ	1.694+1	1.124+1	7.689+0	5.571+0	4.219+0	3.305+0	2.658+0	2.183+0	1.824+0	1.546+0	1.326+0
$E_b =$	β	1.117	1.372	1.475	1.530	1.567	1.595	1.617	1.634	1.649	1.663	1.675
1954.2 eV	γ	1.00+0	1.09+0	9.57 - 1	8.03 - 1	6.51 - 1	5.13 - 1	3.90 - 1	2.82 - 1	1.88 - 1	1.06 - 1	3.46 - 2
	δ	2.00-2	4.46 - 3	-1.12 - 3	-4.35 - 3	-6.64 - 3	-8.38 - 3	-9.79 - 3	-1.10-2	-1.20-2	-1.30-2	-1.38-2
$4p_{1/2}$	σ	1.484+1	1.210+1	9.231+0	7.087+0	5.543+0	4.422+0	3.590+0	2.960+0	2.474+0	2.091+0	1.786+0
$E_b =$	β	0.134	1.164	1.434	1.547	1.605	1.638	1.656	1.664	1.667	1.665	1.661
1743.0 eV	γ	8.48 - 2	8.77 - 1	5.88 - 1	3.26 - 1	1.57 - 1	6.30 - 2	2.29 - 2	2.02 - 2	4.43 - 2	8.72 - 2	1.43 - 1
	δ	2.41 - 1	1.60 - 2	-1.50-2	-2.02 - 2	-2.02-2	-1.90-2	-1.75 - 2	-1.61-2	-1.45-2	-1.28 - 2	-1.10-2