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Bibliography

on

The Analyses of Optical Atomic Spectra

Section 1

$^1\text{H} - ^{23}\text{V}$

NAT'L INST. OF STAND & TECH R.I.C.



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United States Department of Commerce

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

τ , Bibliography
on
The Analyses of Optical Atomic Spectra
Section 1

The Spectra of Hydrogen, Deuterium, Tritium, Helium,
Lithium, Beryllium, Boron, Carbon, Nitrogen, Oxygen,
Fluorine, Neon, Sodium, Magnesium, Aluminum, Silicon,
Phosphorus, Sulfur, Chlorine, Argon, Potassium, Calcium,
Scandium, Titanium, and Vanadium

Charlotte E. Moore ✓

Institute for Basic Standards
National Bureau of Standards
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Abstract

The three published volumes on "Atomic Energy Levels", NBS Circ. 467, contain for each spectrum the bibliography that was used in compiling the data. The present work is a continuation of these bibliographies arranged in the same form. The time interval is the span from the respective dates of the earlier publications to the present. The selection of references is restricted to those needed for the preparation of revised tables of atomic energy levels and multiplets.

The bibliography is being published in three Sections each of which covers the same elements as the respective volumes of AEL. The present Section contains reference lists for the elements 1 H through 23 V, corresponding to Volume I. The spectra of a given element are listed in order of increasing stage of ionization. Listings are included for spectra of the 23 elements.

The original papers have been examined for nearly all of the quoted references. A selected list of general literature references is also included.

Key Words: Spectra, Atomic; Analyses of Atomic Spectra; Elements, Spectra of H thru V; Bibliography, Atomic Spectra; Atomic Spectra, H thru V; References to Atomic Spectra.

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		Li III	7			Ne VII	27
Beryllium	4	Be I	7			Ne VIII	27
		Be II	7			Ne IX	28
		Be III	8			Ne X	28
		Be IV	8	Sodium	11	Na I	28
Boron	5	B I	8			Na II	29
		B II	9			Na III	30
		B III	9			Na IV	30
		B IV	9			Na V	30
		B V	9			Na VI	30
Carbon	6	C I	10			Na VII	31
		C II	11			Na VIII	31
		C III	11			Na IX	31
		C IV	11			Na X	31
		C V	12			Na XI	31
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Bibliography

on

The Analyses of Optical Atomic Spectra

Charlotte E. Moore

The present bibliography has been prepared to meet a steady demand for data on atomic spectra, pending the publication of additional Sections of the writer's current series on Selected Tables of Atomic Spectra [1].¹ No attempt has been made to include references to all work on atomic spectra. Many specialized subjects such as transition probabilities, hyperfine structure, isotope shifts, absorption and fluorescence spectra observed in crystals, theoretical investigations and the like, come under the general subject. Individual bibliographies on these specialized topics are more useful generally than a large unselective list of references touching on many related topics. For example, transition probabilities are being handled in a continuing series that complements the present work [2].

The references included here have been chosen for individual spectra on the same basis as those that were given in the three volumes of "Atomic Energy Levels" [3]. They are essentially references that deal with the outer structure of atoms as revealed by their spectra. An attempt has been made to list all relevant references in the time interval between the publication of the respective "Atomic Energy Levels" Volumes and the present time.

The reference catalog at the National Bureau of Standards, maintained for the "Atomic Energy Levels" Program has provided the source material. The earlier format has been retained for convenience.

A limited number of general references precedes the listings under individual spectra which, in turn, are arranged by element. For a given element the spectra are in order of increasing stage of ionization. The elements are in order of increasing atomic number.

The present bibliography is being published in three Sections, each of which covers the elements contained in the respective volume of "Atomic Energy Levels" [3]. Thus, Section 1, the first of the three, contains the relevant literature references known to the writer of all spectra of the elements H through V from 1949 to the present date. Earlier references, similarly selected, are to be found in "Atomic Energy Levels" Volume I, under the separate spectra.

¹ Figures in brackets indicate the literature references on page VIII.

The former practice of describing the content of individual papers by key letters or words has been continued here. The words are self-explanatory; the letters have the following meanings:

C L	Classified lines
E D	Energy level diagram
G D	Grotrian diagram
I P	Ionization potential
I S	Isotope shift
T	Terms (and/or energy levels)
W L	Wavelength
Z E	Zeeman effect
[]	Forbidden transitions
hfs	Hyperfine structure
Osc.Str.	Oscillator strength
α	Correction connecting sets of terms of different multiplicities

As before, the letters "A" and "L" entered in parentheses before the date of the reference denote, respectively, that the paper is an Abstract or a Letter to the Editor.

The references have been chosen on the basis of those needed for the preparation of current Tables of Atomic Energy Levels and Multiplets [1, 4, 5]. They are designed primarily for users who require a knowledge of ionization and excitation energies, resonance lines, other classified lines, term designations, electron configurations, relative intensities, and the like. They refer, in general, to laboratory analyses. There are a few special cases, however, where forbidden lines observed in nebular or coronal spectra provide the best information or the only data on the intervals of the ground terms of selected spectra. Such references are included.

Some scattered references on related topics such as hyperfine structure, Stark Effect, Lamb Shift, Isotope Shift, etc., have, also, been included. These are only incidental however. They are given for two reasons: occasionally such papers contain information on spectral structure or energy levels, and even a limited number of such references may serve as a guide to the investigator whose specialty is related to the study of atomic structure, but not specifically concerned with the analysis of optical spectra. No effort has been made to provide complete listings for such related subjects.

In tabulating the references for a given spectrum the overall plan has been to arrange them in alphabetical order by author and by year, starting with the earlier papers. Owing to the use of the photographic method for publication, this order has not been followed strictly. If excellent reference material became available after the final typing had been completed, additional references were inserted under the proper spectra where space permitted. This has introduced some irregularities in arrangement, but it has also made the bibliography more useful. Nearly all of the references quoted here have been examined by the author. Only a few which were not available have been copied on the basis of abstracts found in the literature.

It is a pleasure to acknowledge with gratitude the helpful suggestions of colleagues who have generously given the author the benefit of their valuable experience and judgment. B. Edlén and his associates have not only furnished revised analyses especially for inclusion, but have also incorporated in the manuscript suggested additions and corrections that enhance the value of the publication. Similarly, Isabel D. Murray has prepared the copy with the painstaking care required for publication by the photographic method.

References

- [1] C. E. Moore, Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 3, Section 1 (1965); Section 2 (1967).
- [2] B. M. Glennon and W. L. Wiese, Natl. Bur. Std. Misc. Publ. 278, 92 pp. (1966).
- [3] C. E. Moore, Circ. Natl. Bur. Std. 467, Vol. I, 309 pp. (1949); Vol. II, 227 pp. (1952); Vol. III, 245 pp. (1958).
- [4] C. E. Moore, Circ. Natl. Bur. Std. 488, Section 1, 78 pp. (1950); Section 2, 115 pp. (1952); Section 3, 94 pp. (1962); Section 4, 65 pp. (1962); Section 5, 30 pp. (1962).
- [5] C. E. Moore, Reprinting of 1945 Princeton Multiplet Table, Natl. Bur. Std. Tech. Note 36 (PB 151395), 245 pp. (1959).

Washington, D. C.
June 21, 1968.

General References

- J. E. Mack, Rev. Mod. Phys. 22, 64 to 76 (1950). Summary Nuclear Moments
- I. S. Bowen, Astroph. J. 121, 306 to 311 (1955). [C L]
- W. Finkelburg and W. Humbach, Naturwiss. 42, 35 to 37 (1955). I P
- M. A. Catalán y F. R. Rico, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 53, 85 to 94 (1957); 54, 5 to 16 (1958); 54, 289 to 300 (1958); 54, 301 to 308 (1958). I P, T
- B. Edlén, Report of IAU Commission 14, Trans. Intern. Astron. Union 10, 211 to 233 (1958). T, Calc. W L, Standards, Lyman Series H I through O VIII
- C. L. Pekeris, Phys. Rev. 112, 1649 to 1658 (1958). I P Theory He I sequence to Ne IX
- G. Racah and Y. Shadmi, Bull. Research Council Israel 8F, 15 to 46 (1959). Second Spectra of Iron Group Theory
- I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]
- F. R. Rico, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 56, 113 to 120 (1960). I P, T
- G. Herzberg, Report of IAU Commission 14, Trans. Intern. Astron. Union 11A, 97 to 117 (1961); 11B, 208 to 221 (1961). T, W L, Standards
- C. M. Varsavsky, Astroph. J. Suppl. 6, 75 to 107 (1961). Extrapolation of Sequences: He I through Cl I (Ne I omitted)
- W. R. S. Garton, J. Quant. Spectrosc. and Rad. Transfer 2, 335 to 341 (1962). Ultraviolet Absorption Spectra
- Y. Shadmi, Bull. Research Council Israel 10F, 109 to 132 (1962). Third Spectra of Iron Group Theory
- R. Akerib, J. Opt. Soc. Am. 53, 918 to 923 (1963). Empirical Extrapolation of Sequences, I P
- B. Edlén, Reports on Progress in Physics 26, 181 to 212 (1963). Vacuum Ultraviolet Wavelength Measurements
- F. Rohrlich and C. Pecker, Astroph. J. 138, 1246 to 1261 (1963). Extrapolation of Sequences, $s^2 p^n$ configuration
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 80 to 220 (1964). I P, Li to Ne Isoelectronic Sequences, Sp I to xv

General References - Continued

- L. L. House, *Astroph. J. Suppl.* 8, No. 81, 307 to 328 (1964). Ionization Equilibrium Calculations H to Fe
- C. Moore-Sitterly, Report of IAU Commission 14, *Trans. Intern. Astron. Union* 12A, 137 to 162 (1964); 12B, 173 to 185 (1964). T, W L
- A. A. Nikitin and O. A. Iakubofskii, *Doklady Akad. Nauk, SSSR* 156, No. 4, 760 to 762 (1964). *Forb. Trans.*: B I to Ar XIV; Al I to Ni XVI
- W. B. Bridges and A. N. Chester, *IEEE Trans. Qu. Electronics* QE-1, 66 to 84 (1965). Sp. Ion Lasers
- J. D. Garcia and J. E. Meek, *J. Opt. Soc. Am.* 55, 654 to 685 (1965). I P, T, C L Theory, H I Sequence
- W. R. S. Garton, Harvard College Obs. Sci. Report No. 6, 14 pp. (1965). Autoionization
- L. Goldberg, Harvard College Obs. Sci. Report No. 4, 22 pp. (1965). Autoionization
- J. Junkes, E. W. Salpeter, G. Milazzo, *Atlas* (124 pp.), Specola Vaticana, Città del Vaticano, Roma (1965). Atomic Spectra in the Vacuum Ultraviolet, 2250 Å to 1100 Å; Part One: Al, C, Cu, Fe, Ge, Hg, Si
- S. O. Kastner, K. Omidvar and J. H. Underwood, *Astroph. J.* 148, 269 to 273 (1967). C L Ne I Sequence Na II to Fe XVII
- W. Lotz, *J. Opt. Soc. Am.* 57, 873 to 878 (1967). I P, Sequences H to Zn
- C. Moore-Sitterly, Report of IAU Commission 14, *Trans. Intern. Astron. Union* 13A, 229 to 266 (1967). T, W L

HYDROGEN ($Z = 1$)

H I

- C. J. Humphreys, J. Res. Nat. Bur. Std. 50, 1 to 6, RP 2380 (1953). T, C L, Series in Far Infrared
- W. E. Lamb, Jr. and T. M. Sanders, Jr., Phys. Rev. 103, 313 to 314 (1956). Fine Structure of $n = 3$
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 4 (1968). Partial G D
- H. M. Fried and D. R. Yennie, Phys. Rev. Lett. 4, 583 to 584 (1960). Lamb Shift
- S. Goto and S. Machida, Progr. Theoret. Phys. 23, 372 to 374 (1960). Lamb Shift
- W. E. Lamb, Jr. and T. M. Sanders, Jr., Phys. Rev. 119, 1901 to 1914 (1960). T
- L. R. Wilcox and W. E. Lamb, Jr., Phys. Rev. 119, 1915 to 1933 (1960). T
- H. Kleinpoppen, Zeit. Phys. 164, 174 to 189 (1961). Lamb Shift
- D. E. Zwanziger, Phys. Rev. 121, 1128 to 1142 (1961). hfs Theory
- R. Akerib, J. Opt. Soc. Am. 53, 918 to 923 (1963). Calc. Terms H I Sequence
- S. B. Crampton, D. Kleppner and N. F. Ramsey, Phys. Rev. Lett. 11, 338 to 340 (1963). hfs
- B. G. Clark, Astroph. J. 142, 1398 to 1422 (1965). 21-cm Line
- B. Edlén and L. Å. Svensson, Ark. Fys. (Stockholm) 28, No. 36, 427 to 446 (1965). W L Lyman Series
- G. W. Erickson and D. R. Yennie, Ann. Phys. (New York) 35, 271 to 313, 447 to 510 (1965). Lamb Shift
- J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965). I P, T, C L Theory
- K. Bockasten, T. Lundholm and O. Andrade, J. Opt. Soc. Am. 56, 1260 to 1261 (1966). Laser Lines
- S. J. Brodsky and G. W. Erickson, Phys. Rev. 148, 26 to 46 (1966). hfs

HYDROGEN

H I - Continued

R. T. Robiscoe and B. L. Cosens, Phys. Rev. Lett. 17, 69 to 72 (1966).
Lamb Shift

M. F. Soto, Jr., Phys. Rev. Lett. 17, 1153 to 1155 (1966). Lamb Shift

DEUTERIUM AND TRITIUM ($Z = 1$)

$^2\text{H I (D)}$ and $^3\text{H I (T)}$

G. Herzberg, Proc. Roy. Soc. (London) [A] 234, 516 to 528 (1956). Fine
Structure

S. I. Levikov and L. P. Shishatskaya, Opt. i Spektr. 11, 689 to 691 (1961).
W L Ratios H/D

F. M. Pipkin and R. H. Lambert, Phys. Rev. 127, 787 to 792 (1962). hfs
H and T

L. Csillag, Kozp. Fiz. Kut. Int. 12, 453 to 459 (1964). D Fine Structure

J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965). I P,
T, C L Theory

S. B. Crampton, H. G. Robinson, D. Kleppner and N. F. Ramsey, Phys. Rev.
141, 55 to 66 (1966). hfs D

B. S. Mathur, S. B. Crampton, D. Kleppner and N. F. Ramsey, Phys. Rev.
158, 14 to 17 (1967). hfs T

HELIUM ($Z = 2$)

He I

B. Edlén, Ark. Fys. (Stockholm) 4, No. 28, 441 to 453 (1952). I P, T,
C L He I Sequence

C. J. Humphreys and H. J. Kostkowski, J. Res. Nat. Bur. Std. 49, 73 to 84,
RP 2345 (1952). T, C L Infrared Obs.

HELIUM

He I - Continued

- C. J. Humphreys and E. Paul, Jr., U. S. Naval Ord. Lab. NAVORD Report 4589, 25 to 46 (1956). C L Infrared Obs.
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 6 (1968). Partial G D
- W. E. Lamb, Jr. and T. H. Maiman, Phys. Rev. 105, 573 to 579 (1957). T
- A. G. Shenstone, unpublished material (1957). Revised level values:
 $n\ 1,3S(n = 8 \text{ to } 17)$; $n\ 1,3D(n = 8 \text{ to } 19)$.
- G. Herzberg, Proc. Roy. Soc. (London) [A] 248, 309 to 332 (1958). I P, T, C L, W L
- A. Dalgarno and A. L. Stewart, Proc. Phys. Soc. (London) 76, 49 to 55 (1960). Lamb Shift
- W. C. Martin, J. Opt. Soc. Am. 50, 174 to 176 (1960). W L
- W. C. Martin, J. Res. Nat. Bur. Std. 64A, 19 to 28 (1960). I P, T, C L
- A. Kancerevicius, Lietuvos TSR Mokslu Akad. Darbai, Ser B. No. 3, 107 to 123 (1961). I S He I Sequence
- H. Sadjian, H. K. Wimmel and H. Margenau, J. Quant. Sp. Rad. Transfer 1, 46 to 52 (1961). [He I]
- C. Schwartz, Phys. Rev. 123, 1700 to 1705 (1961). Lamb Shift
- C. M. Varsavsky, Astroph. J. Suppl. 6, 75 to 107 (1961). Extrapolation of Sequence
- H. R. Griem, M. Baranger, A. C. Kolb and G. Oertel, Phys. Rev. 125, 177 to 195 (1962). Stark Broadening in Plasma
- C. L. Pekeris, Phys. Rev. 126, 1470 to 1476 (1962). Lamb Shift
- C. L. Pekeris, B. Schiff and H. Lifson, Phys. Rev. 126, 1057 to 1058 (1962). Fine Structure
- E. E. Salpeter and M. H. Zaidi, Phys. Rev. 125, 248 to 255 (1962). I P, Lamb Shift
- C. Schwartz, Phys. Rev. 128, 1146 to 1148 (1962). Theory
- R. Akerib, J. Opt. Soc. Am. 53, 918 to 923 (1963). Calc. Terms He I Sequence, I P

HELIUM

He I - Continued

- E. J. Blau, B. F. Hochheimer, J. T. Massey and A. G. Schulz, J. Appl. Phys. 34, 703 (1963). Lasing Energy Levels
- J. W. Cooper, U. Fano and F. Prats, Phys. Rev. Lett. 10, 518 to 521 (1963). C L
- M. Machacek and C. W. Scherr, J. Chem. Phys. 39, 3151 to 3152 (1963). I S
- R. P. Madden and K. Codling, Phys. Rev. Lett. 10, 516 to 518 (1963). T
- J. Séguier, Compt. Rend. 256, 1703 to 1704 (1963). Infrared Obs.
- E. N. Lassette, V. D. Meyer and M. S. Longmire, J. Chem. Phys. 41, 2952 to 2954 (1964). [He I]
- F. M. J. Pichanick, R. D. Swift and V. W. Hughes, Bull. Am. Phys. Soc. 9, No. 1, 90 (1964). Fine Structure
- J. M. Vaughan, Phys. Lett. 8, 111 to 112 (1964). hfs $^3\text{He I}$
- J. R. Lifshitz, Atomic Energy Commission Report No. C00-1112-21, 173 pp. (1965). Fine Structure
- R. P. Madden and K. Codling, Astroph. J. 141, 364 to 375 (1965). T, C L
- B. Schiff, H. Lifson, C. L. Pekeris and P. Rabinowitz, Phys. Rev. 140A, 1104 to 1121 (1965). Fine Structure
- B. Schiff, C. L. Pekeris and H. Lifson, Phys. Rev. 137A, 1672 to 1675 (1965). Fine Structure
- J. A. Simpson, G. E. Chamberlain and S. R. Mielczarek, Phys. Rev. 139A, 1039 to 1041 (1965). [He I]
- E. Holþien and J. Midtdal, J. Chem. Phys. 45, 3897 (1966). Autoionizing States
- K. S. Suh and M. H. Zaidi, Proc. Roy. Soc. (London) [A] 291, 94 to 105 (1966). Lamb Shift
- H. C. Goldwire, Jr., Phys. Rev. Lett. 18, 433 to 434 (1967). hfs $^3\text{He I}$
- R. D. Kaul, J. Opt. Soc. Am. 57, 1156 to 1157 (L) (1967). Fine Structure
- C. L. Pekeris, Phys. Rev. 112, 1649 to 1658 (1958). I P Theory

HELIUM

He II

- R. Wilson, Mon. Not. Roy. Astron. Soc. 113, 557 to 570 (1953). C L,
nh $^2\text{H}^0$ Series ($n = 13$ to 34)
- G. W. Series, Proc. Roy. Soc. (London) [A] 226, 377 to 392 (1954). Fine
Structure
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams
(1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 5
(1968). Partial G D
- G. Herzberg, Zeit. Phys. 146, 269 to 280 (1956); Physics in Canada 13,
No. 3, 8 to 20 (1957). T
- B. Edlén and L. Å. Svensson, Ark. Fys. (Stockholm) 28, No. 36, 427 to 446
(1964). W L Lyman Series
- F. L. Roesler and J. E. Mack, Phys. Rev. 135A, 58 to 71 (1964). Fine
Structure
- J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965).
I P, T, C L Theory

LITHIUM ($Z = 3$)

Li I

- K. Lidén and N. Starfelt, Ark. Fys. (Stockholm) 5, No. 8, 127 (A) (1952).
I P, C L
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams
(1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 8,
9 (1968). Partial G D, C L
- I. Johansson, Ark. Fys. (Stockholm) 15, No. 14, 169 to 179 (1959). I P,
T, W L, C L, G D
- R. K. Nesbet, Phys. Rev. 118, 681 to 683 (1960). hfs
- C. M. Varsavsky, Astroph. J. Suppl. 6, 75 to 107 (1961). Extrapolation
of Sequence

LITHIUM

Li I - Continued

- K. L. Bell and A. L. Stewart, Proc. Phys. Soc. (London) 83, 1039 to 1043 (1964). Fine Structure
- K. L. Bell, Proc. Phys. Soc. (London) 85, 1314 to 1315 (1965). Fine Structure Li I Sequence
- J. D. Garcia and J. E. Mack, Phys. Rev. 138A, 987 to 991 (1965). T, C L
- G. J. Ritter, Can. J. Phys. 43, 770 to 781 (1965). hfs
- B. Budick, H. Bucka, R. J. Goshen, A. Landman and R. Novick, Phys. Rev. 147, 1 to 5 (1966). Fine Structure, hfs
- K. C. Brog, T. G. Eck and H. Wieder, Phys. Rev. 153, 91 to 103 (1967). Fine Structure, hfs

Li II

- B. Edlén, Ark. Fys. (Stockholm) 4, No. 28, 441 to 453 (1952). I P, T, C L He I Sequence
- T. Tamura, Phys. Rev. 105, 1808 to 1809 (1957). T
- G. W. Series and K. Willis, Proc. Phys. Soc. (London) 71, 274 (1958). C L
- E. Freytag, Naturwiss. 46, 314 to 315 (1959). T, C L
- G. Herzberg and H. R. Moore, Can. J. Phys. 37, No. 11, 1293 to 1313 (1959). I P, T, W L, C L, G D, E D, hfs
- C. L. Pekeris, Phys. Rev. 126, 143 to 145 (1962). I P, Theory
- Y. G. Toresson and B. Edlén, Ark. Fys. (Stockholm) 23, No. 11, 117 to 118 (1962). C L
- B. Schiff, H. Lifson, C. L. Pekeris and P. Rabinowitz, Phys. Rev. 140A, 1104 to 1121 (1965). Fine Structure
- C. L. Pekeris, Phys. Rev. 112, 1649 to 1658 (1958). I P Theory

LITHIUM

Li III

- E. Freytag, Naturwiss. 46, 314 to 315 (1959). C L
- B. Edlén and L. Å. Svensson, Ark. Fys. (Stockholm) 28, No. 36, 427 to 446 (1964). W L Lyman Series
- J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965). I P, T, C L Theory

BERYLLIUM (Z = 4)

Be I

- W. R. Bozman, C. H. Corliss, W. F. Meggers and R. E. Trees, J. Res. Nat. Bur. Std. 50, 131 to 132, RP2399 (1953). T, C L
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 15 (1968). C L
- L. Johansson, Ark. Fys. (Stockholm) 23, No. 12, 119 to 128 (1962). I P, T, C L, G D

Be II

- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 8, 9 (1968). Partial G D, C L
- L. Johansson, Ark. Fys. (Stockholm) 20, No. 33, 489 to 498 (1961). I P, T, C L, G D

BERYLLIUM

Be III

- B. Edlén, Ark. Fys. (Stockholm) 4, No. 28, 441 to 453 (1952). I P, T.
C L He I Sequence
- B. Edlén and L. Å. Svensson, Ark. Fys. (Stockholm) 28, No. 36, 427 to 446
(1965). W L
- C. L. Pekeris, Phys. Rev. 112, 1649 to 1658 (1958). I P Theory

Be IV

- B. Edlén and L. Å. Svensson, Ark. Fys. (Stockholm) 28, No. 36, 427 to 446
(1965). W L Lyman Series
- J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965). I P,
T, C L Theory
- B. Edlén, Ark. Fys. (Stockholm) 31, No. 35, 509 to 510 (1966). W L
Lyman Series

BORON (Z = 5)

B I

- H. E. Clearman, J. Opt. Soc. Am. 42, 373 to 379 (1952). T, C L
- G. Wessel, Phys. Rev. 92, 1581 to 1582 (1953). hfs
- E. W. Burke, Jr. and J. E. Mack, J. Opt. Soc. Am. 46, 100 (1956). T, C L
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams
(1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 21
(1968). C L
- H. Lew and R. S. Title, Can. J. Phys. 38, 868 to 871 (1960). hfs
- P. Gunnvald and L. Minnhagen, Ark. Fys. (Stockholm) 22, No. 21, 327 to
331 (1962). T, C L, E D

BORON

B I - Continued

A. A. Nikitin and O. A. Iakubovskii, Doklady Akad. Nauk. SSSR 156, No. 4, 760 to 762 (1964). C L [B I] Sequence

S. H. Lott, Jr., C. E. Roos and M. L. Ginter, J. Opt. Soc. Am. 56, 775 to 778 (1966). Z E

B II

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

B III

K. Bockasten, R. Hallin and T. P. Hughes, Proc. Phys. Soc. (London) 81, 522 to 530 (1963). C L

B IV

B. Edlén, Ark. Fys. (Stockholm) 4, No. 28, 441 to 453 (1952). I P, T, C L He I Sequence

B. Edlén and L. Å. Svensson, Ark. Fys. (Stockholm) 28, No. 36, 427 to 446 (1964). W L

C. L. Pekeris, Phys. Rev. 112, 1649 to 1658 (1958). I P Theory

B V

B. Edlén and L. Å. Svensson, Ark. Fys. (Stockholm) 28, No. 36, 427 to 446 (1964). W L Lyman Series

J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965). I P, T, C L Theory

B. Edlén, Ark. Fys. (Stockholm) 31, No. 35, 509 to 510 (1966). W L Lyman Series

CARBON ($Z = 6$)

C I

- B. Edlén, Accad. Naz. Lincei Volta Conv. (Rome) 11, 58 (1952) and unpublished material. T, W L
- L. Minnhagen, Ark. Fys. (Stockholm) 7, No. 33, 413 to 414 (1954). T, C L
- P. G. Wilkinson, J. Opt. Soc. Am. 45, 862 to 867 (1955). W L
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 25 (1968). C L
- G. Herzberg, Proc. Roy. Soc. (London) [A] 248, 309 to 332 (1958). W L, C L
- L. Minnhagen, Ark. Fys. (Stockholm) 14, No. 30, 481 to 482 (1959). T, C L Infrared
- I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]
- P. G. Wilkinson and K. L. Andrew, J. Opt. Soc. Am. 53, 710 to 717 (1963). W L Vac. Ultraviolet
- L. Johansson, Ark. Fys. (Stockholm) 25, No. 31, 425 to 431 (1964). C L
- L. Johansson and U. Litzen, Ark. Fys. (Stockholm) 29, No. 13, 175 to 179 (1965). C L Infrared
- L. Johansson, Ark. Fys. (Stockholm) 31, No. 15, 201 to 235 (1966). I P, T, C L, G D
- V. Kaufman and J. F. Ward, J. Opt. Soc. Am. 56, 1591 to 1597 (1966). T, C L, W L
- S. H. Lott, Jr., C. E. Roos and M. L. Ginter, J. Opt. Soc. Am. 56, 775 to 778 (1966). Z E

CARBON

C II

S. Glad, Ark. Fys. (Stockholm) 7, No. 2, 7 to 32 (1954). I P, T, C L

C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 20, 21 (1968). Partial G D, C L

G. Herzberg, Proc. Roy. Soc. (London) [A] 248, 309 to 332 (1958). W L, C L, G D

C III

K. Bockasten, Ark. Fys. (Stockholm) 9, No. 30, 457 to 481 (1955). I P, T, C L

C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 14, 15 (1968). Partial G D, C L

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 200 (1964). I P

S. H. Lott, Jr., C. E. Roos and M. L. Ginter, J. Opt. Soc. Am. 56, 775 to 778 (1966). Z E

C IV

K. Bockasten, Ark. Fys. (Stockholm) 10, No. 40, 567 to 582 (1956). I P, T, C L

C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 8, 9 (1968). Partial G D, C L

K. Bockasten, R. Hallin and T. P. Hughes, Proc. Phys. Soc. (London) 81, 522 to 530 (1963). C L

CARBON

C v

- B. Edlén, Ark. Fys. (Stockholm) 4, No. 28, 441 to 453 (1952). I P, T,
C L He I Sequence
- B. Edlén and L. Å. Svensson, Ark. Fys. (Stockholm) 28, No. 36, 427 to 446
(1965). W L
- B. C. Fawcett and F. E. Irons, Proc. Phys. Soc. (London) 89, 1063 to 1064
(L) (1966). C L
- B. C. Fawcett, A. H. Gabriel, W. G. Griffin, B. B. Jones and R. Wilson,
Nature 200, 1303 to 1304 (L) (1963). C L
- C. L. Pekeris, Phys. Rev. 112, 1649 to 1658 (1958). I P Theory

C vi

- B. Edlén and L. Å. Svensson, Ark. Fys. (Stockholm) 28, No. 36, 427 to 446
(1965). W L Lyman Series
- J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965). I P,
T, C L Theory
- B. Edlén, Ark. Fys. (Stockholm) 31, No. 35, 509 to 510 (1966). W L
Lyman Series
- B. C. Fawcett, A. H. Gabriel, W. G. Griffin, B. B. Jones and R. Wilson,
Nature 200, 1303 to 1304 (L) (1963). C L

NITROGEN (Z = 7)

N i

- I. S. Bowen, Astroph. J. 121, 306 to 311 (1955). [C L]
- P. G. Wilkinson, J. Opt. Soc. Am. 45, 862 to 867 (1955). W L
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams
(1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 29
(1968). C L
- G. Hepner and L. Herman, Ann. de Geoph. 13, 242 to 248 (1957). C L
Infrared
- M. A. Catalán y F. R. Rico, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A]
54, 5 to 16 (1958). I P

NITROGEN

N I - Continued

- K. B. S. Eriksson, Ark. Fys. (Stockholm) 13, No. 34, 429 to 439 (1958).
T, C L, W L
- G. Herzberg, Proc. Roy. Soc. (London) A248, 309 to 332 (1958). C L, W L,
G D
- I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]
- D. F. Heath, Los Alamos Sci. Lab. LA-2335, 35 to 36, 56 (1960). C L, E D
- K. B. S. Eriksson and I. Johansson, Ark. Fys. (Stockholm) 19, No. 16, 235
to 248 (1961). T, C L Infrared
- G. Hepner, Ann. de Phys. [13] 6, 762 (1961). W L Infrared
- W. W. Holloway, Jr., E. Lüscher and R. Novick, Phys. Rev. 126, 2109 to
2115 (1962). hfs
- P. G. Wilkinson and K. L. Andrew, J. Opt. Soc. Am. 53, 710 to 717 (1963).
W L Vac. Ultraviolet
- P. K. Carroll, R. E. Huffman, J. C. Larrabee and Y. Tanaka, Astroph. J.
146, 553 to 557 (1966). I P, T, C L
- K. B. S. Eriksson, Ark. Fys. (Stockholm) 33, No. 25, 357 to 360 (1966).
T, C L
- V. Kaufman and J. F. Ward, Appl. Opt. 6, 43 to 46 (1967). T, C L, W L
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 200
(1964). I P

N II

- I. S. Bowen, Astroph. J. 121, 306 to 311 (1955). [C L]
- P. G. Wilkinson, J. Opt. Soc. Am. 45, 862 to 867 (1955). W L
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams
(1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 24,
25 (1968). Partial G D, C L

NITROGEN

N II - Continued

K. B. S. Eriksson, Ark. Fys. (Stockholm) 13, No. 25, 303 to 329 (1958).
I P, T, C L, W L

I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]

D. F. Heath, Los Alamos Sci. Lab. LA-2335, 37, 57 (1960). C L, E D

W. B. Bridges and A. N. Chester, IEEE Trans. Qu. Electronics QE-1, 81 (1965). C L Laser Obs.

T. Sasaki, N. Kaifu, N. Itoh, Kazuo, Sakai and I. Shimada, Science of Light 14, 142 to 144 (1965). G D

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 200 (1964). I P

N III

C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 21 (1968). C L

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

W. B. Bridges and A. N. Chester, IEEE Trans. Qu. Electronics QE-1, 81 (1965). C L Laser Obs.

N IV

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 15 (1968). C L

W. B. Bridges and A. N. Chester, IEEE Trans. Qu. Electronics QE-1, 81 (1965). C L Laser Obs.

T. Sasaki, N. Kaifu, N. Itoh, Kazuo, Sakai and I. Shimada, Science of Light 14, 142 to 146 (1965). G D

R. Hallin, Ark. Fys. (Stockholm) 32, No. 11. 201 to 210 (1966). I P, T, C L, G D

NITROGEN

N v

- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956), Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 9 (1968). C L
- R. Hallin and T. P. Hughes, Proc. Phys. Soc. (London) 78, 201 to 203 (1961). C L
- K. Bockasten, R. Hallin and T. P. Hughes, Proc. Phys. Soc. (London) 81, 522 to 530 (1963). C L
- S. G. Tilford, J. Opt. Soc. Am. 53, 1051 to 1054 (1963). I P, T, C L
- K. Bockasten, R. Hallin, K. B. Johansson and P. Tsui, Phys. Lett. 8, 181 to 182 (1964). C L
- R. Hallin, Ark. Fys. (Stockholm) 31, No. 36, 511 to 526 (1966). I P, T, C L, G D

N vi

- B. Edlén, Ark. Fys. (Stockholm) 4, No. 28, 441 to 453 (1952). I P, T, C L He I Sequence
- C. L. Pekeris, Phys. Rev. 112, 1649 to 1658 (1958). I P Theory
- B. C. Fawcett, A. H. Gabriel, W. G. Griffin, B. B. Jones and R. Wilson, Nature 200, 1303 to 1304 (L) (1963). C L
- K. Bockasten, R. Hallin, K. B. Johansson and P. Tsui, Phys. Lett. 8, 181 to 182 (1964). C L
- B. C. Fawcett and F. E. Irons, Proc. Phys. Soc. (London) 89, 1063 to 1064 (1966). C L

N vii

- B. C. Fawcett, A. H. Gabriel, W. G. Griffin, B. B. Jones and R. Wilson, Nature 200, 1303 to 1304 (L) (1963). C L
- R. L. Blake, T. A. Chubb, H. Friedman and A. E. Unzicker, Science 146, No. 3647, 1037 to 1038 (1964). W L, C L
- B. Edlén and L. Å. Svensson, Ark. Fys. (Stockholm) 28, No. 36, 427 to 446 (1965). W L Lyman Series
- J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965). I P, T, C L Theory
- B. Edlén, Ark. Fys. (Stockholm) 31, No. 35, 509 to 510 (1966). W L Lyman Series

OXYGEN ($Z = 8$)

O I

- D. O. Davis and K. W. Meissner, J. Opt. Soc. Am. 43, 510 to 511 (1953).
T, C L, Fine Structure
- J. R. Holmes and L. W. Parker, Tech. Report No. 4, Office Naval Research,
62 pp. (1953). I S, Fine Structure, C L
- K. Kambe and J. H. van Vleck, Phys. Rev. 96, 66 to 71 (1954). Z E
- G. Kvifte, Ark. Mat. o Naturv. (Oslo) [B] 52, 65 to 68 (1954). T, C L
Series
- I. S. Bowen, Astroph. J. 121, 306 to 311 (1955). [C L]
- P. G. Wilkinson, J. Opt. Soc. Am. 45, 862 to 867 (1955). W L
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams
(1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 32,
33 (1968). Partial G D, C L
- G. Herzberg, Proc. Roy. Soc. (London) A248, 309 to 332 (1958). W L, C L
- I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]
- D. F. Heath, Los Alamos Sci. Lab. LA-2335, 37, 38, 58 (1960). C L, E D
- K. B. S. Eriksson and H. B. S. Isberg, Ark. Fys. (Stockholm) 24, No. 41,
549 to 558 (1963); 37, No. 17, 221 to 230 (1968). I P, T, C L, W L
- K. B. S. Eriksson, Ark. Fys. (Stockholm) 30, No. 16, 199 to 202 (1965).
W L [O I]
- J. S. M. Harvey, Proc. Roy. Soc. (London) [A] 285, 581 to 596 (1965).
hfs
- G. O. Brink, J. Chem. Phys. 46, 4531 to 4532 (L) (1967). Z E
- R. E. Huffman, J. C. Larrabee and Y. Tanaka, J. Chem. Phys. 46, 2213 to
2233 (1967). I P, T, C L, E D, Autoionization
- B. Isberg, Ark. Fys. (Stockholm) 35, No. 40, 495 to 498 (1967). T, C L

OXYGEN

O II

- I. S. Bowen, *Astroph. J.* 121, 306 to 311 (1955). [C L]
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); *Natl. Std. Ref. Data Series*, Natl. Bur. Std. NSRDS-NBS 23, 28 (1968). Partial G D, C L
- B. Edlén, "Atomic Spectra", *Hand. der Phys.*, *Encycl. of Phys.* 27, 198 (1964). I P
- I. S. Bowen, *Astroph. J.* 132, 1 to 17 (1960). [C L]
- D. F. Heath, Los Alamos Sci. Lab. LA-2335, 39, 40, 59 (1960). C L, E D
- K. B. S. Eriksson, *Ark. Fys.* (Stockholm) 19, No. 15, 229 to 233 (1961). T, Pair Coupling
- W. B. Bridges and A. N. Chester, *IEEE Trans. Qu. Electronics* QE-1, 80 (1965). C L Laser Obs.
- T. Sasaki, N. Kaifu, N. Itoh, Kazuo, Sakai, and I. Shimada, *Science of Light* 14, 142 to 144 (1965). G D
- S. H. Lott, Jr., C. E. Roos and M. L. Ginter, *J. Opt. Soc. Am.* 56, 775 to 778 (1966). Z E

O III

- I. S. Bowen, *Astroph. J.* 121, 306 to 311 (1955). [C L]
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); *Natl. Std. Ref. Data Series*, Natl. Bur. Std. NSRDS-NBS 23, 24 (1968). Partial G D, C L
- B. Edlén, "Atomic Spectra", *Hand. der Phys.*, *Encycl. of Phys.* 27, 198 (1964). I P
- I. S. Bowen, *Astroph. J.* 132, 1 to 17 (1960). [C L]
- K. Bockasten, R. Hallin, K. B. Johansson and P. Tsui, *Phys. Lett.* 8, 181 to 182 (1964). C L
- S. G. Tilford and P. G. Wilkinson, *J. Opt. Soc. Am.* 54, 322 to 325 (1964). C L, E D

OXYGEN

O III - Continued

W. B. Bridges and A. N. Chester, IEEE Trans. Qu. Electronics QE-1, 80 (1965). C L Laser Obs.

T. Sasaki, N. Kaifu, N. Itoh, Kazuo, Sakai and I. Shimada, Science of Light 14, 142 to 144 (1965). G D

W. M. Burton, A. Ridgeley and R. Wilson, UKAEA, CLM-P109, 17 pp. (1966). C L

S. H. Lott, Jr., C. E. Roos and M. L. Ginter, J. Opt. Soc. Am. 56, 775 to 778 (1967). Z E

O IV

C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 21 (1968). C L

W. B. Bridges and A. N. Chester, IEEE Trans. Qu. Electronics QE-1, 80 (1965). C L Laser Obs.

J. Bromander, Uppsala Univ. Inst. Phys., UUIP-540, 27 pp. (1967). I P, T, C L, G D

J. Bromander, B. Johansson and K. Bockasten, J. Opt. Soc. Am. 57, 1158 to 1159 (L) (1967). I P

H. P. Palenius, Ark. Fys. (Stockholm) 34, No. 45, 571 to 572 (1967). W L, C L Vac. Ultraviolet

O V

C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 15 (1968). C L

OXYGEN

O v - Continued

- K. Bockasten, R. Hallin, K. B. Johansson and P. Tsui, Phys. Lett. 8, 181 to 182 (1964). C L
- J. Bromander, B. Johansson and K. Bockasten, J. Opt. Soc. Am. 57, 1158 to 1159 (L) (1967). I P
- W. M. Burton, A. Ridgeley and R. Wilson, Mon. Not. Roy. Astron. Soc. 135, 207 to 233 (1967). C L
- K. Bockasten and K. B. Johansson, Ark. Fys. (Stockholm), in press (1968). I P, T, C L, Calc. W L, G D

O vi

- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 9 (1968). C L
- K. Bockasten, R. Hallin and T. P. Hughes, Proc. Phys. Soc. (London) 81, 522 to 530 (1963). I P, C L
- N. J. Peacock, Proc. Phys. Soc. (London) 84, 803 to 805 (1964). C L

O vii

- C. L. Pekeris, Phys. Rev. 112, 1649 to 1658 (1958). I P Theory
- B. Edlén, Ark. Fys. (Stockholm) 4, No. 28, 441 to 453 (1952). I P, T, C L He I Sequence
- G. A. Sawyer, A. J. Bearden, I. Henins, F. C. Jahoda and F. L. Ribe, Phys. Rev. 131, 1891 to 1897 (1963). C L
- R. L. Blake, T. A. Chubb, H. Friedman and A. E. Unzicker, Science 146, 1037 to 1038 (1964). W L, C L
- N. J. Peacock, Proc. Phys. Soc. (London) 84, 803 to 805 (1964). C L
- B. Edlén and L. Å. Svensson, Ark. Fys. (Stockholm) 28, No. 36, 427 to 446 (1965). W L
- B. C. Fawcett and F. E. Irons, Proc. Phys. Soc. (London) 89, 1063 to 1064 (1966). C L
- B. C. Fawcett, A. H. Gabriel, W. G. Griffin, B. B. Jones and R. Wilson, Nature 200, 1303 to 1304 (L) (1963). C L

OXYGEN

O VIII

- F. L. Ribe, A. J. Bearden, G. A. Sawyer and T. F. Stratton, Bull. Am. Phys. Soc. 6, 310 (A) (1961); unpublished material (1961). W L, C L Obs. X-Ray Region
- F. C. Jahoda, F. L. Ribe, G. A. Sawyer and R.W.P. McWhirter, Proc. Intern. Conf. Ioniz. Phen. in Gases (Paris) 3, 347 to 351 (1963). W L, C L
- G. A. Sawyer, A. J. Bearden, I. Henins, F. C. Jahoda and F. L. Ribe, Phys. Rev. 131, 1891 to 1897 (1963). C L
- R. L. Blake, T. A. Chubb, H. Friedman and A. E. Unzicker, Science 146, 1037 to 1038 (1964). W L, C L
- B. Edlén and L. Å. Svensson, Ark. Fys. (Stockholm) 28, No. 36, 427 to 446 (1965). W L Lyman Series
- J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965). I P, T, C L Theory
- B. Edlén, Ark. Fys. (Stockholm) 31, No. 35, 509 to 510 (1966). W L Lyman Series
- B. C. Fawcett, A. H. Gabriel, W. G. Griffin, B. B. Jones and R. Wilson, Nature 200, 1303 to 1304 (L) (1963). C L

FLUORINE (Z = 9)

F. I

- K. Lidén, Ark. Fys. (Stockholm) 1, No. 9, 229 to 267 (1949). I P, T, C L, hfs
- M. A. Catalán y F. R. Rico, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 54, 5 to 16 (1958). I P
- J. S. M. Harvey, Proc. Roy. Soc. (London) [A] 285, 581 to 596 (1965). hfs
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 200 (1964). I P

FLUORINE

F II

M. A. Catalán y F. R. Rico, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 54, 5 to 16 (1958). I P

I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]

H. Palenius, J. Opt. Soc. Am. 56, 828 (L) (1966); Ark. Fys. (Stockholm), in press (1968). I P, T, C L

F III

M. A. Catalán y F. R. Rico, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 54, 5 to 16 (1958). I P

I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]

H. Palenius, J. Opt. Soc. Am. 56, 828 (L) (1966). C L

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 200 (1964). I P

F IV

I. S. Bowen, Astroph. J. 121, 306 to 311 (1955); 132, 1 to 17 (1960). [C L]

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

F V

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

F VI

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

A. S. Kaufman, T. P. Hughes and R. V. Williams, Proc. Phys. Soc. (London) 76, 17 to 24 (1960). T, C L

FLUORINE

F VII

- K. Bockasten, R. Hallin and T. P. Hughes, Proc. Phys. Soc. (London) 81, 522 to 530 (1963). C L
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

F VIII

- B. Edlén, Ark. Fys. (Stockholm) 4, No. 28, 441 to 453 (1952). I P, T, C L He I Sequence
- C. L. Pekeris, Phys. Rev. 112, 1649 to 1658 (1958). I P Theory

F IX

- B. Edlén and L. Å. Svensson, Ark. Fys. (Stockholm) 28, No. 36, 427 to 446 (1965). W L Lyman Series
- J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965). I P, T, C L Theory
- B. Edlén, Ark. Fys. (Stockholm) 31, No. 35, 509 to 510 (1966). W L Lyman Series

NEON (Z = 10)

Ne I

- K. Burns, K. B. Adams and J. Longwell, J. Opt. Soc. Am. 40, 339 to 344 (1950). T, C L
- C. J. Humphreys and H. J. Kostkowski, J. Res. Nat. Bur. Std. 49, 73 to 84 RP2345 (1952). T, C L Infrared
- J. Blackie and T. A. Littlefield, Proc. Roy. Soc. (London) A229, 468 to 472 (1955). T, W L, C L
- E. K. Plyler, L. R. Blaine and E. D. Tidwell, J. Res. Nat. Bur. Std. 55, 279 to 284, RP 2630 (1955). W L Infrared

NEON

Ne I - Continued

- S. A. Sullivan, Thesis (1955); J. Opt. Soc. Am. 45, 1031 to 1032 (1955).
W L
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 38 (1968). Partial G D
- G. Hepner, Compt. Rend. 248, 1142 to 1145 (1959). C L Infrared
- C. J. Humphreys and E. Paul, Jr., NAVWEPS Report 5996, 23 to 40 (1960).
W L, C L Infrared
- E. Rasmussen and V. Middleboe, Kgl. Danske Videns. Selsk. Mat.-Fys. Medd. 32, No. 14, 15 pp. (1960). hfs
- G. Hepner, Ann. de Phys. [13] 6, 744 to 750 (1961). C L Infrared
- C. J. Humphreys, E. Paul, Jr. and K. B. Adams, NAVWEPS Report 7190, 11 to 28; 7205, 25 to 52 (1961). Partial E D, W L, C L Infrared
- C. J. Humphreys and E. Paul, Jr., NAVWEPS Report 8141, 29 to 46 (1962).
T, C L Infrared
- R. der Agobian, J.-L. Otto, R. Echard and R. Cagnard, Compt. Rend. 257, 3844 to 3847 (1963). C L Infrared
- E. J. Blau, B. F. Hochheimer, J. T. Massey and A. G. Schulz, J. Appl. Phys. 34, 703 (1963). Lasing Energy Levels
- R. P. Madden and K. Codling, Phys. Rev. Lett. 10, 516 to 518 (1963).
Autoionized Series
- P. G. Wilkinson and K. L. Andrew, J. Opt. Soc. Am. 53, 710 to 717 (1963).
W L
- R. der Agobian, R. Cagnard, R. Echard and J.-L. Otto, Compt. Rend. 258, 3661 to 3663; 259, 85 to 88, 323 to 326 (1964); J. Appl. Phys. 35, 2787 (1964); J. de Phys. 25, 887 to 897 (1964). Maser Transitions, C L, Partial G D
- W. L. Faust, R. A. McFarlane, C. K. N. Patel and C. G. B. Garrett, Phys. Rev. 133A, 1476 to 1486 (1964). W L 2 μ to 35 μ , C L, Partial G D
- I. Johansson, Ark. Fys. (Stockholm) 25, No. 27, 381 to 387 (1964). T,
C L Infrared
- J. A. Simpson, S. R. Mielczarek and J. Cooper, J. Opt. Soc. Am. 54, 269 to 270 (L) (1964). T Far Ultraviolet Obs.

NEON

Ne I - Continued

- B. Petersson, Ark. Fys. (Stockholm) 27, No. 23, 317 to 319 (1965). W L
Vac. Ultraviolet
- J. A. Simpson, G. E. Chamberlain and S. R. Mielczarek, Phys. Rev. 139,
1039 to 1041 (1965). Inner Shell Resonances
- W. R. C. Rowley and D. C. Wilson, J. Opt. Soc. Am. 56, 259 (L) (1966).
W L Laser Em.
- J. Séguier, Compt. Rend. 262B, 613 to 615 (1966). C L Infrared
- O. Andrade, M. Gallardo and K. Bockasten, Appl. Phys. Lett. 11, 99 to 100
(1967). C L Laser Obs.
- K. Codling, R. P. Madden and D. L. Ederer, Phys. Rev. 155, 26 to 37
(1967). Series, Photo-Ioniz. Continuum
- H. M. Crosswhite, unpublished material (1967). W L, C L
- K. G. Ericsson and L. R. Lidholt, ~~IEEE~~ J. Qu. Electronics 3, 94 (1967).
C L
- C. J. Humphreys, E. Paul, Jr., R. D. Cowan and K. L. Andrew, J. Opt. Soc.
Am. 57, 855 to 864 (1967). T, C L Infrared
- E. H. Pinnington, J. Opt. Soc. Am. 57, 271 to 272, 963 (L) (1967). Z E
- U. Litzen, Ark. Fys. (Stockholm), in press (1968). T, C L

Ne II

- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams
(1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 37
(1968). C L
- M. A. Catalán y F. R. Rico, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A]
54, 5 to 16 (1958). I P
- K. W. Meissner, R. D. van Veld and P. G. Wilkinson, J. Opt. Soc. Am. 48,
1001 to 1006 (1958). W L, C L Ultraviolet

NEON

Ne II - Continued

- P. G. Wilkinson and K. L. Andrew, J. Opt. Soc. Am. 53, 710 to 717 (1963).
W L Vac. Ultraviolet
- W. B. Bridges and A. N. Chester, IEEE Trans. Qu. Electronics QE-1, 73
(1965). C L Laser Obs.
- K. G. Ericsson and L. R. Lidholt, IEEE J. Qu. Electronics 3, 94 (1967).
C L
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 200
(1964). I P
- W. Persson and L. Minnhagen, Ark. Fys. (Stockholm) 37, No. , 273 to 300
(1968). I P, T, W L, C L, E D Revised Analysis

Ne III

- I. S. Bowen, Astroph. J. 121, 306 to 311 (1955). [C L]
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams
(1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 33
(1968). C L
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198
(1964). I P
- I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]
- W. B. Bridges and A. N. Chester, IEEE Trans. Qu. Electronics QE-1, 73
(1965). C L Laser Obs.
- L. Minnhagen, Spectrum being investigated (1967).
- M. A. Catalán y F. R. Rico, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A]
54, 5 to 16 (1958). I P, T

Ne IV

- I. S. Bowen, Astroph. J. 121, 306 to 311 (1955). [C L]
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams
(1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 29
(1968). C L

NEON

Ne IV - Continued

- I. S. Bowen, *Astroph. J.* 132, 1 to 17 (1960). [C L]
- A. S. Kaufman, T. P. Hughes and R. V. Williams, *Proc. Phys. Soc. (London)* 76, 17 to 24 (1960). T, C L
- F. R. Rico, *An. Real Soc. Esp. Fis. y Quim. (Madrid)* [A] 56, 113 to 120 (1960). I P, T
- K. Bockasten, R. Hallin and T. P. Hughes, *Proc. Phys. Soc. (London)* 81, 522 to 530 (1963). T, C L
- S. Goldsmith and A. S. Kaufman, *Proc. Phys. Soc. (London)* 81, 544 to 552 (1963). T, C L
- W. B. Bridges and A. N. Chester, *IEEE Trans. Qu. Electronics* QE-1, 73 (1965). C L Laser Obs.
- S. G. Tilford and L. E. Giddings, Jr., *Astroph. J.* 141, 1222 to 1225 (1965). T, C L, Partial G D
- B. Edlén, "Atomic Spectra", *Hand. der Phys., Encycl. of Phys.* 27, 198 (1964). I P

Ne v

- I. S. Bowen, *Astroph. J.* 121, 306 to 311 (1955). [C L]
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); *Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS* 23, 25 (1968). C L
- I. S. Bowen, *Astroph. J.* 132, 1 to 17 (1960). [C L]
- A. S. Kaufman, T. P. Hughes and R. V. Williams, *Proc. Phys. Soc. (London)* 76, 17 to 24 (1960). T, C L
- F. R. Rico, *An. Real Soc. Esp. Fis. y Quim. (Madrid)* [A] 56, 113 to 120 (1960). I P, T
- S. Goldsmith and A. S. Kaufman, *Proc. Phys. Soc. (London)* 81, 544 to 552 (1963). T, C L
- B. Edlén, "Atomic Spectra", *Hand. der Phys., Encycl. of Phys.* 27, 198 (1964). I P

NEON

Ne VI

- A. S. Kaufman, T. P. Hughes and R. V. Williams, Proc. Phys. Soc. (London) 76, 17 to 24 (1960). T, C L
- B. C. Fawcett, B. B. Jones and R. Wilson, Proc. Phys. Soc. (London) 78, 1223 to 1226 (1961). C L Ultraviolet
- K. Bockasten, R. Hallin and T. P. Hughes, Proc. Phys. Soc. (London) 81, 522 to 530 (1963). T, C L
- S. Goldsmith and A. S. Kaufman, Proc. Phys. Soc. (London) 81, 544 to 552 (1963). T, C L
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Ne VII

- B. C. Fawcett, B. B. Jones and R. Wilson, Proc. Phys. Soc. (London) 78, 1223 to 1226 (1961). C L Ultraviolet
- K. Bockasten, R. Hallin and T. P. Hughes, Proc. Phys. Soc. (London) 81, 522 to 530 (1963). T, C L
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- B. C. Fawcett, A. H. Gabriel, B. B. Jones, N. J. Peacock, UKAEA, CLM-P40, 11 pp. (1964). W L, C L
- L. L. House and G. A. Sawyer, Astroph. J. 139, 775 to 776 (L) (1964). W L, C L Vac. Ultraviolet

Ne VIII

- B. C. Fawcett, B. B. Jones and R. Wilson, Proc. Phys. Soc. (London) 78, 1223 to 1226 (1961). C L Ultraviolet
- K. Bockasten, R. Hallin and T. P. Hughes, Proc. Phys. Soc. (London) 81, 522 to 530 (1963). C L, W L
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

NEON

Ne VIII - Continued

B. C. Fawcett, A. H. Gabriel, B. B. Jones, N. J. Peacock, UKAEA, CLM-P40, 11 pp. (1964). W L, C L

L. L. House and G. A. Sawyer, Astroph. J. 139, 775 to 776 (L) (1964). W L, C L Vac. Ultraviolet

Ne IX

C. L. Pekeris, Phys. Rev. 112, 1649 to 1658 (1958). I P Theory

F. L. Ribe, A. J. Bearden, G. A. Sawyer and T. F. Stratton, Bull. Am. Phys. Soc. (2) 6, 310 (1961). Limit

B. C. Fawcett, A. H. Gabriel, B. B. Jones, N. J. Peacock, UKAEA, CLM-P40, 11 pp. (1964). W L, C L

B. C. Fawcett, F. E. Irons, Proc. Phys. Soc. (London) 89, 1063 to 1064 (L) (1966). C L

Ne X

F. L. Ribe, A. J. Bearden, G. A. Sawyer and T. F. Stratton, Bull. Am. Phys. Soc. (2) 6, 310 (1961). Limit

B. Edlén and L. Å. Svensson, Ark. Fys. (Stockholm) 28, No. 36, 427 to 446 (1965). W L Lyman Series

J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965). I P, T, C L Theory

B. Edlén, Ark. Fys. (Stockholm) 31, No. 35, 509 to 510 (1966). W L Lyman Series

SODIUM (Z = 11)

Na I

C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 9, 11 (1968). C L

P. Risberg, Ark. Fys. (Stockholm) 10, No. 41, 583 to 606 (1956). I P, T, C L, G D, Revised Analysis

SODIUM

Na I - Continued

- G. Noci, M. Rigutti, Mem. Soc. Astron. Ital. 28, 3 to 18 (1957). Partition Functions
- M. Ardite and T. R. Carver, Phys. Rev. 109, 1012 to 1013 (L) (1958). hfs
- W. E. Bell and A. L. Bloom, Phys. Rev. 109, 219 to 220 (L) (1958). hfs
- J. N. Dodd and R. W. N. Kinnear, Proc. Phys. Soc. (London) 75, 51 to 60 (1960). hfs
- G. Noci, Mem. Soc. Astron. Ital. 31, 1 to 9 (1960). Partition Functions
- D. Conrad, Zeit. Phys. 162, 160 to 168 (1961). hfs
- V. Draganescu, Opt. i Spektr. 10, 301 to 307 (1961). hfs
- I. Johansson, Ark. Fys. (Stockholm) 20, No. 7, 135 to 146 (1961). C L
1.2 μ to 2.3 μ
- L. I. Grechikhin and E. S. Tyunina, Teplofiz. Vysokikh. Temp. 1, 399 to 403 (1963). [Na I] Series
- B. V. Markova and M. P. Chaika, Opt. i Spektr. 17, 319 to 326 (1964). Z E
- H. Ackermann, Zeit. Phys. 194, 253 to 269 (1966). hfs
- M. Baumann, W. Hartmann, H. Krüger and A. Oed, Zeit. Phys. 194, 270 to 279 (1966). hfs

Na II

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- P.-C. Tsui, S.-C. Ma and C. M. Wu, Chinese J. Phys. (Taipei) 3, 127 to 129 (1965). T, C L
- K. Bockasten and P.-C. Tsui, unpublished material (1967). W L

SODIUM

Na III

- M. A. Catalán y F. R. Rico, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 54, 5 to 16 (1958). I P, T
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- L. Minnhagen, unpublished material (1967). W L

Na IV

- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 33 (1968). C L
- I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]
- F. R. Rico, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 56, 113 to 120 (1960). I P, T
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Physics 27, 172, 198 (1964). $x = -288 \text{ cm}^{-1}$ Singlets, I P

Na V

- I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]
- F. R. Rico, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 56, 113 to 120 (1960). I P, T
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Physics 27, 172, 198 (1964). $x = +767 \text{ cm}^{-1}$ Doublets, I P

Na VI

- I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Physics 27, 172, 198 (1964). $x = +120 \text{ cm}^{-1}$ Singlets, I P

SODIUM

Na VII

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Na VIII

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Na IX

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Na X

- F. L. Ribe, A. J. Bearden, G. A. Sawyer and T. F. Stratton, Bull. Am. Phys. Soc. (2) 6, 310 (1961). Limit
- F. C. Jahoda, F. L. Ribe, G. A. Sawyer and T. F. Stratton, Proc. Intern. Conf. Ioniz. Phen. in Gases (Münich) 2, 1987 to 1999 (1962). C L

Na XI

- B. Edlén and L. Å. Svensson, Ark. Fys. (Stockholm) 28, No. 36, 427 to 446 (1965). W L Lyman Series
- J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965). I P, T, C L Theory
- B. Edlén, Ark. Fys. (Stockholm) 31, No. 35, 509 to 510 (1966). W L Lyman Series

MAGNESIUM (Z = 12)

Mg I

- R. A. Fisher and F. E. Eshbach, J. Opt. Soc. Am. 43, 1030 to 1032 (1953). T, C L Infrared
- K. Murakawa, J. Phys. Soc. Japan 8, 213 to 214 (1953). hfs

MAGNESIUM

Mg I - Continued

- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 16, 17, 19 (1968). Partial G D, C L
- F. M. Kelly, Can. J. Phys. 35, 1220 to 1222 (1957). I S
- W. Böttcher, Zeit. Phys. 150, 336 to 345 (1958). Series Continuum
- I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]
- K. Codling, Proc. Phys. Soc. (London) 77, 797 to 800 (1961). I P, Series Ultraviolet
- A. Lurio, Phys. Rev. 126, 1768 to 1773 (1962). hfs
- L. Goldberg, Harvard Coll. Obs. Sci. Report No. 4, 22 pp. (1965). Autoionization
- N. H. Möller, Ark. Fys. (Stockholm) 29, No. 28, 353 to 358 (1965). [Mg I]
- G. Risberg, Ark. Fys. (Stockholm) 28, No. 32, 381 to 395 (1965). I P, T, C L Revised Analysis
- S. H. Lott, Jr., C. E. Roos and M. L. Ginter, J. Opt. Soc. Am. 56, 775 to 778 (1966). Z E
- J. W. Swensson and G. Risberg, Ark. Fys. (Stockholm) 31, No. 16, 237 to 254 (1966). C L, Solar Ident.

Mg II

- P. Risberg, Ark. Fys. (Stockholm) 9, No. 31, 483 to 494 (1955). I P, T, C L, G D Revised Analysis
- K. Bockasten, Phys. Rev. 102, 729 to 730 (1956). Series, Polariz. Formula
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 10 11 (1968). Partial G D, C L
- S. H. Lott, Jr., C. E. Roos and M. L. Ginter, J. Opt. Soc. Am. 56, 775 to 778 (1966). Z E

MAGNESIUM

Mg III

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

L. Minnhagen, Revised Analysis in Progress at Lund (1967).

Mg IV

F. R. Rico, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 56, 113 to 120 (1960). I P, T

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

L. Minnhagen, Revised Analysis in Progress at Lund (1967).

Mg V

G. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 33 (1968). C L

I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 172 (1964). $x = -458 \text{ cm}^{-1}$ Singlets

Mg VI

I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 172, 198 (1964). $x = +1095 \text{ cm}^{-1}$ Doublets, I P

J. Gauzit, Compt. Rend. 262, 523 to 524 (1966). [Mg VI]

Mg VII

I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 172, 198 (1964). $x = -538 \text{ cm}^{-1}$ Singlets, I P

MAGNESIUM

Mg VIII

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Mg IX

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Mg x

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Mg XI

B. Edlén, Ark. Fys. (Stockholm) 4, No. 28, 441 to 453 (1952). I P, T, C L He I Sequence

F. L. Ribe, A. J. Bearden, G. A. Sawyer and T. F. Stratton, Bull. Am. Phys. Soc. (2) 6, 310 (1961). Limit

F. C. Jahoda, F. L. Ribe, G. A. Sawyer and T. F. Stratton, Proc. Intern. Conf. Ioniz. Phen. in Gases (Münich) 2, 1987 to 1999 (1962). C L

Mg XII

B. Edlén and L. Å. Svensson, Ark. Fys. (Stockholm) 28, No. 36, 427 to 446 (1965). W L Lyman Series

J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965). I P, T, C L Theory

B. Edlén, Ark. Fys. (Stockholm) 31, No. 35, 509 to 510 (1966). W L Lyman Series

ALUMINUM (Z = 13)

Al I

W. R. S. Garton, Nature 165, 322 (1950). T, C L

S. Weniger and R. Herman, Compt. Rend. 232, 2300 to 2302 (1951). Series, [C L]

ALUMINUM

Al I - Continued

- H. Lew and G. Wessel, Phys. Rev. 90, 1 to 3 (1953). hfs
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 23 (1968). C L
- M. Shimauchi, Science of Light (Tokyo) 7, 101 to 111 (1958). Series Infrared
- W. R. S. Garton and K. Codling, unpublished material (October 1961). Series Ultraviolet
- K. B. S. Eriksson and H. B. S. Isberg, Ark. Fys. (Stockholm) 23, No. 47, 527 to 542 (1963). I P, T, C L, G D, hfs
- A. A. Nikitin, Astron. Zhur. 40, 1025 to 1035 (1963). Al I Sequence
- M. Shimauchi, Science of Light (Tokyo) 12, 31 to 34 (1963). Series
- A. A. Nikitin and O. A. Iakubovskii, Doklady Akad. Nauk SSSR 156, 760 to 762 (1964). C L [Al I] Sequence
- N. P. Penkin and L. N. Shabanova, Opt. i Spektr. 18, 749 to 755 (1965). Series
- S. Weniger, Ann. d'Astroph. Suppl. 28, 117 to 120 (1965). C L, [Al I]
- T. Yamashita, Science of Light (Tokyo) 14, 28 to 35 (1965). Series
- B. Budick, Colloq. Intern. Centre Nat. Rech. Sci. No. 164, 185 to 194 (1966). hfs
- K. B. S. Eriksson and H. B. S. Isberg, Ark. Fys. 33, No. 39, 593 to 595 (1967). Series

Al II

- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 17 (1968). C L
- S. Weniger, Ann. d'Astroph. Suppl. 28, 117 to 120 (1965). C L
- V. Kaufman, unpublished material (1968). T, C L, W L Vac. Ultraviolet

ALUMINUM

Al III

- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 11 (1968). C L
- B. Isberg, Ark. Fys. (Stockholm), 35, No. 45, 551 to 562 (1968). I P, T, C L, W L, G D

Al v

- F. R. Rico, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 56, 113 to 120 (1960). I P, T
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Al VI

- I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 172 (1964). $x = -460 \text{ cm}^{-1}$ Singlets

Al VII

- I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 172, 198 (1964). $x = +1380 \text{ cm}^{-1}$ Doublets, I P

Al VIII

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198, (1964). I P

Al IX

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

ALUMINUM

Al x

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Al xI

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Al xII

B. Edlén, Ark. Fys. (Stockholm) 4, No. 28, 441 to 453 (1952). I P, T, C L He I Sequence

F. C. Jahoda, F. L. Ribe, G. A. Sawyer and T. F. Stratton, Proc. Intern. Conf. Ioniz. Phen. in Gases (Münich) 2, 1987 to 1999 (1962). C L

Al xIII

B. Edlén and L. Å. Svensson, Ark. Fys. (Stockholm) 28, No. 36, 427 to 446 (1965). W L Lyman Series

J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965). I P, T, C L Theory

B. Edlén, Ark. Fys. (Stockholm) 31, No. 35, 509 to 510 (1966). W L Lyman Series

SILICON (Z = 14)

Si I

P. G. Wilkinson, J. Opt. Soc. Am. 45, 862 to 867 (1955). W L Vac. Ultraviolet

M. A. El'iashevich and O. N. Nikitina, Soviet Phys. Doklady 1, 649 to 651 (1956). T, C L

SILICON

Si - Continued

- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 26, 27 (1968). Partial G D, C L
- L. Herzberg, Can. J. Phys. 35, 766 to 776 (1957). Solar W L Infrared
- C. C. Kiess, unpublished material (July, 1957). T, C L
- A. G. Shenstone, private communication (October, 1957). T
- I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]
- A. G. Shenstone, unpublished material (June, 1960). T, C L
- J. R. Holmes and M. E. Hoover, J. Opt. Soc. Am. 52, 247 to 250 (1962). I S
- M. Wilson, Thesis, unpublished (November, 1964). T, C L
- U. Litzen, Ark. Fys. (Stockholm) 28, No. 20, 239 to 248 (1965). T, C L Infrared
- H. Niewodniczanski and H. Pietruszka, Acta Physica Polon. 27, 807 to 813 (1965). [C L]
- L. J. Radziemski, Jr. and K. L. Andrew, J. Opt. Soc. Am. 55, 474 to 491 (1965). I P, T, C L
- V. Kaufman, L. J. Radziemski, Jr. and K. L. Andrew, J. Opt. Soc. Am. 56, 911 to 915 (1966). T, C L Vac. Ultraviolet
- U. Litzen, Ark. Fys. (Stockholm) 31, No. 30, 453 to 459 (1966). T, C L
- S. H. Lott, Jr., C. E. Roos and M. L. Ginter, J. Opt. Soc. Am. 56, 775 to 778 (1966). Z E
- L. J. Radziemski, Jr., K. L. Andrew, V. Kaufman and U. Litzen, J. Opt. Soc. Am. 57, 336 to 340 (1967). T, C L, W L Vac. Ultraviolet
- D. L. Lambert and B. Warner, Mon. Not. Roy. Astron. Soc. 138, 213 to 227 (1968). C L

SILICON

Si II

- P. G. Wilkinson, J. Opt. Soc. Am. 45, 862 to 867 (1955). W L Vac. Ultraviolet
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 22, 23 (1968). Partial G D, C L
- A. G. Shenstone, Proc. Roy. Soc. (London) A261, 153 to 174 (1961). I P, T, C L
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 200 (1964). I P
- V. Kaufman and J. F. Ward, J. Opt. Soc. Am. 56, 1591 to 1597 (1966). W L, C L Vac. Ultraviolet

Si III

- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 17 (1968). C L
- Y. G. Toresson, Ark. Fys. (Stockholm) 18, No. 28, 389 to 416 (1960). I P, T, C L, G D
- S. H. Lott, Jr., C. E. Roos and M. L. Ginter, J. Opt. Soc. Am. 56, 775 to 778 (1966). Z E

Si IV

- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 11 (1968). C L
- Y. G. Toresson, Ark. Fys. (Stockholm) 17, No. 12, 179 to 192 (1960). I P, T, C L, G D
- W. B. Bridges and A. N. Chester, ~~IEEE~~ Trans. Qu. Electronics QE-1, 82 (1965). C L Laser Obs.
- S. H. Lott, Jr., C. E. Roos and M. L. Ginter, J. Opt. Soc. Am. 56, 775 to 778 (1966). Z E

SILICON

Si VI

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Si VII

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 172, 198 (1964). $x = -450 \text{ cm}^{-1}$ Singlets, I P

Si VIII

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Si IX

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

W. van Rensbergen, Bull. Astr. Inst. Netherlands 19, 6 to 10 (1967).
Autoionization

Si X

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Si XI

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Si XII

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

SILICON

Si XIII

F. C. Jahoda, F. L. Ribe, G. A. Sawyer and T. F. Stratton, Proc. Intern. Conf. Ioniz. Phen. in Gases (Münich) 2, 1987 to 1999 (1962). C L

Si XIV

B. Edlén and L. Å. Svensson, Ark. Fys. (Stockholm) 28, No. 36, 427 to 446 (1965). W L Lyman Series

J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965). I P, T, C L Theory

B. Edlén, Ark. Fys. (Stockholm) 31, No. 35, 509 to 510 (1966). W L Lyman Series

PHOSPHORUS (Z = 15)

P I

W. Finkelburg and F. Stern, Phys. Rev. 77, 303 (1950). I P

S. Mrozowski, Phys. Rev. 93, 933(A) (1954). [C L]

C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 31 (1968). C L

W. C. Martin, J. Opt. Soc. Am. 49, 1070 to 1085 (1959). I P, T, C L, W L

I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 200 (1964). I P

J. M. Pendlebury and K. F. Smith, Proc. Phys. Soc. (London) 84, 849 to 856 (1964). hfs

P II

C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 27 (1968). C L

PHOSPHORUS

P II - Continued

- W. C. Martin, J. Opt. Soc. Am. 49, 1071 to 1085 (1959). I P, T, C L, W L
- I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 200 (1964). I P

P III

- W. C. Martin, unpublished material (1957). T, C L, W L
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 200 (1964). I P

P IV

- W. C. Martin, unpublished material (1957). T, C L, W L

P V

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 196, 198 (1964). I P

P VI

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

P VII

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

PHOSPHORUS

P VIII

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

P IX

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

P X

A. M. Naqvi, Proc. Natl. Inst. Sci. India 19, 461 to 463 (1953). T

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

P XI

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

P XII

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

P XIII

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

P XV

J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965).
I P, T, C L Theory

SULFUR (Z = 16)

S I

- I. S. Bowen, *Astroph. J.* 121, 306 to 311 (1955). [C L]
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); *Natl. Std. Ref. Data Series*, Natl. Bur. Std. NSRDS-NBS 23, 34 35 (1968). Partial G D, C L
- I. S. Bowen, *Astroph. J.* 132, 1 to 17 (1960). [C L]
- Y. G. Toresson, *Ark. Fys. (Stockholm)* 18, No. 29, 417 to 420 (1960). T, C L Vac. Ultraviolet
- J. W. McConkey, D. J. Burns and L. Hilton, *Nature* 204, 1180 (1964). [C L]
- Y. G. Toresson, unpublished material (1964). C L, W L
- L. R. Jakobssen, *Ark. Fys. (Stockholm)* 34, No. 2, 19 to 31 (1967). T, C L Infrared, Partial G D
- V. Kaufman, unpublished material (1968). T, C L, W L Vac. Ultraviolet
- J. W. McConkey, D. J. Burns, K. A. Moran, J. A. Kernahan, *Nature* 217, No. 5128, 538 to 539 (1968). [S I], T

S II

- I. S. Bowen, *Astroph. J.* 121, 306 to 311 (1955); 132, 1 to 17 (1960). [C L]
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); *Natl. Std. Ref. Data Series*, Natl. Bur. Std. NSRDS-NBS 23, 30, 31 (1968). Partial G D, C L
- M. A. Catalán y F. R. Rico, *An. Real Soc. Esp. Fis. y Quim. (Madrid)* [A] 54, 289 to 300 (1958). I P, T
- B. Edlén, "Atomic Spectra", *Hand. der Phys., Encycl. of Phys.* 27, 200 (1964). I P
- Y. G. Toresson, unpublished material (1967). Observations

S III

- I. S. Bowen, *Astroph. J.* 121, 306 to 311 (1955); 132, 1 to 17 (1960). [C L]
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); *Natl. Std. Ref. Data Series*, Natl. Bur. Std. NSRDS-NBS 23, 27 (1968). C L

SULFUR

S III - Continued

M. A. Catalán y F. R. Rico, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 54, 289 to 300 (1958). T, C L

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 200 (1964). I P

Y. G. Toresson, unpublished material (1967). Observations

S IV

Y. G. Toresson, unpublished material (1967). Observations

S V

Y. G. Toresson, unpublished material (1967). Observations

S VI

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 196 (1964). I P

S VII

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

S VIII

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

S IX

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

W. A. Deutschman and L. L. House, Astroph. J. 144, 435 to 437 (1966). C L

E. Ya. Kononov, Opt. i Spektr. 20, 537 to 539 (1966). T, C L

SULFUR

S x

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- W. A. Deutschman and L. L. House, Astroph. J. 144, 435 to 437 (1966). C L
- E. Ya. Kononov, Opt. i Spektr. 20, 537 to 539 (1966). T, C L
- W. A. Deutschman and L. L. House, Astroph. J. 149, 451 to 452 (1967). C L
- B. C. Fawcett, D. D. Burgess and N. J. Peacock, Proc. Phys. Soc. (London) 91, 970 to 972 (1967). C L

S xi

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- A. E. Goertz, J. Opt. Soc. Am. 55, 742 to 743 (L) (1965). T Pred.
- W. A. Deutschman and L. L. House, Astroph. J. 149, 451 to 452 (1967). C L

S xii

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- B. C. Fawcett, D. D. Burgess and N. J. Peacock, Proc. Phys. Soc. (London) 91, 970 to 972 (1967). C L

S xiii

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- M. H. L. Pryce, Astroph. J. 140, 1192 to 1205 (1964). [S xiii]
- B. C. Fawcett, D. D. Burgess and N. J. Peacock, Proc. Phys. Soc. (London) 91, 970 to 972 (1967). C L

S xiv

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

SULFUR

S XIV - Continued

B. C. Fawcett, D. D. Burgess and N. J. Peacock, Proc. Phys. Soc. (London) 91, 970 to 972 (1967). C L

S XVI

J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965).
I P, T, C L Theory

CHLORINE (Z = 17)

Cl I

S. Avellén, Ark. Fys. (Stockholm) 8, No. 20, 211 to 212 (1954). I P, T,
C L Vac. Ultraviolet

M. A. Catalán y F. R. Rico, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 54, 289 to 300 (1958). I P, T

C. J. Humphreys and E. Paul, Jr., NAVORD Report 5920, 43 to 60 (1958);
J. Opt. Soc. Am. 49, 1180 to 1186 (1959). T, C L, E D, W L Infrared

L. Minnhagen, J. Opt. Soc. Am. 51, 298 to 302 (1961). I P, T, C L

G. J. Wolga, Phys. Rev. 127, 805 to 812 (1962). hfs

C. J. Humphreys and E. Paul, Jr., NAVWEPS Report 8812, 13 to 20 (1965).
T, C L Infrared

S. Avellén, unpublished material (1967). C L

L. J. Radziemski, Jr. and V. Kaufman, unpublished material (1968). T,
C L, W L

Cl II

C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams
(1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 35
(1968). C L

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 200
(1964). I P

I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]

CHLORINE

Cl II - Continued

- R. A. McFarlane, Appl. Opt. 3, 1196 (1964). C L Maser Obs.
- W. B. Bridges and A. N. Chester, IEEE Trans. Qu. Electronics, QE-1, 69 to 79 (1965). C L Laser Obs.
- V. Kaufman, unpublished material (1968). C L, W L Vac. Ultraviolet

Cl III

- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 31 (1968). C L
- M. A. Catalán y F. R. Rico, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 54, 289 to 300 (1958). I P, T
- I. S. Bowen, Astroph. J. 121, 306 to 311 (1955); 132, 1 to 17 (1960).[C L]
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 200 (1964). I P

Cl IV

- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 27 (1968). C L
- I. S. Bowen, Astroph. J. 121, 306 to 311 (1955); 132, 1 to 17 (1960). [C L]

Cl VII

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 196 (1964). I P
- W. A. Deutschman and L. L. House, Astroph. J. 144, 435 to 437 (1966). C L

CHLORINE

Cl VIII

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Cl IX

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

W. A. Deutschman and L. L. House, Astroph. J. 144, 435 to 437 (1966). C L

Cl x

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). C L

W. A. Deutschman and L. L. House, Astroph. J. 144, 435 to 437 (1966). C L

Cl XI

W. Finkelburg and W. Hmbach, Naturwiss. 42, 35 (1955). I P

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

W. A. Deutschman and L. L. House, Astroph. J. 144, 435 to 437 (1966); 149, 451 to 452 (1967). C L

Cl XII

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

CHLORINE

Cl XII - Continued

- A. E. Goertz, J. Opt. Soc. Am. 55, 742 to 743 (1965). T Pred.
- W. A. Deutschman and L. L. House, Astroph. J. 149, 451 to 452 (1967). C L
- B. C. Fawcett, D. D. Burgess and N. J. Peacock, Proc. Phys. Soc. (London) 91, 970 to 972 (1967). C L

Cl XIII

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- B. C. Fawcett, D. D. Burgess and N. J. Peacock, Proc. Phys. Soc. (London) 91, 970 to 972 (1967). C L

Cl XIV

- M. H. L. Pryce, Astroph. J. 140, 1192 to 1205 (1964). [Cl XIV]
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- B. C. Fawcett, D. D. Burgess and N. J. Peacock, Proc. Phys. Soc. (London) 91, 970 to 972 (1967). C L

Cl xv

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- B. C. Fawcett, D. D. Burgess and N. J. Peacock, Proc. Phys. Soc. (London) 91, 970 to 972 (1967). C L

CHLORINE

Cl xvii

J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965).
I P, T, C L Theory

ARGON (Z = 18)

Ar i

L. Minnhagen, Ark. Fys. (Stockholm) 1, No. 20, 425 to 457 (1949).
Stark Effect

W. R. Sittner and E. R. Peck, J. Opt. Soc. Am. 39, 474 to 477 (1949).
C L 1.2 μ to 2.2 μ

C. J. Humphreys and H. J. Kostkowski, J. Res. Nat. Bur. Std. 49, RP 2345,
73 to 84 (1952). C L Infrared

K. Burns and K. B. Adams, J. Opt. Soc. Am. 43, 1020 to 1024 (1953). T,
C L, W L

T. A. Littlefield and D. T. Turnbull, Proc. Roy. Soc. (London) [A] 218,
577 to 586 (1953). T, C L, W L

G. H. Dieke and H. M. Crosswhite, Ordnance Project No. TB2-0001 (488),
38 pp. (1954). C L

E. K. Plyler, L. R. Blaine and E. D. Tidwell, J. Res. Nat. Bur. Std. 55,
RP 2630, 279 to 284 (1955). W L Infrared

C. J. Humphreys and E. Paul, Jr., NAVORD Report 4589, 34 to 45 (1956);
4634, 29 to 36 (1957); 4636, 25 to 32 (1958); 5920, 57 to 59 (1958);
5933, 38 to 45 (1958); 5945, 47 to 49 (1958); 5963, 43 to 54 (1959);
NAVWEPS Report 5996, 32 to 37 (1960); 7219, 11 to 18 (1962); 8141, 29
to 46 (1962); 8213, 22 to 28 (1964). T, C L, W L Infrared Partial G D

C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams
(1956); Natl. Std. Ref. Data Series, Nat. Bur. Std. NSRDS-NBS 23, 39
(1968). Partial G D

G. Hepner, Compt. Rend. 248, 1142 to 1145 (1959). C L 2 μ to 2.5 μ

ARGON

Ar I - Continued

- E. Paul, Jr. and C. J. Humphreys, J. Opt. Soc. Am. 49, 1186 to 1187 (1959). C L Infrared
- F. J. Comes and W. Lessman, Zeit. Naturforsch. 16A, 1396 to 1397 (1961). Autoionization
- G. Hepner, Ann. de Phys. [13] 6, 744 to 750 (1961). C L 1μ to 3μ
- C. J. Humphreys, E. Paul, Jr. and K. B. Adams, NAVWEPS Report 7205, 33 to 38 (1961). C L, W L Infrared, Partial G D
- E. R. Peck, B. N. Khanna and N. C. Anderholm, J. Opt. Soc. Am. 52, 536 to 538 (1962). W L Infrared
- T. A. Littlefield and W. R. C. Rowley, Proc. Roy. Soc. (London) [A] 276, 502 to 512 (1963). T, C L, W L Infrared
- R. P. Madden and K. Codling, Phys. Rev. Lett. 10, 516 to 518 (1963). Autoionization Series
- J. A. R. Samson, Phys. Rev. 132, 2122 to 2124 (1963). Autoionization
- R. der Agobian, J. L. Otto, R. Cagnard and R. Echard, J. de Phys. 25, 887 to 897 (1964). C L Infrared
- W. L. Faust, R. A. McFarlane, C. K. N. Patel and C. G. B. Garrett, Phys. Rev. 133, 1476 to 1486 (1964). W L 2μ to 26μ , C L
- T. Sasaki, N. Kaifu, N. Ito, K. Shimada and I. Sakai, Science of Light 13, 115 to 117 (1964). G D
- J. A. Simpson, S. R. Mielczarek and J. Cooper, J. Opt. Soc. Am. 54, 269 to 270(1) (1964). [Ar I] 60eV \pm
- S. P. Stewart, E. R. Huppi, A. T. Stair, Jr. and G. A. Vanasse, Japan J. Appl. Phys. Suppl. 4, 433 to 439 (1964). Obs. 2μ to 6μ
- S. Liberman, Compt. Rend. 261, 2601 to 2604 (1965). Laser Obs. 2μ to 9μ
- B. Petersson, Ark. Fys. (Stockholm) 27, No. 23, 317 to 319 (1965). W L Vac. Ultraviolet
- J. Séguier, Compt. Rend. 261, 2069 to 2070 (1965). C L Infrared
- J. A. Simpson, G. E. Chamberlain and S. R. Mielczarek, Phys. Rev. 139, 1039 to 1041 (1965). [Ar I] 25eV to 28eV

ARGON

Ar I - Continued

- K. Bockasten, T. Lundholm and O. Andrade, Phys. Lett. 22, 145 to 146 (1966). C L Infrared Laser Obs.
- O. Andrade, M. Gallardo and K. Bockasten, Appl. Phys. Lett. 11, 99 to 100 (1967). C L Laser Obs.
- K. Bockasten and O. Andrade, Nature 215, 382 (1967). C L Laser Obs.
- K. G. Ericsson and L. R. Lidholt, IEEE J. Qu. Electronics 3, 94 (1967).
C L
- C. J. Humphreys, E. Paul, Jr., R. D. Cowan and K. L. Andrew, J. Opt. Soc. Am. 57, 855 to 864 (1967). T, C L 4~~u~~ Region
- G. Norlén, Ark. Fys. (Stockholm) 35, No. 8, 119 to 128 (1967). W L, C L,
T

Ar II

- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 36, 37 (1968). Partial G D, C L
- L. Minnhagen and L. Stigmark, Ark. Fys. (Stockholm) 13, No. 2, 27 to 36 (1957). Excitation
- G. Herzberg, Proc. Roy. Soc. (London) A248, 309 to 332 (1958). C L, W L, Partial G D
- L. Maissel, J. Opt. Soc. Am. 48, 853 to 856 (1958). C L, Stark Effect
- L. Minnhagen, Ark. Fys. (Stockholm) 14, No. 9, 123 to 125 (1958). T, C L, Partial G D
- L. Minnhagen, Ark. Fys. (Stockholm) 14, No. 31, 483 to 495 (1958). T,
C L Vac. Ultraviolet
- D. F. Heath, Los Alamos Sci. Lab. LA-2335, 35 (1960). W L
- L. Minnhagen, Ark. Fys. (Stockholm) 18, No. 8, 97 to 134 (1960). I P, T,
C L, G D nf and ng Levels

ARGON

Ar II - Continued

- N. H. Möller, Ark. Fys. (Stockholm) 18, No. 9, 135 to 157 (1960). Theory
- E. H. Pinnington, Proc. Phys. Soc. (London) 80, 608 to 615 (1962). Z E
- B. Kjöllnerström, Ark. Fys. (Stockholm) 23, No. 34, 375 to 384 (1963). Theory
- L. Minnhagen, Ark. Fys. (Stockholm) 25, No. 19, 203 to 284 (1963). I P, T, C L, E D
- G. Convert, M. Armand, P. Martinot-Lagarde, Compt. Rend. 258, 4467 to 4469 (1964). Laser Obs., Partial G D
- L. Minnhagen, Ark. Fys. (Stockholm) 26, No. 18, 270 to 271(A) (1964). Config. Interaction
- T. Sasaki, N. Kaifu, N. Ito, K. Shimada and I. Sakai, Science of Light 13, 115 to 117 (1964). G D
- W. B. Bridges and A. N. Chester, ~~IEEE~~ Trans. Qu. Electronics QE-1, 74 to 75 (1965). C L Laser Obs.
- B. Kjöllnerström, N. H. Möller and H. Svensson, Ark. Fys. (Stockholm) 29, No. 12, 167 to 173 (1965). Theory Config. Interaction
- K. G. Ericsson and L. R. Lidholt, IEEE J. Qu. Electronics 3, 94 (1967). C L
- G. Norlén, Ark. Fys. (Stockholm) 35, No. 8, 119 to 128 (1967). W L, C L

Ar III

- I. S. Bowen, Astroph. J. 121, 306 to 311 (1955). [C L]
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 35 (1968). C L
- L. Minnhagen and L. Stigmark, Ark. Fys. (Stockholm) 13, No. 2, 27 to 36 (1957). Excitation
- M. A. Catalán y F. R. Rico, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 54, 289 to 300 (1958). I P, T

ARGON

Ar III - Continued

- I. S. Bowen, *Astroph. J.* 132, 1 to 17 (1960). [C L]
- R. A. McFarlane, *Appl. Opt.* 3, 1196 (1964). Maser Obs.
- T. Sasaki, N. Kaifu, N. Ito, K. Shimada and I. Sakai, *Science of Light* 13, 115 to 117 (1964). G D
- W. B. Bridges and A. N. Chester, *IEEE Trans. Qu. Electronics* QE-1, 74 to 75 (1965). C L Laser Obs.
- K. G. Ericsson and L. R. Lidholt, *IEEE J. Qu. Electronics* 3, 94 (1967). C L
- L. Minnhagen, spectrum being investigated (1967).
- B. C. Fawcett, N. J. Peacock and R. D. Cowan, UKAEA, CLM-P155, 23 pp. (1968). C L
- B. Edlén, "Atomic Spectra", *Hand. der Phys., Encycl. of Phys.* 27, 200 (1964). I P

Ar IV

- I. S. Bowen, *Astroph. J.* 121, 306 to 311 (1955). [C L]
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); *Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS* 23, 31 (1968). C L
- L. Minnhagen and L. Stigmark, *Ark. Fys. (Stockholm)* 13, No. 2, 27 to 36 (1957). Excitation
- I. S. Bowen, *Astroph. J.* 132, 1 to 17 (1960). [C L]
- W. B. Bridges and A. N. Chester, *IEEE Trans. Qu. Electronics* QE-1, 74 to 75 (1965). C L Laser Obs.
- B. C. Fawcett, A. H. Gabriel and P. A. H. Saunders, *Proc. Phys. Soc. (London)* 90, 863 to 867 (1967). C L
- L. Minnhagen, spectrum being investigated (1967).
- B. C. Fawcett, N. J. Peacock and R. D. Cowan, UKAEA, CLM-P155, 23 pp. (1968). C L

ARGON

Ar v

I. S. Bowen, *Astroph. J.* 121, 306 to 311 (1955). [C L]

C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 27 (1968). C L

I. S. Bowen, *Astroph. J.* 132, 1 to 17 (1960). [C L]

B. C. Fawcett, A. H. Gabriel and P. A. H. Saunders, *Proc. Phys. Soc. (London)* 90, 863 to 867 (1967). C L

Ar vi

B. C. Fawcett, B. B. Jones and R. Wilson, *Proc. Phys. Soc. (London)* 78, 1223 to 1226 (1961). C L

Ar vii

B. C. Fawcett, B. C. Jones and R. Wilson, *Proc. Phys. Soc. (London)* 78, 1223 to 1226 (1961). W L

Ar viii

B. C. Fawcett, B. C. Jones and R. Wilson, *Proc. Phys. Soc. (London)* 78, 1223 to 1226 (1961). C L

Ar ix

W. Finkelburg und W. Humbach, *Naturwiss.* 42, 35 (1955). I P

B. C. Fawcett, A. H. Gabriel, W. G. Griffin, B. B. Jones and R. Wilson, *Nature* 200, 1303 to 1304 (1963). C L

ARGON

Ar IX - Continued

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- B. C. Fawcett, A. H. Gabriel, B. B. Jones and N. J. Peacock, UKAEA, CLM-P40, 11 pp. (1964). W L, C L
- B. C. Fawcett, Proc. Phys. Soc. (London) 86, 1087 to 1089 (1965). C L

Ar x

- B. C. Fawcett, A. H. Gabriel, W. G. Griffin, B. B. Jones and R. Wilson, Nature 200, 1303 to 1304 (1963). C L
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- B. C. Fawcett, A. H. Gabriel, B. B. Jones and N. J. Peacock, UKAEA, CLM-P40, 11 pp. (1964). W L, C L
- B. C. Fawcett, Proc. Phys. Soc. (London) 86, 1087 to 1089 (1965). C L
- W. A. Deutschman and L. L. House, Astroph. J. 144, 435 to 437 (1966). C L

Ar XI

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- B. C. Fawcett, A. H. Gabriel, B. B. Jones and N. J. Peacock, UKAEA, CLM-P40, 11 pp. (1964). W L, C L
- B. C. Fawcett and A. H. Gabriel, Proc. Phys. Soc. (London) 84, 1038 to 1040 (1964). C L
- A. E. Goertz, J. Opt. Soc. Am. 55, 742 to 743 (1965). T Pred.
- W. A. Deutschman and L. L. House, Astroph. J. 144, 435 to 437 (1966). C L

ARGON

Ar XII

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- B. C. Fawcett and A. H. Gabriel, Proc. Phys. Soc. (London) 84, 1038 to 1040 (1964). C L
- B. C. Fawcett, A. H. Gabriel, B. B. Jones and N. J. Peacock, UKAEA, CLM-P40, 11 pp. (1964). W L, C L
- W. A. Deutschman and L. L. House, Astroph. J. 144, 435 to 437 (1966); 149, 451 to 452 (1967). C L

Ar XIII

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- W. A. Deutschman and L. L. House, Astroph. J. 149, 451 to 452 (1967). C L

Ar XIV

- B. Edlén, Mon. Not. Roy. Astron. Soc. 114, 700 to 703 (1954). [Ar XIV]
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Ar XV

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- M. H. L. Pryce, Astroph. J. 140, 1192 to 1205 (1964). [Ar XV]

Ar XVIII

- J. D. Garcia and J. E. Mack, J. Opt. Soc. Am. 55, 654 to 685 (1965). I P, T, C L Theory

POTASSIUM (Z = 19)

K I

- D. Harting and P. F. A. Klinkenberg, *Physica* 14, 669 to 683 (1949). Z E
- H. R. Kratz, *Phys. Rev.* 75, 1844 to 1850 (1949). I P, T, C L, hfs
- J. Tomiser, *Naturwiss.* 41, 34 (1954). Z E
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956), *Natl. Std. Ref. Data Series*, *Natl. Bur. Std. NSRDS-NBS* 23, 9, 13 (1968). C L
- P. Risberg, *Ark. Fys. (Stockholm)* 10, No. 41, 583 to 605 (1956). I P, T, C L, G D Revised Analysis
- G. J. Ritter and G. W. Series, *Proc. Roy. Soc. (London)* [A] 238, 473 to 488 (1957). hfs
- R. A. Fisher, W. C. Knopf, Jr. and F. E. Kinney, *Astroph. J.* 130, 683 to 687 (1959). W L, C L Infrared
- W. N. Fox and G. W. Series, *Proc. Phys. Soc. (London)* 77, 1141 to 1146 (1961). hfs
- I. Johansson, *Ark. Fys. (Stockholm)* 20, 135 to 146 (1961). C L
1.2 μ to 1.5 μ
- P. Feldman and R. Novick, *Phys. Rev. Lett.* 11, 278 to 281 (1963).
Autoionization

K II

- M. A. Catalán y F. R. Rico, *An. Real Soc. Esp. Fis. y Quim. (Madrid)* [A] 54, 289 to 300 (1958). I P, T
- B. Edlén, "Atomic Spectra", *Hand. der Phys., Encycl. of Phys.* 27, 200 (1964). I P
- R. I. Semyonov, *Opt. i Spektr.* 19, 986 to 987 (1965). Z E
- L. Minnhagen, on program at Lund (1968). Observations

K III

- M. A. Catalán y F. R. Rico, *An. Real Soc. Esp. Fis. y Quim. (Madrid)* [A] 54, 289 to 300 (1958). I P, T

POTASSIUM

K III - Continued

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 200 (1964). I P
- A. H. Gabriel, B. C. Fawcett and C. Jordan, Proc. Phys. Soc. (London) 87, 825 to 839 (1966). C L
- L. Minnhagen, On program at Lund (1968). Observations
- L. Å. Svensson and J. O. Ekberg, Ark. Fys. (Stockholm) 37, No. 7, 65 to 84 (1968). I P, C L

K IV

- I. S. Bowen, Astroph. J. 121, 306 to 311 (1955). [C L]
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 35 (1968). C L
- I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]
- A. H. Gabriel, B. C. Fawcett and Carole Jordan, Proc. Phys. Soc. (London) 87, 825 to 839 (1966). C L
- L. Å. Svensson and J. O. Ekberg, Ark. Fys. (Stockholm) 37, No. 7, 65 to 84 (1968). T, C L

K V

- I. S. Bowen, Astroph. J. 121, 306 to 311 (1955). [C L]
- W. Finkelburg und W. Humbach, Naturwiss. 42, 35 (1955). I P
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 31 (1968).
- I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]
- A. H. Gabriel, B. C. Fawcett and C. Jordan, Proc. Phys. Soc. (London) 87, 825 to 839 (1966). C L
- B. C. Fawcett, A. H. Gabriel and P. A. H. Saunders, Proc. Phys. Soc. (London) 90, 863 to 867 (1967). C L

POTASSIUM

K VI

I. S. Bowen, *Astroph. J.* 132, 1 to 17 (1960). [C L]

B. C. Fawcett, A. H. Gabriel and P. A. H. Saunders, *Proc. Phys. Soc.* 90, 863 to 867 (1967). C L

K VIII

M. Wilson, *Astroph. J.* 148, 937 to 938 (1967). Theory

K IX

D. D. Burgess, B. C. Fawcett and N. J. Peacock, *Proc. Phys. Soc. (London)* 92, 805 to 816 (1967). C L

K X

B. Edlén, "Atomic Spectra", *Hand. der Phys., Encycl. of Phys.* 27, 198 (1964). I P

K XI

B. Edlén, "Atomic Spectra", *Hand. der Phys., Encycl. of Phys.* 27, 198 (1964). I P

W. A. Deutschman and L. L. House, *Astroph. J.* 149, 451 to 452 (1967). C L

B. C. Fawcett, D. D. Burgess and N. J. Peacock, *Proc. Phys. Soc. (London)* 91, 970 to 972 (1967). C L

K XII

B. Edlén, "Atomic Spectra", *Hand. der Phys., Encycl. of Phys.* 27, 198 (1964). I P

A. E. Goertz, *J. Opt. Soc. Am.* 55, 742 to 743 (L) (1965). T Pred.

POTASSIUM

K XII - Continued

W. A. Deutschman and L. L. House, *Astroph. J.* 149, 451 to 452 (1967).
C L

B. C. Fawcett, D. D. Burgess and N. J. Peacock, *Proc. Phys. Soc. (London)*
91, 970 to 972 (1967). C L

K XIII

B. Edlén, "Atomic Spectra", *Hand. der Phys., Encycl. of Phys.* 27, 198
(1964). I P

W. A. Deutschman and L. L. House, *Astroph. J.* 149, 451 to 452 (1967).
C L

B. C. Fawcett, D. D. Burgess and N. J. Peacock, *Proc. Phys. Soc. (London)*
91, 970 to 972 (1967). C L

K XIV

B. Edlén, "Atomic Spectra", *Hand. der Phys., Encycl. of Phys.* 27, 198
(1964). I P

M. H. L. Pryce, *Astroph. J.* 140, 1192 to 1205 (1964). [K XIV]

K XV

B. Edlén, "Atomic Spectra", *Hand. der Phys., Encycl. of Phys.* 27, 198
(1964). I P

K XVI

M. H. L. Pryce, *Astroph. J.* 140, 1192 to 1205 (1964). [K XVI]

K XIX

J. D. Garcia and J. E. Mack, *J. Opt. Soc. Am.* 55, 654 to 685 (1965).
I P, T, C L Theory

CALCIUM (Z = 20)

Ca I

- C. J. Humphreys, J. Res. Nat. Bur. Std. 47, 262 to 268, RP2252 (1951).
T, C L Infrared
- A. Pery, Proc. Phys. Soc. (London) 67A, 181 to 185 (1954). I S
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 18, 19 (1968). Partial G D, C L
- K. W. Meissner and V. Kaufman, J. Opt. Soc. Am. 49, 434 to 438, 942 to 943 (1959). Interferometry
- R. W. Ditchburn and R. D. Hudson, Proc. Roy. Soc. (London) A256, 53 to 61 (1960). T, Autoionized Series
- T. R. Kaiser, Proc. Phys. Soc. (London) 75, 152 to 153 (1960). T, Series Ultraviolet
- W. R. S. Garton, J. Quant. Spectrosc. and Rad. Transfer 2, 335 to 341 (1962). Autoionization, Series Perturbations
- W. R. S. Garton and K. Codling, Proc. Phys. Soc. (London) 86, 1067 to 1075 (1965). Series Ultraviolet
- L. Goldberg, Harvard Coll. Obs. Sci. Report No. 4, 22 pp. (1965). Autoionization
- N. P. Penkin and L. N. Shabanova, Opt. i Spektr. 18, 749 to 755, 941 to 946 (1965). I P, Series
- G. H. Newsom, Proc. Phys. Soc. (London) 87, 975 to 982 (1966). T, C L, Autoionized Series
- G. Risberg, Ark. Fys. (Stockholm) 37, No. 18, 231 to 249 (1968). I P, T, C L, W L, G D Revised Analysis

Ca II

- A. Pery, Proc. Phys. Soc. (London) 67A, 181 to 185 (1954). I S
- B. Edlén and P. Risberg, Ark. Fys. (Stockholm) 10, No. 39, 553 to 566 (1956). I P, T, C L, G D Revised Analysis
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Nat. Bur. Std. NSRDS-NBS 23, 12, 13 (1968). Partial G D, C L

CALCIUM

Ca II - Continued

- G. Racah and Y. Shadmi, Bull. Research Council Israel 8F, 15 to 46 (1959).
Theory
- S. H. Lott, Jr., C. E. Roos and M. L. Ginter, J. Opt. Soc. Am. 56, 775 to 778 (1966). Z E
- J. R. Roberts and K. L. Eckerle, Phys. Rev. 159, 104 to 107 (1967).
Stark Effect
- G. Risberg, Ark. Fys. (Stockholm) 37, No. 18, 231 to 249 (1968). T, C L,
W L

Ca III

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 200 (1964). I P
- A. H. Gabriel, B. C. Fawcett and C. Jordan, Proc. Phys. Soc. (London) 87, 825 to 839 (1966). C L
- A. Bórgström, in press (1968). Revised Analysis
- G. Risberg, Ark. Fys. (Stockholm) 37, No. 18, 231 to 249 (1968). W L,
C L

Ca IV

- A. H. Gabriel, B. C. Fawcett and C. Jordan, Nature 206, 390 to 392 (1965). T, C L
- B. C. Fawcett and A. H. Gabriel, Proc. Phys. Soc. (London) 88, 262 to 264 (1966). C L
- A. H. Gabriel, B. C. Fawcett and C. Jordan, Proc. Phys. Soc. (London) 87, 825 to 839 (1966). C L
- L. Minnhagen, On Program at Lund (1968). Observations, W L
- L. Å. Svensson and J. O. Ekberg, Ark. Fys. (Stockholm) 37, No. 7, 65 to 84 (1968). C L

CALCIUM

Ca v

- I. S. Bowen, *Astroph. J.* 121, 306 to 311 (1955); 132, 1 to 17 (1960). [C L]
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Nat. Bur. Std. NSRDS-NBS 23, 35 (1968). C L
- B. C. Fawcett and A. H. Gabriel, *Proc. Phys. Soc. (London)* 88, 262 to 264 (1966). C L
- A. H. Gabriel, B. C. Fawcett and C. Jordan, *Proc. Phys. Soc. (London)* 87, 825 to 839 (1966). C L
- L. Minnhagen (1968). Observations
- L. Å. Svensson and J. O. Ekberg, *Ark. Fys. (Stockholm)* 37, No. 7, 65 to 84 (1968). T, C L

Ca vi

- W. Finkelburg and W. Humbach, *Naturwiss.* 42, 35 (1955). I P
- I. S. Bowen, *Astroph. J.* 132, 1 to 17 (1960). [C L]
- A. H. Gabriel, B. C. Fawcett and C. Jordan, *Proc. Phys. Soc. (London)* 87, 825 to 839 (1966). C L

Ca vii

- I. S. Bowen, *Astroph. J.* 132, 1 to 17 (1960). [C L]

Ca viii

- W. Finkelburg and W. Humbach, *Naturwiss.* 42, 35 (1955). I P

Ca xi

- B. Edlén, "Atomic Spectra", *Hand. der Phys., Encycl. of Phys.* 27, 198 (1964). I P
- S. O. Kastner, K. Omidvar and J. H. Underwood, *Astroph. J.* 148, 269 to 273 (1967). C L, Osc. Str.

CALCIUM

Ca XII

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- M. H. L. Pryce, Astroph. J. 140, 1192 to 1205 (1964). [Ca XII] Solar Obs.
- B. C. Fawcett, D. D. Burgess and N. J. Peacock, Proc. Phys. Soc. (London) 91, 970 to 972 (1967). C L

Ca XIII

- R. Garstang, Astroph. J. 115, 569 to 570 (1952). [Ca XIII]
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- M. H. L. Pryce, Astroph. J. 140, 1192 to 1205 (1964). [Ca XIII] Solar Obs.
- B. C. Fawcett, D. D. Burgess and N. J. Peacock, Proc. Phys. Soc. (London) 91, 970 to 972 (1967). C L

Ca XIV

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- B. C. Fawcett, D. D. Burgess and N. J. Peacock, Proc. Phys. Soc. (London) 91, 970 to 972 (1967). C L

Ca xv

- R. H. Garstang, Astroph. J. 115, 569 to 570 (1952). [Ca xv]
- B. Edlén, Mon. Not. Roy. Astron. Soc. 114, 700 to 703 (1954). [Ca xv]
- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- M. H. L. Pryce, Astroph. J. 140, 1192 to 1205 (1964). [Ca xv] Solar Obs.
- L. L. House, Astroph. J. 149, 211 to 216 (1967). C L Theory

CALCIUM

Ca xvii

M. H. L. Pryce, *Astroph. J.* 140, 1192 to 1205 (1964). [Ca xvii]

R. H. Garstang and L. J. Shamey, *Astroph. J.* 148, 665 to 666 (1967). W L, Osc. Str.

Ca xix

W. M. Neupert, W. Gates, M. Swartz and R. Young, *Astroph. J.* 149, L79 to L83 (1967). Solar Obs.?

L. Cohen, U. Feldman, M. Swartz and J. H. Underwood, *J. Opt. Soc. Am.* 58, 843 to 846 (1968). C L

Ca xx

J. D. Garcia and J. E. Mack, *J. Opt. Soc. Am.* 55, 654 to 685 (1965).
I P, T, C L Theory

W. M. Neupert, W. Gates, M. Swartz and R. Young, *Astroph. J.* 149, L79 to L83 (1967). Solar Obs.?

SCANDIUM (Z = 21)

Sc I

M. A. Catalán y R. Velasco, *An. Real Soc. Esp. Fis. y Quim. (Madrid)* [A] 48, 247 to 266 (1952). I P, T

C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 42, 43 (1968). Partial G D, C L

R. A. Fisher, W. C. Knopf, Jr. and F. E. Kinney, *Astroph. J.* 130, 683 to 687 (1959). W L, C L Infrared

G. Fricke, H. Kopfermann, S. Penselin und K. Schlüpmann, *Zeit. Phys.* 156, 416 to 424 (1959). hfs

SCANDIUM

Sc II

- H. N. Russell, J. Opt. Soc. Am. 40, 618 to 619 (1950). I P
- M. A. Catalán y F. R. Rico, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 48, 247 to 266 (1952). I P, T
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 40, 41 (1968). Partial G D, C L
- G. Racah and Y. Shadmi, Bull. Research Council Israel 8F, 15 to 46 (1959). Theory

Sc III

- Y. Shadmi, Bull. Research Council Israel 10F, 109 to 132 (1962). Theory

Sc IV

- A. H. Gabriel, B. C. Fawcett and C. Jordan, Nature 206, 390 to 392 (1965). T
- A. H. Gabriel, B. C. Fawcett and C. Jordan, Proc. Phys. Soc. (London) 87, 825 to 839 (1966). C L
- B. C. Fawcett, N. J. Peacock and R. D. Cowan, UKAEA, CLM-P155, 23 pp. (1968). C L
- L. Å. Svensson and J. O. Ekberg, Ark. Fys. (Stockholm) 37, No. 7, 65 to 84 (1968). Ar 1 sequence, C L

SCANDIUM

Sc v

- A. H. Gabriel, B. C. Fawcett and C. Jordan, Nature 206, 390 to 392 (1965). C L
- B. C. Fawcett and A. H. Gabriel, Proc. Phys. Soc. (London) 88, 262 to 264 (L) (1966). C L
- A. H. Gabriel, B. C. Fawcett and C. Jordan, Proc. Phys. Soc. (London) 87, 825 to 839 (1966). C L
- B. C. Fawcett, N. J. Peacock and R. D. Cowan, UKAEA, CLM-P155, 23 pp. (1968). C L
- L. Å. Svensson and J. O. Ekberg, Ark. Fys. (Stockholm) 37, No. 7, 65 to 84 (1968). C L

Sc vi

- B. Edlén, Phys. Rev. 62, 434 to 435 (1942). T
- I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]
- A. H. Gabriel, B. C. Fawcett and C. Jordan, Nature 206, 390 to 392 (1965). C L
- B. C. Fawcett and A. H. Gabriel, Proc. Phys. Soc. (London) 88, 262 to 264 (L) (1966). C L
- A. H. Gabriel, B. C. Fawcett and C. Jordan, Proc. Phys. Soc. (London) 87, 825 to 839 (1966). C L
- B. C. Fawcett, N. J. Peacock and R. D. Cowan, UKAEA, CLM-P155, 23 pp. (1968). C L
- L. Å. Svensson and J. O. Ekberg, Ark. Fys. (Stockholm) 37, No. 7, 65 to 84 (1968). T, C L

Sc vii

- W. Finkelburg and W. Humbach, Naturwiss. 42, 35 to 37 (1955). I P
- A. H. Gabriel, B. C. Fawcett and C. Jordan, Nature 206, 390 to 392 (1965). C L

SCANDIUM

Sc VII - Continued

A. H. Gabriel, B. C. Fawcett and C. Jordan, Proc. Phys. Soc. (London) 87, 825 to 839 (1966). C L

B. C. Fawcett, A. H. Gabriel and P. A. H. Saunders, Proc. Phys. Soc. (London) 90, 863 to 867 (1967). C L

Sc VIII

B. C. Fawcett, A. H. Gabriel and P. A. H. Saunders, Proc. Phys. Soc. (London) 90, 863 to 867 (1967). C L

Sc XII

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

B. C. Fawcett, Proc. Phys. Soc. (London) 86, 1087 to 1089 (1965). C L

U. Feldman and L. Cohen, Astroph. J. 149, 265 to 267 (1967). T, C L

S. O. Kastner, K. Omidvar and J. H. Underwood, Astroph. J. 148, 269 to 273 (1967). C L, Osc. Str.

Sc XIII

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

B. C. Fawcett, Proc. Phys. Soc. (London) 86, 1087 to 1089 (1965). C L

B. C. Fawcett, D. D. Burgess and N. J. Peacock, Proc. Phys. Soc. (London) 91, 970 to 972 (1967). C L

L. Cohen, U. Feldman and S. O. Kastner, J. Opt. Soc. Am. 58, 331 to 334 (1968). C L

SCANDIUM

Sc xiv

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

Sc xv

B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

TITANIUM (Z = 22)

Ti i

K. Burns and F. Sullivan, Science Studies 14, No. 3, 4 to 9 (1948). W L

M. A. Catalán y R. Velasco, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 48, 247 to 266 (1952). I P, T

A. K. Wardakee, J. Opt. Soc. Am. 45, 354 to 355 (1955). C L

C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 46, 47 (1968). Partial G D, C L

C. C. Kiess and M. P. Thekaekara, Astroph. J. 130, 1008 to 1020 (1959). T

M. P. Thekaekara, Georgetown Obs. Mono. No. 13, 33 pp. (1959). T, W L, C L

C. M. Wilson and M. P. Thekaekara, J. Opt. Soc. Am. 51, 289 to 297 (1961). T, C L, W L Ultraviolet

J. F. Giuliani and M. P. Thekaekara, J. Opt. Soc. Am. 54, 460 to 463 (1964). Interf. W L, C L

H. W. Banks, W. R. Bozman and C. M. Wilson, Georgetown Obs. Mono. No. 20, 176 pp. (1966). W L, C L

TITANIUM

Ti II

- A. Many, Phys. Rev. 79, 531 to 532 (L) (1950). Theory
- H. N. Russell, J. Opt. Soc. Am. 40, 618 to 619 (1950). I P
- M. A. Catalán y R. Velasco, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 48, 247 to 266 (1952). I P, T
- R. E. Trees, Phys. Rev. 97, 686 to 689 (1955). Theory
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 44, 45 (1968). Partial G D, C L
- N. Sack, Phys. Rev. 102, 1302 to 1303 (1956). Theory
- G. Racah and Y. Shadmi, Bull. Research Council Israel 8F, 15 to 46 (1959). Theory
- G. Racah and N. Spector, Bull. Research Council Israel 9F, 75 to 92 (1960). Theory
- J. F. Giuliani and M. P. Thekaekara, J. Opt. Soc. Am. 54, 460 to 463 (1964). Interf. W L, C L
- H. W. Banks, W. R. Bozman and C. M. Wilson, Georgetown Obs. Mono. No. 20, 176 pp. (1966). W L, C L

Ti III

- M. A. Catalán y R. Velasco, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 48, 247 to 266 (1952). I P, T
- I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]
- Y. Shadmi, Bull. Research Council Israel 10F, 109 to 132 (1962). Theory
- R. W. Mires and C. C. Lin, Phys. Rev. Lett. 12, No. 8, A4 (A) (1964). Theory
- B. Edlén and J. W. Swensson, Analysis complete (1968).

Ti IV

- B. Edlén and J. W. Swensson, Analysis complete (1968).

TITANIUM

Ti v

- A. H. Gabriel, B. C. Fawcett and C. Jordan, Proc. Phys. Soc. (London) 87, 825 to 839 (1966). C L
- B. C. Fawcett, N. J. Peacock and R. D. Cowan, UKAEA, CLM-P 155, 23 pp. (1968). C L
- L. Å. Svensson and J. O. Ekberg, Ark. Fys. (Stockholm) 37, No. 7, 65 to 84 (1968). I P, T, C L

Ti vi

- B. C. Fawcett and A. H. Gabriel, Proc. Phys. Soc. (London) 88, 262 to 264 (L) (1966). C L
- A. H. Gabriel, B. C. Fawcett and C. Jordan, Proc. Phys. Soc. (London) 87, 825 to 839 (1966). C L
- B. C. Fawcett, N. J. Peacock and R. D. Cowan, UKAEA, CLM-P155, 23 pp. (1968). C L
- L. Å. Svensson and J. O. Ekberg, Ark. Fys. (Stockholm) 37, No. 7, 65 to 84 (1968). I P, T, C L

Ti vii

- B. Edlén, Phys. Rev. 62, 434 to 435 (1942). T
- I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]
- B. C. Fawcett and A. H. Gabriel, Proc. Phys. Soc. (London) 88, 262 to 264 (1966). C L
- A. H. Gabriel, B. C. Fawcett and C. Jordan, Proc. Phys. Soc. (London) 87, 825 to 839 (1966). C L
- B. C. Fawcett and N. J. Peacock, Proc. Phys. Soc. (London) 91, 973 to 975 (1967). C L
- B. C. Fawcett, N. J. Peacock and R. D. Cowan, UKAEA, CLM-P155, 23 pp. (1968). C L
- L. Å. Svensson and J. O. Ekberg, Ark. Fys. (Stockholm) 37, No. 7, 65 to 84 (1968). T, C L

TITANIUM

Ti VIII

- W. Finkelburg and W. Humbach, Naturwiss. 42, 35 to 37 (1955). I P
- A. H. Gabriel, B. C. Fawcett and C. Jordan, Proc. Phys. Soc. (London) 87, 825 to 839 (1966). C L
- B. C. Fawcett, A. H. Gabriel and P. A. H. Saunders, Proc. Phys. Soc. (London) 90, 863 to 867 (1967). C L
- B. C. Fawcett and N. J. Peacock, Proc. Phys. Soc. (London) 91, 973 to 975 (1967). C L
- B. Edlén, Analysis nearing completion at Lund (1968).

Ti IX

- B. C. Fawcett, A. H. Gabriel and P. A. H. Saunders, Proc. Phys. Soc. (London) 90, 863 to 867 (1967). C L
- B. C. Fawcett and N. J. Peacock, Proc. Phys. Soc. (London) 91, 973 to 975 (1967). C L
- B. Edlén, Analysis nearing completion at Lund (1968).

Ti X

- W. Finkelburg and W. Humbach, Naturwiss. 42, 35 to 37 (1955). I P
- A. H. Gabriel, B. C. Fawcett and C. Jordan, Proc. Phys. Soc. (London) 87, 825 to 839 (1966). C L
- B. C. Fawcett and N. J. Peacock, Proc. Phys. Soc. (London) 91, 973 to 975 (1967). C L
- B. Edlén, Analysis nearing completion at Lund (1968).

Ti XI

- B. C. Fawcett and N. J. Peacock, Proc. Phys. Soc. (London) 91, 973 to 975 (1967). C L
- B. Edlén, Analysis nearing completion at Lund (1968).

TITANIUM

Ti XII

- B. C. Fawcett and N. J. Peacock, Proc. Phys. Soc. (London) 91, 973 to 975 (1967). C L
- U. Feldman and L. Cohen, J. Opt. Soc. Am. 57, 1128 to 1129 (1967). C L
- B. Edlén, Analysis nearing completion at Lund (1968).

Ti XIII

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- B. C. Fawcett, Proc. Phys. Soc. (London) 86, 1081 to 1089 (1965). C L
- U. Feldman and L. Cohen, Astroph. J. 149, 265 to 267 (1967). T, C L
- S. O. Kastner, K. Omidvar and J. H. Underwood, Astroph. J. 148, 269 to 273 (1967). C L, Osc. Str.

Ti XIV

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- B. C. Fawcett, Proc. Phys. Soc. (London) 86, 1087 to 1089 (1965). C L
- B. C. Fawcett, D. D. Burgess and N. J. Peacock, Proc. Phys. Soc. (London) 91, 970 to 972 (1967). C L
- L. Cohen, U. Feldman and S. O. Kastner, J. Opt. Soc. Am. 58, 331 to 334 (1968). C L

Ti xv

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P

VANADIUM ($Z = 23$)

V I

- C. J. Humphreys and H. J. Kostkowski, J. Opt. Soc. Am. 40, 801 (A) (1950) and unpublished material (1951). T, C L
- A. A. Schweizer, Phys. Rev. 80, 1080 to 1082 (1950). Theory
- M. A. Catalán y R. Velasco, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 48, 247 to 266 (1952). I P, T
- C. J. Humphreys, NOL-Corona Report 146, 41 pp. (1954). T, C L Infrared
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 50, 51 (1968). Partial G D, C L
- W. J. Childs and L. S. Goodman, Phys. Rev. 156, 64 to 70 (1967). hfs
- W. J. Childs, Phys. Rev. 156, 71 to 82 (1967). hfs Theory

V II

- H. N. Russell, J. Opt. Soc. Am. 40, 618 to 619 (1950). I P
- M. A. Catalán y R. Velasco, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 48, 247 to 266 (1952). I P, T
- S. Meshkov, Phys. Rev. 93, 270 to 272 (1954). Theory
- C. E. Moore and P. W. Merrill, Appendix A: Partial Grotrian Diagrams (1956); Natl. Std. Ref. Data Series, Natl. Bur. Std. NSRDS-NBS 23, 48, 49 (1968). Partial G D, C L
- G. Racah and Y. Shadmi, Bull. Research Council Israel 8F, 15 to 46 (1959). Theory
- G. Racah and N. Spector, Bull. Research Council Israel 9F, 75 to 92 (1960). Theory
- L. Iglesias, O. Garcia-Riquelme and R. Velasco, unpublished material (1961). Observations
- R. Velasco, private communication (1966). I P, T

VANADIUM

V III

- M. A. Catalán y R. Velasco, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 48, 247 to 266 (1952). I P, T
- S. Meshkov, Phys. Rev. 93, 270 to 272 (1954). Theory
- L. Iglesias y R. Velasco, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 54, 83 to 90 (1958). W L
- I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]
- L. Iglesias, O. Garcia-Riquelme and R. Velasco, unpublished material (1961). T, C L
- L. Iglesias, An. Real Soc. Esp. Fis. y Quim. (Madrid) [A] 58, 191 to 222 (1962). I P, T, C L, W L
- Y. Shadmi, Bull. Research Council Israel 10F, 109 to 132 (1962). Theory

V IV

- I. S. Bowen, Astroph. J. 132, 1 to 17 (1960). [C L]
- L. Iglesias, J. Research Natl. Bur. Std. 72A, in press (1968). I P, T, C L

V V

- A. H. Gabriel, B. C. Fawcett and C. Jordan, Nature 206, 390 to 392 (1965). C L
- A. H. Gabriel, B. C. Fawcett and C. Jordan, Proc. Phys. Soc. 87, 825 to 839 (1966). C L
- L. Iglesias, J. Research Natl. Bur. Std. 72A, in press (1968). T, C L

V VI

- E. Alexander, U. Feldman and B. S. Fraenkel, J. Opt. Soc. Am. 55, 650 to 653 (1965). C L
- U. Feldman, B. S. Fraenkel and S. Hoory, Astroph. J. 142, 719 to 723 (1965). C L

VANADIUM

V VI - Continued

- A. H. Gabriel, B. C. Fawcett and C. Jordan, Nature 206, 390 to 392 (1965).
C L
- A. H. Gabriel, B. C. Fawcett and C. Jordan, Proc. Phys. Soc. (London) 87,
825 to 839 (1966). C L
- B. C. Fawcett, N. J. Peacock and R. D. Cowan, UKAEA, CLM-P155, 23 pp.
(1968). C L

V VII

- A. H. Gabriel, B. C. Fawcett and C. Jordan, Nature 206, 390 to 392 (1965).
C L
- B. C. Fawcett and A. H. Gabriel, Proc. Phys. Soc. (London) 88, 262 to 264
(L) (1966). C L
- A. H. Gabriel, B. C. Fawcett and C. Jordan, Proc. Phys. Soc. (London) 87,
825 to 839 (1966). C L
- B. C. Fawcett, N. J. Peacock and R. D. Cowan, UKAEA, CLM-P155, 23 pp.
(1968). C L

V VIII

- A. H. Gabriel, B. C. Fawcett and C. Jordan, Nature 206, 390 to 392 (1965).
C L
- B. C. Fawcett and A. H. Gabriel, Proc. Phys. Soc. (London) 88, 262 to 264
(L) (1966). C L
- A. H. Gabriel, B. C. Fawcett and C. Jordan, Proc. Phys. Soc. (London) 87,
825 to 839 (1966). C L
- B. C. Fawcett, A. H. Gabriel and P. A. H. Saunders, Proc. Phys. Soc.
(London) 90, 863 to 867 (1967). C L
- B. C. Fawcett and N. J. Peacock, Proc. Phys. Soc. (London) 91, 973 to 975
(1967). C L

VANADIUM

V IX

- A. H. Gabriel, B. C. Fawcett and C. Jordan, *Nature* 206, 390 to 392 (1965).
C L
- A. H. Gabriel, B. C. Fawcett and C. Jordan, *Proc. Phys. Soc. (London)* 87,
825 to 839 (1966). C L
- B. C. Fawcett, A. H. Gabriel and P. A. H. Saunders, *Proc. Phys. Soc.* 90,
863 to 867 (1967). C L
- B. C. Fawcett and N. J. Peacock, *Proc. Phys. Soc. (London)* 91, 973 to 975
(1967). C L

V X

- M. H. L. Pryce, *Astroph. J.* 140, 1192 to 1205 (1964). [V x]
- B. C. Fawcett and N. J. Peacock, *Proc. Phys. Soc. (London)* 91, 973 to 975
(1967). C L

V XI

- A. H. Gabriel, B. C. Fawcett and C. Jordan, *Proc. Phys. Soc. (London)* 87,
825 to 839 (1966). C L
- B. C. Fawcett and N. J. Peacock, *Proc. Phys. Soc. (London)* 91, 973 to 975
(1967). C L

V XII

- B. C. Fawcett and N. J. Peacock, *Proc. Phys. Soc. (London)* 91, 973 to 975
(1967). C L

V XIII

- B. C. Fawcett and N. J. Peacock, *Proc. Phys. Soc. (London)* 91, 973 to 975
(1967). C L
- U. Feldman and L. Cohen, *J. Opt. Soc. Am.* 57, 1128 to 1129 (1967). C L

VANADIUM

V XIV

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). I P
- B. C. Fawcett, Proc. Phys. Soc. (London) 86, 1087 to 1089 (1965). C L
- U. Feldman and L. Cohen, Astroph. J. 149, 265 to 267 (1967). T, C L
- S. O. Kastner, K. Omidvar and J. H. Underwood, Astroph. J. 148, 269 to 273 (1967). C L, Osc. Str.

V XV

- B. Edlén, "Atomic Spectra", Hand. der Phys., Encycl. of Phys. 27, 198 (1964). C L
- B. C. Fawcett, Proc. Phys. Soc. (London) 86, 1087 to 1089 (1965). C L
- L. Cohen, U. Feldman and S. O. Kastner, J. Opt. Soc. Am. 58, 331 to 334 (1968). C L

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