ATOMIC DATA AND NUCLEAR DATA TABLES **60,** 1–36 (1995)

CROSS SECTIONS AND RATE COEFFICIENTS FOR EXCITATION OF $\Delta n = 0$ TRANSITIONS IN Be-LIKE IONS WITH $6 \leqslant Z \leqslant 54$

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Excitation cross sections and rate coefficients by electron impact are calculated for the transitions among the $1s^22s^2$, $1s^22s2p$, $1s^22p^2$ levels of the Be-like ions C III, O V, Ne VII, Mg IX, Si XI, S XIII, Ar XV, Ca XVII, Ti XIX, Fe XXIII, Zn XXVII, Kr XXXIII, Mo XXXIX, and Xe LI by a Coulomb–Born approximation with exchange and including relativistic effects and configuration interactions. The cross-section and rate coefficient data are fitted by simple functions of the (scaled) electron impact energy and temperature, respectively. Level energies, mixing coefficients, and transition wavelengths and probabilities are also given. © 1995 Academic Press, Inc.

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CONTENTS

INTRODUCTION

In a previous paper on Be-like ions[1] we presented excitation cross sections, rate coefficients, and oscillator strengths for OV, Si XI, Fe XXIII, and Mo XXXIX. The calculations for energy levels, mixing coefficients, and radiative transitions were done using $1/Z$ perturbation theory, and those for the collisional data were done using a Coulomb–Born approximation with exchange and with inclusion of relativistic effects and configuration interaction. In Ref. 1, we compared our results for O V with R-matrix data by the Belfast group[2,3] and with previous Coulomb–Born calculations[4] for Si XI, Fe XXIII, and Mo XXXIX. Two kinds of fitting formulas for cross sections and rate coefficients were also discussed, and fit parameters were given. Here, we present further results for Δn = 0 transitions among the 24 levels arising from the $1s^22s^2$, $1s^22s2p$, and $1s^22p^2$ configurations of Be-like ions in the range Z = 6–54. The theoretical approach to the calculation has been discussed in detail in Ref. 1 and is therefore not repeated.

Level Energies, Mixing Coefficients, and Radiative Transitions

The configurations included in the diagonalization of the energy matrix are $1s^22s^2$, $1s^22s2p$, and $1s^22p^2$. Table I gives ionization potentials for the $1s^22l2l'LSJ$ levels. Our designations for levels follow Ref. 5: letters for configurations (E, $1s^22s^2$; F, $1s^22p^2$; C, $1s^22s2p$; S, $1s^22s$; P, $1s^22p$) and numbers for levels (three numbers indicating $(2S + 1)(2L + 1)(2J + 1)$). These data are used as input to the ATOM program.[6] Calculation of excitation cross sections from $1s^22p^2$ states involves the ionization energy of the $2p$ electron. Thus, we have added

the $1s^22p$–$1s^22s$ transition energy in Table I where appropriate.

Mixing coefficients obtained in intermediate coupling are given in Table II for Z = 6–54. Note that the $2p^2\ ^3P_1$ and $2s2p\ ^3P_2$, $^3P_0$ states are unmixed and that the coefficients for these states are equal to 1. Note also that between Z = 35 and 36 there is a level crossing which required a change in level designations between the $1s^22p^2$ $^3P_2$ and $^1D_2$ levels.

Wavelengths, transition probabilities, and weighted oscillator strengths gf for the 16 allowed dipole transitions are given in Table III. In comparing our gf values with those of Ref. 7, agreement to better than 10% has been found for nearly all transitions in the range Z = 14–54, except for some very weak transitions and the $2s2p\ ^1P_1$–$2p^2\ ^1S_0$ transition, for which deviations increased to 15–20% at low Z.

Excitation Cross Sections and Rate Coefficients

Our calculated cross sections for the 24 $2s^2$–$2s2p$ and $2s2p$–$2p^2$ transitions for the 14 Be-like ions are shown in Graphs I as a function of the scaled scattered electron energy u, given in units of Z_S^2 (Ry), where $Z_S = Z - 3$ is the effective nuclear charge. Cross sections for allowed and J'–J = 0–0, 0–2, and 2–0 forbidden transitions change smoothly with u and their energy dependence does not change very much with Z. For such transitions the curves for different ions do not cross in the entire energy interval; the cross sections at the same energy values decrease with Z. It is possible to display these dependencies in graphs without using a logarithmic scale by dividing all the cross sections by Z^4. The cross-section variations for intercombination transitions are much more complicated. The ratio of the largest to the smallest cross-section value at the same energy is equal to approximately 10^5 for the smallest value of energy. It decreases with increasing energy and is equal to 10–100 for u = 10.24. The curves for different ions also begin to cross.

The collisional excitation rates, R, were calculated from the excitation cross sections assuming a Maxwellian distribution of electron velocities. In Graphs II, scaled excitation rate coefficients, R_C, are shown as a function of the scaled electron temperature $1/\beta$ in units of Z_S^2 (Ry) for the same 14 Be-like ions. R is obtained from the plotted R_C values by multiplying with $10^{-10}e^{-\beta\Delta\epsilon}$, where $\Delta\epsilon$ is the transition energy in units of Z_S^2 (Ry) given in Table IV. The variations with energy and Z are very similar to those seen in Graphs I. These dependencies can be displayed in graphs without using a logarithmic scale by dividing all R_C values by Z^3.

In Ref. 1, we had compared our results with those of Refs. 2–4. Here, we show some additional comparisons of our collisional strengths (derivable from the cross sections with the usual expression as given in, for example, Ref. 4) with recent relativistic distorted-wave calculations.[7] Figure 1 shows that there is rather good agreement for the $2s^2\ ^1S_0$–$2s2p\ ^3P_0$ forbidden transition for the entire range of Z considered here. For the $2s2p\ ^3P_0$–$2p^2\ ^3P_1$ allowed transition shown in Fig. 2, agreement is not as good, especially at low energies and low Z; the discrepancies are generally well within 10%, however.

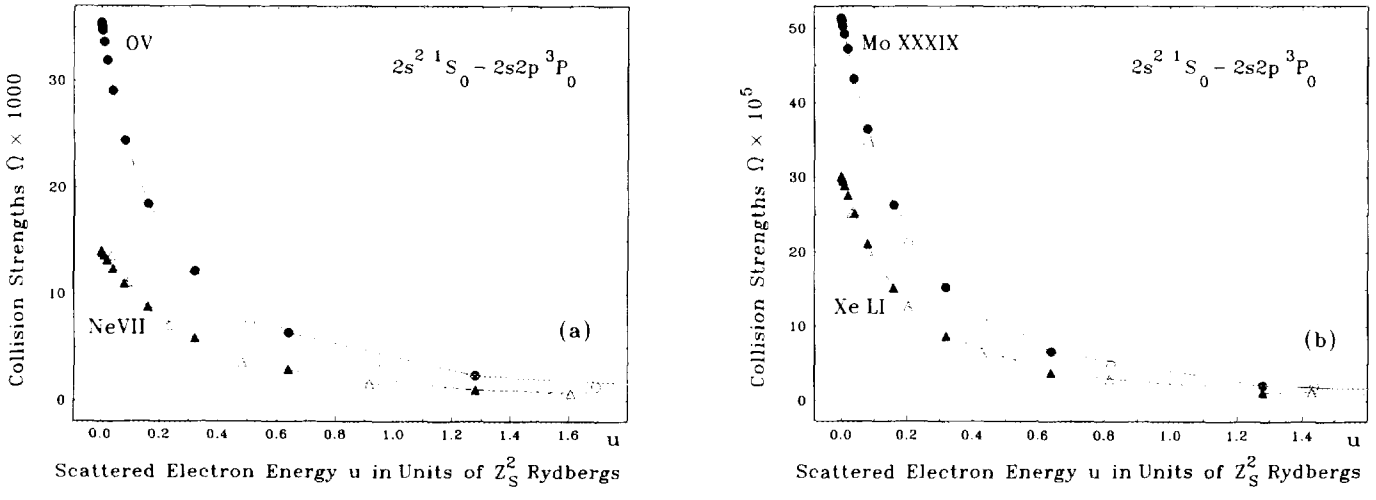

Figure 1. Comparison of collision strengths, plotted against scaled scattered electron energies u, from this work (filled symbols) with those of Ref. 7 (open symbols) for the $2s^2\ ^1S_0$–$2s2p\ ^3P_0$ forbidden transition (a) for low-Z ions O V and Ne VII and (b) for high-Z ions Mo XXXIX and Xe LI.

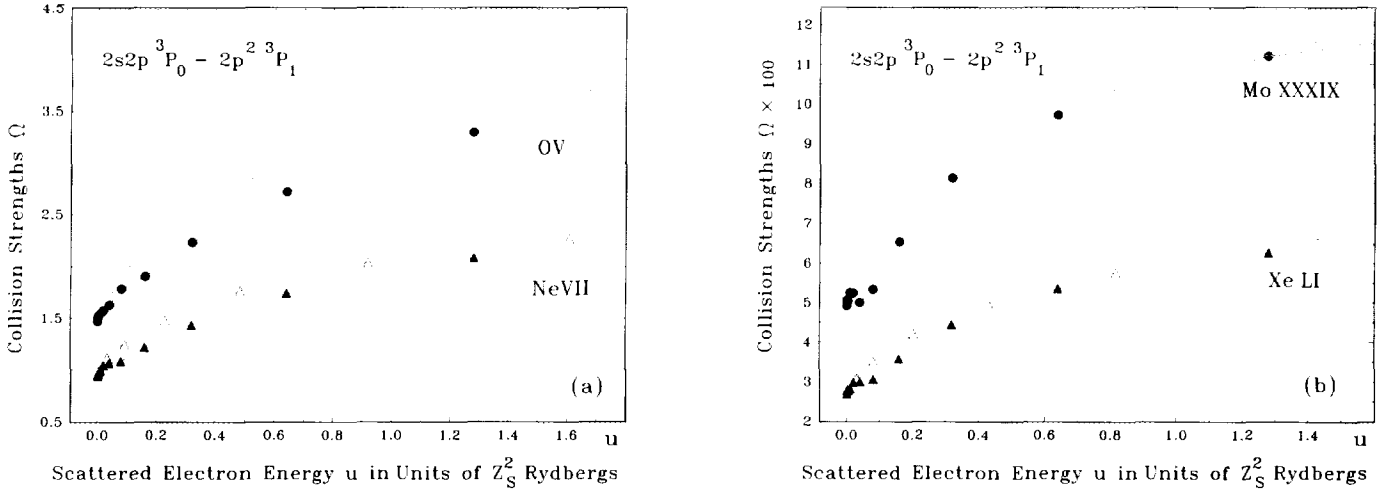

Figure 2. Same as for Fig. 1 but for the $2s2p\ ^3P_0$–$2p^2\ ^3P_1$ allowed transition.

Fitting Formulas

In Ref. 1 a fitting formula based on parameters with a smooth dependence on Z is suggested for the excitation cross section:

$$\sigma(a'J'\text{–}aJ) = \frac{\pi a_0^2}{Z_S^4}\frac{\epsilon_1^{3/2}}{\epsilon_0^{7/2}}\left(\frac{C_1(u^2+a^2)\ln(u+\Delta\epsilon)4f^2}{(u+F_1)(u^2+a^2+bu)} + \frac{C_2\epsilon_0^2}{(u+F_2)(u+0.4)^2}\right). \quad (1)$$

There are two pairs of fit parameters, (C_1, F_1) and (C_2, F_2), which correspond to the direct and exchange contributions to the cross section, respectively. The values of a, b, and f are

$$a = -\Delta\epsilon \ln \Delta\epsilon, \quad b = 0.04a^3/(\Delta\epsilon)^2,$$
$$f^2 = \epsilon_0\epsilon_1/(\Delta\epsilon)^2, \quad (2)$$

with $\Delta\epsilon = \epsilon_1 - \epsilon_0$, where ϵ_0 and ϵ_1 are the ionization energies of the initial and the final states in units of Z_S^2 (Ry). Z_S, the effective nuclear charge, is set at $Z - 3$; a_0 is the Bohr radius. The impact electron energy E is defined in terms of the scattered electron energy u as $E = (u + \Delta\epsilon)Z_S^2$ (Ry). Table IV gives the values of $\Delta\epsilon$, ϵ_0, and ϵ_1. These values are calculated from Table I except that at very high Z they are allowed to vary slightly in order to improve the fits.

TABLE A

Ratio of Calculated to Fitted Excitation Cross Section for the $2s^2\ ^1S_0$–$2s2p\ ^3P_0$ Transition

u\ion	O V	Mg IX	Ar XV	Ti XIX	Fe XXIII	Zn XXVII	Kr XXXIII	Mo XXXIX	Xe LI
6.25×10^{-4}	0.98	0.97	0.93	0.91	0.90	0.89	0.87	0.87	0.86
2.5×10^{-3}	0.98	0.97	0.96	0.97	0.97	0.98	0.99	0.98	0.96
0.01	1.00	0.99	1.05	1.08	1.11	1.13	1.16	1.16	1.14
0.04	1.01	1.06	1.17	1.21	1.24	1.26	1.27	1.29	1.30
0.16	1.07	1.23	1.30	1.31	1.31	1.31	1.31	1.32	1.34
0.64	1.29	1.31	1.25	1.22	1.19	1.18	1.16	1.16	1.17
2.56	0.97	0.86	0.78	0.75	0.73	0.72	0.70	0.70	0.71
10.24	0.47	0.36	0.30	0.28	0.26	0.25	0.24	0.24	0.23

TABLE B

Ratio of Calculated to Fitted Excitation Rate Coefficient for the $2s^2\ ^1S_0$–$2s2p\ ^3P_0$ Transition

β\ion	O V	Mg IX	Ar XV	Ti XIX	Fe XXIII	Zn XXVII	Kr XXXIII	Mo XXXIX	Xe LI
0.5	1.02	1.00	1.01	1.01	1.01	1.01	1.01	1.01	1.02
1	0.97	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
2	0.94	0.97	0.97	0.96	0.96	0.96	0.96	0.96	0.96
4	0.94	0.98	0.97	0.97	0.96	0.96	0.96	0.96	0.96
8	0.96	1.00	0.99	0.99	0.98	0.98	0.98	0.97	0.97
16	0.99	1.01	1.01	1.01	1.01	1.00	1.00	1.00	1.00
32	1.03	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
128	1.04	0.99	1.00	1.00	1.01	1.01	1.01	1.01	1.02

The excitation rate coefficients (in units of $cm^3\ s^{-1}$) are fitted as[1]

$$R(a'J'\text{–}aJ) = \frac{10^{-8}}{Z_S^3}\, e^{-\beta\Delta\epsilon}\beta^{1/2}\frac{\epsilon_1^{3/2}}{\epsilon_0^{7/2}} \times \left(A_1\frac{\beta+1}{\beta+\kappa_1}\ln(2f^2/\beta+f) + \epsilon_0^2 A_2\frac{\beta}{\beta+\kappa_2}\right), \quad (3)$$

where $\beta = Z_S^2\,(\mathrm{Ry})/kT$ (k is the Boltzmann constant) and (A_1, κ_1), (A_2, κ_2) are two pairs of fit parameters.

Fitting formulas (1) and (3) are divided into two parts, corresponding to the direct and exchange contributions. For forbidden transitions (J'–J = 0–0, 0–2, and 2–0) only the exchange part contributes to the cross sections and rate coefficients. In this case C_1, F_1 and A_1, κ_1 are equal to zero and only the second part in Eqs. (1) and (3) is used.

For allowed transitions, good fits to the excitation cross sections can be obtained using only C_1 and F_1. For the rate coefficients we determined not only A_1, A_2, κ_1, and κ_2, but also A and κ. The fit parameters A and κ are calculated using Eq. (3), but omitting the exchange part ($A_2 = 0$, $\kappa_2 = 0$). In the case of $\Delta S = 0$ spin-allowed transitions, the values A_1 and A, κ_1 and κ are almost equal because the influence of the exchange part is not very strong. For intercombination transitions ($\Delta S = 1$) the exchange part gives a more important contribution, especially for small Z. With increasing Z the difference between fits using A or A_1, κ or κ_1 becomes progressively smaller (for Mo XXXIX this difference is about 1–2%). We therefore conclude that it is possible to use only two fit parameters: A and κ. This is very convenient for estimation of R values.

The coefficients C_i, F_i, A_i, κ_i (i = 1, 2), A, and κ are listed in Table IV.

It should be noted that all fit parameters were determined using the calculated values of the cross section $\sigma(a'J'\text{–}aJ)$ and the excitation rate coefficients $R(a'J'\text{–}aJ)$.

TABLE C

Ratio of Calculated to Fitted Excitation Cross Section for the $2s^2\ ^1S_0$–$2s2p\ ^1P_1$ Transition

u\ion	O V	Mg IX	Ar XV	Ti XIX	Fe XXIII	Zn XXVII	Kr XXXIII	Mo XXXIX	Xe LI
6.25×10^{-4}	1.00	0.98	0.99	0.97	0.97	0.97	0.97	0.97	0.97
2.5×10^{-3}	1.00	1.00	1.00	1.00	1.00	0.99	0.99	0.99	1.00
0.01	1.00	1.01	0.98	1.00	1.03	1.04	1.04	1.04	1.00
0.04	0.99	1.00	1.05	1.05	1.02	1.00	0.99	1.00	1.05
0.16	0.99	0.98	0.95	0.94	0.94	0.94	0.94	0.94	0.94
0.64	0.96	0.97	0.98	0.98	0.99	0.99	0.99	0.99	0.98
2.56	1.02	1.02	1.02	1.01	1.02	1.02	1.02	1.02	1.02
10.24	1.04	1.03	1.03	1.02	1.03	1.03	1.03	1.03	1.03

For each value of the scaled scattered electron energy u and inverse temperature β, the ratio, K, of calculated to fitted data was obtained in order to assess the accuracy of the fit parameters. Table A lists K for the cross section of the $2s^2\ ^1S_0$–$2s2p\ ^3P_0$ forbidden transition. Note that K is generally close to unity but substantial deviations occur at the highest u and Z values. The behavior is typical for the J'–J = 0–0, 0–2, and 2–0 transitions. For the corresponding rate coefficient the deviations between fitted and calculated data are never more than 6% (Table B), due to the fact that the lower electron velocities make the predominant contribution to the rate coefficient at all temperatures. For the cross section of the $2s^2\ ^1S_0$–$2s2p\ ^1P_1$ allowed transition, calculated and fitted data are within about ±5% of each other for the entire range of u and Z (Table C), as is typical for other allowed transitions. The same is true for the corresponding rate coefficients.

Summary

This paper has presented collisional data for Be-like ions with $6 \leqslant Z \leqslant 54$. The $1/Z$ perturbation theory and Coulomb–Born approximation calculations performed here are less complicated than the R-matrix method[2,3] and the relativistic distorted-wave approximation[7] but give good agreement with those results as discussed here and in Ref. 1. The fitting formulas we proposed for excitation cross sections and rate coefficients separate naturally into direct and exchange contributions, and the fit parameters exhibit a smooth dependence on Z. In the majority of cases, our numerical results can be approximated using only two fit parameters; this makes our approach very convenient for the estimation of collisional data for ions in a wide range of Z values.

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EXPLANATION OF TABLES

TABLE I. Ionization Potentials (in 10^4 cm^{-1}) for Be-like Ions, Z = 6–54

Letters indicate the configuration and the three numbers following a letter the LSJ level, given as $(2S + 1)(2L + 1)(2J + 1)$.

E $1s^2 2s^2$ configuration
F $1s^2 2p^2$ configuration
C $1s^2 2s2p$ configuration
S $1s^2 2s$ configuration
P $1s^2 2p$ configuration

TABLE II. Mixing Coefficients for Be-like Ions, Z = 6–54

Rows list expansion coefficients for LSJ levels in the LS-coupling basis set. For example, for $Z = 8$ the wave function of the second excited even-parity $J = 0$ level (labeled F 111 in Table I) is given by $\Psi(3) = 0.257939\Psi(1s^2 2s^2\ ^1S_0) + 0.005465\Psi(1s^2 2p^2\ ^3P_0) + 0.966146\Psi(1s^2 2p^2\ ^1S_0)$. Note that there is a level crossing between $Z = 35$ and 36 for the $1s^2 2p^2\ ^3P_2$ and $^1D_2$ levels and that the order of the basis states is interchanged for $Z > 35$.

TABLE III. Wavelengths, Transition Probabilities, and Weighted Oscillator Strengths, Z = 6–54

TRANSITION	Labels for initial and final state as in Table I
WL	Transition wavelength in Angstroms
A	Transition probability in s^{-1}; 1.18+03 means $1.18 \times 10^3\ s^{-1}$
gf	Weighted oscillator strength; 1.05−07 means 1.05×10^{-7}

TABLE IV. Fit Parameters for Excitation Cross Sections and Rate Coefficients for Δn = 0 Transitions, Z = 6, 8, 10, 12, 14, 16, 18, 20, 22, 26, 30, 36, 42, 54

Each data block gives fitting parameters for the transition listed in the first row for the 14 ions identified by their spectroscopic designation in the second row.

$\Delta\epsilon$	Transition energy, $\Delta\epsilon = \epsilon_0 - \epsilon_1$; ϵ_0, ϵ_1, and $\Delta\epsilon$ are given in units of Z_S^2 (Ry) with $Z_S = Z - 3$, where 5.303 − 2 means 5.303×10^{-2} Ry
ϵ_0	Ionization threshold of lower level
ϵ_1	Ionization threshold of upper level
C1, F1, C2, F2	Fit parameters C_1, F_1, C_2, and F_2 for the excitation cross section (Eq. (1)); parameters not listed are zero
A1, κ1, A2, κ2	Fit parameters A_1, κ_1, A_2, and κ_2 for the excitation rate coefficient (Eq. (3)); parameters not listed are zero
A, κ	Fit parameters for the excitation rate coefficient (Eq. (3)) to be used in place of A_1, κ_1 with A_2, κ_2 set equal to zero

EXPLANATION OF GRAPHS

Each graph is labeled on top by the transition. The symbols are keyed to the ions on the right-hand side.

GRAPHS I. Excitation Cross Sections for $\Delta n = 0$ Transitions, $Z = 6, 8, 10, 12, 14, 16, 18, 20, 22, 26, 30, 36, 42, 54$

Abscissa Scaled scattered electron energy, u; the impact electron energy (in eV) is given by $E = 13.6 \times Z_S^2 (\Delta\epsilon + u)$, with $Z_S = Z - 3$ and $\Delta\epsilon$ from Table IV

Ordinate Excitation cross section, in 10^{-n} cm^2

GRAPHS II. Excitation Rate Coefficients for $\Delta n = 0$ Transitions, $Z = 6, 8, 10, 12, 14, 16, 18, 20, 22, 26, 30, 36, 42, 54$

Abscissa Scaled temperature $1/\beta$; the temperature (in eV) is given by $T = 13.6 \times Z_S^2/\beta$

Ordinate Scaled excitation rate coefficient R_C; the excitation rate coefficient (in cm^3 s^{-1}) is given by $R = 10^{-10} e^{-\beta\Delta\epsilon} R_C$, with $\Delta\epsilon$ from Table IV

EXAMPLE OF USE OF TABLE IV

We consider the $2s^2\ ^1S_0$–$2s2p\ ^3P_0$ and $2s^2\ ^1S_0$–$2s2p\ ^1P_1$ transitions for Mg IX when the scaled scattered electron energy $u = 0.01$ and the scaled temperature $1/\beta = 1/0.5$.

a) The $2s^2\ ^1S_0$–$2s2p\ ^3P_0$ Transition

For this transition we find from the column for Mg IX that $\Delta\epsilon = 1.582 \times 10^{-2}$, $\epsilon_0 = 0.2977$, $\epsilon_1 = 0.2819$, $C_2 = 1.17 \times 10^{-1}$, $F_2 = 1.56 \times 10^{-2}$, $A_2 = 1.50$, and $\kappa_2 = 2.37$. Use of these values and the recommended value of $Z - 3$ for the screened charge Z_S in Eq. (1) gives for the cross section

$$\sigma(2s^2\ ^1S_0\text{–}2s2p\ ^3P_0) = \frac{8.797 \times 10^{-17}}{(12-3)^4}\frac{(0.2819)^{3/2}}{(0.2977)^{7/2}}\frac{0.117(0.2977)^2}{(0.01+0.0156)(0.01+0.4)^2}$$
$$= 3.36 \times 10^{-19}\ \text{cm}^{-2}.$$

The impact electron energy E in eV is equal to

$$E = 13.6(12-3)^2(0.01+0.01582)\ \text{eV} = 28.4\ \text{eV}.$$

We use Eq. (3) and the parameter values from Table IV and obtain for the excitation rate coefficient

$$R(2s^2\ ^1S_0\text{–}2s2p\ ^3P_0) = \frac{10^{-8}}{(12-3)^3}\exp(-0.5 \times 0.01582)(0.5)^{1/2}\frac{(0.2819)^{3/2}}{(0.2977)^{7/2}}$$
$$\times (0.2977)^2 1.50\frac{0.5}{(0.5+2.37)} = 2.32 \times 10^{-12}\ \text{cm}^3\ \text{s}^{-1}.$$

The electron temperature T in eV for $\beta = 0.5$ is equal to

$$T\,(\text{eV}) = 13.6(12-3)^2/0.5 = 2204\ \text{eV}.$$

b) The $2s^2\ ^1S_0$–$2s2p\ ^1P_1$ Transition

For this transition we find from the column for Mg IX that $\Delta\epsilon = 3.056 \times 10^{-2}$, $\epsilon_0 = 0.2977$, $\epsilon_1 = 0.2671$, $C_1 = 4.16$, $F_1 = 2.63 \times 10^{-2}$, $A_1 = 9.36$, $\kappa_1 = 1.11$, $A_2 = 2.91$, and $\kappa_2 = 2.57$. First we calculate a, b, and f using Eq. (2):

$$a = -0.03056\ln(0.03056) = 0.1066, \quad b = 0.04(0.1066)^3/(0.03056)^2 = 0.05188,$$
$$f^2 = 0.2977 \times 0.2671/(0.03056)^2 = 85.14.$$

Use of these values together with Eq. (1) gives for the cross section

$$\sigma(2s^2\ ^1S_0\text{–}2s2p\ ^1P_1) = \frac{8.797 \times 10^{-17}}{(12-3)^4}\frac{(0.2671)^{3/2}}{(0.2977)^{7/2}}\frac{4.16}{(0.01+0.0263)}$$
$$\times \frac{[(0.01)^2+(0.1066)^2]\ln[(0.01+0.03056)4 \times 85.14]}{[(0.01)^2+(0.1066)^2+0.05188 \times 0.01]} = 3.70 \times 10^{-17}\ \text{cm}^{-2}.$$

The impact electron energy E in eV is equal to

$$E = 13.6(12-3)^2(0.01+0.03056)\ \text{eV} = 44.7\ \text{eV}.$$

EXAMPLE OF USE OF TABLE IV continued

We use Eq. (3) and the above parameter values from Table IV and obtain for the excitation rate coefficient

$$R(2s^2\ {}^1S_0\text{–}2s2p\ {}^1P_1) = \frac{10^{-8}}{(12-3)^3}\exp(-0.5\times 0.03056)(0.5)^{1/2}\frac{(0.2671)^{3/2}}{(0.2977)^{7/2}}$$
$$\times\left(9.36\frac{(0.5+1)}{0.5+1.11}\ln(2\times 85.14/0.5+9.227)\right.$$
$$\left.+(0.2977)^2\times 2.91\frac{0.5}{0.5+2.57}\right)$$
$$= 9.16\times 10^{-11}(51.08+0.042)$$
$$= 4.68\times 10^{-9}\ \mathrm{cm^3\ s^{-1}}.$$

The electron temperature T in eV for $\beta = 0.5$ is equal to

$$T\,(\mathrm{eV}) = 13.6(12-3)^2/0.5 = 2204\ \mathrm{eV}.$$

Using instead the parameters $A = 9.45$ and $\kappa = 1.12$ in Eq. (3) results in a fitted value for the excitation rate coefficient,

$$R(2s^2\ {}^1S_0\text{–}2s2p\ {}^1P_1) = \frac{10^{-8}}{(12-3)^3}\exp(-0.5\times 0.03056)(0.5)^{1/2}\frac{(0.2671)^{3/2}}{(0.2977)^{7/2}}$$
$$\times 9.45\frac{(0.5+1)}{0.5+1.12}\ln(2\times 85.14/0.5+9.227) = 4.69\times 10^{-9}\ \mathrm{cm^3\ s^{-1}},$$

which is very close to the value given above.

TABLE I. Ionization Potentials (in 10^4 cm^{-1}) for Be-like Ions, Z = 6–54

See page 7 for Explanation of Tables

Designations: E-$1s^2 2s^2$, F-$1s^2 2p^2$, C-$1s^2 2s2p$, S-$1s^2 2s$,P-$1s^2 2p$; numbers after letter:(2S+1)(2L+1)(2J+1)

Z	E 111 -S 212	F 331 -S 212	F 333 -S 212	F 335 -S 212	F 155 -S 212	F 111 -S 212	C 133 -S 212	C 331 -S 212	C 333 -S 212	C 335 -S 212	P 234 -S 212	P 232 -S 212
6	38.6397	24.9043	24.9011	24.8961	24.0621	20.3780	28.3827	33.4025	33.3998	33.3932	6.4592	6.4476
7	62.5018	44.9492	44.9413	44.9284	43.6140	38.9653	49.4330	55.7818	55.7749	55.7589	8.0738	8.0463
8	91.8828	70.5331	70.5166	70.4890	68.7040	63.0910	76.0116	83.6878	83.6732	83.6403	9.6928	9.6373
9	126.7802	101.6380	101.6072	101.5552	99.3080	92.7326	108.1064	117.1156	117.0883	117.0275	11.3263	11.2255
10	167.1973	138.2554	138.2024	138.1129	135.4117	127.8762	145.7120	156.0659	156.0189	155.9154	12.9832	12.8138
11	213.1398	180.3820	180.2961	180.1520	177.0056	168.5121	188.8266	200.5429	200.4675	200.3017	14.6722	14.4041
12	264.6158	228.0179	227.8848	227.6653	224.0823	214.6333	237.4509	250.5533	250.4383	250.1853	16.4024	15.9979
13	321.6348	281.1653	280.9666	280.6465	276.6353	266.2333	291.5865	306.1057	305.9376	305.5665	18.1842	17.5963
14	384.2074	339.8285	339.5407	339.0909	334.6585	323.3063	351.2363	367.2101	366.9729	366.4458	20.0276	19.2002
15	452.3456	404.0136	403.6069	402.9946	398.1447	385.8460	416.4036	433.8782	433.5533	432.8245	21.9445	20.8107
16	526.0628	473.7288	473.1656	472.3552	467.0866	453.8454	487.0924	506.1226	505.6890	504.7041	23.9466	22.4286
17	605.3732	548.9839	548.2177	547.1713	541.4744	527.2968	563.3068	583.9576	583.3918	582.0865	26.0477	24.0541
18	690.2927	629.7908	628.7645	627.4437	621.2975	606.1907	645.0510	667.3989	666.6747	664.9744	28.2613	25.6881
19	780.8378	716.1641	714.8073	713.1747	706.5417	690.5165	732.3295	756.4626	755.5522	753.3694	30.6032	27.3314
20	877.0267	808.1203	806.3481	804.3694	797.1915	780.2615	825.1466	851.1669	850.0405	847.2748	33.0891	28.9851
21	978.8792	905.6779	903.3891	901.0340	893.2280	875.4112	923.5065	951.5309	950.1575	946.6934	35.7350	30.6491
22	1086.415	1008.858	1005.932	1003.177	994.6302	975.9495	1027.413	1057.575	1055.922	1051.628	38.5608	32.3246
23	1199.657	1117.685	1113.981	1110.809	1101.376	1081.858	1136.870	1169.320	1167.356	1162.083	41.5849	34.0111
24	1318.628	1232.184	1227.536	1223.939	1213.441	1193.118	1251.880	1286.790	1284.481	1278.060	44.8266	35.7097
25	1443.353	1352.382	1346.603	1342.576	1330.802	1309.705	1372.448	1410.009	1407.323	1399.565	48.3081	37.4209
26	1573.858	1478.309	1471.183	1466.730	1453.435	1431.599	1498.575	1539.002	1535.908	1526.601	52.0515	39.1470
27	1710.168	1609.995	1601.280	1596.407	1581.317	1558.775	1630.263	1673.796	1670.265	1659.171	56.0795	40.8864
28	1852.316	1747.472	1736.898	1731.615	1714.424	1691.207	1767.516	1814.418	1810.424	1797.281	60.4177	42.6405
29	2000.329	1890.775	1878.040	1872.358	1852.735	1828.870	1910.334	1960.900	1956.416	1940.934	65.0927	44.4094
30	2154.240	2039.936	2024.711	2018.642	1996.227	1971.737	2058.720	2113.270	2108.275	2090.136	70.1308	46.1957

Z	E 111 -S 212	F 331 -S 212	F 333 -S 212	F 335 -S 212	F 155 -S 212	F 111 -S 212	C 133 -S 212	C 331 -S 212	C 333 -S 212	C 335 -S 212	P 234 -S 212	P 232 -S 212
31	2314.081	2194.991	2176.914	2170.469	2144.875	2119.780	2212.675	2271.562	2266.036	2244.891	75.5600	47.9988
32	2479.888	2355.976	2334.653	2327.844	2298.656	2272.972	2372.202	2435.809	2429.735	2405.204	81.4099	49.8166
33	2651.696	2522.928	2497.933	2490.771	2457.547	2431.283	2537.303	2606.046	2599.412	2571.081	87.7085	51.6531
34	2829.543	2695.884	2666.759	2659.255	2621.519	2594.686	2707.980	2782.310	2775.104	2742.525	94.4947	53.5071
35	3013.468	2874.884	2841.135	2833.298	2790.545	2763.149	2884.234	2964.640	2956.853	2919.544	101.7966	55.3824
36	3203.513	3059.969	3021.066	2964.599	3012.906	2936.642	3066.071	3153.074	3144.702	3102.143	109.6517	57.2752
37	3399.718	3251.178	3206.557	3143.649	3198.081	3115.132	3253.494	3347.656	3338.693	3290.328	118.0963	59.1868
38	3602.129	3448.556	3397.613	3327.666	3388.831	3298.587	3446.504	3548.425	3538.871	3484.103	127.1664	61.1225
39	3810.792	3652.147	3594.238	3516.615	3585.159	3486.974	3645.108	3755.429	3745.283	3683.476	136.9037	63.0782
40	4025.753	3861.994	3796.440	3710.463	3787.069	3680.254	3849.309	3968.714	3957.976	3888.452	147.3495	65.0567
41	4247.063	4078.150	4004.224	3909.175	3994.568	3878.395	4059.115	4188.327	4177.001	4099.040	158.5415	67.0554
42	4474.771	4300.657	4217.595	4112.712	4207.660	4081.354	4274.526	4414.317	4402.408	4315.243	170.5332	69.0808
43	4708.931	4529.571	4436.558	4321.038	4426.351	4289.094	4495.552	4646.739	4634.249	4537.069	183.3662	71.1303
44	4949.598	4764.941	4661.121	4534.109	4650.646	4501.575	4722.198	4885.646	4872.579	4764.526	197.0886	73.2013
45	5196.828	5006.825	4891.288	4751.885	4880.553	4718.752	4954.469	5131.091	5117.455	4997.618	211.7487	75.2990
46	5450.680	5255.278	5127.066	4974.323	5116.076	4940.582	5192.373	5383.135	5368.933	5236.355	227.4001	77.4236
47	5711.215	5510.358	5368.462	5201.373	5357.220	5167.017	5435.915	5641.835	5627.075	5480.742	244.0963	79.5749
48	5978.499	5772.126	5615.481	5432.990	5603.994	5398.009	5685.104	5907.257	5891.943	5730.788	261.8937	81.7557
49	6252.590	6040.646	5868.131	5669.123	5856.400	5633.509	5939.943	6179.461	6163.601	5986.498	280.8484	83.9606
50	6533.561	6315.980	6126.417	5909.719	6114.451	5873.463	6200.443	6458.517	6442.114	6247.880	301.0248	86.1977
51	6821.481	6598.201	6390.348	6154.727	6378.147	6117.817	6466.610	6744.492	6727.556	6514.944	322.4872	88.4642
52	7116.424	6887.375	6659.927	6404.084	6647.498	6366.513	6738.449	7037.459	7019.992	6787.694	345.2918	90.7629
53	7418.459	7183.577	6935.164	6657.736	6922.509	6619.491	7015.972	7337.489	7319.500	7066.139	369.5137	93.0911
54	7727.670	7486.879	7216.064	6915.620	7203.187	6876.694	7299.183	7644.663	7626.157	7350.289	395.2198	95.4541

TABLE II. Mixing Coefficients for Be-like Ions, Z = 6–54

See page 7 for Explanation of Tables

$$\Psi(i)=C(i,1)\Psi(1s^2 2s^2\ {}^1S_0) + C(i,2)\Psi(1s^2 2p^2\ {}^3P_0) + C(i,3)\Psi(1s^2 2p^2\ {}^1S_0)$$

Z=6			Z=7			Z=8		
0.961227	-0.000645	-0.275757	0.964219	-0.001182	-0.265105	0.966161	-0.001955	-0.257932
0.000148	0.999998	-0.001823	0.000282	0.999994	-0.003434	0.000479	0.999983	-0.005784
0.275758	0.001711	0.961226	0.265108	0.003236	0.964213	0.257939	0.005465	0.966146
Z= 9			Z=10			Z=11		
0.967548	-0.003002	-0.252669	0.968613	-0.004361	-0.248536	0.969479	-0.006067	-0.245098
0.000750	0.999959	-0.009008	0.001107	0.999912	-0.013232	0.001560	0.999826	-0.018578
0.252685	0.008526	0.967511	0.248572	0.012542	0.968532	0.245168	0.017629	0.969320
Z=12			Z=13			Z=14		
0.970221	-0.008147	-0.242086	0.970882	-0.010626	-0.239324	0.971492	-0.013520	-0.236686
0.002118	0.999681	-0.025155	0.002789	0.999449	-0.033060	0.003582	0.999096	-0.042370
0.242214	0.023894	0.969929	0.239543	0.031429	0.970377	0.237045	0.040314	0.970662
Z=15			Z=16			Z=17		
0.972072	-0.016838	-0.234078	0.972635	-0.020579	-0.231427	0.973190	-0.024732	-0.228670
0.004500	0.998577	-0.053142	0.005549	0.997843	-0.065407	0.006732	0.996839	-0.079163
0.234640	0.050605	0.970764	0.232274	0.062333	0.970651	0.229905	0.075501	0.970280
Z=18			Z=19			Z=20		
0.973744	-0.029273	-0.225758	0.974300	-0.034169	-0.222647	0.974862	-0.039373	-0.219304
0.008048	0.995505	-0.094370	0.009498	0.993781	-0.110951	0.011078	0.991611	-0.128785
0.227506	0.090076	0.969602	0.225054	0.105985	0.968565	0.222535	0.123118	0.967119
Z=21			Z=22			Z=23		
0.975429	-0.044827	-0.215704	0.976003	-0.050465	-0.211829	0.976582	-0.056215	-0.207673
0.012784	0.988948	-0.147711	0.014610	0.985759	-0.167527	0.016548	0.982028	-0.188008
0.219941	0.141324	0.965222	0.217266	0.160413	0.962841	0.214510	0.180169	0.959961
Z=24			Z=25			Z=26		
0.977164	-0.062001	-0.203240	0.977747	-0.067748	-0.198545	0.978330	-0.073386	-0.193608
0.018589	0.977760	-0.208903	0.020723	0.972981	-0.229952	0.022939	0.967740	-0.250903
0.211672	0.200354	0.956584	0.208759	0.220720	0.952734	0.205775	0.241025	0.948453
Z=27			Z=28			Z=29		
0.978910	-0.078852	-0.188461	0.979484	-0.084091	-0.183140	0.980049	-0.089063	-0.177683
0.025224	0.962102	-0.271520	0.027567	0.956145	-0.291593	0.029953	0.949955	-0.310949
0.202729	0.261040	0.943800	0.199629	0.280562	0.938847	0.196485	0.299423	0.933670
Z=30			Z=31			Z=32		
0.980604	-0.093735	-0.172131	0.981146	-0.098089	-0.166524	0.981674	-0.102115	-0.160900
0.032370	0.943619	-0.329448	0.034805	0.937222	-0.346993	0.037245	0.930841	-0.363521
0.193307	0.317486	0.928351	0.190106	0.334655	0.922966	0.186893	0.350867	0.917586
Z=33			Z=34			Z=35		
0.982185	-0.105812	-0.155292	0.982679	-0.109186	-0.149733	0.983154	-0.112249	-0.144248
0.039679	0.924545	-0.379002	0.042095	0.918390	-0.393431	0.044484	0.912422	-0.406826
0.183678	0.366088	0.912273	0.180470	0.380313	0.907079	0.177281	0.393556	0.902045
Z=36			Z=37			Z=38		
0.983610	-0.115014	-0.138861	0.984047	-0.117498	-0.133589	0.984463	-0.119721	-0.128448
0.046834	0.906675	-0.419222	0.049138	0.901173	-0.430665	0.051388	0.895933	-0.441206
0.174118	0.405848	0.897201	0.170989	0.417230	0.892570	0.167903	0.427750	0.888166
Z=39			Z=40			Z=41		
0.984860	-0.121700	-0.123450	0.985237	-0.123455	-0.1186	0.985595	-0.125004	-0.113912
0.053578	0.890963	-0.450903	0.055701	0.886266	-0.4598	0.057754	0.881838	-0.468002
0.164864	0.437462	0.883995	0.161880	0.446421	0.8800	0.158954	0.454682	0.876355
Z=42			Z=43			Z=44		
0.985935	-0.126363	-0.109383	0.986257	-0.127549	-0.105018	0.986562	-0.128576	-0.100816
0.059732	0.877675	-0.475520	0.061632	0.873768	-0.482423	0.063453	0.870106	-0.488763
0.156091	0.462298	0.872878	0.153294	0.469320	0.869620	0.150564	0.475798	0.866572
Z=45			Z=46			Z=47		
0.986851	-0.129460	-0.096778	0.987124	-0.130213	-0.092901	0.987383	-0.130845	-0.089183
0.065192	0.866678	-0.494589	0.066850	0.863473	-0.499946	0.068426	0.860477	-0.504873
0.147905	0.481777	0.863722	0.145317	0.487298	0.861060	0.142800	0.492401	0.858574
Z=48			Z=49			Z=50		
0.987629	-0.131369	-0.085621	0.987862	-0.131793	-0.082210	0.988084	-0.132126	-0.078947
0.069921	0.857678	-0.509411	0.071335	0.855064	-0.513592	0.072669	0.852623	-0.517449
0.140356	0.497122	0.856253	0.137983	0.501494	0.854087	0.135681	0.505546	0.852065
Z=51			Z=52			Z=53		
0.988295	-0.132377	-0.075827	0.988496	-0.132553	-0.072844	0.988687	-0.132659	-0.069995
0.073925	0.850344	-0.521010	0.075105	0.848215	-0.524301	0.076210	0.846226	-0.527345
0.133448	0.509305	0.850176	0.131285	0.512798	0.848412	0.129189	0.516045	0.846763
Z=54								
0.988870	-0.132703	-0.067273						
0.077244	0.844369	-0.530165						
0.127158	0.519068	0.845221						

TABLE II. Mixing Coefficients for Be-like Ions, Z = 6–54

See page 7 for Explanation of Tables

$\Psi(i)=C(i,1)\Psi(1s^2 2p^2\ ^3P_2\ ) + C(i,2)\Psi(1s^2 2p^2\ ^1D_2)$

Z=6		Z=7		Z=8		Z= 9	
0.999988	0.004942	0.999968	0.008051	0.999922	0.012518	0.999828	0.018567
-0.004942	0.999988	-0.008051	0.999968	-0.012518	0.999922	-0.018567	0.999828
Z=10		Z=11		Z=12		Z=13	
0.999650	0.026451	0.999336	0.036442	0.998807	0.048832	0.997955	0.063923
-0.026451	0.999650	-0.036442	0.999336	-0.048832	0.998807	-0.063923	0.997955
Z=14		Z=15		Z=16		Z=17	
0.996630	0.082024	0.994637	0.103431	0.991722	0.128401	0.987581	0.157109
-0.082024	0.996630	-0.103431	0.994637	-0.128401	0.991722	-0.157109	0.987581
Z=18		Z=19		Z=20		Z=21	
0.981863	0.189590	0.974203	0.225674	0.964268	0.264929	0.951835	0.306611
-0.189590	0.981863	-0.225674	0.974203	-0.264929	0.964268	-0.306611	0.951835
Z=22		Z=23		Z=24		Z=25	
0.936861	0.349703	0.919534	0.393009	0.900283	0.435306	0.879713	0.475506
-0.349703	0.936861	-0.393009	0.919534	-0.435306	0.900283	-0.475506	0.879713
Z=26		Z=27		Z=28		Z=29	
0.858512	0.512794	0.837338	0.546685	0.816747	0.576995	0.797146	0.603787
-0.512794	0.858512	-0.546685	0.837338	-0.576995	0.816747	-0.603787	0.797146
Z=30		Z=31		Z=32		Z=33	
0.778795	0.627278	0.761832	0.647775	0.746291	0.665619	0.732145	0.681148
-0.627278	0.778795	-0.647775	0.761832	-0.665619	0.746291	-0.681148	0.732145
Z=34		Z=35		Z=36		Z=37	
0.719323	0.694676	0.707730	0.706483	0.716817	-0.697262	0.725887	-0.687814
-0.694676	0.719323	-0.706483	0.707730	-0.697262	0.716817	0.687814	0.725887
Z=38		Z=39		Z=40		Z=41	
0.733876	-0.679283	0.740935	-0.671576	0.747195	-0.664605	0.752764	-0.658290
0.679283	0.733876	0.671576	0.740935	0.664605	0.747195	0.658290	0.752764
Z=42		Z=43		Z=44		Z=45	
0.757736	-0.652562	0.762188	-0.647356	0.766187	-0.642618	0.769790	-0.638297
0.652562	0.757736	0.647356	0.762188	0.642618	0.766187	0.638297	0.769790
Z=46		Z=47		Z=48		Z=49	
0.773046	-0.634350	0.775996	-0.630738	0.778676	-0.627426	0.781116	-0.624386
0.634350	0.773046	0.630738	0.775996	0.627426	0.778676	0.624386	0.781116
Z=50		Z=51		Z=52		Z=53	
0.783343	-0.621589	0.785381	-0.619013	0.787249	-0.616635	0.788965	-0.614438
0.621589	0.783343	0.619013	0.785381	0.616635	0.787249	0.614438	0.788965
Z=54							
0.790544	-0.612405						
0.612405	0.790544						

$\Psi(i)=C(i,1)\Psi(1s^2 2s2p\ ^1P_1) + C(i,2)\Psi(1s^2 2s2p\ ^3P_1)$

Z=6		Z=7		Z=8		Z= 9	
1.000000	0.000948	0.999998	0.001816	0.999995	0.003096	0.999988	0.004863
-0.000948	1.000000	-0.001816	0.999998	-0.003096	0.999995	-0.004863	0.999988
Z=10		Z=11		Z=12		Z=13	
0.999974	0.007193	0.999948	0.010158	0.999904	0.013828	0.999833	0.018267
-0.007193	0.999974	-0.010158	0.999948	-0.013828	0.999904	-0.018267	0.999833
Z=14		Z=15		Z=16		Z=17	
0.999723	0.023533	0.999559	0.029680	0.999325	0.036750	0.998997	0.044779
-0.023533	0.999723	-0.029680	0.999559	0.036750	0.999325	-0.044779	0.998997
Z=18		Z=19		Z=20		Z=21	
0.998552	0.053787	0.997964	0.063784	0.997201	0.074764	0.996234	0.086704
-0.053787	0.998552	-0.063784	0.997964	-0.074764	0.997201	-0.086704	0.996234
Z=22		Z=23		Z=24		Z=25	
0.995031	0.099564	0.993563	0.113285	0.991801	0.127791	0.989725	0.142986
-0.099564	0.995031	-0.113285	0.993563	-0.127791	0.991801	-0.142986	0.989725
Z=26		Z=27		Z=28		Z=29	
0.987317	0.158763	0.984569	0.174999	0.981480	0.191563	0.978061	0.208319
-0.158763	0.987317	-0.174999	0.984569	-0.191563	0.981480	-0.208319	0.978061
Z=30		Z=31		Z=32		Z=33	
0.974328	0.225132	0.970309	0.241869	0.966036	0.258407	0.961549	0.274633
-0.225132	0.974328	-0.241869	0.970309	-0.258407	0.966036	-0.274633	0.961549
Z=34		Z=35		Z=36		Z=37	
0.956890	0.290451	0.952103	0.305777	0.947233	0.320547	0.942321	0.334710
-0.290451	0.956890	-0.305777	0.952103	-0.320547	0.947233	-0.334710	0.942321
Z=38		Z=39		Z=40		Z=41	
0.937408	0.348233	0.932529	0.361095	0.927716	0.373287	0.922995	0.384812
-0.348233	0.937408	-0.361095	0.932529	-0.373287	0.927716	-0.384812	0.922995
Z=42		Z=43		Z=44		Z=45	
0.918389	0.395680	0.913914	0.405907	0.909585	0.415517	0.905412	0.424534
-0.395680	0.918389	-0.405907	0.913914	-0.415517	0.909585	-0.424534	0.905412
Z=46		Z=47		Z=48		Z=49	
0.901401	0.432986	0.897555	0.440903	0.893875	0.448316	0.890363	0.455252
-0.432986	0.901401	-0.440903	0.897555	-0.448316	0.893875	-0.455252	0.890363
Z=50		Z=51		Z=52		Z=53	
0.887013	0.461743	0.883825	0.467817	0.880793	0.473502	0.877912	0.478822
-0.461743	0.887013	-0.467817	0.883825	-0.473502	0.880793	-0.478822	0.877912
Z=54							
0.875176	0.483805						
-0.483805	0.875176						

TABLE III. Wavelengths, Transition Probabilities, and Weighted Oscillator Strengths, Z = 6–54

See page 7 for Explanation of Tables

Designations: E-$1s^2 2s^2$, F-$1s^2 2p^2$, C-$1s^2 2s2p$,
numbers after letter: (2S+1)(2L+1)(2J+1)

Z= 6

TRANSITION	WL	A	gf
F 111-C 333	767.94	1.18+03	1.05-07
C 133-E 111	974.95	1.21+09	5.19-01
F 155-C 333	1070.9	4.96+03	4.26-06
F 155-C 335	1071.7	3.38+04	2.90-05
F 335-C 333	1176.0	2.66+08	2.75-01
F 333-C 331	1176.3	3.54+08	2.20-01
F 333-C 333	1176.6	2.65+08	1.65-01
F 335-C 335	1176.9	7.95+08	8.25-01
F 331-C 333	1177.1	1.06+09	2.20-01
F 333-C 335	1177.6	4.41+08	2.75-01
F 111-C 133	1249.3	1.74+09	4.08-01
C 333-E 111	1908.4	1.20+02	1.96-07
F 155-C 133	2314.5	1.31+08	5.28-01
F 335-C 133	2868.1	1.84+03	1.13-05
F 333-C 133	2872.2	1.76+01	6.54-08
F 331-C 133	2874.9	2.83+02	3.51-07

Z= 7

TRANSITION	WL	A	gf
F 111-C 333	594.90	5.62+03	2.98-07
C 133-E 111	765.18	1.78+09	4.68-01
F 155-C 333	822.31	1.35+04	6.87-06
F 155-C 335	823.39	1.20+05	6.10-05
F 335-C 333	921.96	3.78+08	2.41-01
F 333-C 331	922.47	5.04+08	1.93-01
F 333-C 333	923.05	3.77+08	1.44-01
F 335-C 335	923.31	1.13+09	7.20-01
F 331-C 333	923.73	1.51+09	1.92-01
F 333-C 335	924.41	6.26+08	2.40-01
F 111-C 133	955.32	2.60+09	3.57-01
C 333-E 111	1486.6	6.53+02	6.48-07
F 155-C 133	1718.5	2.22+08	4.92-01
F 335-C 133	2220.0	6.12+03	2.26-05
F 333-C 133	2226.3	9.30+01	2.07-07
F 331-C 133	2230.3	1.33+03	9.87-07

Z= 8

TRANSITION	WL	A	gf
F 111-C 333	485.86	1.99+04	7.02-07
C 133-E 111	630.07	2.35+09	4.20-01
F 155-C 333	668.04	3.51+04	1.17-05
F 155-C 335	669.51	3.70+05	1.24-04
F 335-C 333	758.48	4.94+08	2.13-01
F 333-C 331	759.23	6.56+08	1.70-01
F 333-C 333	760.07	4.91+08	1.27-01
F 335-C 335	760.38	1.47+09	6.35-01
F 331-C 333	761.03	1.95+09	1.69-01
F 333-C 335	761.98	8.12+08	2.11-01
F 111-C 133	773.96	3.50+09	3.15-01
C 333-E 111	1218.1	2.54+03	1.69-06
F 155-C 133	1368.4	3.21+08	4.50-01
F 335-C 133	1810.7	1.83+04	4.50-05
F 333-C 133	1819.8	3.54+02	5.28-07
F 331-C 133	1825.3	4.68+03	2.34-06

Z= 9

TRANSITION	WL	A	gf
F 111-C 333	410.58	5.74+04	1.45-06
C 133-E 111	535.51	2.94+09	3.78-01
F 155-C 333	562.42	8.35+04	1.98-05
F 155-C 335	564.35	1.00+06	2.39-04
F 335-C 333	643.79	6.12+08	1.90-01
F 333-C 331	644.81	8.12+08	1.52-01
F 333-C 333	645.95	6.06+08	1.13-01
F 335-C 335	646.32	1.81+09	5.65-01
F 331-C 333	647.24	2.41+09	1.51-01
F 333-C 335	648.50	9.97+08	1.88-01
F 111-C 133	650.46	4.43+09	2.81-01
C 333-E 111	1031.8	7.87+03	3.75-06
F 155-C 133	1136.6	4.26+08	4.11-01
F 335-C 133	1526.4	4.88+04	8.52-05
F 333-C 133	1538.7	1.09+03	1.15-06
F 331-C 133	1546.0	1.36+04	4.86-06

Z=10

TRANSITION	WL	A	gf
F 111-C 333	355.33	1.44+05	2.72-06
C 133-E 111	465.43	3.53+09	3.45-01
F 155-C 333	485.27	1.85+05	3.27-05
F 155-C 335	487.72	2.42+06	4.32-04
F 335-C 333	558.47	7.33+08	1.71-01
F 333-C 331	559.80	9.71+08	1.37-01
F 111-C 133	560.67	5.38+09	2.53-01
F 333-C 333	561.28	7.22+08	1.02-01
F 335-C 335	561.72	2.16+09	5.10-01
F 331-C 333	562.95	2.86+09	1.36-01
F 333-C 335	564.56	1.18+09	1.69-01
C 333-E 111	894.59	2.08+04	7.47-06
F 155-C 133	970.85	5.37+08	3.78-01
F 335-C 133	1315.9	1.18+05	1.53-04
F 333-C 133	1331.6	2.85+03	2.27-06
F 331-C 133	1341.1	3.42+04	9.24-06

Z=11

TRANSITION	WL	A	gf
F 111-C 333	312.94	3.22+05	4.74-06
C 133-E 111	411.30	4.13+09	3.15-01
F 155-C 333	426.22	3.84+05	5.22-05
F 155-C 335	429.26	5.36+06	7.40-04
F 335-C 333	492.24	8.60+08	1.56-01
F 111-C 133	492.26	6.35+09	2.31-01
F 333-C 331	493.91	1.14+09	1.25-01
F 333-C 333	495.75	8.42+08	9.30-02
F 335-C 335	496.29	2.52+09	4.64-01
F 331-C 333	497.87	3.33+09	1.24-01
F 333-C 335	499.86	1.37+09	1.54-01
C 333-E 111	789.12	4.88+04	1.36-05
F 155-C 133	845.95	6.53+08	3.51-01
F 335-C 133	1152.8	2.63+05	2.62-04
F 333-C 133	1172.3	6.68+03	4.11-06
F 331-C 133	1184.2	7.71+04	1.62-05

TABLE III. Wavelengths, Transition Probabilities, and Weighted Oscillator Strengths, Z = 6–54

See page 7 for Explanation of Tables

Designations: E-$1s^2 2s^2$, F-$1s^2 2p^2$, C-$1s^2 2s2p$;

numbers after letter: (2S+1)(2L+1)(2J+1)

Z=12

TRANSITION	WL	A	gf
F 111-C 333	279.29	6.62+05	7.74-06
C 133-E 111	368.12	4.75+09	2.89-01
F 155-C 333	379.42	7.60+05	8.19-05
F 155-C 335	383.10	1.10+07	1.21-03
F 111-C 133	438.26	7.36+09	2.12-01
F 335-C 333	439.12	9.94+08	1.44-01
F 333-C 331	441.14	1.31+09	1.14-01
F 333-C 333	443.39	9.66+08	8.52-02
F 335-C 335	444.05	2.88+09	4.25-01
F 331-C 333	446.02	3.80+09	1.13-01
F 333-C 335	448.42	1.56+09	1.40-01
C 333-E 111	705.34	1.04+05	2.33-05
F 155-C 133	748.03	7.77+08	3.27-01
F 335-C 133	1021.9	5.51+05	4.32-04
F 333-C 133	1045.4	1.43+04	7.02-06
F 331-C 133	1060.1	1.59+05	2.68-05

Z=13

TRANSITION	WL	A	gf
F 111-C 333	251.86	1.27+06	1.21-05
C 133-E 111	332.80	5.39+09	2.68-01
F 155-C 333	341.27	1.45+06	1.26-04
F 155-C 335	345.65	2.14+07	1.91-03
F 111-C 133	394.43	8.39+09	1.96-01
F 335-C 333	395.40	1.14+09	1.33-01
F 333-C 331	397.79	1.49+09	1.06-01
F 333-C 333	400.47	1.09+09	7.89-02
F 335-C 335	401.29	3.25+09	3.92-01
F 331-C 333	403.67	4.27+09	1.04-01
F 333-C 335	406.51	1.74+09	1.29-01
C 333-E 111	637.05	2.07+05	3.78-05
F 155-C 133	668.85	9.08+08	3.03-01
F 335-C 133	914.08	1.09+06	6.84-04
F 333-C 133	941.63	2.84+04	1.13-05
F 331-C 133	959.57	3.04+05	4.20-05

Z=14

TRANSITION	WL	A	gf
F 111-C 333	229.01	2.29+06	1.80-05
C 133-E 111	303.30	6.06+09	2.50-01
F 155-C 333	309.46	2.66+06	1.91-04
F 155-C 335	314.59	3.94+07	2.92-03
F 111-C 133	358.04	9.47+09	1.82-01
F 335-C 333	358.65	1.29+09	1.24-01
F 333-C 331	361.41	1.68+09	9.87-02
F 333-C 333	364.54	1.23+09	7.32-02
F 335-C 335	365.57	3.63+09	3.63-01
F 331-C 333	368.40	4.77+09	9.69-02
F 333-C 335	371.68	1.93+09	1.20-01
C 333-E 111	580.23	3.87+05	5.85-05
F 155-C 133	603.22	1.05+09	2.86-01
F 335-C 133	823.36	2.08+06	1.06-03
F 333-C 133	855.02	5.32+04	1.75-05
F 331-C 133	876.57	5.48+05	6.30-05

Z=15

TRANSITION	WL	A	gf
F 111-C 333	209.61	3.92+06	2.58-05
C 133-E 111	278.23	6.75+09	2.35-01
F 155-C 333	282.42	4.76+06	2.84-04
F 155-C 335	288.35	6.95+07	4.33-03
F 335-C 333	327.24	1.46+09	1.17-01
F 111-C 133	327.25	1.06+10	1.70-01
F 333-C 331	330.35	1.89+09	9.26-02
F 333-C 333	333.93	1.37+09	6.87-02
F 335-C 335	335.24	4.02+09	3.38-01
F 331-C 333	338.52	5.27+09	9.06-02
F 333-C 335	342.26	2.12+09	1.11-01
C 333-E 111	532.13	6.87+05	8.73-05
F 155-C 133	547.68	1.20+09	2.69-01
F 335-C 133	745.78	3.82+06	1.59-03
F 333-C 133	781.45	9.50+04	2.61-05
F 331-C 133	807.08	9.35+05	9.12-05

Z=16

TRANSITION	WL	A	gf
F 111-C 333	192.89	6.43+06	3.57-05
C 133-E 111	256.61	7.49+09	2.22-01
F 155-C 333	259.05	8.29+06	4.17-04
F 155-C 335	265.83	1.18+08	6.25-03
F 335-C 333	300.00	1.64+09	1.11-01
F 111-C 133	300.78	1.18+10	1.60-01
F 333-C 331	303.43	2.11+09	8.74-02
F 333-C 333	307.47	1.52+09	6.45-02
F 335-C 335	309.13	4.42+09	3.16-01
F 331-C 333	312.88	5.79+09	8.49-02
F 333-C 335	317.07	2.31+09	1.04-01
C 333-E 111	490.83	1.17+06	1.27-04
F 155-C 133	499.86	1.36+09	2.55-01
F 335-C 133	678.56	6.77+06	2.33-03
F 333-C 133	718.04	1.63+05	3.78-05
F 331-C 133	748.26	1.52+06	1.27-04

Z=17

TRANSITION	WL	A	gf
F 111-C 333	178.27	1.01+07	4.83-05
C 133-E 111	237.72	8.27+09	2.10-01
F 155-C 333	238.57	1.41+07	6.00-04
F 155-C 335	246.23	1.95+08	8.85-03
F 335-C 333	276.09	1.84+09	1.05-01
F 111-C 133	277.70	1.30+10	1.51-01
F 333-C 331	279.80	2.36+09	8.30-02
F 333-C 333	284.30	1.68+09	6.12-02
F 335-C 335	286.41	4.82+09	2.96-01
F 331-C 333	290.62	6.33+09	8.01-02
F 333-C 335	295.26	2.51+09	9.85-02
C 333-E 111	454.93	1.92+06	1.78-04
F 155-C 133	458.04	1.54+09	2.42-01
F 335-C 133	619.76	1.17+07	3.36-03
F 333-C 133	662.73	2.68+05	5.31-05
F 331-C 133	698.13	2.36+06	1.73-04

TABLE III. Wavelengths, Transition Probabilities, and Weighted Oscillator Strengths, Z = 6–54

See page 7 for Explanation of Tables

Designations: E-$1s^2 2s^2$, F-$1s^2 2p^2$, C-$1s^2 2s2p$;
numbers after letter: (2S+1)(2L+1)(2J+1)

Z=18

TRANSITION	WL	A	gf
F 111-C 333	165.33	1.54+07	6.30-05
F 155-C 333	220.38	2.34+07	8.52-04
C 133-E 111	221.04	9.10+09	2.00-01
F 155-C 335	228.96	3.10+08	1.22-02
F 335-C 333	254.90	2.07+09	1.00-01
F 111-C 133	257.33	1.44+10	1.43-01
F 333-C 331	258.84	2.63+09	7.91-02
F 333-C 333	263.78	1.86+09	5.82-02
F 335-C 335	266.45	5.22+09	2.78-01
F 331-C 333	271.11	6.88+09	7.59-02
F 333-C 335	276.17	2.70+09	9.25-02
F 155-C 133	420.99	1.74+09	2.31-01
C 333-E 111	423.41	3.04+06	2.45-04
F 335-C 133	567.95	1.95+07	4.71-03
F 333-C 133	614.00	4.29+05	7.26-05
F 331-C 133	655.24	3.53+06	2.27-04

Z=19

TRANSITION	WL	A	gf
F 111-C 333	153.76	2.27+07	8.04-05
F 155-C 333	204.04	3.80+07	1.18-03
C 133-E 111	206.15	1.00+10	1.91-01
F 155-C 335	213.55	4.81+08	1.64-02
F 335-C 333	235.98	2.31+09	9.66-02
F 111-C 133	239.16	1.58+10	1.36-01
F 333-C 331	240.07	2.93+09	7.58-02
F 333-C 333	245.43	2.05+09	5.55-02
F 335-C 335	248.79	5.61+09	2.60-01
F 331-C 333	253.87	7.46+09	7.20-02
F 333-C 335	259.32	2.90+09	8.75-02
F 155-C 133	387.78	1.95+09	2.20-01
C 333-E 111	395.48	4.69+06	3.30-04
F 335-C 133	522.07	3.17+07	6.48-03
F 333-C 133	570.70	6.68+05	9.78-05
F 331-C 133	618.54	5.07+06	2.91-04

Z=20

TRANSITION	WL	A	gf
F 111-C 333	143.31	3.24+07	9.96-05
F 155-C 333	189.22	6.00+07	1.61-03
C 133-E 111	192.75	1.10+10	1.83-01
F 155-C 335	199.67	7.24+08	2.16-02
F 335-C 333	218.96	2.59+09	9.30-02
F 111-C 133	222.79	1.74+10	1.29-01
F 333-C 331	223.12	3.26+09	7.30-02
F 333-C 333	228.87	2.25+09	5.31-02
F 335-C 335	233.07	5.98+09	2.43-01
F 331-C 333	238.54	8.06+09	6.87-02
F 333-C 335	244.34	3.10+09	8.35-02
F 155-C 133	357.72	2.19+09	2.10-01
C 333-E 111	370.56	7.05+06	4.35-04
F 335-C 133	481.31	4.99+07	8.67-03
F 333-C 133	531.96	1.01+06	1.29-04
F 331-C 133	587.25	7.01+06	3.63-04

Z=21

TRANSITION	WL	A	gf
F 111-C 333	133.78	4.49+07	1.20-04
F 155-C 333	175.66	9.21+07	2.13-03
C 133-E 111	180.59	1.20+10	1.76-01
F 155-C 335	187.04	1.06+09	2.78-02
F 335-C 333	203.57	2.90+09	9.00-02
F 333-C 331	207.72	3.64+09	7.05-02
F 111-C 133	207.92	1.91+10	1.24-01
F 333-C 333	213.82	2.48+09	5.10-02
F 335-C 335	219.02	6.32+09	2.27-01
F 331-C 333	224.81	8.68+09	6.57-02
F 333-C 335	230.92	3.31+09	7.95-02
F 155-C 133	330.27	2.46+09	2.01-01
C 333-E 111	348.17	1.03+07	5.64-04
F 335-C 133	445.00	7.62+07	1.13-02
F 333-C 133	497.08	1.50+06	1.67-04
F 331-C 133	560.80	9.34+06	4.41-04

Z=22

TRANSITION	WL	A	gf
F 111-C 333	125.04	6.05+07	1.42-04
F 155-C 333	163.16	1.37+08	2.73-03
C 133-E 111	169.48	1.32+10	1.71-01
F 155-C 335	175.45	1.51+09	3.48-02
F 335-C 333	189.60	3.25+09	8.76-02
F 333-C 331	193.64	4.06+09	6.84-02
F 111-C 133	194.31	2.10+10	1.18-01
F 333-C 333	200.04	2.74+09	4.92-02
F 335-C 335	206.40	6.62+09	2.11-01
F 331-C 333	212.46	9.32+09	6.30-02
F 333-C 335	218.84	3.52+09	7.55-02
F 155-C 133	305.04	2.76+09	1.92-01
C 333-E 111	327.94	1.48+07	7.17-04
F 335-C 133	412.63	1.13+08	1.43-02
F 333-C 133	465.53	2.18+06	2.12-04
F 331-C 133	538.83	1.20+07	5.22-04

Z=23

TRANSITION	WL	A	gf
F 111-C 333	116.96	7.95+07	1.63-04
F 155-C 333	151.56	1.97+08	3.39-03
C 133-E 111	159.27	1.45+10	1.65-01
F 155-C 335	164.73	2.09+09	4.25-02
F 335-C 333	176.85	3.65+09	8.55-02
F 333-C 331	180.70	4.54+09	6.66-02
F 111-C 133	181.78	2.31+10	1.14-01
F 333-C 333	187.35	3.02+09	4.77-02
F 335-C 335	195.04	6.87+09	1.95-01
F 331-C 333	201.31	9.99+09	6.06-02
F 333-C 335	207.89	3.73+09	7.25-02
F 155-C 133	281.74	3.09+09	1.84-01
C 333-E 111	309.58	2.09+07	9.00-04
F 335-C 133	383.73	1.60+08	1.77-02
F 333-C 133	436.88	3.10+06	2.66-04
F 331-C 133	521.11	1.48+07	6.00-04

TABLE III. Wavelengths, Transition Probabilities, and Weighted Oscillator Strengths, Z = 6–54

See page 7 for Explanation of Tables

Designations: E-$1s^2 2s^2$, F-$1s^2 2p^2$, C-$1s^2 2s2p$,
numbers after letter: (2S+1)(2L+1)(2J+1)

Z=24

TRANSITION	WL	A	gf
F 111-C 333	109.45	1.02+08	1.82-04
F 155-C 333	140.77	2.75+08	4.08-03
C 133-E 111	149.82	1.59+10	1.61-01
F 155-C 335	154.75	2.82+09	5.05-02
F 335-C 333	165.18	4.10+09	8.37-02
F 333-C 331	168.76	5.09+09	6.51-02
F 111-C 133	170.17	2.54+10	1.10-01
F 333-C 333	175.61	3.33+09	4.62-02
F 335-C 335	184.77	7.06+09	1.80-01
F 331-C 333	191.19	1.07+10	5.85-02
F 333-C 335	197.92	3.94+09	6.95-02
F 155-C 133	260.15	3.47+09	1.76-01
C 333-E 111	292.85	2.88+07	1.11-03
F 335-C 133	357.91	2.21+08	2.11-02
F 333-C 133	410.77	4.33+06	3.30-04
F 331-C 133	507.53	1.75+07	6.78-04

Z=25

TRANSITION	WL	A	gf
F 111-C 333	102.44	1.27+08	1.99-04
F 155-C 333	130.68	3.70+08	4.74-03
C 133-E 111	141.03	1.75+10	1.57-01
F 155-C 335	145.43	3.72+09	5.90-02
F 335-C 333	154.45	4.61+09	8.25-02
F 333-C 331	157.71	5.71+09	6.39-02
F 111-C 133	159.38	2.80+10	1.06-01
F 333-C 333	164.69	3.69+09	4.50-02
F 335-C 335	175.48	7.22+09	1.66-01
F 331-C 333	181.98	1.14+10	5.64-02
F 333-C 335	188.81	4.16+09	6.65-02
F 155-C 133	240.12	3.91+09	1.69-01
C 333-E 111	277.55	3.91+07	1.35-03
F 335-C 133	334.79	2.93+08	2.46-02
F 333-C 133	386.92	5.95+06	3.99-04
F 331-C 133	498.14	2.00+07	7.44-04

Z=26

TRANSITION	WL	A	gf
F 111-C 333	95.868	1.54+08	2.13-04
F 155-C 333	121.25	4.85+08	5.34-03
C 133-E 111	132.83	1.93+10	1.53-01
F 155-C 335	136.68	4.79+09	6.70-02
F 335-C 333	144.56	5.21+09	8.16-02
F 333-C 331	147.45	6.43+09	6.28-02
F 111-C 133	149.30	3.09+10	1.03-01
F 333-C 333	154.50	4.09+09	4.38-02
F 335-C 335	167.03	7.33+09	1.53-01
F 331-C 333	173.58	1.21+10	5.49-02
F 333-C 335	180.45	4.39+09	6.40-02
F 155-C 133	221.54	4.42+09	1.62-01
C 333-E 111	263.51	5.22+07	1.63-03
F 335-C 133	314.05	3.77+08	2.79-02
F 333-C 133	365.07	8.02+06	4.80-04
F 331-C 133	493.18	2.18+07	7.95-04

Z=27

TRANSITION	WL	A	gf
F 111-C 333	89.693	1.84+08	2.22-04
F 155-C 333	112.43	6.17+08	5.85-03
C 133-E 111	125.15	2.13+10	1.50-01
F 155-C 335	128.45	6.05+09	7.45-02
F 335-C 333	135.40	5.91+09	8.13-02
F 333-C 331	137.90	7.25+09	6.20-02
F 111-C 133	139.88	3.42+10	1.00-01
F 333-C 333	144.96	4.54+09	4.29-02
F 335-C 335	159.34	7.41+09	1.41-01
F 331-C 333	165.88	1.29+10	5.31-02
F 333-C 335	172.74	4.61+09	6.20-02
F 155-C 133	204.31	5.01+09	1.57-01
C 333-E 111	250.60	6.84+07	1.93-03
F 335-C 133	295.40	4.71+08	3.09-02
F 333-C 133	345.03	1.07+07	5.70-04
F 331-C 133	493.05	2.28+07	8.31-04

Z=28

TRANSITION	WL	A	gf
F 111-C 333	83.880	2.14+08	2.26-04
F 155-C 333	104.17	7.67+08	6.24-03
C 133-E 111	117.92	2.36+10	1.47-01
F 155-C 335	120.69	7.52+09	8.20-02
F 335-C 333	126.90	6.74+09	8.13-02
F 333-C 331	129.00	8.20+09	6.13-02
F 111-C 133	131.04	3.80+10	9.78-02
F 333-C 333	136.01	5.06+09	4.20-02
F 335-C 335	152.30	7.47+09	1.30-01
F 331-C 333	158.81	1.37+10	5.19-02
F 333-C 335	165.61	4.85+09	5.95-02
F 155-C 133	188.36	5.72+09	1.52-01
C 333-E 111	238.71	8.84+07	2.26-03
F 335-C 133	278.59	5.73+08	3.33-02
F 333-C 133	326.61	1.39+07	6.69-04
F 331-C 133	498.50	2.27+07	8.46-04

Z=29

TRANSITION	WL	A	gf
F 111-C 333	78.402	2.44+08	2.25-04
F 155-C 333	96.451	9.32+08	6.48-03
C 133-E 111	111.12	2.61+10	1.45-01
F 155-C 335	113.38	9.21+09	8.85-02
F 335-C 333	118.97	7.71+09	8.19-02
F 333-C 331	120.69	9.30+09	6.09-02
F 111-C 133	122.75	4.23+10	9.54-02
F 333-C 333	127.59	5.65+09	4.14-02
F 335-C 335	145.84	7.53+09	1.20-01
F 331-C 333	152.30	1.45+10	5.04-02
F 333-C 335	159.00	5.08+09	5.75-02
F 155-C 133	173.62	6.56+09	1.48-01
C 333-E 111	227.72	1.12+08	2.62-03
F 335-C 133	263.37	6.80+08	3.54-02
F 333-C 133	309.66	1.79+07	7.74-04
F 331-C 133	510.73	2.14+07	8.37-04

TABLE III. Wavelengths, Transition Probabilities, and Weighted Oscillator Strengths, Z = 6–54

See page 7 for Explanation of Tables

Designations: E-$1s^2 2s^2$, F-$1s^2 2p^2$, C-$1s^2 2s2p$,
numbers after letter: (2S+1)(2L+1)(2J+1)

Z=30

TRANSITION	WL	A	gf
F 111-C 333	73.238	2.73+08	2.19-04
F 155-C 333	89.248	1.11+09	6.63-03
C 133-E 111	104.69	2.91+10	1.43-01
F 155-C 335	106.49	1.12+10	9.50-02
F 335-C 333	111.58	8.87+09	8.28-02
F 333-C 331	112.92	1.06+10	6.05-02
F 111-C 133	114.96	4.72+10	9.36-02
F 333-C 333	119.67	6.32+09	4.08-02
F 335-C 335	139.89	7.58+09	1.11-01
F 331-C 333	146.28	1.54+10	4.92-02
F 333-C 335	152.85	5.33+09	5.60-02
F 155-C 133	160.02	7.56+09	1.45-01
C 333-E 111	217.56	1.41+08	3.00-03
F 335-C 133	249.56	7.92+08	3.69-02
F 333-C 133	294.04	2.28+07	8.85-04
F 331-C 133	531.64	1.90+07	8.07-04

Z=31

TRANSITION	WL	A	gf
F 111-C 333	68.372	3.00+08	2.10-04
F 155-C 333	82.536	1.31+09	6.66-03
C 133-E 111	98.614	3.24+10	1.42-01
F 155-C 335	99.985	1.34+10	1.00-01
F 335-C 333	104.65	1.02+10	8.40-02
F 333-C 331	105.66	1.20+10	6.04-02
F 111-C 133	107.65	5.29+10	9.18-02
F 333-C 333	112.21	7.09+09	4.02-02
F 335-C 335	134.39	7.63+09	1.03-01
F 331-C 333	140.70	1.62+10	4.80-02
F 333-C 335	147.11	5.57+09	5.40-02
F 155-C 133	147.49	8.76+09	1.43-01
C 333-E 111	208.14	1.75+08	3.39-03
F 335-C 133	236.98	9.07+08	3.81-02
F 333-C 133	279.63	2.85+07	1.00-03
F 331-C 133	564.49	1.58+07	7.53-04

Z=32

TRANSITION	WL	A	gf
F 111-C 333	63.789	3.23+08	1.97-04
F 155-C 333	76.291	1.52+09	6.60-03
C 133-E 111	92.864	3.62+10	1.40-01
F 155-C 335	93.856	1.60+10	1.05-01
F 335-C 333	98.155	1.19+10	8.58-02
F 333-C 331	98.858	1.37+10	6.03-02
F 111-C 133	100.77	5.94+10	9.03-02
F 333-C 333	105.17	7.99+09	3.96-02
F 335-C 335	129.29	7.69+09	9.65-02
F 331-C 333	135.51	1.71+10	4.71-02
F 155-C 133	135.97	1.02+10	1.41-01
F 333-C 335	141.74	5.83+09	5.25-02
C 333-E 111	199.40	2.13+08	3.81-03
F 335-C 133	225.50	1.02+09	3.90-02
F 333-C 133	266.32	3.52+07	1.12-03
F 331-C 133	614.89	1.20+07	6.78-04

Z=33

TRANSITION	WL	A	gf
F 111-C 333	59.478	3.43+08	1.82-04
F 155-C 333	70.490	1.74+09	6.48-03
C 133-E 111	87.419	4.06+10	1.39-01
F 155-C 335	88.080	1.90+10	1.10-01
F 335-C 333	92.059	1.38+10	8.79-02
F 333-C 331	92.496	1.57+10	6.04-02
F 111-C 133	94.320	6.69+10	8.91-02
F 333-C 333	98.543	9.01+09	3.93-02
F 335-C 335	124.54	7.76+09	9.00-02
F 155-C 133	125.38	1.19+10	1.40-01
F 331-C 333	130.67	1.80+10	4.62-02
F 333-C 335	136.71	6.09+09	5.10-02
C 333-E 111	191.27	2.57+08	4.23-03
F 335-C 133	214.97	1.14+09	3.93-02
F 333-C 133	254.00	4.30+07	1.24-03
F 331-C 133	693.53	8.11+06	5.85-04

Z=34

TRANSITION	WL	A	gf
F 111-C 333	55.426	3.58+08	1.65-04
F 155-C 333	65.111	1.98+09	6.27-03
C 133-E 111	82.263	4.56+10	1.39-01
F 155-C 335	82.641	2.25+10	1.15-01
F 335-C 333	86.331	1.62+10	9.03-02
F 333-C 331	86.542	1.80+10	6.07-02
F 111-C 133	88.264	7.55+10	8.82-02
F 333-C 333	92.298	1.02+10	3.90-02
F 155-C 133	115.66	1.39+10	1.40-01
F 335-C 335	120.11	7.85+09	8.50-02
F 331-C 333	126.15	1.90+10	4.53-02
F 333-C 335	131.99	6.35+09	4.97-02
C 333-E 111	183.70	3.07+08	4.65-03
F 335-C 133	205.30	1.25+09	3.96-02
F 333-C 133	242.60	5.18+07	1.37-03
F 331-C 133	823.24	4.68+06	4.77-04

Z=35

TRANSITION	WL	A	gf
F 111-C 333	51.624	3.69+08	1.47-04
F 155-C 333	60.130	2.23+09	6.03-03
C 133-E 111	77.380	5.14+10	1.38-01
F 155-C 335	77.520	2.65+10	1.19-01
F 335-C 333	80.948	1.89+10	9.30-02
F 333-C 331	80.969	2.07+10	6.10-02
F 111-C 133	82.584	8.55+10	8.73-02
F 333-C 333	86.417	1.16+10	3.90-02
F 155-C 133	106.74	1.64+10	1.40-01
F 335-C 335	115.97	7.94+09	8.00-02
F 331-C 333	121.91	1.99+10	4.44-02
F 333-C 335	127.54	6.62+09	4.84-02
C 333-E 111	176.63	3.62+08	5.07-03
F 335-C 133	196.40	1.37+09	3.96-02
F 333-C 133	232.02	6.18+07	1.49-03
F 331-C 133	1062.6	2.09+06	3.54-04

TABLE III. Wavelengths, Transition Probabilities, and Weighted Oscillator Strengths, Z = 6–54

See page 7 for Explanation of Tables

Designations: E-$1s^2 2s^2$, F-$1s^2 2p^2$, C-$1s^2 2s2p$,

numbers after letter: (2S+1)(2L+1)(2J+1)

Z=36

TRANSITION	WL	A	gf
F 111-C 333	48.063	3.75+08	1.30-04
F 335-C 333	55.524	2.50+09	5.79-03
F 335-C 335	72.705	3.12+10	1.23-01
C 133-E 111	72.759	5.81+10	1.38-01
F 333-C 331	75.752	2.38+10	6.15-02
F 155-C 333	75.888	2.22+10	9.57-02
F 111-C 133	77.261	9.70+10	8.67-02
F 333-C 333	80.883	1.32+10	3.87-02
F 335-C 133	98.551	1.93+10	1.40-01
F 155-C 335	112.09	8.05+09	7.55-02
F 331-C 333	117.92	2.09+10	4.35-02
F 333-C 335	123.34	6.90+09	4.72-02
C 333-E 111	170.04	4.23+08	5.49-03
F 155-C 133	188.17	1.48+09	3.93-02
F 333-C 133	222.19	7.28+07	1.62-03
F 331-C 133	1619.9	5.63+05	2.21-04

Z=37

TRANSITION	WL	A	gf
F 111-C 333	44.730	3.76+08	1.13-04
F 335-C 333	51.271	2.79+09	5.49-03
F 335-C 335	68.177	3.66+10	1.27-01
C 133-E 111	68.389	6.58+10	1.38-01
F 333-C 331	70.872	2.75+10	6.20-02
F 155-C 333	71.131	2.61+10	9.90-02
F 111-C 133	72.273	1.10+11	8.64-02
F 333-C 333	75.680	1.50+10	3.87-02
F 335-C 133	91.039	2.28+10	1.42-01
F 155-C 335	108.44	8.17+09	7.20-02
F 331-C 333	114.16	2.20+10	4.29-02
F 333-C 335	119.37	7.19+09	4.60-02
C 333-E 111	163.87	4.89+08	5.91-03
F 155-C 133	180.55	1.59+09	3.90-02
F 333-C 133	213.05	8.51+07	1.73-03
F 331-C 133	4169.3	3.13+04	8.16-05

Z=38

TRANSITION	WL	A	gf
F 111-C 333	41.617	3.72+08	9.66-05
F 335-C 333	47.348	3.09+09	5.19-03
F 335-C 335	63.924	4.29+10	1.31-01
C 133-E 111	64.258	7.47+10	1.39-01
F 333-C 331	66.307	3.17+10	6.27-02
F 155-C 333	66.662	3.07+10	1.02-01
F 111-C 133	67.605	1.26+11	8.61-02
F 333-C 333	70.792	1.72+10	3.87-02
F 335-C 133	84.149	2.70+10	1.43-01
F 155-C 335	105.00	8.30+09	6.85-02
F 331-C 333	110.61	2.30+10	4.23-02
F 333-C 335	115.62	7.48+09	4.49-02
C 333-E 111	158.09	5.60+08	6.30-03
F 155-C 133	173.48	1.70+09	3.84-02
F 333-C 133	204.53	9.84+07	1.85-03
C 133-F 331	5109.6	5.37+03	6.30-05

Z=39

TRANSITION	WL	A	gf
F 111-C 333	38.713	3.65+08	8.19-05
F 335-C 333	43.732	3.42+09	4.89-03
F 335-C 335	59.931	5.03+10	1.35-01
C 133-E 111	60.357	8.51+10	1.39-01
F 333-C 331	62.038	3.67+10	6.35-02
F 155-C 333	62.465	3.62+10	1.06-01
F 111-C 133	63.236	1.44+11	8.61-02
F 333-C 333	66.206	1.97+10	3.87-02
F 335-C 133	77.826	3.19+10	1.45-01
F 155-C 335	101.75	8.44+09	6.55-02
F 331-C 333	107.24	2.41+10	4.14-02
F 333-C 335	112.06	7.78+09	4.39-02
C 333-E 111	152.66	6.37+08	6.66-03
F 155-C 133	166.91	1.81+09	3.78-02
F 333-C 133	196.58	1.13+08	1.96-03
C 133-F 331	1443.2	2.25+05	2.10-04

Z=40

TRANSITION	WL	A	gf
F 111-C 333	36.007	3.53+08	6.87-05
F 335-C 333	40.402	3.77+09	4.62-03
F 335-C 335	56.184	5.89+10	1.39-01
C 133-E 111	56.676	9.71+10	1.40-01
F 333-C 331	58.047	4.25+10	6.44-02
F 155-C 333	58.525	4.27+10	1.09-01
F 111-C 133	59.152	1.64+11	8.61-02
F 333-C 333	61.906	2.26+10	3.90-02
F 335-C 133	72.023	3.78+10	1.47-01
F 155-C 335	98.675	8.60+09	6.25-02
F 331-C 333	104.05	2.52+10	4.08-02
F 333-C 335	108.68	8.09+09	4.29-02
C 333-E 111	147.55	7.18+08	7.02-03
F 155-C 133	160.77	1.92+09	3.72-02
F 333-C 133	189.15	1.28+08	2.06-03
C 133-F 331	796.29	1.26+06	3.60-04

Z=41

TRANSITION	WL	A	gf
F 111-C 333	33.489	3.38+08	5.67-05
F 335-C 333	37.338	4.14+09	4.32-03
F 335-C 335	52.669	6.89+10	1.43-01
C 133-E 111	53.207	1.11+11	1.41-01
F 333-C 331	54.317	4.93+10	6.53-02
F 155-C 333	54.828	5.04+10	1.13-01
F 111-C 133	55.334	1.88+11	8.64-02
F 333-C 333	57.878	2.60+10	3.93-02
F 335-C 133	66.694	4.48+10	1.49-01
F 155-C 335	95.761	8.76+09	6.00-02
F 331-C 333	101.01	2.63+10	4.02-02
F 333-C 335	105.47	8.41+09	4.20-02
C 333-E 111	142.74	8.05+08	7.38-03
F 155-C 133	155.04	2.02+09	3.66-02
F 333-C 133	182.18	1.45+08	2.16-03
C 133-F 331	529.41	4.03+06	5.07-04

TABLE III. Wavelengths, Transition Probabilities, and Weighted Oscillator Strengths, Z = 6–54

See page 7 for Explanation of Tables

Designations: E-$1s^2 2s^2$, F-$1s^2 2p^2$, C-$1s^2 2s2p$,
numbers after letter: (2S+1)(2L+1)(2J+1)

Z=42

TRANSITION	WL	A	gf
F 111-C 333	31.147	3.20+08	4.65-05
F 335-C 333	34.519	4.54+09	4.05-03
F 335-C 335	49.376	8.06+10	1.47-01
C 133-E 111	49.940	1.27+11	1.42-01
F 333-C 331	50.833	5.72+10	6.64-02
F 155-C 333	51.362	5.94+10	1.17-01
F 111-C 133	51.767	2.16+11	8.67-02
F 333-C 333	54.109	3.00+10	3.93-02
F 335-C 133	61.800	5.31+10	1.52-01
F 155-C 335	92.997	8.94+09	5.80-02
F 331-C 333	98.119	2.75+10	3.96-02
F 333-C 335	102.41	8.74+09	4.12-02
C 333-E 111	138.20	8.95+08	7.68-03
F 155-C 133	149.67	2.13+09	3.57-02
F 333-C 133	175.65	1.63+08	2.26-03
C 133-F 331	385.15	9.82+06	6.54-04

Z=43

TRANSITION	WL	A	gf
F 111-C 333	28.972	3.00+08	3.78-05
F 335-C 333	31.928	4.97+09	3.81-03
F 335-C 335	46.290	9.42+10	1.51-01
C 133-E 111	46.866	1.46+11	1.44-01
F 333-C 331	47.578	6.64+10	6.75-02
F 155-C 333	48.114	7.02+10	1.22-01
F 111-C 133	48.436	2.48+11	8.73-02
F 333-C 333	50.584	3.46+10	3.99-02
F 335-C 133	57.303	6.30+10	1.55-01
F 155-C 335	90.368	9.13+09	5.60-02
F 331-C 333	95.358	2.87+10	3.90-02
F 333-C 335	99.491	9.07+09	4.03-02
C 333-E 111	133.91	9.90+08	7.98-03
F 155-C 133	144.63	2.24+09	3.51-02
F 333-C 133	169.51	1.81+08	2.34-03
C 133-F 331	295.61	2.04+07	7.98-04

Z=44

TRANSITION	WL	A	gf
F 111-C 333	26.954	2.77+08	3.03-05
F 335-C 333	29.545	5.43+09	3.54-03
F 335-C 335	43.400	1.10+11	1.55-01
C 133-E 111	43.976	1.68+11	1.46-01
F 333-C 331	44.539	7.71+10	6.88-02
F 155-C 333	45.072	8.28+10	1.26-01
F 111-C 133	45.326	2.86+11	8.79-02
F 333-C 333	47.291	4.00+10	4.02-02
F 335-C 133	53.167	7.46+10	1.58-01
F 155-C 335	87.864	9.33+09	5.40-02
F 331-C 333	92.719	2.99+10	3.84-02
F 333-C 335	96.707	9.42+09	3.96-02
C 333-E 111	129.85	1.09+09	8.25-03
F 155-C 133	139.89	2.34+09	3.42-02
F 333-C 133	163.73	2.01+08	2.42-03
C 133-F 331	235.14	3.79+07	9.42-04

Z=45

TRANSITION	WL	A	gf
F 111-C 333	25.081	2.53+08	2.38-05
F 335-C 333	27.355	5.92+09	3.33-03
F 335-C 335	40.695	1.29+11	1.59-01
C 133-E 111	41.262	1.93+11	1.48-01
F 333-C 331	41.701	8.97+10	7.01-02
F 155-C 333	42.225	9.78+10	1.30-01
F 111-C 133	42.423	3.29+11	8.88-02
F 333-C 333	44.215	4.63+10	4.05-02
F 335-C 133	49.363	8.85+10	1.61-01
F 155-C 335	85.478	9.54+09	5.20-02
F 331-C 333	90.193	3.11+10	3.78-02
F 333-C 335	94.046	9.77+09	3.88-02
C 333-E 111	125.99	1.19+09	8.52-03
F 155-C 133	135.43	2.45+09	3.36-02
F 333-C 133	158.27	2.22+08	2.50-03
C 133-F 331	191.89	6.53+07	1.08-03

Z=46

TRANSITION	WL	A	gf
F 111-C 333	23.345	2.28+08	1.86-05
F 335-C 333	25.342	6.45+09	3.09-03
F 335-C 335	38.164	1.50+11	1.64-01
C 133-E 111	38.715	2.23+11	1.50-01
F 333-C 331	39.052	1.04+11	7.15-02
F 155-C 333	39.562	1.15+11	1.35-01
F 111-C 133	39.715	3.79+11	8.97-02
F 333-C 333	41.345	5.36+10	4.11-02
F 335-C 133	45.862	1.05+11	1.65-01
F 155-C 335	83.200	9.77+09	5.05-02
F 331-C 333	87.773	3.24+10	3.75-02
F 333-C 335	91.501	1.01+10	3.81-02
C 333-E 111	122.34	1.30+09	8.76-03
F 155-C 133	131.21	2.55+09	3.30-02
F 333-C 133	153.12	2.43+08	2.56-03
C 133-F 331	159.67	1.06+08	1.22-03

Z=47

TRANSITION	WL	A	gf
F 111-C 333	21.736	2.03+08	1.43-05
F 335-C 333	23.491	7.02+09	2.90-03
F 335-C 335	35.795	1.76+11	1.68-01
C 133-E 111	36.325	2.57+11	1.53-01
F 333-C 331	36.580	1.21+11	7.30-02
F 155-C 333	37.070	1.36+11	1.40-01
F 111-C 133	37.188	4.37+11	9.06-02
F 333-C 333	38.668	6.21+10	4.17-02
F 335-C 133	42.637	1.24+11	1.69-01
F 155-C 335	81.021	1.00+10	4.91-02
F 331-C 333	85.451	3.38+10	3.69-02
F 333-C 335	89.063	1.05+10	3.75-02
C 333-E 111	118.86	1.41+09	8.97-03
F 155-C 133	127.23	2.66+09	3.21-02
C 133-F 331	134.89	1.65+08	1.35-03
F 333-C 133	148.25	2.66+08	2.63-03

TABLE III. Wavelengths, Transition Probabilities, and Weighted Oscillator Strengths, Z = 6–54

See page 7 for Explanation of Tables

Designations: E-$1s^2 2s^2$, F-$1s^2 2p^2$, C-$1s^2 2s2p$,

numbers after letter: (2S+1)(2L+1)(2J+1)

Z=48

TRANSITION	WL	A	gf
F 111-C 333	20.246	1.77+08	1.09-05
F 335-C 333	21.789	7.63+09	2.71-03
F 335-C 335	33.580	2.05+11	1.73-01
C 133-E 111	34.085	2.97+11	1.55-01
F 333-C 331	34.273	1.41+11	7.46-02
F 155-C 333	34.742	1.60+11	1.45-01
F 111-C 133	34.832	5.05+11	9.18-02
F 333-C 333	36.171	7.20+10	4.23-02
F 335-C 133	39.666	1.47+11	1.73-01
F 155-C 335	78.936	1.02+10	4.78-02
F 331-C 333	83.219	3.51+10	3.63-02
F 333-C 335	86.726	1.09+10	3.68-02
C 133-F 331	115.37	2.48+08	1.48-03
C 333-E 111	115.54	1.53+09	9.15-03
F 155-C 133	123.46	2.77+09	3.15-02
F 333-C 133	143.63	2.89+08	2.68-03

Z=49

TRANSITION	WL	A	gf
F 111-C 333	18.865	1.52+08	8.10-06
F 335-C 333	20.224	8.29+09	2.54-03
F 335-C 335	31.509	2.39+11	1.78-01
C 133-E 111	31.986	3.44+11	1.58-01
F 333-C 331	32.120	1.64+11	7.63-02
F 155-C 333	32.565	1.89+11	1.50-01
F 111-C 133	32.633	5.83+11	9.30-02
F 333-C 333	33.844	8.36+10	4.29-02
F 335-C 133	36.926	1.74+11	1.77-01
F 155-C 335	76.938	1.05+10	4.65-02
F 331-C 333	81.074	3.65+10	3.60-02
F 333-C 335	84.483	1.13+10	3.62-02
C 133-F 331	99.687	3.60+08	1.61-03
C 333-E 111	112.38	1.64+09	9.33-03
F 155-C 133	119.88	2.87+09	3.09-02
F 333-C 133	139.25	3.14+08	2.73-03

Z=50

TRANSITION	WL	A	gf
F 111-C 333	17.585	1.27+08	5.88-06
F 335-C 333	18.783	9.00+09	2.38-03
F 335-C 335	29.572	2.79+11	1.83-01
C 133-E 111	30.020	3.98+11	1.61-01
F 333-C 331	30.111	1.91+11	7.80-02
F 155-C 333	30.532	2.23+11	1.55-01
F 111-C 133	30.583	6.73+11	9.42-02
F 333-C 333	31.676	9.70+10	4.38-02
F 335-C 133	34.398	2.05+11	1.82-01
F 155-C 335	75.023	1.08+10	4.53-02
F 331-C 333	79.008	3.80+10	3.54-02
F 333-C 335	82.330	1.17+10	3.56-02
C 133-F 331	86.879	5.11+08	1.73-03
C 333-E 111	109.36	1.77+09	9.51-03
F 155-C 133	116.48	2.98+09	3.03-02
F 333-C 133	135.09	3.39+08	2.78-03

Z=51

TRANSITION	WL	A	gf
F 111-C 333	16.400	1.04+08	4.17-06
F 335-C 333	17.457	9.76+09	2.23-03
F 335-C 335	27.761	3.25+11	1.88-01
C 133-E 111	28.180	4.60+11	1.64-01
F 333-C 331	28.237	2.23+11	7.98-02
F 155-C 333	28.632	2.62+11	1.61-01
F 111-C 133	28.670	7.77+11	9.57-02
F 333-C 333	29.655	1.13+11	4.44-02
F 335-C 133	32.064	2.42+11	1.87-01
F 155-C 335	73.183	1.10+10	4.42-02
C 133-F 331	76.273	7.10+08	1.85-03
F 331-C 333	77.019	3.95+10	3.51-02
F 333-C 335	80.259	1.21+10	3.51-02
C 333-E 111	106.48	1.89+09	9.63-03
F 155-C 133	113.24	3.09+09	2.97-02
F 333-C 133	131.13	3.65+08	2.82-03

Z=52

TRANSITION	WL	A	gf
F 111-C 333	15.303	8.18+07	2.87-06
F 335-C 333	16.236	1.06+10	2.09-03
F 335-C 335	26.069	3.79+11	1.93-01
C 133-E 111	26.458	5.33+11	1.68-01
F 333-C 331	26.488	2.59+11	8.18-02
F 155-C 333	26.858	3.08+11	1.66-01
F 111-C 133	26.886	8.98+11	9.72-02
F 333-C 333	27.773	1.31+11	4.53-02
F 335-C 133	29.908	2.86+11	1.91-01
C 133-F 331	67.392	9.67+08	1.97-03
F 155-C 335	71.415	1.13+10	4.32-02
F 331-C 333	75.100	4.10+10	3.48-02
F 333-C 335	78.268	1.26+10	3.46-02
C 333-E 111	103.71	2.02+09	9.78-03
F 155-C 133	110.15	3.21+09	2.91-02
F 333-C 133	127.35	3.92+08	2.86-03

Z=53

TRANSITION	WL	A	gf
F 111-C 333	14.286	6.17+07	1.89-06
F 335-C 333	15.111	1.15+10	1.96-03
F 335-C 335	24.486	4.42+11	1.98-01
C 133-E 111	24.846	6.17+11	1.71-01
F 333-C 331	24.855	3.02+11	8.38-02
F 155-C 333	25.201	3.62+11	1.72-01
F 111-C 133	25.222	1.04+12	9.90-02
F 333-C 333	26.019	1.52+11	4.62-02
F 335-C 133	27.915	3.37+11	1.96-01
C 133-F 331	59.878	1.30+09	2.09-03
F 155-C 335	69.715	1.16+10	4.23-02
F 331-C 333	73.247	4.26+10	3.42-02
F 333-C 335	76.350	1.30+10	3.41-02
C 333-E 111	101.06	2.16+09	9.90-03
F 155-C 133	107.21	3.32+09	2.86-02
F 333-C 133	123.75	4.20+08	2.89-03

TABLE III. Wavelengths, Transition Probabilities, and Weighted Oscillator Strengths, Z = 6–54

See page 7 for Explanation of Tables

Designations: E-$1s^2 2s^2$, F-$1s^2 2p^2$, C-$1s^2 2s2p$,
numbers after letter: (2S+1)(2L+1)(2J+1)

Z=54

TRANSITION	WL	A	gf
F 111-C 333	13.343	4.38+07	1.17-06
F 335-C 333	14.074	1.24+10	1.84-03
F 335-C 335	23.006	5.15+11	2.04-01
F 333-C 331	23.332	3.51+11	8.59-02
C 133-E 111	23.339	7.15+11	1.75-01
F 155-C 333	23.654	4.25+11	1.78-01
F 111-C 133	23.669	1.20+12	1.01-01
F 333-C 333	24.385	1.77+11	4.71-02
F 335-C 133	26.072	3.97+11	2.02-01
C 133-F 331	53.467	1.72+09	2.20-03
F 155-C 335	68.077	1.19+10	4.14-02
F 331-C 333	71.458	4.43+10	3.39-02
F 333-C 335	74.502	1.35+10	3.36-02
C 333-E 111	98.521	2.29+09	9.99-03
F 155-C 133	104.40	3.44+09	2.81-02
F 333-C 133	120.31	4.49+08	2.92-03

TABLE IV. Fit Parameters for Excitation Cross Sections and Rate Coefficients for $\Delta n = 0$ Transitions, Z = 6, 8, 10, 12, 14, 16, 18, 20, 22, 26, 30, 36, 42, 54

See page 7 for Explanation of Tables

$2s^2\ {}^1S_0$-$2s2p\ {}^3P_0$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
ΔE	5.303-2	2.987-2	2.070-2	1.582-2	1.280-2	1.076-2	9.273-3	8.155-3	7.281-3	6.005-3	5.122-3	4.221-3	5.047-3	7.892-3
ε_0	0.3912	0.3349	0.3110	0.2977	0.2894	0.2837	0.2796	0.2766	0.2743	0.2711	0.2699	0.2681	0.2682	0.2710
ε_1	0.3382	0.3051	0.2902	0.2819	0.2766	0.2729	0.2703	0.2684	0.2670	0.2651	0.2642	0.2639	0.2631	0.2631
C2	2.34-1	1.53-1	1.29-1	1.17-1	1.11-1	1.07-1	1.04-1	1.02-1	1.01-1	9.98-2	9.89-2	9.82-2	9.73-2	9.52-2
F2	4.06-2	2.73-2	2.13-2	1.56-2	1.17-2	9.21-3	7.49-3	6.29-3	5.39-3	4.18-3	3.40-3	2.67-3	3.09-3	4.65-3
A2	3.63+0	2.01+0	1.58+0	1.50+0	1.51+0	1.52+0	1.54+0	1.55+0	1.57+0	1.59+0	1.60+0	1.62+0	1.64+0	1.68+0
K2	3.05+0	2.61+0	2.32+0	2.37+0	2.49+0	2.61+0	2.71+0	2.80+0	2.87+0	2.97+0	3.05+0	3.13+0	3.19+0	3.26+0

$2s^2\ {}^1S_0$-$2s2p^3P_1$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
ΔE	5.306-2	2.993-2	2.079-2	1.595-2	1.298-2	1.099-2	9.566-3	8.510-3	7.698-3	6.538-3	5.746-3	4.922-3	5.054-3	7.903-3
ε_0	0.3912	0.3349	0.3110	0.2977	0.2894	0.2837	0.2796	0.2766	0.2743	0.2711	0.2699	0.2681	0.2682	0.2710
ε_1	0.3382	0.3050	0.2902	0.2818	0.2764	0.2727	0.2700	0.2680	0.2666	0.2646	0.2636	0.2632	0.2631	0.2630
C1	4.08-2	2.05-2	1.57-2	1.43-2	1.45-2	1.62-2	2.01-2	2.73-2	3.91-2	8.25-2	1.56-1	3.15-1	4.91-1	8.14-1
F1	9.33-4	6.77-4	6.17-4	4.41-4	4.18-4	6.37-4	1.11-3	1.82-3	2.61-3	4.00-3	4.78-3	5.27-3	5.61-3	7.20-3
A	6.77-1	2.47-1	1.47-1	1.22-1	1.18-1	1.16-1	1.08-1	1.06-1	1.18-1	1.79-1	2.88-1	5.15-1	7.90-1	1.47+0
K	1.18+1	1.21+1	1.08+1	1.10+1	1.15+1	1.01+1	6.47+0	3.70+0	2.31+0	1.20+0	8.38-1	6.33-1	6.00-1	7.71-1
A1	6.57-6	6.51-5	3.16-4	1.09-3	3.03-3	7.16-3	1.48-2	2.79-2	4.81-2	1.19-1	2.32-1	4.65-1	7.40-1	1.41+0
K1	9.73-1	1.03+0	9.61-1	9.00-1	8.67-1	8.35-1	7.96-1	7.54-1	7.14-1	6.42-1	5.85-1	5.22-1	5.30-1	7.20-1
A2	1.01+1	5.91+0	4.70+0	4.49+0	4.49+0	4.54+0	4.59+0	4.61+0	4.65+0	4.65+0	4.63+0	4.55+0	4.48+0	4.46+0
K2	2.92+0	2.57+0	2.30+0	2.36+0	2.49+0	2.61+0	2.71+0	2.80+0	2.87+0	2.98+0	3.06+0	3.14+0	3.19+0	3.26+0

$2s^2\ {}^1S_0$-$2s2p\ {}^3P_2$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
ΔE	5.313-2	3.005-2	2.098-2	1.624-2	1.338-2	1.152-2	1.025-2	9.382-3	8.782-3	8.141-3	8.013-3	8.483-3	9.558-3	1.322-2
ε_0	0.3912	0.3349	0.3110	0.2977	0.2894	0.2837	0.2796	0.2766	0.2743	0.2711	0.2699	0.2681	0.2682	0.2710
ε_1	0.3381	0.3049	0.2900	0.2815	0.2760	0.2722	0.2693	0.2672	0.2655	0.2630	0.2613	0.2596	0.2586	0.2577
C2	1.17+0	7.65-1	6.46-1	5.84-1	5.50-1	5.27-1	5.12-1	5.00-1	4.90-1	4.72-1	4.57-1	4.38-1	4.20-1	3.96-1
F2	4.28-2	2.76-2	2.16-2	1.60-2	1.22-2	9.78-3	8.20-3	7.14-3	6.41-3	5.58-3	5.24-3	5.27-3	5.73-3	7.55-3
A2	1.74+1	1.00+1	7.92+0	7.51+0	7.50+0	7.56+0	7.61+0	7.65+0	7.68+0	7.67+0	7.63+0	7.52+0	7.41+0	7.30+0
K2	2.95+0	2.59+0	2.32+0	2.37+0	2.50+0	2.62+0	2.72+0	2.81+0	2.89+0	3.00+0	3.08+0	3.17+0	3.23+0	3.31+0

$2s^2\ {}^1S_0$-$2s2p^1P_1$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
ΔE	1.039-1	5.786-2	3.996-2	3.056-2	2.483-2	2.101-2	1.832-2	1.636-2	1.489-2	1.297-2	1.194-2	1.150-2	1.200-2	1.493-2
ε_0	0.3912	0.3349	0.3110	0.2977	0.2894	0.2837	0.2796	0.2766	0.2743	0.2711	0.2699	0.2681	0.2682	0.2710
ε_1	0.2874	0.2771	0.2710	0.2671	0.2645	0.2627	0.2613	0.2602	0.2594	0.2582	0.2574	0.2566	0.2562	0.2560
C1	6.24+0	4.93+0	4.43+0	4.16+0	3.98+0	3.89+0	3.83+0	3.80+0	3.76+0	3.72+0	3.68+0	3.63+0	3.60+0	3.69+0
F1	1.13-1	5.19-2	3.45-2	2.63-2	2.11-2	1.85-2	1.68-2	1.53-2	1.40-2	1.20-2	1.10-2	1.05-2	1.10-2	1.38-2
A	1.49+1	1.21+1	1.04+1	9.45+0	8.74+0	8.19+0	7.81+0	7.58+0	7.42+0	7.21+0	7.07+0	6.95+0	6.94+0	7.31+0
K	1.13+0	1.21+0	1.16+0	1.12+0	1.07+0	1.01+0	9.62-1	9.34-1	9.15-1	8.90-1	8.73-1	8.65-1	8.76-1	9.22-1
A1	1.42+1	1.19+1	1.03+1	9.36+0	8.66+0	8.13+0	7.76+0	7.52+0	7.37+0	7.16+0	7.02+0	6.90+0	6.88+0	7.24+0
K1	1.05+0	1.18+0	1.15+0	1.11+0	1.05+0	9.94-1	9.51-1	9.24-1	9.05-1	8.81-1	8.63-1	8.55-1	8.65-1	9.09-1
A2	7.67+0	4.02+0	3.13+0	2.91+0	2.88+0	2.87+0	2.88+0	2.92+0	2.94+0	3.04+0	3.14+0	3.35+0	3.54+0	3.83+0
K2	3.42+0	2.82+0	2.54+0	2.57+0	2.66+0	2.75+0	2.83+0	2.90+0	2.96+0	3.05+0	3.12+0	3.20+0	3.26+0	3.32+0

TABLE IV. Fit Parameters for Excitation Cross Sections and Rate Coefficients for $\Delta n = 0$ Transitions, Z = 6, 8, 10, 12, 14, 16, 18, 20, 22, 26, 30, 36, 42, 54

See page 7 for Explanation of Tables

$2s2p\ ^3P_1\text{-}2p^2\ ^3P_0$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
ΔE	8.601-2	4.790-2	3.304-2	2.523-2	2.044-2	1.723-2	1.494-2	1.322-2	1.188-2	9.923-3	8.543-3	7.091-3	6.097-3	7.722-3
ϵ_0	0.4036	0.3403	0.3143	0.3002	0.2913	0.2856	0.2815	0.2785	0.2763	0.2736	0.2694	0.2680	0.2680	0.2707
ϵ_1	0.3176	0.2924	0.2813	0.2750	0.2710	0.2684	0.2665	0.2653	0.2644	0.2637	0.2608	0.2609	0.2619	0.2630
C1	8.56-1	7.64-1	6.84-1	6.38-1	6.12-1	5.98-1	5.85-1	5.77-1	5.70-1	5.63-1	5.69-1	5.84-1	6.05-1	6.64-1
F1	7.39-2	4.33-2	2.94-2	2.18-2	1.84-2	1.61-2	1.41-2	1.24-2	1.10-2	9.13-3	7.93-3	6.93-3	6.43-3	7.35-3
A	1.95+0	1.82+0	1.56+0	1.40+0	1.28+0	1.20+0	1.15+0	1.12+0	1.09+0	1.05+0	1.03+0	1.01+0	9.93-1	1.17+0
K	1.09+0	1.18+0	1.12+0	1.07+0	9.94-1	9.46-1	9.16-1	8.95-1	8.73-1	8.25-1	7.72-1	6.91-1	6.22-1	7.26-1
A1	1.84+0	1.78+0	1.53+0	1.38+0	1.26+0	1.19+0	1.14+0	1.11+0	1.08+0	1.04+0	1.02+0	9.93-1	9.81-1	1.15+0
K1	1.00+0	1.14+0	1.10+0	1.05+0	9.77-1	9.29-1	9.00-1	8.79-1	8.58-1	8.10-1	7.56-1	6.76-1	6.08-1	7.10-1
A2	1.47+0	9.37-1	7.22-1	6.78-1	6.77-1	6.89-1	7.08-1	7.34-1	7.63-1	8.27-1	9.16-1	1.01+0	1.08+0	1.13+0
K2	2.94+0	2.72+0	2.43+0	2.46+0	2.56+0	2.66+0	2.75+0	2.82+0	2.88+0	2.96+0	3.09+0	3.16+0	3.20+0	3.27+0

$2s2p\ ^3P_0\text{-}2p^2\ ^3P_1$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
ΔE	8.608-2	4.801-2	3.322-2	2.550-2	2.084-2	2.777-2	1.565-2	1.413-2	1.304-2	1.168-2	1.107-2	1.105-2	1.179-2	1.502-2
ϵ_0	0.4036	0.3404	0.3144	0.3003	0.2916	0.2858	0.2818	0.2788	0.2767	0.2741	0.2700	0.2687	0.2687	0.2714
ϵ_1	0.3175	0.2924	0.2812	0.2748	0.2708	0.2681	0.2661	0.2647	0.2637	0.2624	0.2589	0.2577	0.2569	0.2564
C1	2.92+0	2.30+0	2.06+0	1.92+0	1.84+0	1.80+0	1.76+0	1.74+0	1.71+0	1.69+0	1.68+0	1.68+0	1.71+0	1.82+0
F1	9.34-2	4.34-2	2.96-2	2.21-2	1.86-2	1.65-2	1.48-2	1.33-2	1.22-2	1.08-2	1.01-2	1.01-2	1.07-2	1.39-2
A	6.88+0	5.48+0	4.69+0	4.23+0	3.87+0	3.64+0	3.50+0	3.40+0	3.33+0	3.24+0	3.19+0	3.21+0	3.30+0	3.61+0
K	1.13+0	1.18+0	1.12+0	1.07+0	1.00+0	9.53-1	9.25-1	9.06-1	8.92-1	8.68-1	8.57-1	8.57-1	8.73-1	9.24-1
A1	6.44+0	5.35+0	4.62+0	4.17+0	3.83+0	3.60+0	3.46+0	3.36+0	3.30+0	3.20+0	3.16+0	3.18+0	3.27+0	3.57+0
K1	1.02+0	1.14+0	1.10+0	1.05+0	9.84-1	9.37-1	9.10-1	8.92-1	8.78-1	8.55-1	8.44-1	8.44-1	8.60-1	9.10-1
A2	5.16+0	2.80+0	2.14+0	1.99+0	1.96+0	1.96+0	1.96+0	1.96+0	1.97+0	1.98+0	2.01+0	2.02+0	2.04+0	2.09+0
K2	3.12+0	2.72+0	2.43+0	2.46+0	2.56+0	2.66+0	2.75+0	2.82+0	2.88+0	2.97+0	3.10+0	3.18+0	3.24+0	3.30+0

$2s2p\ ^3P_1\text{-}2p^2\ ^3P_1$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
ΔE	8.606-2	4.796-2	3.314-2	2.537-2	2.066-2	1.754-2	1.535-2	1.378-2	1.262-2	1.115-2	1.045-2	1.035-2	1.107-2	1.437-2
ϵ_0	0.4036	0.3403	0.3143	0.3002	0.2913	0.2856	0.2815	0.2785	0.2763	0.2736	0.2694	0.2680	0.2680	0.2707
ϵ_1	0.3175	0.2924	0.2812	0.2748	0.2708	0.2681	0.2661	0.2647	0.2637	0.2624	0.2589	0.2577	0.2569	0.2564
C1	7.28-1	5.78-1	5.18-1	4.83-1	4.64-1	4.49-1	4.40-1	4.33-1	4.25-1	4.10-1	3.96-1	3.78-1	3.62-1	3.44-1
F1	7.70-2	4.04-2	2.82-2	2.12-2	1.79-2	1.58-2	1.40-2	1.26-2	1.14-2	9.93-3	9.21-3	9.05-3	9.62-3	1.25-2
A	1.98+0	1.45+0	1.22+0	1.09+0	9.93-1	9.26-1	8.88-1	8.61-1	8.37-1	7.95-1	7.63-1	7.28-1	7.07-1	7.02-1
K	1.37+0	1.27+0	1.18+0	1.11+0	1.04+0	9.87-1	9.57-1	9.36-1	9.19-1	8.92-1	8.76-1	8.78-1	9.03-1	9.74-1
A1	1.61+0	1.34+0	1.15+0	1.04+0	9.54-1	8.92-1	8.56-1	8.31-1	8.07-1	7.67-1	7.35-1	7.00-1	6.77-1	6.66-1
K1	1.02+0	1.14+0	1.10+0	1.05+0	9.81-1	9.34-1	9.07-1	8.87-1	8.71-1	8.44-1	8.27-1	8.25-1	8.45-1	9.02-1
A2	4.29+0	2.34+0	1.79+0	1.67+0	1.65+0	1.66+0	1.68+0	1.70+0	1.73+0	1.78+0	1.86+0	1.94+0	2.00+0	2.06+0
K2	3.12+0	2.72+0	2.43+0	2.46+0	2.56+0	2.66+0	2.75+0	2.82+0	2.89+0	2.98+0	3.11+0	3.19+0	3.25+0	3.32+0

$2s2p\ ^3P_2\text{-}2p^2\ ^3P_1$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
ΔE	8.599-2	4.784-2	3.294-2	2.509-2	2.026-2	1.701-2	1.467-2	1.291-2	1.154-2	9.547-3	8.197-3	6.785-3	5.852-3	8.984-3
ϵ_0	0.4035	0.3402	0.3141	0.2999	0.2911	0.2851	0.2808	0.2776	0.2752	0.2720	0.2671	0.2644	0.2628	0.2654
ϵ_1	0.3175	0.2924	0.2812	0.2748	0.2708	0.2681	0.2661	0.2647	0.2637	0.2624	0.2589	0.2577	0.2569	0.2564
C1	7.29-1	5.76-1	5.16-1	4.80-1	4.61-1	4.48-1	4.38-1	4.29-1	4.22-1	4.11-1	4.02-1	3.94-1	3.90-1	4.19-1
F1	8.55-2	4.20-2	2.88-2	2.14-2	1.80-2	1.57-2	1.37-2	1.20-2	1.06-2	8.70-3	7.58-3	6.68-3	6.24-3	8.14-3
A	1.83+0	1.40+0	1.19+0	1.06+0	9.69-1	9.07-1	8.67-1	8.38-1	8.12-1	7.65-1	7.24-1	6.73-1	6.36-1	7.72-1
K	1.23+0	1.21+0	1.14+0	1.08+0	1.01+0	9.57-1	9.26-1	9.02-1	8.78-1	8.21-1	7.62-1	6.79-1	6.12-1	7.99-1
A1	1.61+0	1.34+0	1.15+0	1.04+0	9.46-1	8.87-1	8.49-1	8.21-1	7.96-1	7.51-1	7.11-1	6.61-1	6.25-1	7.58-1
K1	1.02+0	1.14+0	1.10+0	1.04+0	9.74-1	9.26-1	8.97-1	8.75-1	8.52-1	7.97-1	7.40-1	6.58-1	5.92-1	7.76-1
A2	2.58+0	1.40+0	1.07+0	9.94-1	9.77-1	9.74-1	9.75-1	9.77-1	9.78-1	9.80-1	9.94-1	9.98-1	1.00+0	1.02+0
K2	3.12+0	2.72+0	2.43+0	2.46+0	2.56+0	2.66+0	2.76+0	2.83+0	2.90+0	3.00+0	3.13+0	3.24+0	3.33+0	3.41+0

TABLE IV. Fit Parameters for Excitation Cross Sections and Rate Coefficients for $\Delta n = 0$ Transitions, Z = 6, 8, 10, 12, 14, 16, 18, 20, 22, 26, 30, 36, 42, 54

See page 7 for Explanation of Tables

$2s2p\ ^3P_1\text{-}2p^2\ ^3P_2$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
$\Delta\varepsilon$	8.611-2	4.806-2	3.330-2	2.562-2	2.100-2	1.798-2	1.589-2	1.440-2	1.332-2	1.192-2	1.120-2	1.103-2	1.167-2	1.422-2
ε_0	0.4036	0.3403	0.3143	0.3002	0.2913	0.2856	0.2815	0.2785	0.2763	0.2736	0.2694	0.2680	0.2680	0.2707
ε_1	0.3175	0.2923	0.2810	0.2746	0.2705	0.2676	0.2656	0.2641	0.2630	0.2617	0.2581	0.2570	0.2563	0.2560
C1	1.21+0	9.60-1	8.61-1	8.04-1	7.72-1	7.53-1	7.39-1	7.28-1	7.23-1	7.25-1	7.62-1	8.83-1	1.03+0	1.28+0
F1	8.56-2	4.21-2	2.91-2	2.18-2	1.84-2	1.64-2	1.47-2	1.33-2	1.22-2	1.07-2	9.96-3	9.79-3	1.04-2	1.33-2
A	3.06+0	2.34+0	1.99+0	1.79+0	1.64+0	1.54+0	1.49+0	1.45+0	1.42+0	1.41+0	1.40+0	1.71+0	2.00+0	2.56+0
K	1.23+0	1.22+0	1.15+0	1.09+0	1.02+0	9.75-1	9.48-1	9.32-1	9.19-1	9.01-1	8.88-1	8.82-1	8.93-1	9.39-1
A1	2.68+0	2.23+0	1.93+0	1.74+0	1.60+0	1.51+0	1.45+0	1.41+0	1.39+0	1.37+0	1.43+0	1.66+0	1.95+0	2.50+0
K1	1.02+0	1.14+0	1.10+0	1.05+0	9.87-1	9.41-1	9.14-1	8.96-1	8.82-1	8.61-1	8.47-1	8.44-1	8.59-1	9.06-1
A2	4.32+0	2.35+0	1.82+0	1.73+0	1.74+0	1.81+0	1.91+0	2.06+0	2.23+0	2.60+0	2.92+0	3.18+0	3.31+0	3.45+0
K2	3.12+0	2.72+0	2.43+0	2.46+0	2.56+0	2.67+0	2.76+0	2.83+0	2.89+0	2.99+0	3.11+0	3.20+0	3.26+0	3.33+0

$2s2p\ ^3P_2\text{-}2p^2\ ^3P_2$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
$\Delta\varepsilon$	8.604-2	4.794-2	3.311-2	2.534-2	2.060-2	1.744-2	1.520-2	1.353-2	1.223-2	1.031-2	8.938-3	7.468-3	6.447-3	9.350-2
ε_0	0.4035	0.3402	0.3141	0.2999	0.2911	0.2851	0.2808	0.2776	0.2752	0.2720	0.2671	0.2644	0.2628	0.2654
ε_1	0.3175	0.2923	0.2810	0.2746	0.2705	0.2676	0.2656	0.2641	0.2630	0.2617	0.2581	0.2570	0.2563	0.2560
C1	2.18+0	1.72+0	1.55+0	1.44+0	1.37+0	1.32+0	1.27+0	1.20+0	1.12+0	9.14-1	7.38-1	5.81-1	5.04-1	4.71-1
F1	8.66-2	4.22-2	2.90-2	2.17-2	1.83-2	1.61-2	1.42-2	1.26-2	1.13-2	9.39-3	8.15-3	7.04-3	6.44-3	8.32-3
A	5.44+0	4.19+0	3.55+0	3.19+0	2.90+0	2.69+0	2.52+0	2.36+0	2.16+0	1.73+0	1.36+0	1.02+0	8.50-1	8.81-1
K	1.21+0	1.21+0	1.14+0	1.08+0	1.01+0	9.60-1	9.30-1	9.07-1	8.87-1	8.45-1	7.98-1	7.26-1	6.61-1	8.26-1
A1	4.83+0	4.01+0	3.46+0	3.11+0	2.84+0	2.64+0	2.48+0	2.32+0	2.13+0	1.70+0	1.33+0	1.00+0	8.30-1	8.57-1
K1	1.02+0	1.14+0	1.10+0	1.05+0	9.80-1	9.33-1	9.05-1	8.84-1	8.65-1	8.23-1	7.75-1	7.01-1	6.35-1	7.91-1
A2	7.14+0	3.86+0	2.93+0	2.69+0	2.60+0	2.51+0	2.42+0	2.30+0	2.16+0	1.91+0	1.79+0	1.71+0	1.69+0	1.72+0
K2	3.12+0	2.72+0	2.43+0	2.46+0	2.56+0	2.67+0	2.76+0	2.84+0	2.91+0	3.00+0	3.14+0	3.25+0	3.34+0	3.32+0

$2s2p\ ^3P_0\text{-}2p^2\ ^3P_0$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
$\Delta\varepsilon$	8.604-2	4.793-2	3.312-2	2.533-2	2.062-2	1.747-2	1.523-2	1.354-2	1.230-2	1.046-2	9.168-3	7.792-3	6.811-3	8.375-3
ε_0	0.4036	0.3404	0.3144	0.3003	0.2916	0.2858	0.2818	0.2788	0.2767	0.2741	0.2700	0.2687	0.2687	0.2714
ε_1	0.3176	0.2924	0.2813	0.2750	0.2710	0.2684	0.2665	0.2653	0.2644	0.2637	0.2608	0.2609	0.2619	0.2630
C2	1.33-1	8.89-2	7.38-2	6.69-2	6.32-2	6.10-2	5.86-2	5.94-2	5.93-2	5.89-2	5.81-2	5.72-2	5.61-2	5.50-2
F2	5.02-2	3.95-2	3.08-2	2.30-2	1.77-2	1.42-2	1.18-2	1.02-2	8.94-3	7.27-3	5.98-3	4.90-3	4.18-3	4.94-3
A2	2.13+0	1.28+0	9.72-1	9.06-1	8.95-1	9.00-1	8.92-1	9.24-1	9.40-1	9.55-1	9.73-1	9.72-1	9.61-1	9.71-1
K2	3.09+0	2.76+0	2.45+0	2.47+0	2.56+0	2.66+0	2.75+0	2.82+0	2.88+0	2.96+0	3.08+0	3.15+0	3.20+0	3.20+0

$2s2p\ ^1P_1\text{-}2p^2\ ^3P_0$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
$\Delta\varepsilon$	3.522-2	1.996-2	1.387-2	1.061-2	8.592-3	7.206-3	6.181-3	5.369-3	4.684-3	3.491-3	2.349-3	5.11-4	1.000-5	2.234-3
ε_0	0.3528	0.3124	0.2951	0.2856	0.2796	0.2756	0.2727	0.2706	0.2691	0.2671	0.2623	0.2614	0.2618	0.2653
ε_1	0.3176	0.2924	0.2813	0.2750	0.2710	0.2684	0.2665	0.2653	0.2644	0.2637	0.2608	0.2609	0.2619	0.2630
C1	3.47-3	1.52-3	1.32-3	1.90-3	1.93-3	3.09-3	3.77-3	7.86-3	1.20-2	2.27-2	3.36-2	4.06-2	3.79-2	3.24-2
F1	5.98-4	4.11-4	4.47-4	1.52-3	1.31-3	2.35-3	2.62-3	3.94-3	4.44-3	5.11-3	5.92-3	1.39-3	1.08-4	6.73-3
A	6.62-2	1.50-2	1.08-2	9.99-3	8.87-3	9.44-3	9.75-3	1.54-2	2.08-2	3.41-2	4.61-2	6.12-2	7.04-2	4.29-2
K	1.22+1	1.19+1	1.13+1	6.06+0	5.11+0	2.41+0	1.78+0	9.81-1	7.45-1	5.25-1	4.43-1	5.33-1	6.64-1	4.05-1
A1	7.96-6	4.39-5	1.92-4	1.48-3	1.58-3	3.60-3	4.61-3	1.09-2	1.68-2	3.10-2	4.39-2	6.01-2	7.00-2	4.23-2
K1	9.98-1	9.26-1	8.68-1	8.24-1	7.61-1	6.90-1	6.23-1	5.63-1	5.11-1	4.33-1	3.97-1	5.15-1	6.58-1	3.93-1
A2	1.06+0	4.68-1	4.01-1	3.93-1	3.93-1	3.90-1	3.83-1	3.70-1	3.54-1	3.09-1	2.59-1	1.80-1	1.23-1	6.80-2
K2	3.43+0	2.48+0	2.34+0	2.46+0	2.60+0	2.72+0	2.82+0	2.89+0	2.95+0	3.04+0	3.17+0	3.24+0	3.26+0	3.35+0

TABLE IV. Fit Parameters for Excitation Cross Sections and Rate Coefficients for $\Delta n = 0$ Transitions, Z = 6, 8, 10, 12, 14, 16, 18, 20, 22, 26, 30, 36, 42, 54

See page 7 for Explanation of Tables

$2s2p\ ^3P_0$-$2p^2\ ^3P_2$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
ΔE	8.612-2	4.811-2	3.339-2	2.575-2	2.118-2	1.821-2	1.618-2	1.476-2	1.373-2	1.245-2	1.183-2	1.173-2	1.238-2	1.536-2
ε_0	0.4036	0.3404	0.3144	0.3003	0.2916	0.2858	0.2818	0.2788	0.2767	0.2741	0.2700	0.2687	0.2687	0.2714
ε_1	0.3175	0.2923	0.2810	0.2746	0.2705	0.2676	0.2656	0.2641	0.2630	0.2617	0.2581	0.2570	0.2563	0.2560
C2	1.78-1	1.15-1	9.89-2	9.43-2	9.55-2	1.02-1	1.12-1	1.26-1	1.41-1	1.69-1	1.82-1	1.88-1	1.89-1	1.86-1
F2	5.62-2	3.96-2	3.10-2	2.33-2	1.81-2	1.47-2	1.24-2	1.09-2	9.84-3	8.52-3	7.55-3	7.16-3	7.31-3	8.67-3
A2	3.18+0	1.66+0	1.30+0	1.28+0	1.36+0	1.51+0	1.71+0	1.97+0	2.26+0	2.78+0	3.12+0	3.32+0	3.41+0	3.48+0
K2	3.27+0	2.76+0	2.45+0	2.47+0	2.57+0	2.67+0	2.76+0	2.83+0	2.89+0	2.98+0	3.11+0	3.19+0	3.25+0	3.32+0

$2s2p\ ^1P_1$-$2p^2\ ^3P_1$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
ΔE	3.526-2	2.002-2	1.397-2	1.076-2	8.809-3	7.510-3	6.597-3	5.928-3	5.423-3	4.719-3	4.252-3	3.767-3	4.847-3	8.891-3
ε_0	0.3528	0.3124	0.2951	0.2856	0.2796	0.2756	0.2727	0.2706	0.2691	0.2671	0.2623	0.2614	0.2618	0.2653
ε_1	0.3175	0.2924	0.2812	0.2748	0.2708	0.2681	0.2661	0.2647	0.2637	0.2624	0.2589	0.2577	0.2569	0.2564
C1	8.29-3	4.50-3	3.70-3	3.47-3	3.46-3	3.66-3	3.81-3	5.09-3	6.64-3	1.22-2	2.15-2	4.07-2	6.19-2	9.93-2
F1	3.39-4	3.63-4	2.23-4	2.67-5	5.50-5	8.70-6	4.93-5	6.30-4	1.18-3	2.45-3	3.50-3	4.47-3	5.12-3	7.45-3
A	1.15-1	4.39-2	2.94-2	2.56-2	2.49-2	2.47-2	2.36-2	2.18-2	2.18-2	2.76-2	3.97-2	6.53-2	1.02-1	1.90-1
K	1.27+1	1.16+1	1.06+1	1.09+1	1.16+1	1.12+1	1.01+1	5.10+0	3.05+0	1.40+0	8.84-1	6.26-1	6.41-1	8.71-1
A1	1.02-6	8.92-6	4.31-5	1.49-4	4.04-4	9.29-4	1.30-3	3.48-3	5.96-3	1.44-2	2.80-2	5.49-2	9.08-2	1.76-1
K1	9.25-1	9.27-1	8.68-1	8.27-1	7.70-1	7.08-1	6.51-1	6.03-1	5.65-1	5.12-1	4.78-1	4.46-1	5.17-1	7.72-1
A2	1.44+0	1.40+0	1.21+0	1.19+0	1.20+0	1.21+0	1.21+0	1.20+0	1.18+0	1.15+0	1.12+0	1.07+0	1.04+0	1.04+0
K2	3.11+0	2.48+0	2.35+0	2.46+0	2.61+0	2.73+0	2.82+0	2.90+0	2.96+0	3.05+0	3.20+0	3.30+0	3.35+0	3.41+0

$2s2p\ ^3P_2$-$2p^2\ ^3P_0$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
ΔE	8.595-2	4.778-2	3.285-2	2.494-2	2.005-2	1.670-2	1.425-2	1.235-2	1.080-2	8.320-3	6.276-3	3.530-2	8.757-4	2.327-3
ε_0	0.4035	0.3402	0.3141	0.2999	0.2911	0.2851	0.2808	0.2776	0.2752	0.2720	0.2671	0.2644	0.2628	0.2654
ε_1	0.3176	0.2924	0.2813	0.2750	0.2710	0.2684	0.2665	0.2653	0.2644	0.2637	0.2608	0.2609	0.2619	0.2630
C2	3.32-2	2.21-2	1.80-2	1.60-2	1.46-2	1.35-2	1.25-2	1.16-2	1.06-2	8.69-3	6.86-3	4.88-2	3.71-3	2.40-3
F2	4.99-2	3.93-2	3.06-2	2.27-2	1.72-2	1.36-2	1.11-2	9.23-3	7.82-3	5.75-3	4.02-3	2.10-3	3.60-4	1.20-3
A2	5.35-1	3.17-1	2.37-1	2.16-1	2.07-1	2.00-1	1.91-1	1.81-1	1.68-1	1.41-1	1.14-1	8.16-1	6.07-2	4.11-2
K2	3.11+0	2.76+0	2.45+0	2.47+0	2.56+0	2.67+0	2.75+0	2.83+0	2.89+0	2.98+0	3.12+0	3.21+0	3.27+0	3.35+0

$2s2p\ ^1P_1$-$2p^2\ ^3P_2$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
ΔE	3.530-2	2.012-2	1.413-2	1.101-2	9.147-3	7.947-3	7.132-3	6.552-3	6.118-3	5.486-3	5.010-3	4.449-3	5.443-3	9.257-3
ε_0	0.3528	0.3124	0.2951	0.2856	0.2796	0.2756	0.2727	0.2706	0.2691	0.2671	0.2632	0.2614	0.2618	0.2653
ε_1	0.3175	0.2923	0.2810	0.2746	0.2705	0.2676	0.2656	0.2641	0.2630	0.2617	0.2581	0.2570	0.2563	0.2560
C1	1.39-2	7.92-3	7.72-3	1.07-2	1.90-2	3.78-2	5.32-2	1.40-1	2.40-1	4.93-1	6.95-1	8.12-1	8.27-1	8.26-1
F1	3.70-4	5.56-4	9.58-4	1.86-3	3.27-3	4.58-3	4.87-3	5.80-3	5.96-3	5.99-3	5.92-3	5.86-3	6.11-3	8.38-3
A	1.95-1	7.99-2	6.02-2	5.29-2	5.94-2	8.81-2	1.11-1	2.53-1	4.10-1	7.95-1	1.08+0	1.22+0	1.32+0	1.53+0
K	1.29+1	1.24+1	1.04+1	5.34+0	2.38+0	1.35+0	1.08+0	7.81-1	6.90-1	6.00-1	5.53-1	5.06-1	5.78-1	8.07-1
A1	1.01-4	8.05-4	3.01-3	9.38-3	2.47-2	5.73-2	8.21-2	2.26-1	3.84-1	7.72-1	1.06+0	1.20+0	1.30+0	1.51+0
K1	9.25-1	9.28-1	8.71-1	8.33-1	7.83-1	7.31-1	6.85-1	6.46-1	6.16-1	5.68-1	5.32-1	4.90-1	5.62-1	7.87-1
A2	4.07+0	2.35+0	2.04+0	2.03+0	2.07+0	2.11+0	2.14+0	2.15+0	2.13+0	2.04+0	1.95+0	1.82+0	1.76+0	1.73+0
K2	3.11+0	2.48+0	2.35+0	2.47+0	2.61+0	2.73+0	2.83+0	2.91+0	2.97+0	3.06+0	3.21+0	3.30+0	3.36+0	3.42+0

TABLE IV. Fit Parameters for Excitation Cross Sections and Rate Coefficients for $\Delta n = 0$ Transitions, Z = 6, 8, 10, 12, 14, 16, 18, 20, 22, 26, 30, 36, 42, 54

See page 7 for Explanation of Tables

$2s2p\ ^1P_1 - 2p^2\ ^1D_2$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
ΔE	4.375-2	2.663-2	1.916-2	1.504-2	1.249-2	1.079-2	9.621-3	8.815-3	8.169-3	7.776-3	7.812-3	7.973-3	7.712-3	9.430-3
$\mathcal{E}_0$	0.3528	0.3124	0.2951	0.2856	0.2796	0.2756	0.2727	0.2706	0.2691	0.2671	0.2623	0.2614	0.2618	0.2653
$\mathcal{E}_1$	0.3090	0.2658	0.2760	0.2706	0.2671	0.2648	0.2631	0.2618	0.2609	0.2594	0.2553	0.2534	0.2541	0.2558
C1	3.59+0	3.18+0	3.00+0	2.90+0	2.81+0	2.73+0	2.63+0	2.53+0	2.39+0	2.08+0	1.82+0	1.61+0	1.51+0	1.48+0
F1	4.69-2	2.48-2	1.81-2	1.47-2	1.19-2	1.01-2	8.96-3	8.24-3	7.71-3	7.39-3	7.35-3	7.41-3	7.23-3	8.50-3
A	7.62+0	6.83+0	6.08+0	5.65+0	5.39+0	5.14+0	4.87+0	4.60+0	4.26+0	3.68+0	3.23+0	2.88+0	2.67+0	2.76+0
K	9.96-1	1.03+0	9.51-1	9.02-1	8.73-1	8.43-1	8.10-1	7.79-1	7.50-1	7.30-1	7.36-1	7.48-1	7.34-1	8.16-1
A1	7.42+0	6.75+0	6.03+0	5.61+0	5.35+0	5.11+0	4.84+0	4.75+0	4.23+0	3.64+0	3.19+0	2.84+0	2.63+0	2.72+0
K1	9.58-1	1.01+0	9.39-1	8.92-1	8.64-1	8.34-1	8.01-1	7.71-1	7.41-1	7.20-1	7.22-1	7.31-1	7.15-1	7.94-1
A2	4.43+0	2.53+0	2.16+0	2.11+0	2.13+0	2.16+0	2.19+0	2.26+0	2.34+0	2.55+0	2.82+0	3.11+0	3.25+0	3.38+0
K2	3.21+0	2.56+0	2.42+0	2.53+0	2.66+0	2.78+0	2.87+0	2.94+0	3.00+0	3.09+0	3.24+0	3.35+0	3.39+0	3.42+0

$2s2p\ ^1P_1 - 2p^2\ ^1S_0$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
ΔE	8.105-2	4.709-2	3.317-2	2.567-2	2.104-2	1.793-2	1.574-2	1.415-2	1.299-2	1.154-2	1.016-2	7.990-3	7.731-3	9.455-3
$\mathcal{E}_0$	0.3528	0.3124	0.2951	0.2856	0.2796	0.2756	0.2727	0.2706	0.2691	0.2671	0.2623	0.2614	0.2618	0.2653
$\mathcal{E}_1$	0.2717	0.2653	0.2620	0.2599	0.2586	0.2576	0.2570	0.2576	0.2561	0.2556	0.2530	0.2534	0.2541	0.2558
C1	2.12+0	1.57+0	1.37+0	1.25+0	1.18+0	1.14+0	1.10+0	1.06+0	1.02+0	9.58-1	8.89-1	7.87-1	7.26-1	6.75-1
F1	8.50-2	4.14-2	2.89-2	2.18-2	1.85-2	1.65-2	1.47-2	1.33-2	1.21-2	1.06-2	9.25-3	7.49-3	7.32-3	8.63-3
A	4.90+0	3.74+0	3.12+0	2.76+0	2.49+0	2.30+0	2.18+0	2.07+0	1.99+0	1.83+0	1.67+0	1.40+0	1.28+0	1.25+0
K	1.09+0	1.17+0	1.12+0	1.07+0	1.00+0	9.55-1	9.26-1	9.06-1	8.91-1	8.65-1	8.31-1	7.41-1	7.25-1	8.0-1
A1	4.71+0	3.69+0	3.09+0	2.74+0	2.47+0	2.29+0	2.16+0	2.08+0	1.97+0	1.82+0	1.66+0	1.39+0	1.27+0	1.24+0
K1	1.03+0	1.14+0	1.11+0	1.06+0	9.93-1	9.45-1	9.16-1	8.96-1	8.81-1	8.56-1	8.22-1	7.32-1	7.16-1	7.95-1
A2	2.71+0	1.28+0	1.01+0	9.29-1	8.99-1	8.73-1	8.67-1	8.47-1	8.37-1	8.26-1	8.17-1	7.89-1	7.66-1	7.35-1

$2s2p\ ^3P_0 - 2p^2\ ^1D_2$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
ΔE	9.457-2	5.462-2	3.841-2	2.978-2	2.452-2	2.105-2	1.867-2	1.702-2	1.578-2	1.474-2	1.463-2	1.526-2	1.463-2	1.554-2
$\mathcal{E}_0$	0.4036	0.3404	0.3144	0.3003	0.2916	0.2858	0.2818	0.2788	0.2767	0.2741	0.2700	0.2687	0.2687	0.2714
$\mathcal{E}_1$	0.3090	0.2658	0.2760	0.2706	0.2671	0.2648	0.2631	0.2618	0.2609	0.2594	0.2553	0.2534	0.2541	0.2558
C2	3.58-1	2.24-1	1.79-1	1.55-1	1.37-1	1.20-1	1.03-1	8.45-2	6.55-2	3.30-2	1.47-2	4.62-3	1.72-3	3.54-4
F2	5.91-2	4.31-2	3.40-2	2.58-2	2.02-2	1.65-2	1.40-2	1.23-2	1.11-2	9.86-3	9.09-3	9.02-3	8.47-3	8.76-3
A	6.64+0	3.33+0	2.45+0	2.17+0	2.00+0	1.82+0	1.61+0	1.35+0	1.07+0	5.53-1	2.58-1	8.39-2	3.16-2	6.63-3
K	3.33+0	2.82+0	2.51+0	2.53+0	2.62+0	2.71+0	2.79+0	2.86+0	2.92+0	3.01+0	3.14+0	3.23+0	3.27+0	3.32+0

$2s2p\ ^3P_2 - 2p^2\ ^1D_2$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
ΔE	9.448-2	5.445-2	3.813-2	2.937-2	2.394-2	2.029-2	1.769-2	1.519-2	1.428-2	1.260-2	1.124-2	1.101-2	8.696-3	9.524-2
$\mathcal{E}_0$	0.4035	0.3402	0.3141	0.2999	0.2911	0.2851	0.2808	0.2776	0.2752	0.2720	0.2671	0.2644	0.2628	0.2654
$\mathcal{E}_1$	0.3090	0.2658	0.2760	0.2706	0.2671	0.2648	0.2631	0.2618	0.2609	0.2594	0.2553	0.2534	0.2541	0.2558
C1	2.55-2	1.19-2	8.49-3	1.08-2	1.63-2	2.92-2	5.49-2	9.95-2	1.66-1	3.44-1	5.02-1	6.56-1	7.09-1	7.92-1
F1	1.30-3	1.30-3	1.09-3	2.83-3	4.97-3	7.66-3	9.89-3	1.10-2	1.12-2	1.07-2	9.69-3	9.57-3	7.72-3	8.40-3
A	5.99-1	1.96-1	1.07-1	1.06-1	9.39-2	1.07-1	1.52-1	2.36-1	3.62-1	6.99-1	9.89-1	1.28+0	1.31+0	1.49+0
K	1.12+1	1.24+1	1.12+1	1.05+1	5.18+0	2.63+0	1.67+0	1.29+0	1.11+0	9.78-1	9.19-1	8.99-1	8.09-1	8.39-1
A1	1.25-4	7.45-4	2.72-4	8.23-3	2.10-2	4.77-2	9.85-2	1.85-1	3.12-1	6.48-1	9.39-1	1.23+0	1.27+0	1.45+0
K1	1.03+0	1.16+0	1.13+0	1.09+0	1.04+0	9.80-1	9.40-1	9.15-1	8.97-1	8.74-1	8.49-1	8.45-1	7.65-1	7.98-1
A2	6.18+0	3.32+0	2.56+0	2.40+0	2.39+0	2.45+0	2.55+0	2.67+0	2.82+0	3.08+0	3.27+0	3.41+0	3.41+0	3.42+0
K2	3.19+0	2.77+0	2.49+0	2.52+0	2.61+0	2.71+0	2.80+0	2.87+0	2.93+0	3.03+0	3.17+0	3.29+0	3.37+0	3.42+0

TABLE IV. Fit Parameters for Excitation Cross Sections and Rate Coefficients for $\Delta n = 0$ Transitions, Z = 6, 8, 10, 12, 14, 16, 18, 20, 22, 26, 30, 36, 42, 54

See page 7 for Explanation of Tables

$2s2p\ ^3P_2-2p^2\ ^1S_0$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
ΔE	1.318-1	7.491-2	5.213-2	4.000-2	3.249-2	2.743-2	2.381-2	2.113-2	1.910-2	1.637-2	1.411-2	1.107-2	8.715-3	9.548-5
ε_0	0.4035	0.3402	0.3141	0.2999	0.2911	0.2851	0.2808	0.2776	0.2752	0.2720	0.2671	0.2644	0.2628	0.2654
ε_1	0.2717	0.2653	0.2620	0.2599	0.2586	0.2576	0.2570	0.2576	0.2561	0.2556	0.2530	0.2534	0.2541	0.2558
C2	1.54-2	1.23-2	1.13-2	1.08-2	1.09-2	1.13-2	1.20-2	1.29-2	1.40-2	1.67-2	1.93-2	2.30-2	2.59-2	2.98-2
F2	6.38-2	5.07-2	4.05-2	3.09-2	2.43-2	1.98-2	1.67-2	1.44-2	1.27-2	1.05-2	8.45-3	6.36-3	4.84-3	5.16-3
A	3.61-1	2.10-1	1.71-1	1.66-1	1.71-1	1.82-1	1.97-1	2.16-1	2.38-1	2.89-1	3.47-1	4.18-1	4.74-1	5.57-1
K	3.73+0	3.01+0	2.69+0	2.69+0	2.75+0	2.82+0	2.89+0	2.95+0	3.00+0	3.08+0	3.21+0	3.29+0	3.37+0	3.42+0

$2s2p\ ^3P_1-2p^2\ ^1D_2$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
ΔE	9.454-2	5.457-2	3.033-2	2.965-2	2.434-2	2.082-2	1.838-2	1.667-2	1.537-2	1.421-2	1.401-2	1.456-2	1.392-2	1.490-2
ε_0	0.4036	0.3403	0.3143	0.3002	0.2913	0.2856	0.2815	0.2785	0.2763	0.2736	0.2694	0.2680	0.2680	0.2707
ε_1	0.3090	0.2658	0.2760	0.2706	0.2671	0.2648	0.2631	0.2618	0.2609	0.2594	0.2553	0.2534	0.2541	0.2558
C1	2.53-2	1.14-2	8.21-3	7.17-3	7.04-3	7.84-3	1.02-2	1.49-2	2.27-2	4.19-2	5.07-2	4.04-2	1.06-1	7.54-3
F1	1.29-3	1.17-3	1.12-3	9.85-4	1.12-3	1.76-3	3.13-3	5.22-3	7.40-3	1.02-2	1.12-2	1.23-2	1.27-2	1.29-2
A	5.95-1	1.87-1	1.04-1	8.14-2	7.48-2	6.94-2	5.98-2	5.85-2	6.70-2	9.59-2	1.08-1	8.41-2	2.09-1	1.55-2
K	1.11+1	1.19+1	1.12+1	1.17+1	1.25+1	1.06+1	5.90+0	3.08+0	1.91+0	1.22+0	1.06+0	1.01+0	9.16-1	9.88-1
A1	1.25-4	1.12-4	3.27-4	8.80-4	2.19-3	5.05-3	1.09-2	2.15-2	3.79-2	7.73-2	9.63-2	7.80-2	2.06-1	1.46-2
K1	1.03+0	1.16+0	1.13+0	1.10+0	1.04+0	9.89-1	9.51-1	9.27-1	9.11-1	8.97-1	8.97-1	9.06-1	8.97-1	9.09-1
A2	6.14+0	3.27+0	2.46+0	2.23+0	2.12+0	2.01+0	1.88+0	1.70+0	1.49+0	1.04+0	6.95-1	3.57-1	1.78-1	4.88-2
K2	3.19+0	2.77+0	2.49+0	2.52+0	2.61+0	2.71+0	2.79+0	2.86+0	2.92+0	3.01+0	3.15+0	3.24+0	3.28+0	3.33+0

$2s2p\ ^3P_0-2p^2\ ^1S_0$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
ΔE	1.319-1	7.508-2	5.243-2	4.041-2	3.307-2	2.819-2	2.479-2	2.239-2	2.061-2	1.850-2	1.698-2	1.528-2	1.465-2	1.556-2
ε_0	0.4036	0.3404	0.3144	0.3003	0.2916	0.2858	0.2818	0.2788	0.2767	0.2741	0.2700	0.2687	0.2687	0.2714
ε_1	0.2717	0.2653	0.2620	0.2599	0.2586	0.2576	0.2570	0.2576	0.2561	0.2556	0.2530	0.2534	0.2541	0.2558
C2	1.52-2	1.17-2	1.01-2	8.89-3	7.82-3	6.78-3	5.70-3	4.60-3	3.54-3	1.78-3	6.98-4	1.03-4	7.28-6	1.09-5
F2	6.38-2	5.08-2	4.07-2	3.13-2	2.47-2	2.06-2	1.74-2	1.53-2	1.38-2	1.19-2	1.03-2	9.03-3	8.48-3	5.11-3
A	3.55-1	2.00-1	1.53-1	1.36-1	1.23-1	1.10-1	9.36-2	7.67-2	5.99-2	3.08-2	1.25-2	1.87-3	1.34-4	2.04-4
K	3.73+0	3.01+0	2.69+0	2.69+0	2.75+0	2.83+0	2.88+0	2.94+0	2.98+0	3.06+0	3.17+0	3.23+0	3.27+0	3.42+0

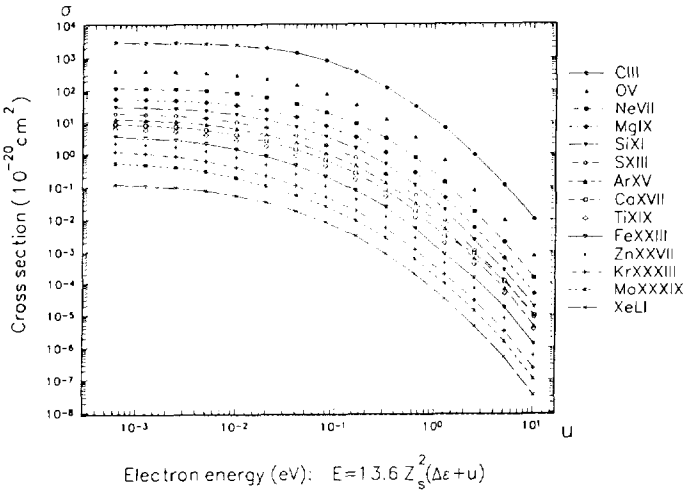
$2s2p\ ^3P_1-2p^2\ ^1S_0$

	CIII	OV	NeVII	MgIX	SiXI	SXIII	ArXV	CaXVII	TiXIX	FeXXIII	ZnXXVII	KrXXXIII	MoXXXIX	XeLI
ΔE	1.318-1	7.503-2	5.234-2	4.028-2	3.289-2	2.796-2	2.450-2	2.200-2	2.019-2	1.797-2	1.636-2	1.458-2	1.394-2	1.492-2
ε_0	0.4036	0.3403	0.3143	0.3002	0.2913	0.2856	0.2815	0.2785	0.2763	0.2736	0.2694	0.2680	0.2680	0.2707
ε_1	0.2717	0.2653	0.2620	0.2599	0.2586	0.2576	0.2570	0.2576	0.2561	0.2556	0.2530	0.2534	0.2541	0.2558
C1	1.36-3	6.91-4	5.17-4	4.57-4	4.50-4	4.93-4	5.91-4	7.50-4	9.56-4	1.32-3	1.30-3	6.58-4	1.74-4	4.03-6
F1	1.18-3	1.29-3	1.24-3	1.17-3	1.40-3	2.08-3	3.29-3	4.88-3	6.56-3	9.28-3	1.03-2	9.76-3	8.09-3	6.19-4
A	4.01-2	1.34-2	7.76-3	6.11-3	5.59-3	5.21-3	4.44-3	3.94-3	3.81-3	3.82-3	3.27-3	1.57-3	4.45-4	3.62-5
K	1.02+1	1.14+1	1.12+1	1.20+1	1.31+1	1.19+1	7.68+0	4.56+0	2.99+0	1.78+0	1.42+0	1.30+0	1.49+0	1.25+1
A1	7.96-7	5.27-6	2.13-5	6.39-5	1.58-4	3.38-4	6.27-4	1.03-3	1.52-3	2.37-3	2.41-3	1.21-3	3.07-4	2.04-6
K1	1.89+0	1.25+0	1.23+0	1.18+0	1.14+0	1.10+0	1.06+0	1.02+0	9.87-1	9.51-1	9.29-1	9.06-1	8.97-1	9.09-1
A2	3.21-1	1.96-1	1.57-1	1.44-1	1.36-1	1.29-1	1.21-1	1.10-1	9.86-2	7.14-2	4.65-2	2.03-2	8.00-3	1.31-3

GRAPHS I. Excitation Cross Sections for $\Delta n = 0$ Transitions, Z = 6, 8, 10, 12, 14, 16, 18, 20, 22, 26, 30, 36, 42, 54

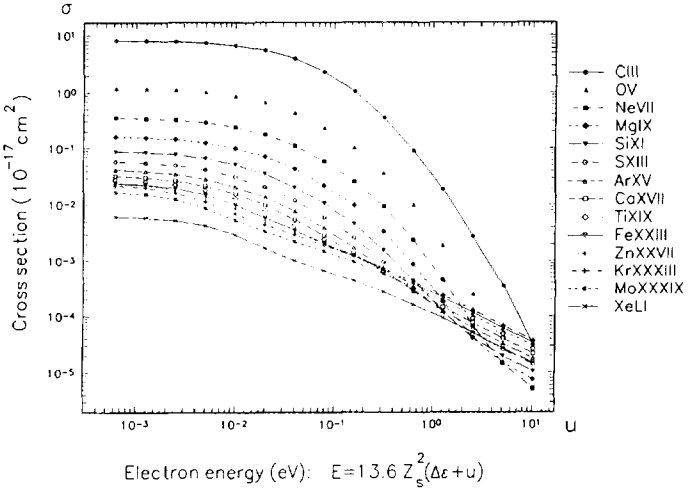
See page 8 for Explanation of Graphs

$2s^2\ ^1S_0 - 2s2p\ ^3P_0$



Electron energy (eV): $E = 13.6\, Z_s^2/(\Delta\varepsilon + u)$

$2s^2\ ^1S_0 - 2s2p\ ^3P_1$



Electron energy (eV): $E = 13.6\, Z_s^2/(\Delta\varepsilon + u)$

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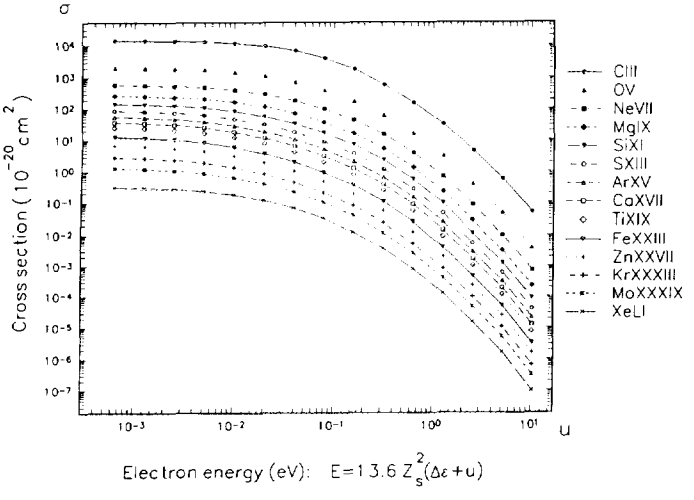
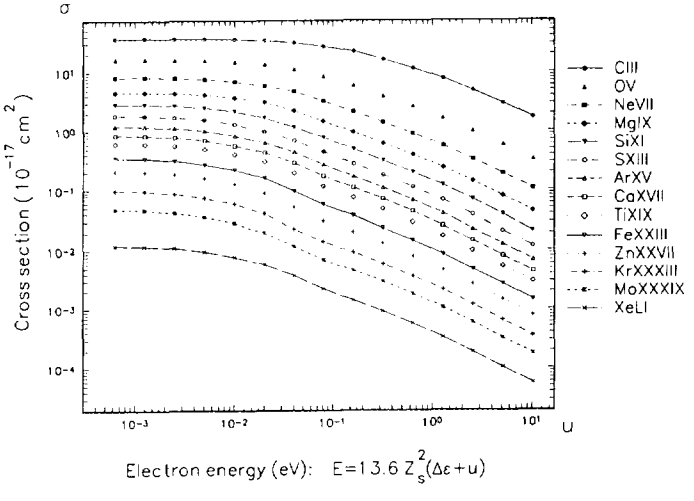


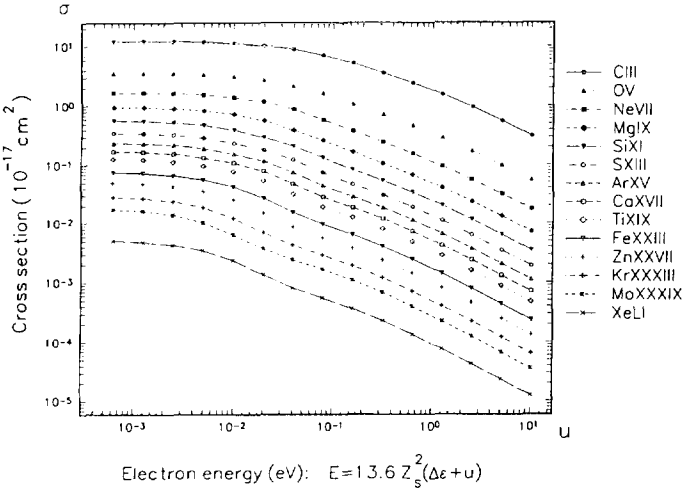
Electron energy (eV): $E = 13.6\, Z_s^2/(\Delta\varepsilon + u)$

$2s^2\ ^1S_0 - 2s2p\ ^1P_1$



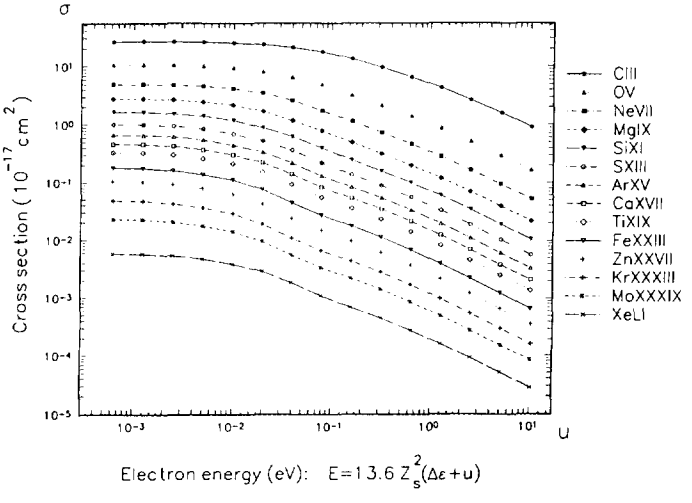
Electron energy (eV): $E = 13.6\, Z_s^2/(\Delta\varepsilon + u)$

$2s2p\ ^3P_1 - 2p^2\ ^3P_0$



Electron energy (eV): $E = 13.6\, Z_s^2/(\Delta\varepsilon + u)$

$2s2p\ ^3P_0 - 2p^2\ ^3P_1$



Electron energy (eV): $E = 13.6\, Z_s^2/(\Delta\varepsilon + u)$

GRAPHS I. Excitation Cross Sections for $\Delta n = 0$ Transitions, Z = 6, 8, 10, 12, 14, 16, 18, 20, 22, 26, 30, 36, 42, 54

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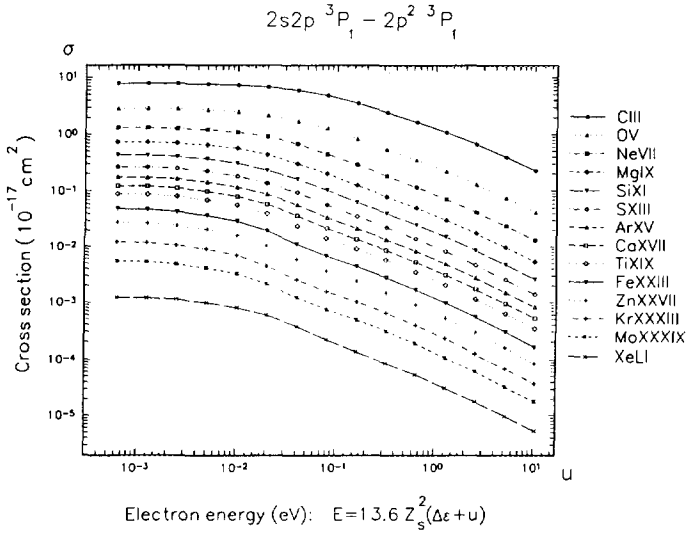

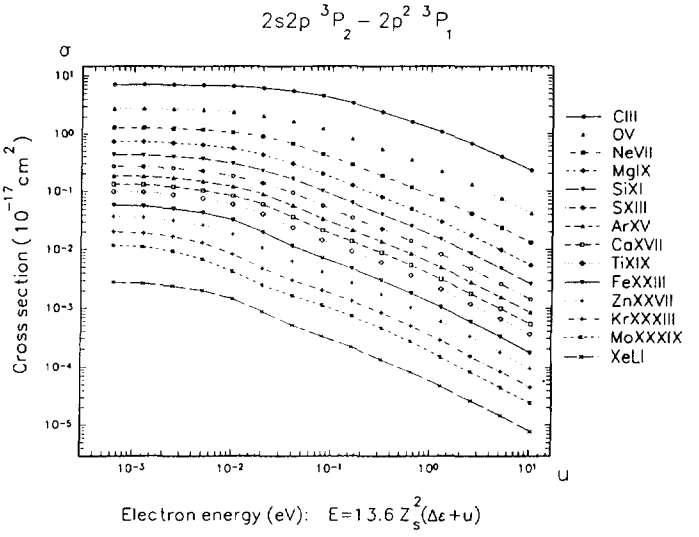

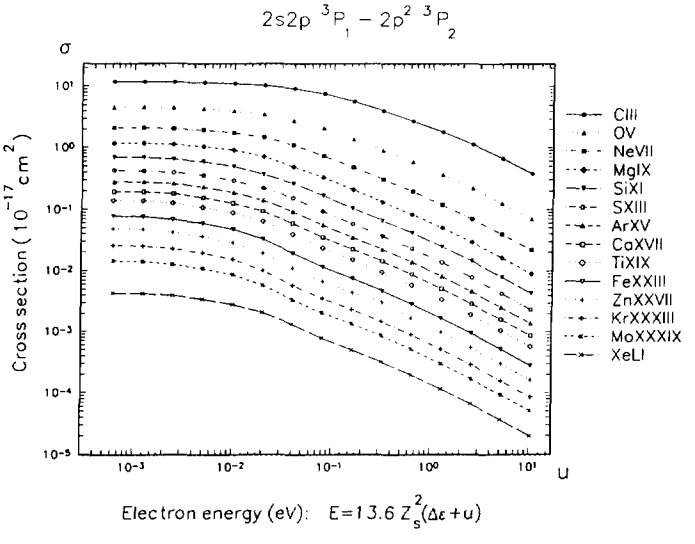

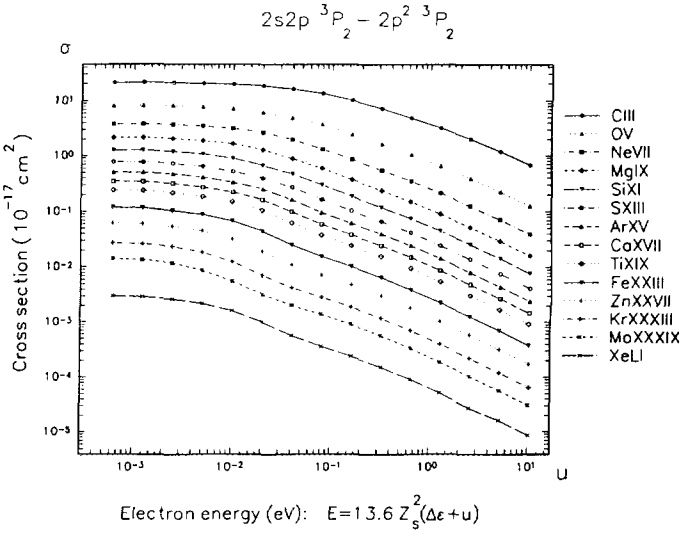

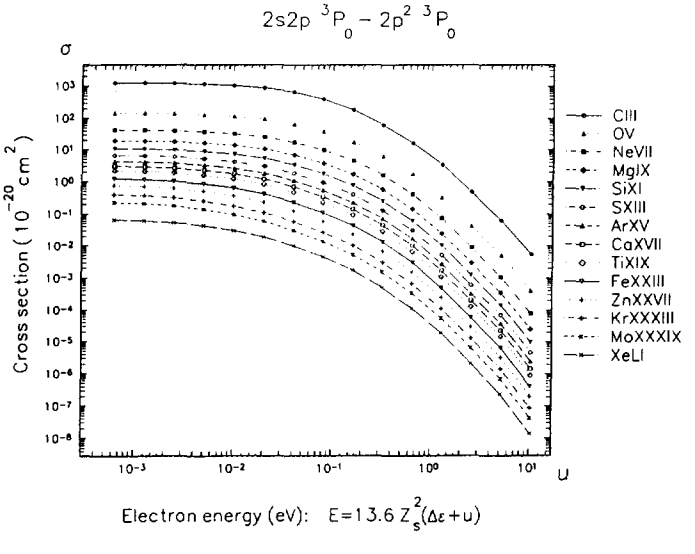

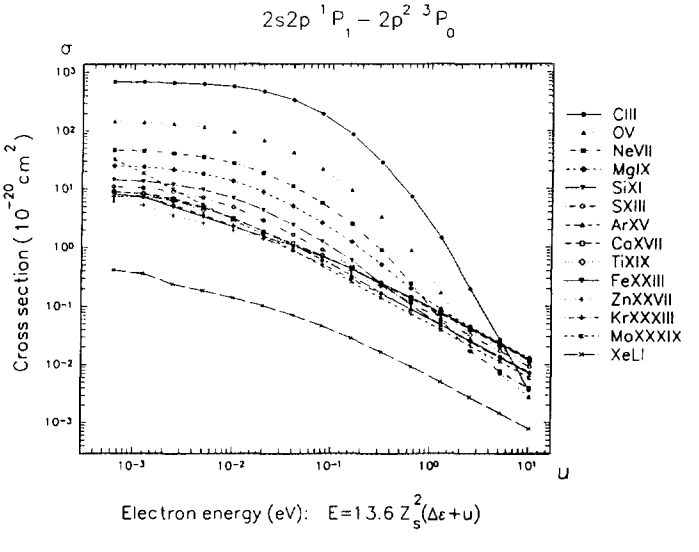

GRAPHS I. Excitation Cross Sections for $\Delta n = 0$ Transitions, Z = 6, 8, 10, 12, 14, 16, 18, 20, 22, 26, 30, 36, 42, 54

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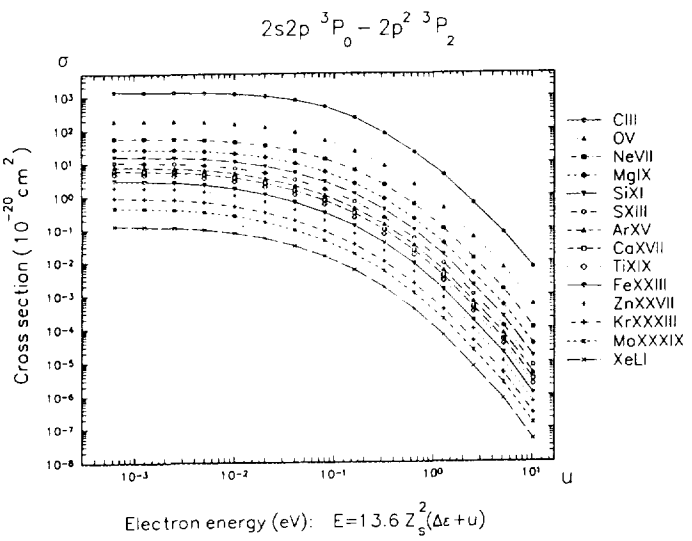

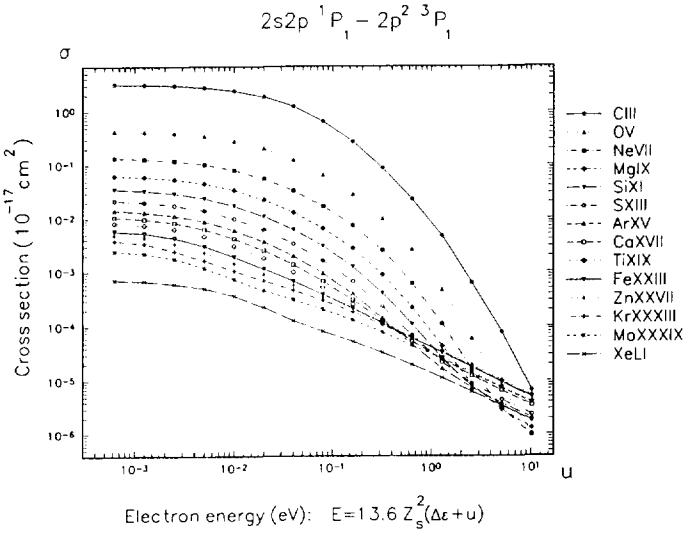

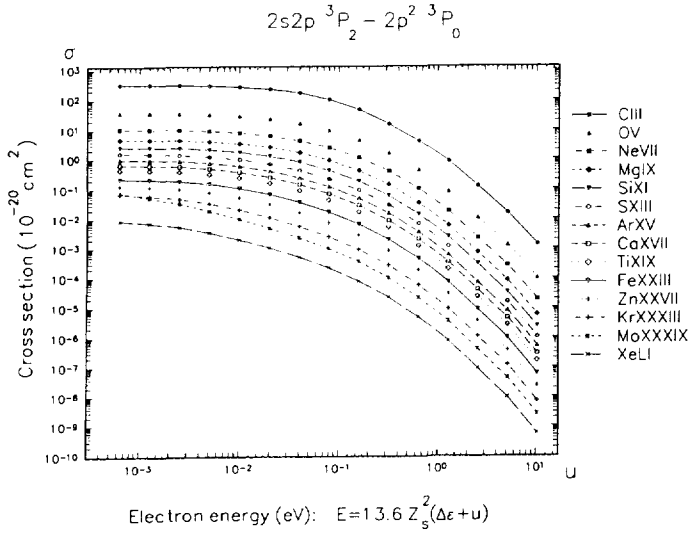

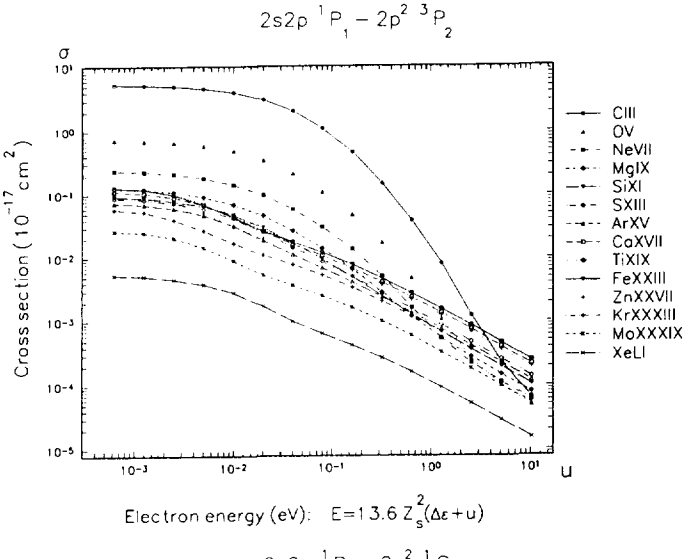

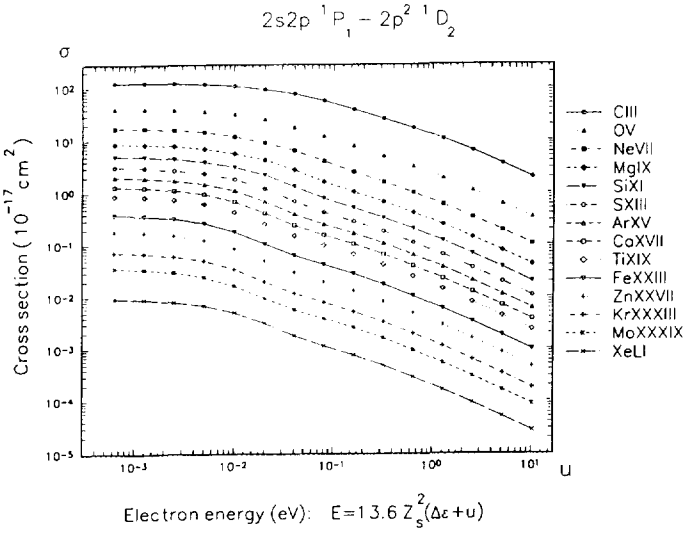

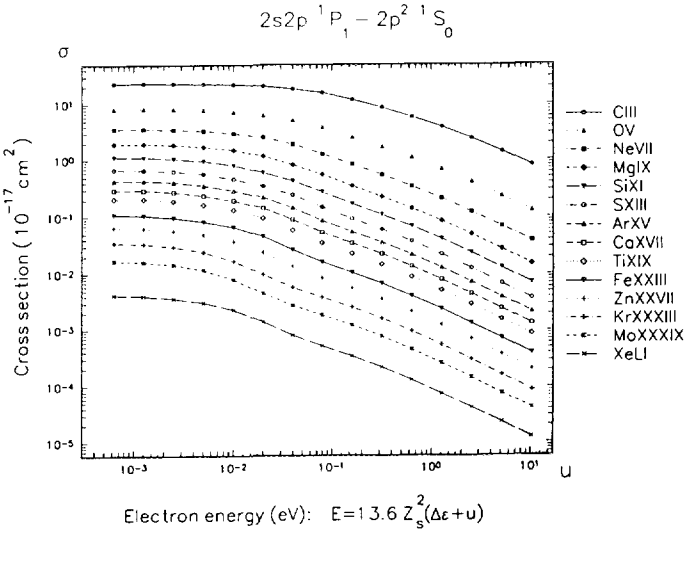

GRAPHS I. Excitation Cross Sections for $\Delta n = 0$ Transitions, Z = 6, 8, 10, 12, 14, 16, 18, 20, 22, 26, 30, 36, 42, 54

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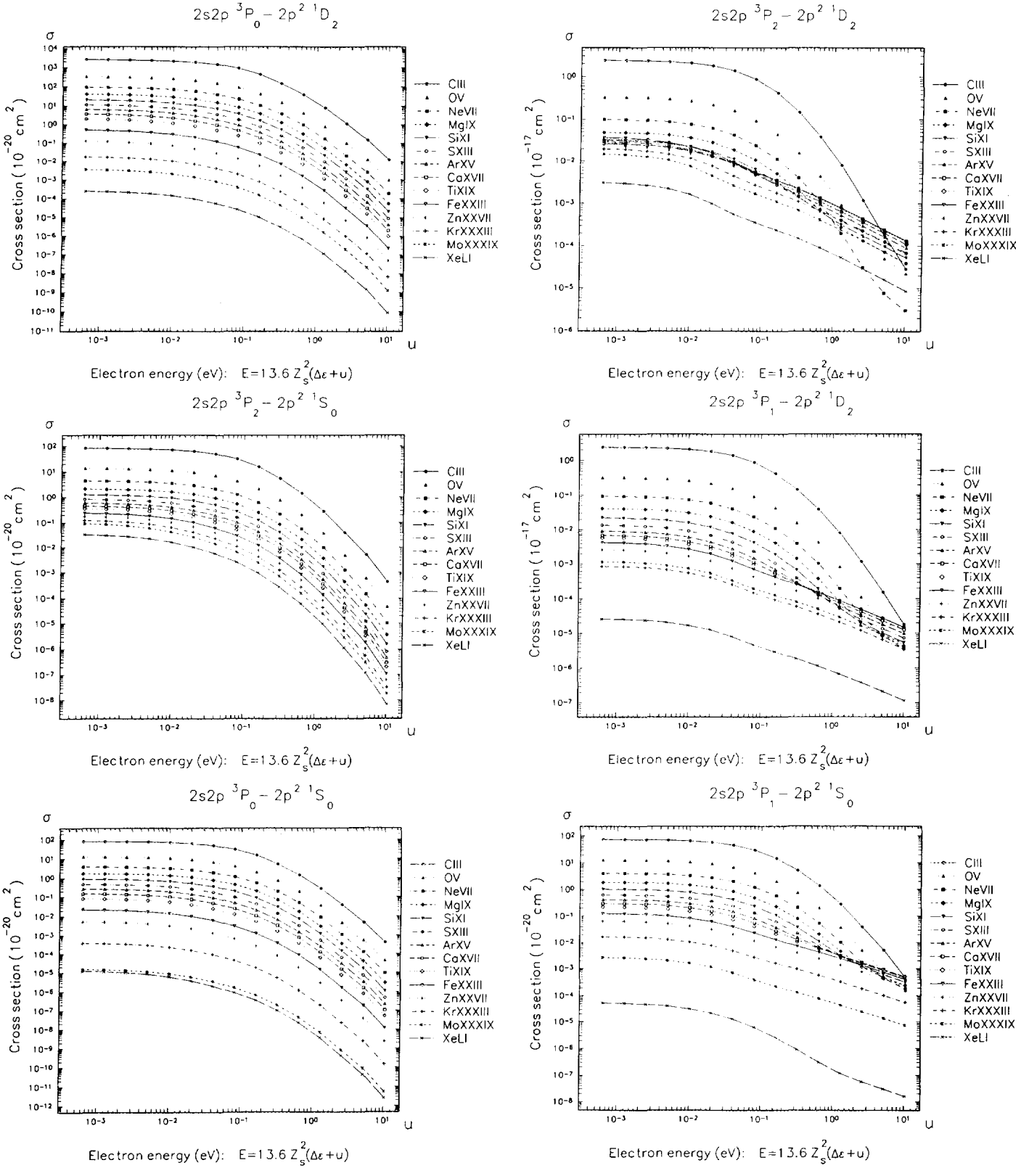

GRAPHS II. Excitation Rate Coefficients for $\Delta n = 0$ Transitions, Z = 6, 8, 10, 12, 14, 16, 18, 20, 22, 26, 30, 36, 42, 54

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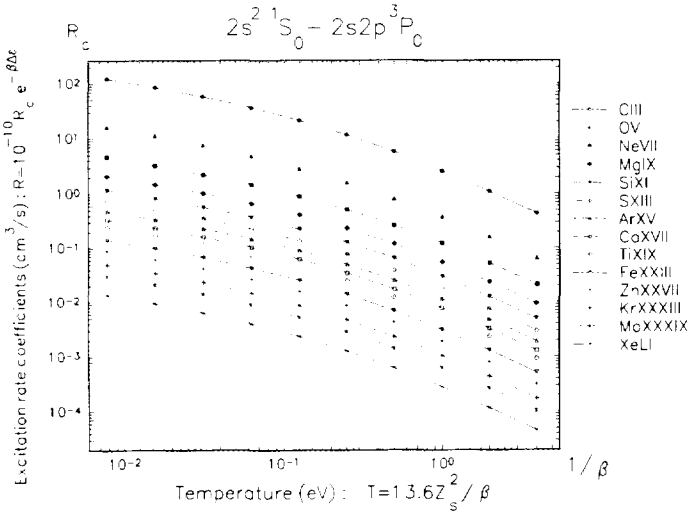

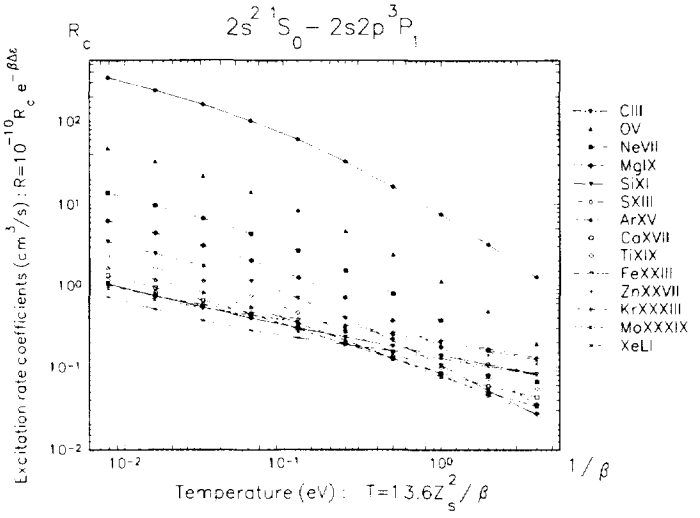

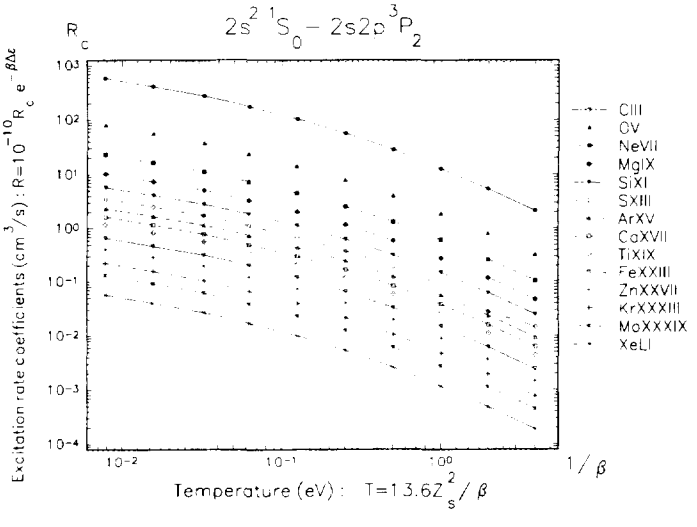

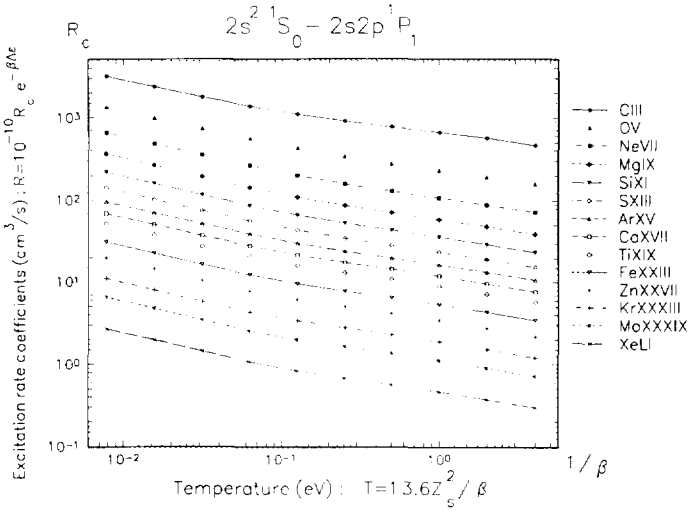

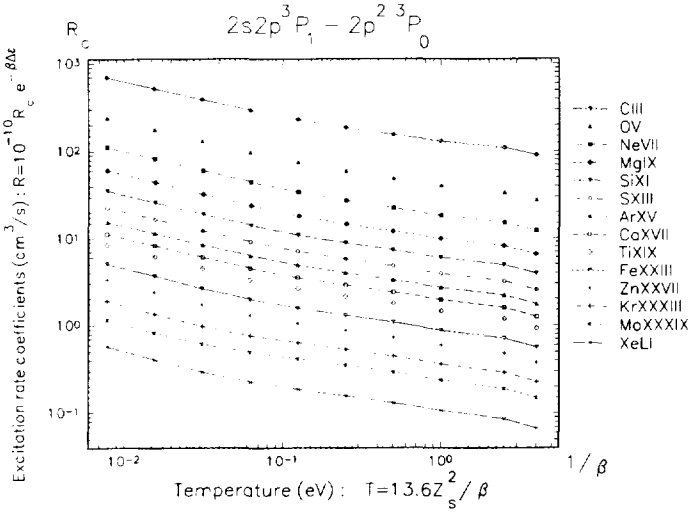

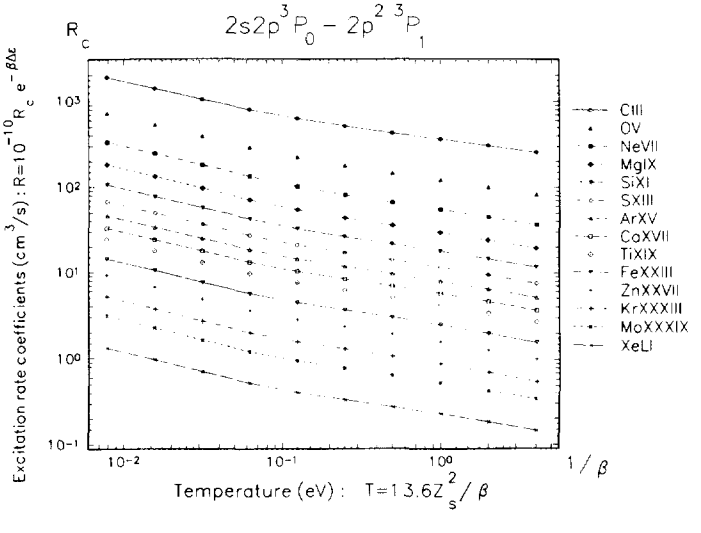

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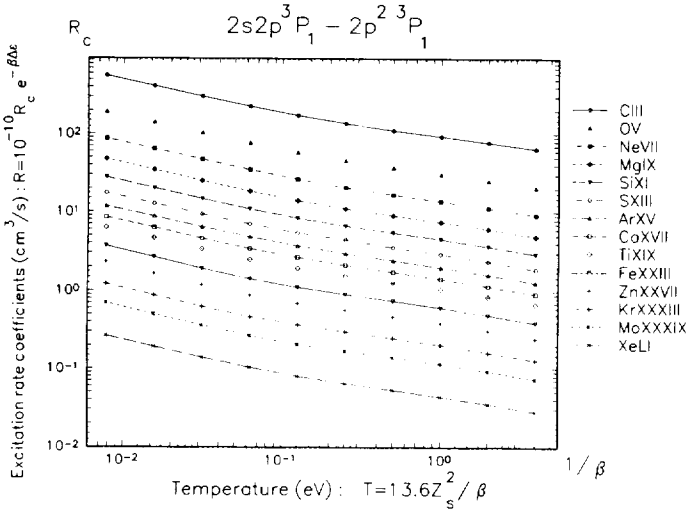

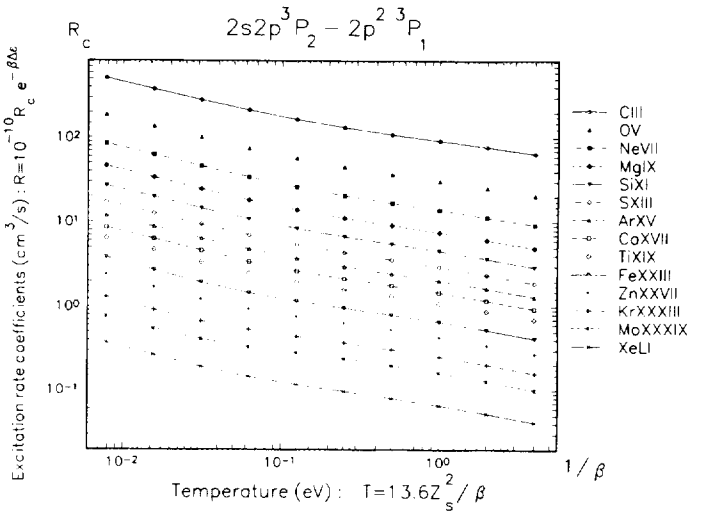

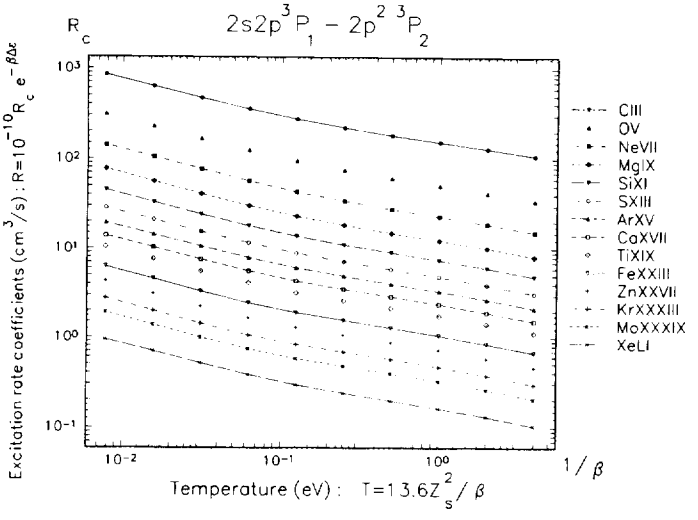

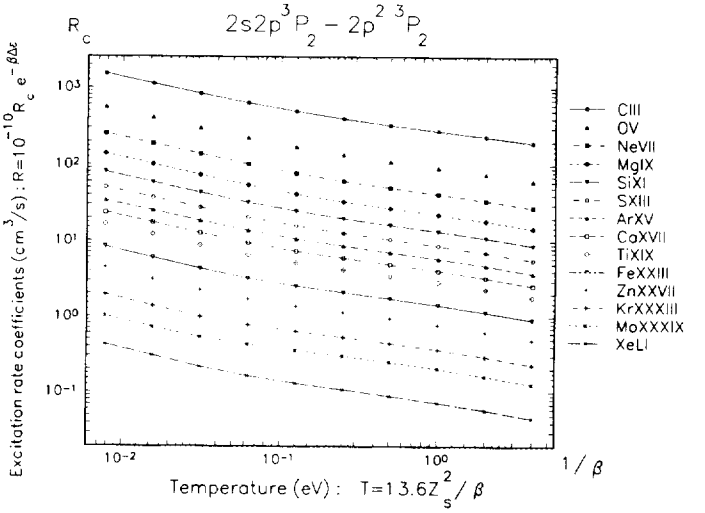

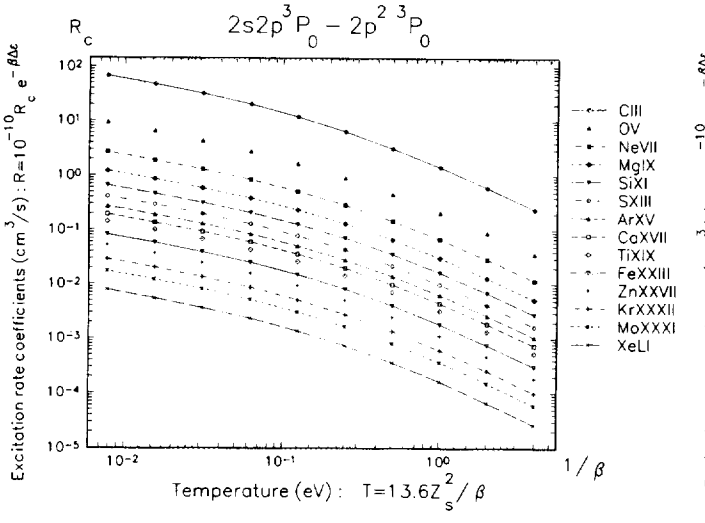

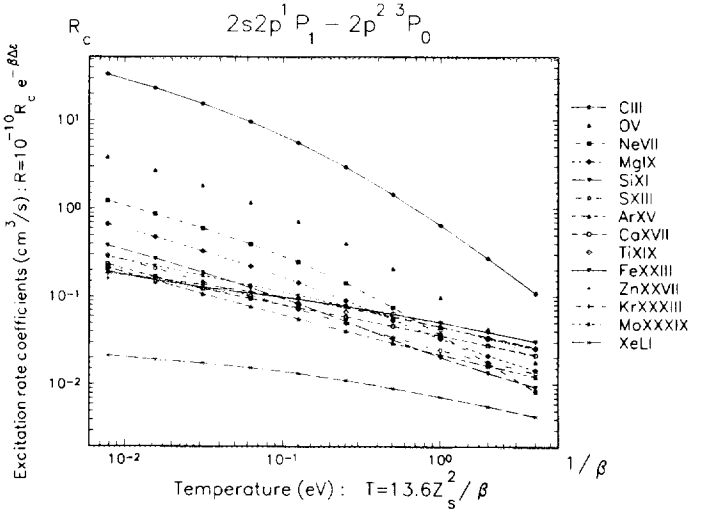

GRAPHS II. Excitation Rate Coefficients for $\Delta n = 0$ Transitions, Z = 6, 8, 10, 12, 14, 16, 18, 20, 22, 26, 30, 36, 42, 54

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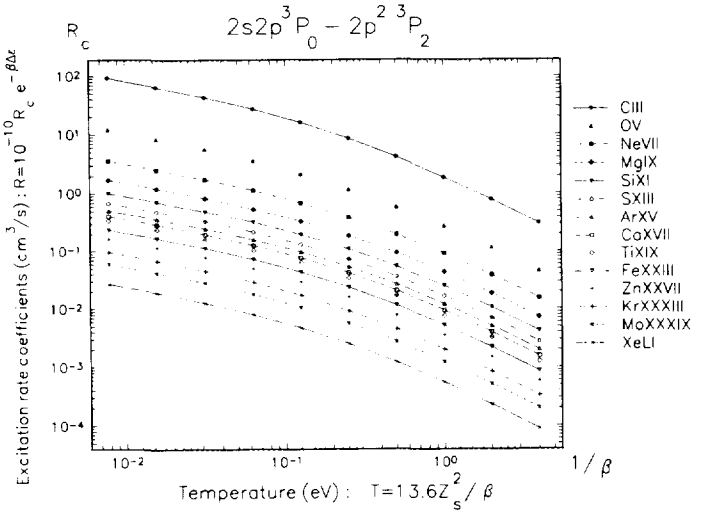

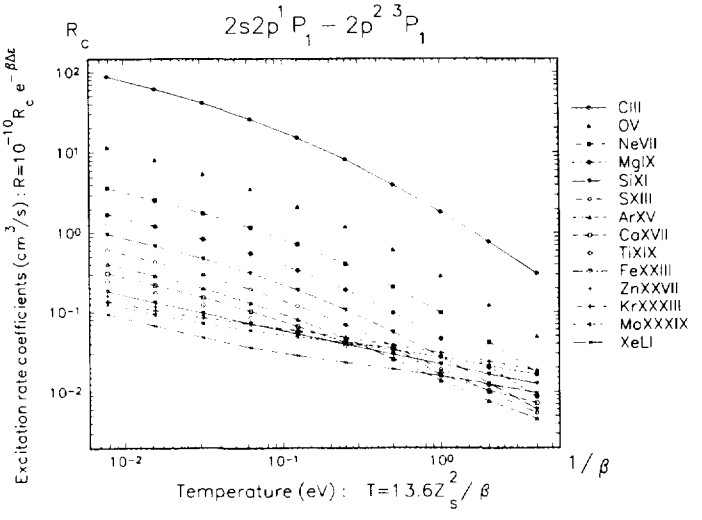

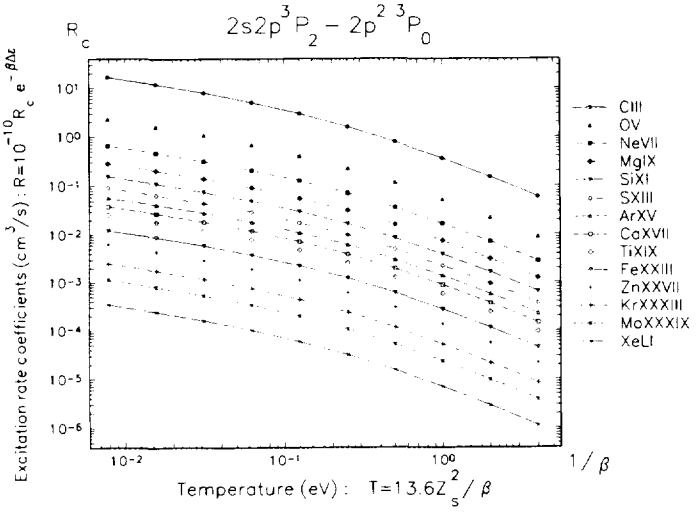

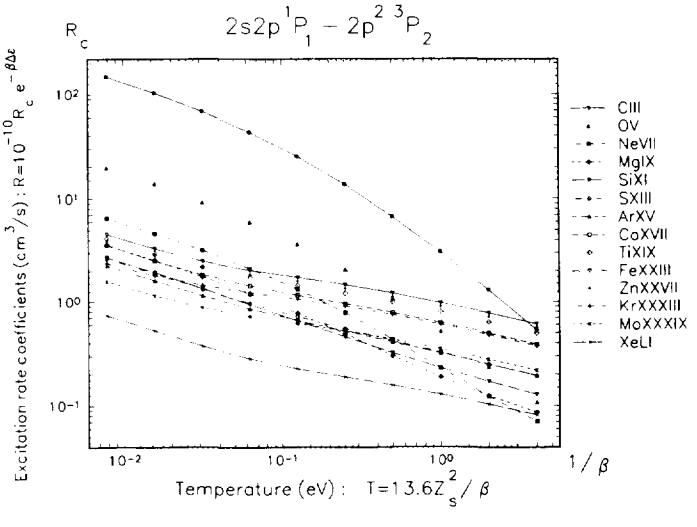

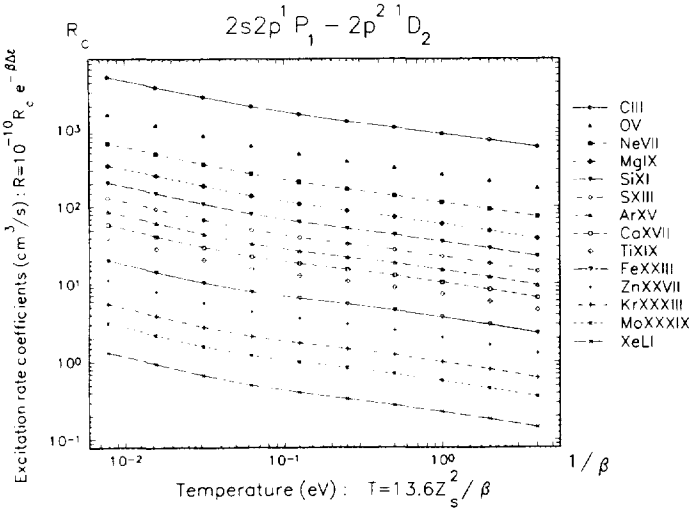

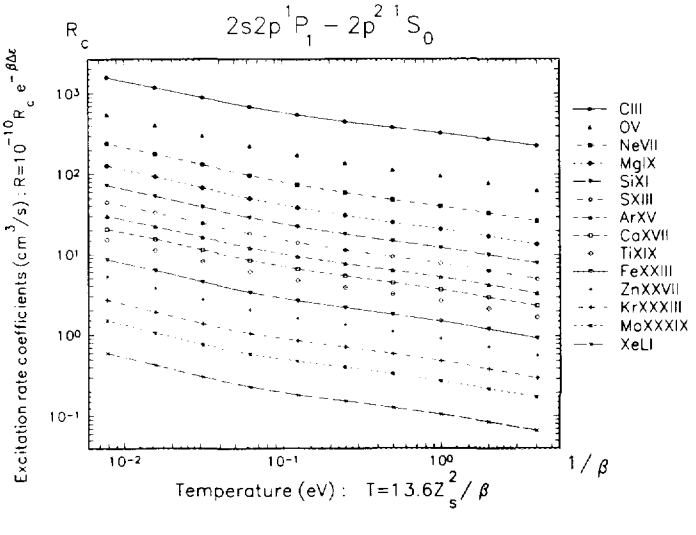

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