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Bibliography on Atomic Transition Probabilities

May 1966 through December 1967



United States Department of Commerce

National Bureau of Standards

Miscellaneous Publication 278—Supplement

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—Office of Engineering Standards Services—Office of Invention and Innovation—Office of Vehicle Systems Research—Clearinghouse for Federal Scientific and Technical Information³—Materials Evaluation Laboratory—NBS/GSA Testing Laboratory.

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² Located at Boulder, Colorado, 80302.

³ Located at 5285 Port Royal Road, Springfield, Virginia 22151.

UNITED STATES DEPARTMENT OF COMMERCE • C. R. Smith, *Secretary*

NATIONAL BUREAU OF STANDARDS • A. V. Astin, *Director*

Bibliography on Atomic Transition Probabilities

May 1966 through December 1967

B. M. Glennon and W. L. Wiese

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Washington, D.C.



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Bibliography on Atomic Transition Probabilities^{*}

May 1966 Through December 1967

B. M. Glennon and W. L. Wiese

A supplement to NBS Miscellaneous Publication 278, Bibliography on Atomic Transition Probabilities is presented, which covers the most recent literature on this subject from May 1966 through December 1967. The papers are arranged according to elements and stages of ionization, and the method employed and class of transitions are indicated behind each reference. Only articles on discrete transitions, both allowed and forbidden, are listed. Papers containing data for more than 20 individual elements or stages of ionization are collected separately in front of the list in order to keep this bibliography at a reasonable size. Also included is a selected list of papers dealing with the subject of transition probabilities from a general point of view.

Key words: Allowed, atomic, discrete, forbidden, transition probability

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1. INTRODUCTION

Since the publication of our second bibliography on atomic transition probabilities in April 1966, the number of articles containing either numerical data on these quantities or important reviews or comments of general interest has increased by about 250 from the 920 articles included there. This supplement contains the references to these new papers, with a cut-off date of January 1, 1968. (More specifically, it contains references from journals and other material received in the NBS library or sent to us before that date). In this supplement essentially the same format as in the two preceding bibliographies^{1,2} is retained.

Section 3.1 contains the important new papers dealing with the subject of atomic transition probabilities from a general point of view. However, we do not have new entries under all the subjects listed in the last bibliography; for example, there are no new general tables of numerical values which are sufficiently comprehensive to be listed here. We would like to emphasize that this section contains only selected papers which are of more than special interest.

In Section 3.2 we have listed those new comprehensive papers which contain data for at least 20 individual species, that is, either elements or stages of ionization. In these cases, we have indicated the transitions for which the numerical data are available, in addition to listing all the species that have been treated.

In Section 3.3 we have listed, in alphabetical order of the element symbols, all references containing data on individual elements and have classified these papers according to the methods employed. Work on forbidden lines is indicated by "forb.". We have marked with an asterisk the element symbols of those species for which additional material is available from one of the comprehensive papers listed in Section 3.2.

It is a pleasure to acknowledge the competent assistance of Miss J. Grabusnik in arranging and typing this bibliography.

¹B. M. Glennon and W. L. Wiese, "Bibliography on Atomic Transition Probabilities," National Bureau of Standards Monograph 50 (1962).

²B. M. Glennon and W. L. Wiese, "Bibliography on Atomic Transition Probabilities," NBS Miscellaneous Publication 278 (U.S. Government Printing Office, Washington, D. C., 20402 (1966)).

2. ABBREVIATIONS USED FOR CLASSIFICATION OF THE ARTICLES

Except where "rel." (relative) appears, all determinations in the papers listed give absolute values.

A. Theoretical methods:

1. SCF - self-consistent field calculations
2. CA - Coulomb approximation
3. Quant. - other quantum mechanical calculations
4. Quant. forb. - quantum mechanical calculations for forbidden lines
5. Estim. - estimations from sum rules, etc.

B. Experimental methods:

1. Emiss. - measurements in emission (arc, furnace, discharge tube, shock tube, etc.)
2. Absorpt. - measurement in absorption (King furnace, absorption tube, etc.)
3. Life - direct lifetime measurements
4. Hook - anomalous dispersion measurements
5. Misc. - miscellaneous experimental methods (magneto-rotation, polarization, magnetic resonance, astrophysical measurements, Hanle-effect, etc.)

C. Miscellaneous:

1. Comm. - comments, additions, or corrections to other articles, methods, etc.
2. Incompl. - article not yet classified (because translation is needed, incomplete information available, etc.)
3. Compil. - compilations



3. BIBLIOGRAPHY

3.1 GENERAL REFERENCES

a. Previous Literature Compilations

Glennon, B. M. and Wiese, W. L., National Bureau of Standards Miscellaneous Publication 278 (U. S. Government Printing Office, Washington, D. C., 1966).

* * * * *

b. Review Articles

Garstang, R. H., Astronomical Union, Symposium #26, 57-76 (1966).

* * * * *

c. Detailed Descriptions of Experimental or Theoretical Methods

Marlow, W. C., Applied Optics 6, 1715-1724 (1967) (Hook method).

Stroke, H. H., Physics Today 19, 55-60 (1966) (Lifetime measurements).

deZafra, R. L. & Kirk, W., Am. J. Phys. 35, 573-582 (1967) (Hanle-effect method).

* * * * *

d. General Comments

Dugan, C. H., J. Quant. Spectrosc. Radiat. Transfer 5, 761-764 (1966) (On the role of magnetic quadrupole radiation).

Hefferlin, R. & Rascon, L., J. Opt. Soc. Am. 57, 964-966 (1967) (Trend of oscillator strengths in isoelectronic sequences).

Kohl, J. L., Phys. Letters 24A, 125-126 (1967) (On new experimental method using beam-foil excitation).

LaPaglia, S. R. & Sinanoglu, O., J. Chem. Phys. 44, 1888-1898 (1966) (Formulation of a many electron theory for situations with configuration interaction).

Norman, G. E., Optics and Spectroscopy (U.S.S.R.) 19, 369-371 (1965) (On the application of the Coulomb Approximation in situations with configuration interaction).

Wiese, W. L., Proceedings Conference on Beam-Foil Excitation Spectroscopy, Tucson, Arizona (1967) (Gordon and Breach, New York).

* * * * *

3.2 COMPREHENSIVE ARTICLES

Cohen, M.

Can. J. Phys. 45, 2009-2014 (1967).

quant.

Transitions treated:

He Sequence

$$\underline{^1S - ^1P^o}$$

$$1s - 2p$$

$$1s - 3p$$

$$2s - 2p$$

$$2s - 3p$$

$$\underline{^3S - ^3P^o}$$

$$2s - 2p$$

$$2s - 3p$$

$$\underline{^1P^o - ^1D} \text{ and } \underline{^3P^o - ^3D}$$

$$2p - 3d$$

$$3p - 3d$$

Li Sequence

$$\underline{^2S - ^2P^o}$$

$$2s - 2p$$

$$2s - 3p$$

$$2p - 3s$$

$$3s - 3p$$

$$\underline{^2P^o - ^2D}$$

$$2p - 3d$$

$$3p - 3d$$

* * * * *

Cohen, M. & Dalgarno, A.

Proc. Roy. Soc. London A 280, 258-270 (1964).

quant.

Transitions treated:

All multiplets of the type

$$1s^a 2s^b 2p^c - 1s^a 2s^{b-1} 2p^{c+1},$$

with $a = 1, 2;$

$b = 1, 2;$

$c = 0, 1, 2, 3, 4;$

for isoelectronic sequences of He, Li, Be, B, C, N, O, F and Ne.

* * * * *

Dalgarno, A. & Parkinson, E. M.

Proc. Roy. Soc. London A 301, 253-260 (1967).

quant.

Transitions treated:

$$1s^2 \ ^1S - 1snp \ ^1P^o \text{ of He Sequence}$$

* * * * *

Transitions treated:

Intercombination line $2^1S_0 - 2^3P_1^o$

for Be Sequence up to Ca XVII

and for He Sequence from Na X to Si XIII.

* * * * *

21, 151-152 (1966).

Transitions treated:

$$mp^n - mp^{n-1}(m+1)s$$

where $m = 2, 3$ and $n = 1, 2, 3, 4, 5, 6$ (resonance multiplets; a modified Coulomb approximation is applied).

For Be Sequence ($m = 2; n = 1$) to C V,

B Sequence ($m = 2; n = 2$) to Ne VI (Doublet),

B Sequence ($m = 2; n = 2$) C II to Si X (Quartet),

C Sequence ($m = 2; n = 2$) to P X,

N Sequence ($m = 2; n = 3$) to S X,

O Sequence ($m = 2; n = 4$) to Cl X,

F Sequence ($m = 2; n = 5$) to Ca XII,

Ne Sequence ($m = 2; n = 6$) to Sc XII,

Mg Sequence ($m = 3; n = 1$) to Ti XI,

Al Sequence ($m = 3; n = 1$) to Sc IX,

Si Sequence ($m = 3; n = 2$) to Sc VIII,

P Sequence ($m = 3; n = 3$) to Ar IV,

S Sequence ($m = 3; n = 4$) to Fe XI,

Cl Sequence ($m = 3; n = 5$) to Ar II,

Ar Sequence ($m = 3; n = 6$) to Ti V.

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Transitions treated:

$2p^2$ configuration for: Ar XIII, K XIV, Ca XV.

$3p^2$ configuration for: Ca VII, V X, Cr XI, Mn XII, Fe XIII, Ni XV.

$2p^4$ configuration for: Ca XIII.
 $3p^4$ configuration for: Cr IX, Mn X, Fe XI.

$2p^5$ configuration for: Ar X, K XI, Ca XII.
 $3p^5$ configuration for: Ni XII.

$2s2p$ configuration for: Ar XV.
 $3s3p$ configuration for: Co XVI, Ni XVII.

$2p$ configuration for: S XII, Ar XIV.
 $3p$ configuration for: Mn XIII, Co XV, Ni XVI.

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Mizushima, M.

J. Phys. Soc. Japan 21, 2335-2344 (1966).

quant. forb.

Transitions treated:

Magnetic quadrupole transition $\underline{3P^0} - \underline{1S}$.

For He Sequence to F VIII,

Be Sequence to P XII (except Ne VII),

Mg Sequence to Sc X.

Magnetic quadrupole transition $\underline{4P_{5/2}} - \underline{2P_{3/2}^0}$.

For B Sequence to Si X,

F Sequence to Cl IX,

Al Sequence to Si II,

Cl Sequence to Ti VI.

Magnetic quadrupole transition $\underline{5S^0} - \underline{3P}$.

For C Sequence to P X,

O Sequence to Ne III.

* * * * *

Naqvi, A. M.

Proceedings of the Seventh International Conference

quant.

on Ionization Phenomena in Gases, Vol. III

p. 558-561 (Gradevinska Knyiga Publishing House,

Belgrade (1966).

Transitions treated:

Li Sequence 2s-2p and 3p-3d from B III to P XIII.

Be Sequence $2s^2$ - $2s2p$ and $2s^2$ - $2s4p$ for the lines ${}^1S_0 - {}^1P_1^o$
and ${}^1S_0 - {}^3P_1^o$ from C III to Ca XVII.

B Sequence $3s-3p$ from N III to Na VII.

3.3 REFERENCES ON INDIVIDUAL ELEMENTS AND STAGES OF IONIZATION

AUTHOR

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Ag (Silver)*

Ag I

Bieniewski, T. M.	"Atomic Collision Processes", Proceedings p. 1055-1064 (ed. McDowell, M.R.C., John Wiley & Sons, Inc., New York, 1964).	absorpt.
Bucka, H., Ney, J. & Heppke, G.	Z. Angew. Physik <u>20</u> , 354-362 (1966).	misc.
Levin, L. A. & Budick, B.	Bull. Am. Phys. Soc. Series II, <u>11</u> , 455 (1966).	misc.
Moise, N. L.	Astrophys. J. <u>144</u> , 774-781 (1966).	absorpt.
Slavenas, I-Yu, Yu.	Optics and Spectroscopy (U.S.S.R.) <u>20</u> , 264-265 (1966).	hook
Cunningham, P. T. & Link, J. K.	J. Opt. Soc. Am. <u>57</u> , 1000-10007 (1967).	life

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Al (Aluminum)*

Al I

Budick, B.	Bull. Am. Phys. Soc. Series II, <u>11</u> , 456 (1966).	misc.
Gruzdev, P. F.	Optics and Spectroscopy (U.S.S.R.) <u>20</u> , 209-213 (1966).	quant.
Synek, M. & Lichodziejewski, W.	Phys. Letters <u>22</u> , 578-579 (1966).	SCF

Al II

Weiss, A. W.	J. Chem. Phys. <u>47</u> , 3573-3578 (1967).	quant.
Zare, R. N.	J. Chem. Phys. <u>47</u> , 3561-3572 (1967).	quant.

Al III

Chapman, R. D., Clarke, W. H. & Aller, L. H.	Astrophys. J. <u>144</u> , 376-380 (1966).	SCF
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* See Section 3.2.

AUTHOR

JOURNAL

CLASSIFICATION

Al IV

Kastner, S. O., Omidvar, K. & Astrophys. J. 148, 269-273 (1967). quant.
Underwood, J. H.

Al VIII

Froese, C. Astrophys. J. 145, 932-935 (1966). quant. forb.

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Ar (Argon) *

Ar I

Bott, J. F.	Phys. Fluids <u>9</u> , 1540-1547 (1966).	emiss.
Coates, P. B. & Gaydon, A. G.	Proc. Roy. Soc. London A <u>293</u> , 452-468 (1966).	emiss.
Frish, M. S.	Optics and Spectroscopy (U.S.S.R.) <u>22</u> , 9-11 (1967).	emiss.
Gruzdev, P. F.	Optics and Spectroscopy (U.S.S.R.) <u>22</u> , 170-171 (1967).	quant.
Johnston, P. D.	Proc. Phys. Soc. London A <u>92</u> , 896-908 (1967).	quant.
Klose, J. Z.	"Excitation Electronique d'une Vapeur Atomique Application a la Spectroscopie" p. 191 (edition du Centre National de la Recherche Scientifique Paris, 1966).	life
Klose, J. Z.	J. Opt. Soc. Am. <u>57</u> , 1242-1244 (1967).	life
Lewis, E. L.	Proc. Phys. Soc. London <u>92</u> , 817-825 (1967).	comm.
Malone, B. S. & Corcoran, W. H.	J. Quant. Spectrosc. Radiat. Transfer <u>6</u> , 443-449 (1966).	emiss.
Minnhagen, L	Arkiv. für Fysik <u>1</u> , 425-457 (1950).	quant., rel.
Morack, J. L. & Fairchild, C. E.	Phys. Rev. <u>162</u> , 125-129 (1967).	life
Osherovich, A. L. & Veroleinen, Ya. F.	Vestnik Leningrad. Univ. Fiz. i Khim. #1, 140-141 (1967).	life
Richter, J.	Z. Astrophys. <u>52</u> , 262-272 (1961).	emiss.
Shumaker, Jr., J. B. & Popenoe, C. H.	J. Opt. Soc. Am. <u>57</u> , 8-10 (1967).	emiss.
Wende, B.	Z. Physik <u>198</u> , 1-17 (1967).	emiss.
Wiese, W. L.	"Proc. Eighth International Conference on Phenomena in Ionized Gases", Vienna, Austria, 447 (Springer Verlag, Vienna, 1967).	emiss. & comm.

* See Section 3.2.

AUTHOR

JOURNAL

CLASSIFICATION

Wilkinson, P. G.

Can. J. Phys. 45, 1709-1713 (1967).

comm.

Ar II

Bakos, J., Szigeti, J., & Varga, L.	Phys. Letters <u>20</u> , 503-504 (1966).	life
Beth, M. U., Bohn, W. L. & Nedder, G.	Z. Naturforsch. <u>21a</u> , 1203-1204 (1966).	emiss.
Ervens, W.	Thesis Physikalisches Institut der Technischen Hochschule Aachen	emiss.
Marantz, H., Rudko, R. I. & Tang, C. L.	Applied Phys. Letters <u>2</u> , 409-411 (1966).	quant., rel.
Savage, B. D. & Lawrence, G. M.	Astrophys. J. <u>146</u> , 940-943 (1966).	life
Berg, H. F. & Ervens, W.	Z. Physik <u>206</u> , 184-188 (1967).	emiss.
Shipp, J. I. & Tidwell, E. D.	J. Opt. Soc. Am. <u>57</u> , 1061-1062 (1967).	comm.

Ar IX

Kastner, S. O., Omidvar, K. &
Underwood, J. H.Astrophys. J. 148, 269-273 (1967).

quant.

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As (Arsenic)*

As I

Lawrence, G. M.

Astrophys. J. 148, 261-263 (1967).

quant. rel.

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Au (Gold)*

Au I

Levin, L. A. & Budick, B.
Moise, N. L.Bull. Am. Phys. Soc. Series II, 11, 455 (1966).
Astrophys. J. 144, 774-781 (1966).misc.
absorpt.

Au III

Menilowitz, H.

J. Research Nat. Bur. Standards 71A, 149-156 (1967).

quant., rel.

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* See Section 3.2.

AUTHOR

JOURNAL

CLASSIFICATION

B (Boron)*

B II

Froese, C.

J. Chem. Phys. 47, 4010-4015 (1967).

SCF

B III

Balashov, V. V., Senashenko,

Phys. Letters 25A, 487-488 (1967).

quant.

V. S. & Tekou, B.

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Can. J. Phys. 45, 1661-1673 (1967).

SCF

Sokoloff, J., Cohen, M., Purdom,

Air Force Weapons Laboratory Technical Report No.

SCF

K. L. & Kelly, P. S.

AFWL-TR-66-150 (1967).

B IV

Cohen, M. & Kelly, P. S.

Can. J. Phys. 45, 2079-2090 (1967).

quant.

Elton, R. C.

Astrophys. J. 148, 573-578 (1967).

quant.

Weiss, A. W.

J. Research Natl. Bur. Standards 71A, 163-168

quant.

(1967).

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Ba (Barium)*

Ba I

Hudson, R. D. & Carter, V. L.

Opt. Soc. Am. Meeting, ThG12, p. 22, March (1966).

absorpt.

Letfus, V.

Optics and Spectroscopy (U.S.S.R.) 21, 371-374

comm.

(1966).

Ba II

Bucka, H., Eichler, J. & Eppen,

Z. Naturforsch. 21a, 654-656 (1966).

misc.

G. V.

Garstang, R. H. & Hill, S. J.

Publ. Astron. Soc. Pacific 78, 70-72 (1966).

SCF, comm. &

Gallagher, A.

Phys. Rev. 157, 24-30 (1967).

quant. forb.

misc.

* * * * *

^{*}See Section 3.2.

AUTHOR

JOURNAL

CLASSIFICATION

Be (Beryllium)*

Be I

Altick, P. L. & Glassgold, A. E.	Phys. Rev. <u>133</u> , A632-A646 (1964).	quant.
Naqvi, A. M.	J. Quant. Spectrosc. Radiat. Transfer <u>4</u> , 597-615 (1964).	quant.
Froese, C.	Phys. Rev. <u>150</u> , 1-6 (1966).	SCF
LaPaglia, S. R. & Sinanoglu, O.	J. Chem. Phys. <u>44</u> , 1888-1898 (1966).	quant.
Steele, R. & Trefftz, E.	J. Quant. Spectrosc. Radiat. Transfer <u>6</u> , 833-846 (1966).	quant.
Froese, C.	J. Chm. Phys. <u>47</u> , 4010-4015 (1967).	SCF
Garstang, R. H.	Astrophys. J. <u>148</u> , 579-584 (1967).	quant. forb.
Gruzdev, P. F.	Optics and Spectroscopy (U.S.S.R.) <u>22</u> , 89-91 (1967).	quant.

Be II

Balashov, V. V., Senashenko, V. S. & Tekou, B.	Phys. Letters <u>25A</u> , 487-488 (1967).	quant.
Cohen, M. & Kelly, P. S.	Can. J. Phys. <u>45</u> , 1661-1673 (1967).	SCF
Sokoloff, J., Cohen, M., Purdom, K. L. & Kelly, P. S.	Air Force Weapons Laboratory Technical Report No. AFWL-TR-66-150 (1967).	SCF

Be III

Froese, C.	Phys. Rev. <u>150</u> , 1-6 (1966).	SCF
Cohen, M. & Kelly, P. S.	Can. J. Phys. <u>45</u> , 2079-2090 (1967).	quant.
Elton, R. C.	Astrophys. J. <u>148</u> , 573-578 (1967).	quant.
Froese, C.	J. Chm. Phys. <u>47</u> , 4010-4015 (1967).	SCF
Weiss, A. W.	J. Research Nat. Bur. Standards <u>71A</u> , 163-168 (1967).	quant.

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Bi (Bismuth)*

Bi I

Lvov, B. V.	Optics and Spectroscopy (U.S.S.R.) <u>19</u> , 282-284 (1965).	absorpt.
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*See Section 3.2.

AUTHOR

JOURNAL

CLASSIFICATION

Cunningham, P. T. & Link, J. K.

J. Opt. Soc. Am. 57, 1000-10007 (1967).

life

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Br (Bromine)*

Br I

Lawrence, G. M.

Astrophys. J. 148, 261-268 (1967).

quant. rel.

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C (Carbon)*

C I

Henning, H.

Z. Astrophys. 62, 109-120 (1965).

emiss.

Froese, C.

Astrophys. J. 145, 932-935 (1966).

quant. forb.

Beth, M.-U.

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emiss.

Miller, M., Murphy, P.,

Bull. Am. Phys. Soc. Ser. II, Vol. 11, 818-819

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Weiss, A. W.

Phys. Rev. 162, 71-80 (1967).

quant.

Wilkerson, T., Koopman, D.,

NASA Scientific and Technical Information Facility

emiss.

Miller, M., Bengtson, R.

Report #N67-28764 (1967).

& Charatis, G.

C II

Osterbrock, D. E.

Astrophys. J. 142, 1423-1430 (1965).

quant. forb.

Roberts, J. R. & Eckerle, K. L.

Phys. Rev. 153, 87-90 (1967).

emiss., rel.

Weiss, A. W.

Phys. Rev. 162, 71-80 (1967).

quant.

C III

Steele, R. & Trefftz, E.

J. Quant. Spectrosc. Radiat. Transfer 6, 833-846
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quant.

Froese, C.

J. Chm. Phys. 47, 4010-4015 (1967).

SCF

*See Section 3.2.

AUTHOR

JOURNAL

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C IV

Cohen, M. & Kelly, P. S.	Can. J. Phys. <u>45</u> , 1661-1673 (1967).	SCF
Sokoloff, J., Cohen, M., Purdom, K. L. & Kelly, P. S.	Air Force Weapons Laboratory Technical Report No. AFWL-TR-66-150 (1967).	SCF

C V

Cohen, M. & Kelly, P. S.	Can. J. Phys. <u>45</u> , 2079-2090 (1967).	quant.
Elton, R. C.	Astrophys. J. <u>148</u> , 573-578 (1967).	quant.
Weiss, A. W.	J. Research Nat. Bur. Standards <u>71A</u> , 163-168 (1967).	quant.

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Ca (Calcium)^{*}

Ca I

Altick, P. L. & Glassgold, A. E.	Phys. Rev. <u>133</u> , A632-A646 (1964).	quant.
Letfus, V.	Optics and Spectroscopy (U.S.S.R.) <u>21</u> , 371-374 (1966).	comm.
Moores, D. L.	Proc. Phys. Soc. London <u>A88</u> , 843-859 (1966).	quant.
Newson, G. H.	Proc. Phys. Soc. London A <u>87</u> , 975-982 (1966).	absorpt.
Smith, W. W. & Gallagher, A.	Phys. Rev. <u>145</u> , 26-35 (1966).	misc.
Chenevier, M., Dufayard, J. & Pebay-Peyroula, J. C.	Phys. Letters <u>25A</u> , 283-284 (1967).	misc.
Gruzdev, P. F.	Optics and Spectroscopy (U.S.S.R.) <u>22</u> , 89-91 (1967).	quant.

Ca II

Petrini, D.	Comp. rend. <u>260</u> , 4929-4932 (1965).	quant.
Ionescu-Pallas, N. J.	Revue Roumaine de Physique <u>11</u> , 643-647 (1966).	quant.
Smith, W. W. & Gallagher, A.	Phys. Rev. <u>145</u> , 26-35 (1966).	misc.
Gallagher, A.	Phys. Rev. <u>157</u> , 24-30 (1967).	misc.
Weiss, A. W.	J. Research Nat. Bur. Standards <u>71A</u> , 157-162 (1967).	SCF

Ca IX

Zare, R. N.	J. Chem. Phys. <u>47</u> , 3561-3572 (1967).	quant.
* See Section 3.2.		

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Ca XI

Kastner, S. C., Emidvar, K. & Underwood, J. H.	<i>Astrophys. J.</i> <u>148</u> , 269-273 (1967).	quant.
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Ca XV

Froese, C. House, L. L.	<i>Astrophys. J.</i> <u>145</u> , 932-935 (1966). <i>Astrophys. J.</i> <u>149</u> , 211-216 (1967).	quant. forb. quant.
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Cd (Cadmium)^{*}

Cd I

Bieniewski, T. M.	"Atomic Collision Processes", Proceedings p. 1055-1064 (ed. McDowell, M.R.C., John Wiley & Sons, Inc., New York, 1964).	absorpt.
Lvov, B. V.	<i>Optics and Spectroscopy</i> (U.S.S.R.) <u>19</u> , 282-284 (1965).	absorpt.
Ionescu-Pallas, N. J.	<i>Revue Roumaine de Physique</i> <u>11</u> , 643-647 (1966).	quant.
Moise, N. L.	<i>Astrophys. J.</i> <u>144</u> , 763-773 (1966).	absorpt.
Verolainen, Ya. F. & Osherovich, A. L.	<i>Optics and Spectroscopy</i> (U.S.S.R.) <u>20</u> , 517-520 (1966).	life
Garstang, R. H.	<i>Astrophys. J.</i> <u>148</u> , 579-584 (1967).	quant. forb.
Gruzdev, P. F.	<i>Optics and Spectroscopy</i> (U.S.S.R.) <u>22</u> , 89-91 (1967).	quant.

Cd II

Bialas-Zabawa, A., Kuchari, M., Skulska, E., Urbaczka, J. & Walach, Z.	<i>Acta. Phys. Polon.</i> <u>30</u> , 897-900 (1966).	quant.
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^{*}See Section 3.2.

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Cl (Chlorine)^{*}

Cl I

Hofmann, W.	Max Planck Institut für Physik und Astrophysik MPI-PAE/Extraterr. August (1967).	emiss.
Lawrence, G. M.	Astrophys. J. <u>148</u> , 261-268 (1967).	quant. rel. & life

Cl VIII

Kastner, S. O., Omidvar, K. & Underwood, J. H.	Astrophys. J. <u>148</u> , 269-273 (1967).	quant.
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Cl XII

Froese, C.	Astrophys. J. <u>142</u> , 932-935 (1966).	quant. forb.
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Co (Cobalt)^{*}

Co II

Warner, B.	Memoirs Roy. Astron. Soc. <u>70</u> , 165-253 (1967).	emiss., rel. & CA
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Cr (Chromium)^{*}

Cr I

Bucka, H., Budick, B., Goshen, R. J. & Marcus, S.	Phys. Rev. <u>144</u> , 96-102 (1966).	misc.
Synek, M. & Lichodziejewski, W.	Phys. Letters <u>22</u> , 578-579 (1966).	quant. forb. & SCF
Huber, M. & Tobey, Jr., L.	Harvard College Observatory Scientific Report No. 16 (1967).	absorpt.

^{*}See Section 3.2..

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Cr II

Huber, M. & Tobey, Jr., L.	Harvard College Observatory Scientific Report No. 16 (1967).	absorpt.
Warner, B.	Memoirs Roy. Astron. Soc. <u>70</u> , 165-253 (1967).	emiss., rel. & CA

Cr IV

Synek, M. & Lichodziejewski, W.	Phys. Letters <u>22</u> , 578-579 (1966).	quant. forb. & SCF
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Cr XV

Kastner, S. O., Omidvar, K. & Underwood, J. H.	Astrophys. J. <u>148</u> , 269-273 (1967).	quant.
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Cs (Cesium)^{*}

Cs I

Startsev, G. P.	Doklady Akad. Nauk S.S.S.R. <u>95</u> , 1181-1184 (1954).	incompl.
Altman, E. L. & Chaika, M. P.	Optics and Spectroscopy (U.S.S.R.) <u>19</u> , 538-541 (1965).	misc.
Anderson, E. M., Anderson, E. K., Trusov, V. F.	Optics and Spectroscopy (U.S.S.R.) <u>21</u> , 63-64 (1966).	quant.
Ionescu-Pallas, N. J.	Revue Roumaine de Physique <u>11</u> , 643-647 (1966).	quant.
Link, J. K.	J. Opt. Soc. Am. <u>56</u> , 1195-1199 (1966).	misc.
Link, J. K.	J. Opt. Soc. Am. <u>56</u> , 1262 (1966).	comm.
Gallagher, A.	Phys. Rev. <u>157</u> , 68-72 (1967).	misc.
Zemtsov, Yu. K.	Doklady Akad. Nauk. (U.S.S.R.) <u>12</u> , 470-471 (1967).	quant. forb., rel.

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^{*}See Section 3.2.

Cu (Copper)^{*}

Cu I

Ostroumenko, P. P. & Rossikhin, V. S.	Optics and Spectroscopy (U.S.S.R.) <u>19</u> , 365-366 (1965).	absorpt., rel.
Bucke, H., Ney, J. & Heppke, G.	Z. Angew. Physik <u>20</u> , 354-362 (1966).	misc.
Levin, L. A. & Budick, B.	Bull. Am. Phys. Soc. Series II <u>11</u> , #4, 455-456 (1966).	misc.
Moise, N. L.	Astrophys. J. <u>144</u> , 774-781 (1966).	absorpt.
Moise, N. L.	Astrophys. J. <u>144</u> , 782-784 (1966).	misc.
Ney, J.	Z. Physik <u>196</u> , 53-65 (1966).	misc.
Slavenas, I-Yu, Yu.	Optics and Spectroscopy (U.S.S.R.) <u>20</u> , 264-265 (1966).	hook
Cunningham, P. T. & Link, J. K.	J. Opt. Soc. Am. <u>57</u> , 1000-10007 (1967).	life
Kowalski, J. & zuPutlitz, G.	Z. Physik <u>208</u> , 459-463 (1967).	misc.

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Eu (Europium)^{*}

Eu I

Lange, W., Luther, J., Steudel, A., & Walther, H.	Phys. Letters <u>20</u> , 166-167 (1966).	misc.
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F (Fluorine)^{*}

F IV

Froese, C.	Astrophys. J. <u>145</u> , 932-935 (1966).	quant. forb.
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F VIII

Elton, R. C.	Astrophys. J. <u>148</u> , 573-578 (1967).	quant.
Weiss, A. W.	J. Research Nat. Bur. Standards <u>71A</u> , 163-168 (1967).	quant.

^{*}See Section 3.2.

* * * * *

Fe (Iron)*

Fe I

Corliss, C. H. & Warner, B.	J. Research Nat. Bur. Standards <u>70A</u> , 325-371 (1966).	comm. & emiss., rel.
Bayard, P. L.	J. Quant. Spectrosc. Radiat. Transfer <u>7</u> , 559-569 (1967).	emiss.
Cowley, C. R. & Warner, B.	The Observatory <u>87</u> , 117-123 (1967).	comm.
Huber, M. & Tobey, Jr., L.	Harvard College Observatory Scientific Report No. 16 (1967).	absorpt.

Fe II

Warner, B.	Memoirs Roy. Astron. Soc. <u>70</u> , 165-253 (1967).	emiss., rel. & CA
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Fe VIII

Czyzak, S. J. & Krueger, T. K.	Astrophys. J. <u>144</u> , 381-407 (1966).	SCF & quant. forb.
Weiss, A. W.	J. Research Nat. Bur. Standards <u>71A</u> , 163-168 (1967).	quant.

Fe IX

Froese, C.	Bull. Astron. Inst. Netherlands <u>19</u> , 86-89 (1967).	SCF
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Fe X

Froese, C.	Bull. Astron. Inst. Netherlands <u>19</u> , 86-89 (1967).	SCF
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Fe XI

Froese, C.	Bull. Astron. Inst. Netherlands <u>19</u> , 86-89 (1967).	SCF
Krueger, T. K. & Czyzak, S. J.	Astrophys. J. <u>149</u> , 237 (1967).	comm.

* See Section 3.2.

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Fe XIII

- House, L. L. *Astrophys. J.* 149, 211-216 (1967).
 Krueger, T. K. & Czyzak, S. J. *Astrophys. J.* 149, 237 (1967).

quant.
comm.

Fe XIV

- Steele, R. & Trefftz, E. *J. Quant. Spectrosc. Radiat. Transfer* 6, 833-846 (1966).

quant. forb.

Fe XV

- Steele, R. & Trefftz, E. *J. Quant. Spectrosc. Radiat. Transfer* 6, 833-846 (1966).

quant. forb.

Fe XVI

- Steele, R. & Trefftz, E. *J. Quant. Spectrosc. Radiat. Transfer* 6, 833-846 (1966).
 Dupree, A. K. & Goldberg, L. *Solar Physics* 1, 229-241 (1967).

quant. forb.

comm.

Fe XVII

- Garstang, R. H. *Publ. Astron. Soc. Pacific* 78, 399-406 (1966).
 Froese, C. *Bull. Astron. Inst. Netherlands* 19, 86-89 (1967).
 Kastner, S. O., Omidvar, K. & Underwood, J. H. *Astrophys. J.* 148, 269-273 (1967).

quant.

SCF

quant.

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Ga (Gallium)^{*}

Ga I

- Gruzdev, P. F. *Optics and Spectroscopy (U.S.S.R.)* 20, 209-213 (1966).
 Cunningham, P. T. & Link, J. K. *J. Opt. Soc. Am.* 57, 1000-10007 (1967).
 Penkin, N. P. & Shabanova, L. N. *Optics and Spectroscopy (U.S.S.R.)* 23, 11-13 (1967).

quant.

life

absorpt. &

hook

* * * * *

^{*} See Section 3.2.

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Ge (Germanium)^{*}

Ge I

Lawrence, G. M.

Astrophys. J. 148, 261-268 (1967).

quant. rel.&life

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H (Hydrogen)

H I

Inokuti, M.

Argonne National Laboratory Radiological Physics

quant.

Division Summary Report July 1962 through
June 1963 ANL - 6769.

May, R. M.

Nuclear Fusion 4, 244-245 (1964).

quant.

Ankudinov, V. A., Bobashev,

Soviet Phys. JETP 21, 26-32 (1965).

life

S. V. & Andreev, E. P.

Bickel, W. S. & Goodman, A. S.

Phys. Rev. 148, 1-4 (1966).

life

Goodman, A. S. & Donahue, D. J.

Phys. Rev. 141, 1-3 (1966).

life

Hughes, R. H., Dawson, H. R. &

J. Opt. Soc. Am. 56, 830-831 (1966).

life

Doughty, B. M.

Michael, J. V. & Weston, Jr.,

J. Chem. Phys. 45, 3632-3641 (1966).

emiss.

R. E.

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He (Helium)^{*}

He I

Ankudinov, V. A., Bobashev,

Soviet Phys. JETP 21, 26-32 (1965).

life

S. V. & Andreev, E. P.

Fowler, R. G., Holzberlein, T.

Phys. Rev. 140, A1050-A1051 (1965).

comm.

M. & Jacobson, C. H.

Bakos, J. & Szigeti, J.

Acta Physica Academ. Scientiarum Hungaricae, 21,

life

149-167 (1966).

Froese, C.

Phys. Rev. 150, 1-6 (1966).

SCF

Green, L. C., Johnson, N. C.

Astrophys. J. 144, 369-375 (1966).

quant.

& Kolchin, E. K.

Lincke, R. & Griem, H. R.

Phys. Rev. 143, 66-73 (1966).

emiss.

^{*}See Section 3.2.

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Bridgett, K. A. & King, T. A.	Proc. Phys. Soc. London A <u>92</u> , 75-78 (1967).	life
Cohen, M. & Kelly, P. S.	Can. J. Phys. <u>45</u> , 2079-2090 (1967).	quant.
Elton, R. C.	Astrophys. J. <u>148</u> , 573-578 (1967).	quant.
Froese, C.	J. Chm. Phys. <u>47</u> , 4010-4015 (1967).	SCF
Garstang, R. H.	Astrophys. J. <u>148</u> , 579-584 (1967).	quant. forb.
Kay, R. B. & Hughes, R. H.	Phys. Rev. <u>154</u> , 61-69 (1967).	life
Landman, D. A.	Bull. Am. Phys. Soc. Series II, <u>12</u> , 94 (1967).	misc.
Lewis, E. L.	Proc. Phys. Soc. London <u>92</u> , 817-825 (1967).	comm.
Niles, F. E.	BRL Report No. 1354 (1967).	compil., estim.
Osherovich, A. L. & Veroleinen, Ya. F.	Vestnik Leningrad. Univ. Fiz. i Khim. #1, 140-141 (1967).	life
Victor, G. A.	Proc. Phys. Soc. <u>91</u> , 825-829 (1967).	quant.
Weiss, A. W.	J. Research Nat. Bur. Standards <u>71A</u> , 163-168 (1967).	quant.
He II		
Goldwire, Jr., H. C. & Goss, W. M.	Astrophys. J. <u>149</u> , 15-22 (1967).	quant.
Heroux, L.	Phys. Rev. <u>161</u> , 47-50 (1967).	life
Jordan, Jr., J. A., Bakken, G. S. & Yager, R. E.	J. Opt. Soc. Am. <u>57</u> , 530-534 (1967).	life
Osherovich, A. L. & Veroleinen, Ya. F.	Vestnik Leningrad. Univ. Fiz. i Khim. #1, 140-141 (1967).	life

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Hg ^{*} (Mercury)

Hg I

Barrat, J. P., Cojan, J. L.	Comp. rend. <u>262</u> , 609-612 (1966).	misc.
Lecluse, Y.		
Brule, M., Lagrue, J., Barrat, J. P. & Cojan, J. L.	Comp. rend. <u>263</u> , 1312-1314 (1966).	emiss., rel.
Ionescu-Pallas, N. J.	Revue Roumaine de Physique <u>11</u> , 643-647 (1966).	quant.
Verolainen, Ya. F. & Osherovich, A. L.	Optics and Spectroscopy (U.S.S.R.) <u>20</u> , 517-520 (1966).	life

* See Section 3.2.

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Anderson, R. J., Lee, E. T. P., & Lin, C. C.	Phys. Rev. <u>157</u> , 31-40 (1967).	quant.
Bigeon, M. C.	J. Physique <u>28</u> , 51-60 (1967).	quant. forb. & absorpt.
Frisch, S. E. & Klucharyov, A. N.	Optics and Spectroscopy (U.S.S.R.) <u>22</u> , 92-94 (1967).	forb. emiss., rel.
Garstang, R. H.	Astrophys. J. <u>148</u> , 579-584 (1967).	quant. forb.
Gruzdev, P. F.	Optics and Spectroscopy (U.S.S.R.) <u>22</u> , 89-91 (1967).	quant.
Jean, P., Martin, M. Barrat, J-P. & Cojan, J-L.	Comp. rend. <u>264B</u> , 1709-1712 (1967).	absorpt.
Jean, P., Martin, M. & Lecler, D.	Comp. rend. <u>264B</u> , 1791-1794 (1967).	misc.
Lecluse, L.	J. Physique <u>28</u> , 671-680 (1967).	misc.
Nussbaum, G. H. & Pipkin, F. M.	Phys. Rev. Letters <u>19</u> , 1089-1092 (1967).	life

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I (Iodine)*

I I

Husain, D. & Wiesenfeld, J. R.	Nature <u>213</u> , 1227-1228 (1967).	misc. forb.
Lawrence, G. M.	Astrophys. J. <u>148</u> , 261-268 (1967).	quant. rel. & life

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In (Indium)*

In I

Gruzdev, P. F.	Optics and Spectroscopy (U.S.S.R.) <u>20</u> , 209-213 (1966).	quant.
Cunningham, P. T. & Link, J. K.	J. Opt. Soc. Am. <u>57</u> , 1000-1000? (1967).	life
Penkin, N. P. & Shabanova, L. N.	Optics and Spectroscopy (U.S.S.R.) <u>23</u> , 11-13 (1967).	absorpt. & hook

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* See Section 3.2.

K (Potassium)*

K I

Naqvi, A. M.	J. Quant. Spectrosc. Radiat. Transfer <u>4</u> , 597-615 (1964).	quant.
Anderson, E. M., Anderson, E. K., & Trusov, V. F.	Optics and Spectroscopy (U.S.S.R.) <u>21</u> , 63-64 (1966).	quant.
Ionescu-Pallas, N. J.	Revue Roumaine de Physique <u>11</u> , 643-647 (1966).	quant.
Link, J. K.	J. Opt. Soc. Am. <u>56</u> , 1195-1199 (1966).	misc.
Baylis, W. E.	Max Planck Institut für Physik und Astrophysik MPI-PAE/Extraterr. July (1967).	misc.
Weiss, A. W.	J. Research Nat. Bur. Standards <u>71A</u> , 157-162 (1967).	SCF
Zemtsov, Yu. K.	Doklady Akad. Nauk. (U.S.S.R.) <u>12</u> , 470-471 (1967).	quant. forb., rel.

K X

Kastner, S. G., Omidiar, K. & Underwood, J. H.	Astrophys. J. <u>148</u> , 269-273 (1967).	quant.
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K XIV

Froese, C.	Astrophys. J. <u>145</u> , 932-935 (1966).	quant. forb.
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Kr (Krypton)*

Kr I

Turner, R.	Phys. Rev. <u>140</u> , A426-A431 (1965).	life
Dow, J. D. & Knox, R. S.	Phys. Rev. <u>152</u> , 50-56 (1966).	SCF
Baylis, W. E.	Max Planck Institut für Physik und Astrophysik MPI-PAE/Extraterr. July (1967).	misc.
Chashchina, G. I. & Shreider, E. Ya.	Optics and Spectroscopy (U.S.S.R.) <u>22</u> , 284-285 (1967).	absorpt.
Gruzdev, P. F.	Optics and Spectroscopy (U.S.S.R.) <u>22</u> , 170-171 (1967).	quant.

* See Section 3.2.

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Hutcherson, J. W. & Griffin, P. M.	Bull. Am. Phys. Soc. II, <u>12</u> , 524 (1967).	absorpt.
Lewis, E. L.	Proc. Phys. Soc. London <u>92</u> , 817-825 (1967).	comm.
Osherovich, A. L. & Veroleinen, Ya. F.	Vestnik Leningrad. Univ. Fiz. i Khim. #1, 140-141 (1967).	life
Wilkinson, P. G.	Can. J. Phys. <u>45</u> , 1709-1713 (1967).	comm.

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Li (Lithium) *

Li I

Feldman, P. & Novick, R.	"Atomic Collision Processes", Proceedings p. 201-210 (ed. McDowell, M.R.C., John Wiley & Sons, Inc. New York, 1964).	misc. forb.
Naqvi, A. M.	J. Quant. Spectrosc. Radiat. Transfer <u>4</u> , 597-615 (1964).	quant.
Balashov, V. V., Senashenko, V. S. & Tekou, B.	Phys. Letters <u>25A</u> , 487-488 (1967).	quant.
Buchet, J. P., Denis, A., Desesquelles, J. & Dufay, M.	Comp. rend. <u>265B</u> , 471-474 (1967).	life
Cohen, M. & Kelly, P. S.	Can. J. Phys. <u>45</u> , 1661-1673 (1967).	SCF
Karstensen, F. & Schramm, J.	J. Opt. Soc. Am. <u>57</u> , 654-656 (1967).	life
Sokoloff, J., Cohen, M., Purdom, K. L. & Kelly, P. S.	Air Force Weapons Laboratory Technical Report No. AFWL-TR-66-150 (1967).	SCF

Li II

Froese, C.	Phys. Rev. <u>150</u> , 1-6 (1966).	SCF
Cohen, M. & Kelly, P. S.	Can. J. Phys. <u>45</u> , 2079-2090 (1967).	quant.
Elton, R. C.	Astrophys. J. <u>148</u> , 573-578 (1967).	quant.
Froese, C.	J. Chem. Phys. <u>47</u> , 4010-4015 (1967).	SCF
Weiss, A. W.	J. Research Nat. Bur. Standards <u>71A</u> , 163-168 (1967).	quant.

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* See Section 3.2.

Mg (Magnesium)*

Mg I

Altick, P. L. & Glassgold, A. E.	Phys. Rev. <u>133</u> , A632-A646 (1964).	quant.
Ionescu-Pallas, N. J.	Revue Roumaine de Physique <u>11</u> , 643-647 (1966).	quant.
Möller, N. H.	Arkiv. för Fysik <u>29</u> , 353-358 (1966).	quant. forb.
Smith, W. W. & Gallagher, A.	Phys. Rev. <u>145</u> , 26-35 (1966).	misc.
Anderson, E. M., Zilitis, V. A. & Sorokina, E. S.	Optics and Spectroscopy (U.S.S.R.) <u>23</u> , 102-105 (1967).	quant. & SCF
Garstang, R. H.	Astrophys. J. <u>148</u> , 579-584 (1967).	quant. forb.
Gruzdev, P. F.	Optics and Spectroscopy (U.S.S.R.) <u>22</u> , 89-91 (1967).	quant.
Weiss, A. W.	J. Chem. Phys. <u>47</u> , 3573-3578 (1967).	quant.
Zare, R. N.	J. Chem. Phys. <u>47</u> , 3561-3572 (1967).	quant.

Mg II

Chapman, R. D., Clarke, W. H. & Alter, L. H.	Astrophys. J. <u>144</u> , 376-380 (1966).	SCF
Smith, W. W. & Gallagher, A.	Phys. Rev. <u>145</u> , 26-35 (1966).	misc.

Mg III

Kastner, S. O., Ömidvar, K. & Underwood, J. H.	Astrophys. J. <u>148</u> , 269-273 (1967).	quant.
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Mg VII

Froese, C.	Astrophys. J. <u>145</u> , 932-935 (1966).	quant. forb.
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Mn (Manganese)*

Mn I

Piltch, M., Walter, W. T. Solimene, N. & Gould, G. Bennett, Jr.	Appl. Phys. Letters <u>2</u> , 309-310 (1965).	quant., rel.
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*See Section 3.2.

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Luther, J. & Walther, H.	Phys. Letters <u>23</u> , 551-554 (1966).	misc.
Woodgate, B.	Monthly Notices Roy. Astron. Soc. <u>134</u> , 287-313 (1966).	emiss. & rel.
Cowley, C. R. & Warner, B.	The Observatory <u>87</u> , 117-123 (1967).	emiss. comm.
	Mn II	
Woodgate, B.	Monthly Notices Roy. Astron. Soc. <u>134</u> , 287-313 (1966).	emiss.
Warner, B.	Memoirs Roy. Astron. Soc. <u>70</u> , 165-253 (1967).	emiss., rel. & CA
	Mn IV	
Synek, M. & Lichodziejewski, W.	Phys. Letters <u>22</u> , 578-579 (1966).	SCF
	Mn XVI	
Kastner, S. O., Omidvar, K. &	Astrophys. J. <u>148</u> , 269-273 (1967).	quant.
Underwood, J. H.		
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	N (Nitrogen) [*]	
	N I	
Clark, K. C. & Fairchild, C. E.	"Atomic Collision Processes", Proceedings p. 581-585 (ed. McDowell, M.R.C., John Wiley & Sons, Inc., New York, 1964).	misc.
Armstrong, B. H. & Purdum, K. L.	Phys. Rev. <u>150</u> , 51-59 (1966).	quant.
Lawrence, G. M.	Astrophys. J. <u>147</u> , 293-300 (1967).	quant.
	N II	
Froese, C.	Astrophys. J. <u>145</u> , 932-935 (1966).	quant. forb.
Heroux, L.	Phys. Rev. <u>153</u> , 156-163 (1967).	life
Lewis, M. R., Marshall, T., Carnevale, E. H., Zimnoch, F. S. & Wares, G. W.	Phys. Rev. <u>164</u> , 94-103 (1967).	life

* See Section 3.2.

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Zemtsov, Yu. K.

Doklady Akad. Nauk. (U.S.S.R.) 12, 470-471 (1967).

quant. forb.

N III

Heroux, L.

Phys. Rev. 153, 156-163 (1967).

life

Lewis, M. R., Marshall, T.,

Phys. Rev. 164, 94-103 (1967).

life

Carnevale, E. H., Zimnoch,
F. S., & Wares, G. W.

N IV

LaPaglia, S. R. & Sinanoglu, O.

J. Chem. Phys. 44, 1888-1898 (1966).

quant.

Steele, R. & Trefftz, E.

J. Quant. Spectrosc. Radiat. Transfer 6, 833-846
(1966).

quant.

Balashov, V. V., Senashenko,
V. S. & Tekou, B.Phys. Letters 25A, 487-488 (1967).

quant.

Heroux, L.

Phys. Rev. 153, 156-163 (1967).

life

Lewis, M. R., Marshall, T.,

Phys. Rev. 164, 94-103 (1967).

life

Carnevale, E. H., Zimnoch,
F. S., & Wares, G. W.

N V

Heroux, L.

Phys. Rev. 153, 156-163 (1967).

life

Lewis, M. R., Marshall, T.,

Phys. Rev. 164, 94-103 (1967).

life

Carnevale, E. H., Zimnoch,
F. S., & Wares, G. W.

N VI

Elton, R. C.

Astrophys. J. 148, 573-578 (1967).

quant.

Weiss, A. W.

J. Research Nat. Bur. Standards 71A, 163-168
(1967).

quant.

* * * * *

Na (Sodium)^{*}

Na I

Naqvi, A. M.

J. Quant. Spectrosc. Radiat. Transfer 4, 597-615
(1964).

quant.

^{*}See Section 3.2..

AUTHOR	JOURNAL	CLASSIFICATION
Ackermann, H.	Z. Physik <u>194</u> , 253-269 (1966).	misc.
Anderson, E. M., Anderson, E. K. & Trusov, V. F.	Optics and Spectroscopy (U.S.S.R.) <u>21</u> , 63-64 (1966).	quant.
Chapman, R. D., Clarke, W. H. & Aller, L. H.	Astrophys. J. <u>144</u> , 376-380 (1966).	SCF
Ionescu-Pallas, N. J.	Revue Roumaine de Physique <u>11</u> , 643-647 (1966).	quant.
Karstensen, F. & Schramm, J.	Z. Physik <u>195</u> , 370-379 (1966).	life
Link, J. K.	J. Opt. Soc. Am. <u>56</u> , 1195-1199 (1966).	misc.
Mazing, M. A. & Penkin, N. P.	Optics and Spectroscopy (U.S.S.R.) <u>21</u> , 408-409 (1966).	comm.
Baylis, W. E.	Max Planck Institut für Physik und Astrophysik MPI-PAE/Extraterr. July (1967).	misc.
Cunningham, P. T. & Link, J. K.	J. Opt. Soc. Am. <u>57</u> , 1000-10007 (1967).	life
Kibble, B. P., Copley, G., & Krause, L.	Phys. Rev. <u>153</u> , 9-12 (1967).	life
Zemtsov, Yu. K.	Doklady Akad. Nauk. (U.S.S.R.) <u>12</u> , 470-471 (1967).	quant. forb. rel.

Na II

Gruzdev, P. F.	Optics and Spectroscopy (U.S.S.R.) <u>22</u> , 170-171 (1967).	quant.
Kastner, S. O., Omidvar, K. & Underwood, J. H.	Astrophys. J. <u>148</u> , 269-273 (1967).	quant.

Na IV

Balashov, V. V., Senashenko, V. S. & Tekou, B.	Phys. Letters <u>25A</u> , 487-488 (1967).	quant.
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Na VI

Froese, C.	Astrophys. J. <u>145</u> , 932-935 (1966).	quant. forb.
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Ne (^{*}Neon)

Bennett, Jr., W. R. & Kindermann, P. J.	Phys. Rev. <u>149</u> , 38-51 (1966).	life
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^{*} See Section 3.2.

AUTHOR

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CLASSIFICATION

Decomps, B. & Dumont, M.	Comp. rend. <u>262B</u> , 1695-1698 (1966).	misc.
Donin, V. I. & Chebotaev, V. P.	Optics and Spectroscopy (U.S.S.R.) <u>20</u> , 414-415 (1966).	emiss.
Hänsch, Th. & Toschek, P.	Phys. Letters <u>20</u> , 273-275 (1966).	emiss., rel.
Irwin, J. C. & Nodwell, R. A.	Can. J. Phys. <u>44</u> , 1781-1786 (1966).	emiss., rel.
Krupenikova, T. & Chaika, M.	Optics and Spectroscopy (U.S.S.R.) <u>20</u> , 604-605 (1966).	misc.
Rosenberger, D. & Thumb, I.	Z. Naturforsch. <u>21a</u> , 175-177 (1966).	life
Bakos, J & Szigeti, J.	Optics and Spectroscopy (U.S.S.R.) <u>23</u> , 255-256 (1967).	life
Bychkova, T. V., Kirpilenko, V. G., Routian, S. G. & Khaikin, A. S.	Optics and Spectroscopy (U.S.S.R.) <u>22</u> , 371-372 (1967).	life
Codling, K., Madden, R. P. & Eierer, D. L.	Phys. Rev. <u>155</u> , 26-37 (1967).	absorpt.
Gruzdev, P. F.	Optics and Spectroscopy (U.S.S.R.) <u>22</u> , 170-171 (1967).	quant.
Kuhn, H. G. & Lewis, E. L.	Proc. Roy. Soc. London A <u>299</u> , 423-433 (1967).	misc.
Lewis, E. L.	Proc. Phys. Soc. London <u>92</u> , 817-825 (1967).	comm.
Oshirovich, A. L. & Verolainen, Ya. F.	Optics and Spectroscopy (U.S.S.R.) <u>22</u> , 181-184 (1967).	life
Wilkinson, P. G.	Can. J. Phys. <u>45</u> , 1709-1713 (1967).	comm.

Ne II

Naqvi, A. M.	J. Quant. Spectrosc. Radiat. Transfer <u>4</u> , 597-615 (1964).	quant.
Hinnov, E.	J. Opt. Soc. Am. <u>56</u> , 1179-1188 (1966).	emiss.
Savage, B. D. & Lawrence, G. M.	Astrophys. J. <u>146</u> , 940-943 (1966).	life
Oshirovich, A. L. & Verolainen, Ya. F.	Optics and Spectroscopy (U.S.S.R.) <u>22</u> , 181-184 (1967).	life

Ne III

Hinnov, E.	J. Opt. Soc. Am. <u>56</u> , 1179-1188 (1966).	emiss.
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Ne IV

Bashkin, S., Wangsness, R. K. & Heroux, L.	Phys. Rev. <u>151</u> , 87-96 (1966).	life
Hinnov, E.	J. Opt. Soc. Am. <u>56</u> , 1179-1188 (1966).	emiss.
Bickel, W. S.	Phys. Rev. <u>162</u> , 7-11 (1967).	life

AUTHOR

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CLASSIFICATION

Ne V

Froese, C.	Astrophys. J. <u>145</u> , 932-935 (1966).	quant. forb.
Hinnov, E.	J. Opt. Soc. Am. <u>56</u> , 1179-1188 (1966).	emiss.
Bickel, W. S.	Phys. Rev. <u>162</u> , 7-11 (1967).	life

Ne VI

Bashkin, S., Wangsness,	Phys. Rev. <u>151</u> , 87-96 (1966).	life
R. K. & Heroux, L.		
Hinnov, E.	J. Opt. Soc. Am. <u>56</u> , 1179-1188 (1966).	emiss.

Ne VII

Hinnov, E.	J. Opt. Soc. Am. <u>56</u> , 1179-1188 (1966).	emiss.
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Ne VIII

Hinnov, E.	J. Opt. Soc. Am. <u>56</u> , 1179-1188 (1966).	emiss.
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Ne IX

Elton, R. C.	Astrophys. J. <u>148</u> , 573-578 (1967).	quant.
Weiss, A. W.	J. Research Nat. Bur. Standards <u>71A</u> , 163-168 (1967).	quant.

* * * * *

 Θ (Oxygen)^{*} Θ I

Armstrong, B. H. & Purdum, K. L.	Phys. Rev. <u>150</u> , 51-59 (1966).	quant.
LeBlanc, F. J., Oldenberg, O. & Carleton, N. P.	J. Chem. Phys. <u>45</u> , 2200-2203 (1966).	emiss., forb.
McConkey, J. W., Burns, D. J., Moran, K. A. & Emeleus, K. G.	Phys. Letters <u>22</u> , 416-417 (1966).	emiss. forb., rel.
Savage, B. D. & Lawrence, G. M. Boldt, G. & Labuhn, F.	Astrophys. J. <u>146</u> , 940-943 (1966). Max Planck Institut für Physik und Astrophysik MPI-PAE/Extraterr. May (1967).	life emiss.

*See Section 3.2.

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Foster, E. W.	Proc. Phys. Soc. London A <u>90</u> , 275-282 (1967).	emiss.
Parkes, D. A., Keyser, L. F. & Kaufman, F.	Astrophys. J. <u>149</u> , 217-223 (1967).	absorpt.
Zemtsov, Yu. K.	Doklady Akad. Nauk. (U.S.S.R.) <u>12</u> , 470-471 (1967).	quant. forb.
O II		
Armstrong, B. H. & Purdum, K. L.	Phys. Rev. <u>150</u> , 51-59 (1966).	quant.
Berg, H. F.	Z. Physik <u>207</u> , 404-410 (1967).	emiss.
Zemtsov, Yu. K.	Doklady Akad. Nauk. (U.S.S.R.) <u>12</u> , 470-471 (1967).	quant. forb.
O III		
Armstrong, B. H. & Purdum, K. L.	Phys. Rev. <u>150</u> , 51-59 (1966).	quant.
Froese, C.	Astrophys. J. <u>145</u> , 932-935 (1966).	quant. forb.
Berg, H. F.	Z. Physik <u>199</u> , 445-455 (1967).	emiss.
Bickel, W. S.	Phys. Rev. <u>162</u> , 7-11 (1967).	life
O IV		
Armstrong, B. H. & Purdum, K. L.	Phys. Rev. <u>150</u> , 51-59 (1966).	quant.
Bashkin, S. & Burton, K. S.	J. Opt. Soc. Am. <u>57</u> , 282-283 (1967).	emiss., rel.
Bickel, W. S.	Phys. Rev. <u>162</u> , 7-11 (1967).	life
O V		
Bickel, W. S. & Bashkin, S.	Phys. Letters <u>20</u> , 488-489 (1966).	life
LaPaglia, S. R. & Sinanoglu, O.	J. Chem. Phys. <u>44</u> , 1888-1898 (1966).	quant.
Steele, R. & Trefftz, E.	J. Quant. Spectrosc. Radiat. Transfer <u>6</u> , 833-846 (1966).	quant.
Balashov, V. V., Senashenko, V. S. & Tekou, B.	Phys. Letters <u>25A</u> , 487-488 (1967).	quant.
Froese, C.	J. Chem. Phys. <u>47</u> , 4010-4015 (1967).	SCF
O VII		
Elton, R. C.	Astrophys. J. <u>148</u> , 573-578 (1967).	quant.
Garstang, R. H.	Astrophys. J. <u>148</u> , 579-584 (1967).	quant. forb.

AUTHOR

JOURNAL

CLASSIFICATION

Weiss, A. W.

J. Research Nat. Bur. Standards 71A, 163-168
(1967).

quant.

* * * * *

P (Phosphorus)^{*}

P I

Savage, B. D. & Lawrence, G. M.
Lawrence, G. M.Astrophys. J. 146, 940-943 (1966).
Astrophys. J. 148, 261-268 (1967).life
quant. rel.

P II

Savage, B. D. & Lawrence, G. M.

Astrophys. J. 146, 940-943 (1966).

life

P IV

Zare, R. N.

J. Chem. Phys. 47, 3561-3572 (1967).

quant.

P VI

Kastner, S. O., Omidvar, K. &
Underwood, J. H.Astrophys. J. 148, 269-273 (1967).

quant.

P X

Froese, C.

Astrophys. J. 145, 932-935 (1966).

quant. forb.

* * * * *

Pb (Lead)^{*}

Pb I

Lvov, B. V.

Optics and Spectroscopy (U.S.S.R.) 19, 282-284
(1965).

absorpt.

Brown, W. A.

Phys. Fluids 9, 1273-1277 (1966).

emiss.

Hults, M. E.

J. Opt. Soc. Am. 56, 1298-1304 (1966).

quant. forb.

& emiss.

forb.

^{*}See Section 3.2.

AUTHOR

JOURNAL

CLASSIFICATION

Saloman, E. B.	Phys. Rev. <u>144</u> , 23-24 (1966).	misc.
Saloman, E. B.	Phys. Rev. <u>152</u> , 79-81 (1966).	misc.
Saloman, E. B. & Happer, W.	Phys. Rev. <u>144</u> , 7-22 (1966).	misc.
Cunningham, P. T. & Link, J. K.	J. Opt. Soc. Am. <u>57</u> , 1000-10007 (1967).	life
Lawrence, G. M.	Astrophys. J. <u>148</u> , 261-268 (1967).	quant. rel.

Pb II

Hults, M. E.	J. Opt. Soc. Am. <u>56</u> , 1298-1304 (1966).	quant. forb.
		& emiss.
		forb.

* * * * *

Pd (Palladium)^{*}

Pd I

Budick, B.	Bull. Am. Phys. Soc. Series II, Vol. <u>12</u> , #6, 905 (1967).	misc.
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* * * * *

Rb (Rubidium)^{*}

Rb I

Feichtner, J. D.	Thesis University of Colorado (1964).	misc.
Bucka, H., Grosswendt, B. & Schüssler, H. A.	Z. Physik <u>194</u> , 193-200 (1966).	misc.
Link, J. K.	J. Opt. Soc. Am. <u>56</u> , 1195-1199 (1966).	misc.
Feichtner, J. D., Gallagher, J. H. & Mizushima, M.	Phys. Rev. <u>164</u> , 44-48 (1967).	misc.
Gallagher, A.	Phys. Rev. <u>157</u> , 68-72 (1967).	misc.
Zemtsov, Yu. K.	Doklady Akad. Nauk. (U.S.S.R.) <u>12</u> , 470-471 (1967).	quant. forb., rel.

Rb II

Gruzdev, P. F.	Optics and Spectroscopy (U.S.S.R.) <u>22</u> , 170-171 (1967).	quant.
----------------	--	--------

* * * * *

^{*}See Section 3.2.

AUTHOR

JOURNAL

CLASSIFICATION

S (Sulphur)*

S I

Bridges, J. M.	Thesis Maryland Univ. (1966).	emiss.
Savage, B. D. & Lawrence, G. M.	Astrophys. J. <u>146</u> , 940-943 (1966).	life
Bridges, J. M. & Wiese, W. L.	Phys. Rev. <u>159</u> , 31-38 (1967).	emiss.
Foster, E. W.	Proc. Phys. Soc. London A <u>90</u> , 275-282 (1967).	emiss.
Lawrence, G. M.	Astrophys. J. <u>148</u> , 261-268 (1967).	quant. rel.
Miller, M., Murphy, P.,	Bull. Am. Phys. Soc. Ser. II, Vol. <u>11</u> , 818-819	emiss.
LaSalle, T. & Wilkerson, T.	(1967).	

S II

Czyzak, S. J. & Krueger, T. K.	"Atomic Collision Processes", Proceedings p. 213-225(ed. McDowell, M.R., John Wiley & Sons, Inc. New York, 1964).	quant. forb.
Bridges, J. M.	Thesis Maryland Univ. (1966).	emiss.
Savage, B. D. & Lawrence, G. M.	Astrophys. J. <u>146</u> , 940-943 (1966).	life
Bridges, J. M. & Wiese, W. L.	Phys. Rev. <u>159</u> , 31-38 (1967).	emiss.

S VII

Kastner, S. E., Omidvar, K. & Underwood, J. H.	Astrophys. J. <u>148</u> , 269-273 (1967).	quant.

S XI

Froese, C.	Astrophys. J. <u>145</u> , 932-935 (1966).	quant. forb.

* * * * *

Sb (Antimony)*

Sb I

Lvov, B. V.	Optics and Spectroscopy (U.S.S.R.) <u>19</u> , 282-284 (1965).	absorpt.

* * * * *

* See Section 3.2.

AUTHOR

JOURNAL

CLASSIFICATION

Sc (Scandium)*

Sc II

Warner, B.

Memoirs Roy. Astron. Soc. 70, 165-253 (1967).

emiss., rel.

& CA

Sc III

Weiss, A. W.

J. Research Nat. Bur. Standards 71A, 157-162 (1967).

SCF

Sc XII

Kastner, S. O., Omidvar, K. &

Astrophys. J. 148, 269-273 (1967).

quant.

Underwood, J. H.

* * * * *

Se (Selenium)*

Se I

Lawrence, G. M.

Astrophys. J. 148, 261-268 (1967).

quant. rel.

* * * * *

Si (Silicon)*

Si I

Savage, B. D. & Lawrence, G. M.

Astrophys. J. 146, 940-943 (1966).

life

Woodgate, B.

Monthly Notices Roy. Astron. Soc. 134, 287-313

emiss.

(1966).

Lawrence, G. M.

Astrophys. J. 148, 261-268 (1967).

quant. rel.

life

Si II

Froese, C. & Underhill, A. B.

Astrophys. J. 146, 301-303 (1966).

SCF

Savage, B. D. & Lawrence, G. M.

Astrophys. J. 146, 940-943 (1966).

life

Woodgate, B.

Monthly Notices Roy. Astron. Soc. 134, 287-313

emiss.

(1966).

*See Section 3.2.

AUTHOR	JOURNAL	CLASSIFICATION
Dupree, A. K. & Goldberg, L.	Solar Physics <u>1</u> , 229-241 (1967).	quant.
	Si III	
Weiss, A. W.	J. Chem. Phys. <u>42</u> , 3573-3578 (1967).	quant.
Zare, R. N.	J. Chem. Phys. <u>42</u> , 3561-3572 (1967).	quant.
	Si IV	
Chapman, R. D., Clarke, W. H. & Aller, L. H.	Astrophys. J. <u>144</u> , 376-380 (1966).	SCF
	Si V	
Kastner, S. O., Omidvar, K. & Underwood, J. H.	Astrophys. J. <u>148</u> , 269-273 (1967).	quant.
	Si VIII	
Froese, C.	Bull. Astron. Inst. Netherlands <u>19</u> , 86-89 (1967).	SCF
	Si IX	
Froese, C.	Astrophys. J. <u>145</u> , 932-935 (1966).	quant. forb.
Froese, C.	Bull. Astron. Inst. Netherlands <u>19</u> , 86-89 (1967).	SCF
	Si XI	
Garstang, R. H.	Astrophys. J. <u>148</u> , 579-584 (1967).	quant. forb.

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Sn (Tin)*

Sn I

Lawrence, G. M.	Astrophys. J. <u>148</u> , 261-268 (1967).	quant. rel. & life
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* See Section 3.2.

AUTHOR

JOURNAL

CLASSIFICATION

Sr (Strontium)*

Sr I

Altick, P. L. & Glassgold, A. E.	Phys. Rev. <u>133</u> , A632-A646 (1964).	quant.
Ackermann, F., Baumann, M. &	Z. Naturforsch. <u>21a</u> , 664-665 (1966).	life
Gayler, J.		
Hudson, R. D. & Carter, V. L.	Opt. Soc. Am. Meeting, ThG12, p. 22, March (1966).	absorpt.
Letfus, V.	Optics and Spectroscopy (U.S.S.R.) <u>21</u> , 371-374 (1966).	comm.
Gruzdev, P. F.	Optics and Spectroscopy (U.S.S.R.) <u>22</u> , 89-91 (1967).	quant.
Ma, I.-J., zuPutlitz, G. &	Z. Physik <u>208</u> , 276-298 (1967).	misc.
Schütte, G.		

Sr II

Gallagher, A.	Phys. Rev. <u>157</u> , 24-30 (1967).	misc.
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Te (Tellurium)*

Te I

Lvov, B. V.	Optics and Spectroscopy (U.S.S.R.) <u>19</u> , 282-284 (1965).	absorpt.
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Ti (Titanium)*

Ti II

Warner, B.	Memoirs Roy. Astron. Soc. <u>70</u> , 165-253 (1967).	emiss., rel. & CA
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* See Section 3.2.

AUTHOR

JOURNAL

CLASSIFICATION

Tl XIII

Kastner, S. O., Omidvar, K. & Astrophys. J. 148, 269-273 (1967).
Underwood, J. H.

quant.

* * * * *

Tl (Thallium)*

Tl I

Gruzdev, P. F. Optics and Spectroscopy (U.S.S.R.) 20,
209-213 (1966). quant.
Marr, G. V. & Heppinstall, R. Proc. Phys. Soc. London A 87, 293-298 (1966). quant.
Anderson, E. M., Anderson,
E. K. & Trusov, V. F. Optics and Spectroscopy (U.S.S.R.) 22, 471-473
(1967).
Cunningham, P. T. & Link, J. K. J. Opt. Soc. Am. 57, 1000-10007 (1967). life

Tl II

Lemos, A. M. & Burke, E. A. Bull. Am. Phys. Soc. Series II, 12, 336
(1967). quant.

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V (Vanadium)*

V II

Warner, B. Memoirs Roy. Astron. Soc. 70, 165-253 (1967). emiss., rel.
& CA

V XIV

Kastner, S. O., Omidvar, K. & Astrophys. J. 148, 269-273 (1967). quant.
Underwood, J. H.

* * * * *

* See Section 3.2.

Xe (Xenon)^{*}

Xe I

Chašchina, G. I. & Shreider, E. Ya.	Optics and Spectroscopy (U.S.S.R.) <u>20</u> , 283-284 (1966).	absorpt.
Dow, J. D. & Knox, R. S.	Phys. Rev. <u>152</u> , 50-56 (1966).	SCF
Wilkinson, P. G.	J. Quant. Spectrosc. Radiat. Transfer <u>6</u> , 823-831 (1966).	absorpt.
Gruzdev, P. F.	Optics and Spectroscopy (U.S.S.R.) <u>22</u> , 170-171 (1967).	quant.
Hutcherson, J. W. & Griffin, P. M.	Bull. Am. Phys. Soc. II, <u>12</u> , 524 (1967).	absorpt.
Lewis, E. L.	Proc. Phys. Soc. London <u>92</u> , 817-825 (1967).	comm.
Wilkinson, P. G.	Can. J. Phys. <u>45</u> , 1709-1713 (1967).	comm.

* * * * *

Yb (Ytterbium)^{*}

Yb I

Baumann, M. & Wandelt, G.	Phys. Letters <u>22</u> , 283-285 (1966).	misc.
Budick, B. & Smir, J.	Bull. Am. Phys. Soc. Series II, <u>12</u> , 186 (1967).	misc.

* * * * *

Zn (Zinc)^{*}

Zn I

Landman, A. & Novick, R.	Phys. Rev. <u>134</u> , A56-A65 (1964).	misc.
Lvov, B. V.	Optics and Spectroscopy (U.S.S.R.) <u>19</u> , 282-284 (1965).	absorpt.
Barrat, M. & Duclos, J.	Comp. rend. <u>263</u> , 1170-1173 (1966).	misc.
Moise, N. L.	Astrophys. J. <u>144</u> , 763-773 (1966).	absorpt.
Moise, N. L.	Astrophys. J. <u>144</u> , 782-784 (1966).	misc.
Ionescu-Pallas, N. J.	Revue Roumaine de Physique <u>11</u> , 643-647 (1966).	quant.
Garstang, R. H.	Astrophys. J. <u>148</u> , 579-584 (1967).	quant. forb.

^{*}See Section 3.2.

AUTHOR

JOURNAL

CLASSIFICATION

Gruzdev, P. F.

Optics and Spectroscopy (U.S.S.R.) 22, 89-91
(1967).

quant.

Zn II

Bialas-Zabawa, A., Kuchari,
M., Skulska, E., Urbaczka,
J. & Walach, Z.Acta. Phys. Polon. 20, 897-900 (1966).

quant.



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