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**Bibliography
on Atomic Energy Levels
and Spectra**

July 1968 through June 1971

**U.S.
DEPARTMENT
OF
COMMERCE**

National
Bureau
of
Standards

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Office of Standard Reference Data—Office of Technical Information and Publications—Library—Office of International Relations.

¹ Headquarters and Laboratories at Gaithersburg, Maryland, unless otherwise noted; mailing address Washington, D.C. 20234.

² Part of the Center for Radiation Research

³ Located at Boulder, Colorado 80302.

Bibliography on Atomic Energy Levels and Spectra

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Lucy Hagan and W. C. Martin

Optical Physics Division
Institute for Basic Standards
National Bureau of Standards
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Foreword

The National Standard Reference Data System was established in 1963 for the purpose of promoting the critical evaluation and dissemination of numerical data of the physical sciences. The program is coordinated by the Office of Standard Reference Data of the National Bureau of Standards but involves the efforts of many groups in universities, government laboratories, and private industry. The primary aim of the program is to provide compilations of critically evaluated physical and chemical property data. These tables are published in the *Journal of Physical and Chemical Reference Data*, in the NSRDS-NBS series of the National Bureau of Standards, and through other appropriate channels.

The task of critical evaluation is carried out in various data centers, each with a well-defined technical scope. A necessary preliminary step to the critical evaluation process is the retrieval from the world scientific literature of all papers falling within the scope of the center. Each center, therefore, builds up a comprehensive well-indexed bibliographical file which forms the base for the evaluation task. Bibliographies derived from these files are published when they appear to be of value to research workers and others interested in the particular technical area.

Further information on NSRDS and the publications which form the primary output of the program may be obtained by writing to the Office of Standard Reference Data, National Bureau of Standards, Washington, D.C. 20234.

DAVID R. LIDE, JR., *Chief*
Office of Standard Reference Data

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Bibliography on Atomic Energy Levels and Spectra

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The bibliography contains approximately 1100 references classified by subject for individual atoms and atomic ions. A number index identifies the references. An author index is included. References included contain data on energy levels, classified lines, wavelengths, Zeeman effect, Stark effect, hyperfine structure, isotope shift, ionization potentials, or theory which gives results for specific atoms or atomic ions.

Key words: Atomic energy levels; atomic spectra; bibliography; energy levels, atomic; spectra, atomic; wavelengths, atoms and ions.

1. Introduction

This bibliography is the first of a series expected to be issued under the same title by the Atomic Energy Levels Data Center. With the exception of a few references to earlier papers, the bibliography begins chronologically where C. E. Moore's *Bibliography on the Analyses of Optical Atomic Spectra* [1]¹ left off.

1.1. Reference Classification Scheme and Scope of Bibliography

The references pertain to atomic structure and spectra that arise from interactions or excitations involving electrons in the outer shells of free atoms and atomic ions, or from inner-shell excitations corresponding to frequencies up to the soft x-ray range. A paper was included if it gave results for a particular ion or spectrum falling into one of the following categories:

EL Energy Levels. Experimental energy differences, except Hfs or IS. Includes references that suggest the rejection of previously reported levels.

ND New Designations. New or changed designations or *J* values for known energy levels.

CL Classified Lines. Indicates the assignment of observed lines to transitions between energy levels that are specified by theoretical designations and/or by their positions in a known level scheme.

W Wavelengths (or wavenumbers). New measurements, or wavelengths newly assigned to a particular spectrum. References that list measurements of other entities corresponding to energy differences between levels may also be included.

ZE Zeeman Effect data or interpretation.

SE Stark Effect data or interpretation.

Hfs Hyperfine structure. Observations and theory.

IS Isotopic or Isomeric (Nuclear) Shifts.

IP Ionization Potential.

SF Series Formulae. Evaluated series constants, including those appearing in polarization-theory formulae.

TE Theoretical Energies. Restricted to a few references that give calculated energy levels with accuracies about equal to or exceeding those now obtainable by observation.

PT Parametric Theory. Evaluations of the usual energy parameters of Slater-Condon theory, or extensions thereof, based on fitting the theory to experimental levels, *g*-factors and/or other observed quantities.

AT Ab initio Theory. These references are mostly to Hartree-Fock type calculations of energy parameters or levels.

OT Other Theory. Predictions of energy levels by theoretical methods not primarily classifiable as PT or AT (for example, *Z* expansion techniques).

These categories are based on those used for describing references in *Atomic Energy Levels* [2] and in other publications of C. E. Moore.

¹ Figures in brackets refer to the literature references in section 1.3 on page 2.

The changes are mainly to allow more specific descriptions of some types of results.

References in the first two categories are limited mainly to those judged useful for compiling tables of atomic energy levels. The bibliography is probably less complete for references in the last two categories than for the other categories, and there is some overlap in the coverages of the theoretical categories. It is worth noting explicitly that the reference categories do not include transition probabilities, line intensities, or broadening. The NBS data center on atomic transition probabilities publishes bibliographies on this subject [3].

This bibliography is further restricted, with few exceptions, to original research papers or monographs; textbooks and extensive compilations are not usually included. Some of the more recent compilations of special interest that are not included in the classified references are given as references [4-9] at the end of this introduction.

1.2. Arrangement of Bibliography and Handling of Special Types of References

Each reference has been assigned a number. In section 2.2 the appropriate reference numbers are given under headings for individual spectra (element and ionization stage). The reference numbers under each spectrum heading are listed separately for each of the content categories explained above. Reference numbers for papers reporting wavelengths of unknown ionization stage are given as the last group for the element.

The full references are given in order of the assigned numbers in section 3. Each such reference is followed by the spectra and category symbols appropriate to the content. Except for Russian titles, which are given in English, the titles of articles are given in the language in which they were published. References to articles from Russian journals that also appear in English translations are to the translation journals.

Section 2.1 is an index to the spectra for which there are references, and an author index (sec. 4) follows the listing of the complete references.

The main exception from the arrangement described above is for the references 1250 through 1281. Each of these papers gives theoretical results for a rather large number of elements and/or ionization stages. These references are included in section 4, along with the usual information on their content, and in the author index. However, they were omitted from the reference numbers for the individual spectra (sec. 2.2).

Most of the reference numbers followed by an "A" indicate abstracts of papers presented at meetings of the Optical Society of America, the American Physical Society, or the European Group for Atomic Spectroscopy. The assigned content categories for these abstracts are those

thought to be applicable to the paper itself, as indicated by the abstract; the indicated results are not necessarily included in the abstracts. These abstracts (mostly reference numbers 950A through 1107A) frequently provide information about work in progress. A few of the "A" references are to abstracts of theses in Dissertation Abstracts. Some of the other references are to theses for which the AEL Data Center has obtained copies.

Dr. Charlotte E. Moore helped us greatly in the learning of techniques for continuation of the bibliographic files on atomic spectra previously maintained by her in this laboratory. We gratefully acknowledge her kind assistance.

We are indebted to Dr. David Garvin, who suggested the keyboard format for the references and whose programs we used to put this bibliography into Document Image Code on magnetic tape for the computer. To Mr. James Koch we are especially grateful for providing the program decks, anticipating our problems, explaining the programs, and making sure the programs ran correctly.

We thank the NSRDS staff, particularly Robert McClenon, Carla Messina, and Robert Thompson, for the programs that reformatted our bibliography and produced the author index.

For the difficult job of keyboarding the references we thank especially Kathy Weaver, who transposed the references to the present format, and Christine Kellerman, Mary Jackson, and Barbara Reader.

1.3. References

- [1] Moore, C. E., Bibliography on the Analyses of Optical Atomic Spectra, Nat. Bur. Stand. (U.S.), Spec. Publ. 306, Section 1, 80 pp. (Sept. 1968); Section 2, 57 pp. (Feb. 1969); Section 3, 37 pp. (May 1969); Section 4, 48 pp. (Aug. 1969).
- [2] Moore, C. E., Atomic Energy Levels as Derived from Analyses of Optical Spectra, Nat. Bur. Stand. (U.S.), Circ. 467, Vol. 1, 309 pp. (1949); Vol. 2, 227 pp. (1952); Vol. 3, 245 pp. (1958).
- [3] Fuhr, J. R., and Wiese, W. L., Nat. Bur. Stand. (U.S.), Spec. Publ. 320, Suppl. 1, 60 pp. (Sept. 1971). References to earlier work are included in this reference.
- [4] Kelly, R. L., Atomic Emission Lines Below 2000 Ångstroms (Hydrogen through Argon), NRL Report 6648, 354 pp. (1968).
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- [6] Harrison, G., Editor, M.I.T. Wavelength Tables, 2nd edition, 429 pp. (M.I.T. Press, Cambridge, Mass., 1969).
- [7] Zaidel', A. N., Prokof'ev, V. K., Raikii, S. M., Slavnyi, V. A., and Shreider, E. Ya., Tables of Spectral Lines, 782 pp. (IFI/Plenum Press, New York, N.Y., 1970).
- [8] Moore, C. E., Ionization Potentials and Ionization Limits Derived from the Analyses of Optical Spectra, Nat. Stand. Ref. Data Ser., Nat. Bur. Stand. (U.S.), 34, 10 pp. (1970).
- [9] Kelly, R. L., and Harrison, Jr., D. E., Ionization Potentials, Experimental and Theoretical, of the Elements Hydrogen to Krypton, U.S. Naval Postgraduate School, NPS-61Ke70071A, 31 pp. (1970).

2. Classified References for Individual Spectra

2.1. Index to Spectra

Element	Z	Spectrum	Page	Element	Z	Spectrum	Page
Actinium	89	Ac I	32	Bismuth	83	Bi I Bi II Bi III Bi IV Bi V	32
Aluminum	13	Al I Al II Al III Al IV Al VI Al VII Al VIII Al IX Al X Al XI Al XII Al XIII Al	13	Boron	5	B B I B II B III B IV	9
Americium	95	Am I Am III Am IV Am V Am VI Am VII	33	Bromine	35	Br Br I Br II Br III Br IV Br V Br VI Br VIII Br XXV Br XXXI	25
Antimony	51	Sb I Sb II	27 28	Cadmium	48	Cd I Cd II	27
Argon	18	Ar I Ar II Ar III Ar IV Ar V Ar VI Ar VII Ar IX Ar X Ar XI Ar XII Ar XIII Ar XIV Ar XV Ar XVI Ar XVII Ar XVIII Ar	15 16	Calcium	20	Ca I Ca II Ca III Ca IV Ca V Ca VI Ca VII Ca VIII Ca IX Ca X Ca XI Ca XII Ca XIII Ca XIV Ca XV Ca XVI Ca XVII Ca XIX	17 18
Arsenic	33	As I As II As VI As VII As XXIII As XXIX	24	Californium	98	Cf I Cf II Cf III Cf IV Cf V Cf VI Cf VII	33
Barium	56	Ba I Ba II Ba III	28	Carbon	6	C C I C II C III C IV C V C VI C IX C	10
Berkelium	97	Bk I Bk II Bk III Bk IV Bk V Bk VI Bk VII	33	Cerium	58	Ce I Ce II Ce III Ce IV	28 29
Beryllium	4	Be I Be II Be III Be IV	9				

2.1. Index to Spectra—Continued

Element	Z	Spectrum	Page	Element	Z	Spectrum	Page
Cesium	55	Cs I Cs II Cs III	28	Curium	96	Cm I Cm III Cm IV Cm V Cm VI Cm VII	33
Chlorine	17	Cl I Cl II Cl IV Cl V Cl VI Cl VII Cl VIII Cl IX Cl X Cl XI Cl XII Cl XIII Cl XIV Cl XV	15	Dysprosium	66	Dy I Dy II Dy III Dy IV	30
Chromium	24	Cr I Cr II Cr III Cr IV Cr V Cr VI Cr VII Cr VIII Cr IX Cr X Cr XI Cr XII Cr XIII Cr XIV Cr XV Cr XVII Cr XX Cr XXII	20	Einsteinium	99	Es I Es II Es III Es IV Es V Es VI Es VII	33
				Erbium	68	Er I Er II Er III Er IV	30
				Europium	63	Eu I Eu II Eu III Eu IV	29
				Fermium	100	Fm III Fm IV Fm V Fm VI Fm VII	33
				Fluorine	9	F F I F II F III F IV F V F VI F VII F VIII	11
Cobalt	27	Co I Co II Co III Co IV Co VII Co VIII Co IX Co X Co XI Co XII Co XIII Co XIV Co XV Co XVI Co XVII Co XVIII Co XXIII Co XXV	22	Francium	87	Fr II	32
				Gadolinium	64	Gd I Gd II Gd III Gd IV	29
				Gallium	31	Ga I Ga III Ga IV Ga V Ga XXI Ga XXVII Ga XXX	24
Copper	29	Cu I Cu II Cu III Cu IV Cu XI Cu XII Cu XIII Cu XIV Cu XVIII Cu XIX Cu XXV Cu XXVII Cu XXVIII	23	Germanium	32	Ge I Ge II Ge V Ge VI Ge XXII Ge XXVIII	24
				Gold	79	Au I Au II	31

2.1. Index to Spectra—Continued

Element	Z	Spectrum	Page	Element	Z	Spectrum	Page
Hafnium	72	Hf I Hf II	31	Lanthanum	57	La I La II La III La IV La V	28
Helium	2	He He I He II	9	Lawrencium	103	Lr V	33
Holmium	67	Ho I Ho II Ho III Ho IV	30	Lead	82	Pb I Pb II Pb IV Pb V	31 32
Hydrogen	1	H H I	9	Lithium	3	Li Li I Li II Li III	9
Indium	49	In I In II In III In IV In V	27	Lutetium	71	Lu I Lu III Lu IV Lu V	30 31
Iodine	53	I I I I II I III I IV I V I VI I VII I VIII	28	Magnesium	12	Mg I Mg II Mg III Mg IV Mg V Mg VI Mg VII Mg VIII Mg IX Mg X Mg XI Mg XII	12 13
Iridium	77	Ir II	31	Manganese	25	Mn I Mn II Mn III Mn IV Mn V Mn VI Mn VII Mn VIII Mn IX Mn X Mn XI Mn XII Mn XIII Mn XIV Mn XV Mn XVI Mn XVII Mn XVIII Mn XIX Mn XX Mn XXI Mn XXII Mn XXIII Mn XXIV Mn XXV Mn XXVI Mn XXVII Mn XXVIII Mn XXIX Mn XXX Mn XXXI Mn XXXII Mn XXXIII Mn XXXIV	20 21
Iron	26	Fe I Fe II Fe III Fe IV Fe V Fe VI Fe VII Fe VIII Fe IX Fe X Fe XI Fe XII Fe XIII Fe XIV Fe XV Fe XVI Fe XVII Fe XVIII Fe XIX Fe XX Fe XXI Fe XXII Fe XXIII Fe XXIV Fe XXV Fe XXVI Fe	21 22	Mendelevium	101	Md III Md IV Md V Md VI Md VII	33
Krypton	36	Kr I Kr II Kr III Kr VII Kr VIII Kr X Kr XXVI Kr XXXIV	25	Mercury	80	Hg I Hg II Hg III Hg IV Hg V Hg VI Hg VII Hg VIII Hg IX	31

2.1. Index to Spectra—Continued

Element	Z	Spectrum	Page	Element	Z	Spectrum	Page			
Molybdenum	42	Mo I	26	Nitrogen	7	N	10			
		Mo II				N I				
		Mo III	27			N II				
		Mo VI				N III				
		Mo VII				N IV				
		Mo VIII				N V				
		Mo IX				N VI				
		Mo X				N VII				
		Mo XI	Nobelium	102	No IV	33				
		Mo XII			No V					
		Mo XIII			No VI					
		Mo XIV			No VII					
		Mo XV	Osmium	76	Os I	31				
		Mo XVI			Os II					
		Mo XXXII	Oxygen	8	O	10				
Neodymium	60	Nd I			29			O I		
		Nd II						O II	11	
		Nd III						O III		
		Nd IV						O IV		
Neon	10	Ne I			11			O V		
		Ne II						O VI		
		Ne III						O VII		
		Ne IV						O VIII		
		Ne V	12	Palladium	46	Pd I	27			
		Ne VI				Pd II				
		Ne VII				Pd III				
		Ne VIII		Phosphorus	15	P I	14			
		Ne IX				P II				
		Ne X				P III				
Ne	P IV									
Neptunium	93	Np III	32			P V				
		Np IV				P VI				
		Np V				P VII				
		Np VI				P VIII				
		Np VII				P IX				
Nickel	28	Ni I	23			P X		31		
		Ni II				P XI				
		Ni III				P XII				
		Ni IV				P XIII				
		Ni VIII				P XIV				
		Ni X	Platinum	78	Pt I	31				
		Ni XI			Pu I		32			
		Ni XII	Plutonium	94	Pu II					
		Ni XIII			Pu III					
		Ni XIV			Pu IV					
		Ni XV			Pu V					
		Ni XVI			Pu VI					
		Ni XVII			Pu VII					
		Ni XVIII			Pu VIII					
		Ni XXIV	Polonium	84	Po I	32				
		Ni XXVI			K I		16			
		Niobium	41	Nb I	26	Potassium			19	K II
Nb II	K III									
Nb III	K IV									
Nb VI	K V									
Nb VII	K VI									
Nb VIII	K VII									
Nb XI	K VIII									
Nb XII	K IX									
Nb XIII	K X									
Nb XIV	K XI									
Nb XV	K XII									
Nb XXXI										

2.1. Index to Spectra—Continued

Element	Z	Spectrum	Page	Element	Z	Spectrum	Page
Potassium—Con.		K XIII K XIV K XV K XVII	17	Silicon	14	Si I Si II Si III Si IV Si V Si VII Si VIII Si IX Si X Si XI Si XII Si XIII Si XIV Si XVI	13
Praseodymium	59	Pr I Pr III Pr IV Pr V	29				14
Promethium	61	Pm I Pm III Pm IV	29				
Protactinium	91	Pa I Pa II Pa III Pa IV Pa V	32	Silver	47	Ag I Ag II Ag III	27
Radium	88	Ra I	32	Sodium	11	Na I Na II Na III Na IV Na V Na VI Na VII Na VIII Na IX Na X Na XI Na	12
Radon	86	Rn I	32				
Rhenium	75	Re I Re III	31				
Rhodium	45	Rh I Rh II Rh III Rh XXXV	27	Strontium	38	Sr I Sr II Sr III Sr IV Sr V Sr VI Sr XXVIII	25
Rubidium	37	Rb I Rb II Rb III Rb XXVII	25				
Ruthenium	44	Ru I Ru II Ru III Ru XXXIV	27	Sulfur	16	S S I S II S III S IV S V S VI S VII S VIII S IX S X S XI S XII S XIII S XIV S XV S XVI	14
Samarium	62	Sm I Sm II Sm III Sm IV	29				15
Scandium	21	Sc I Sc II Sc III Sc IV Sc V Sc VI Sc VII Sc VIII Sc IX Sc X Sc XI Sc XII Sc XIV Sc XVII Sc XIX Sc XX Sc	18	Tantalum	73	Ta I Ta II	31
				Technetium	43	Tc I Tc II Tc III Tc XXXIII	27
				Tellurium	52	Te I Te II	28
Selenium	34	Se I Se IV Se VII Se VIII Se XXIV Se XXX	24	Terbium	65	Tb I Tb II Tb III Tb IV	29 30
			25				

2.1. Index to Spectra—Continued

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Thorium	90	Th I Th II Th III Th IV	32				
Thulium	69	Tm I Tm II Tm III Tm IV	30	Xenon	54	Xe I Xe II Xe III	28
Tin	50	Sn I Sn IV	27	Ytterbium	70	Yb I Yb II Yb III Yb IV	30
Titanium	22	Ti I Ti II Ti III Ti V Ti VI Ti VII Ti VIII Ti IX Ti x Ti XI Ti XII Ti XIII Ti XV Ti XVIII Ti XX Ti XXI Ti XXII Ti	18 19	Yttrium	39	Y I Y II Y III Y IV Y V Y IX Y x Y XI Y XII Y XIII Y XXIX	25 26
				Zinc	30	Zn I Zn II Zn III Zn IV Zn XII Zn XIII Zn XX Zn XXVI Zn XXVIII	24
Tungsten	74	W I	31				
Uranium	92	U I U II U III U IV U V U VI U VII	32	Zirconium	40	Zr I Zr II Zr III Zr IV Zr V Zr VI Zr VII Zr VIII Zr IX Zr x Zr XI Zr XII Zr XIII Zr XIV Zr XXX	26
Vanadium	23	V I V II V III V IV V V V VI V VII V VIII V IX	19				

2.2. Reference Numbers for Individual Spectra

H ⁻	EL	978A, 1005A	IP	241				
	CL	1005A		SF	873			
	W	1005A		PT	128, 411			
	TE	850, 887		AT	40, 896, 910, 912, 1127, 1290, 1301, 1302			
	AT	81, 287, 458, 850, 1246		OT	241			
	OT	887, 1293, 1294						
H I	EL	46, 203, 508, 617, 822, 829, 894, 908, 945A, 991A, 1013A, 1142A, 1164	Li II	W	947A, 1066A, 1200			
	W	46, 1091A		Hfs	37			
	ZE	123, 613, 615, 921		SF	663, 757			
	SE	367, 768, 1009A		TE	663, 682, 711, 757, 887			
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	Hfs	896			CL	481, 483, 1235		
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	ZE	833		AT	3, 9, 11, 137, 299, 590, 1127, 1247, 1286			
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	PT	651		PT	3			
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	OT	241, 682, 789, 830, 870, 887, 945, 1306		Be III	EL	539, 1051A		
	EL	311, 684, 973A, 975A, 1071A, 1072A, 1152, 1162, 1186, 1199, 1201A			CL	229, 539, 1051A		
	W	302, 518, 907			W	229, 490, 539, 1051A		
	ZE	1094A			TE	682, 887		
SE	1162	PT	539					
Hfs	160, 240, 312, 652, 684, 840, 877, 977A, 1094A, 1152, 1186, 1196, 1197, 1227	AT	81, 287, 500, 574					
IS	684, 1152	OT	682, 887					
AT	83	Be IV	CL	229				
			W	229				
He II	EL	1190	B ⁻	Hfs	1282			
	EL	308, 411, 546, 873, 895, 912, 974A, 1193, 1235		AT	162, 1282, 1284, 1305			
	CL	128, 217, 358, 411, 873, 912, 1070A, 1235	B I	EL	694, 874			
	W	217, 308, 358, 411, 873, 912, 1066A, 1070A, 1200, 1235		CL	732, 874			
	ZE	86, 128, 546		W	732, 874			
	SE	254, 307, 1165		Hfs	407, 440, 621, 836, 844, 846, 1220			
Hfs	40, 68, 86, 128, 321, 357, 411, 507, 547, 621, 641, 656, 813, 824, 838, 844, 888, 890, 895, 896, 904, 974A, 1020A, 1093A, 1203A, 1220, 1290, 1301	IS		694				
		IP		143, 241, 694				
Li ⁻	EL	1190	AT	SF	694			
	EL	308, 411, 546, 873, 895, 912, 974A, 1193, 1235		AT	162, 322, 407, 846, 900, 1049A, 1206, 1284, 1285, 1305			
Li I	CL	128, 217, 358, 411, 873, 912, 1070A, 1235	OT	143, 241, 525, 1244, 1292	B II	EL	876	
	W	217, 308, 358, 411, 873, 912, 1066A, 1070A, 1200, 1235		CL		49, 732, 876		
	ZE	86, 128, 546	W	49, 732, 876		IP	876	
	SE	254, 307, 1165	SF	876		AT	299, 1127, 1284	
	Hfs	40, 68, 86, 128, 321, 357, 411, 507, 547, 621, 641, 656, 813, 824, 838, 844, 888, 890, 895, 896, 904, 974A, 1020A, 1093A, 1203A, 1220, 1290, 1301	OT	525, 876, 1244		B III	EL	482
			EL	482, 732			CL	482, 732
			W	482, 732	W		482, 732	

2.2. Reference Numbers for Individual Spectra—Continued

B III—Continued			N ⁻	Hfs	1282
	Hfs	656, 1301		AT	1282, 1284, 1285, 1287, 1305
	IP	482	N I	EL	187
	SF	482		CL	187
	AT	900, 1127, 1301		W	44, 56, 187, 1144
B IV	CL	49, 732		ZE	44
	W	49, 490, 732		Hfs	44, 360, 407, 621, 671, 709, 911, 1204A, 1220, 1225
	TE	682, 887		IP	241, 244
	AT	81, 287, 500, 574, 609		PT	333
	OT	682, 887		AT	322, 333, 407, 709, 849, 1206, 1284, 1285, 1287, 1305
C ⁻	EL	1240		OT	241, 1292
	Hfs	1282	N II	W	169, 391, 392
	AT	1282, 1284, 1285, 1287, 1305		Hfs	1282
C I	EL	187, 1113		PT	334
	CL	187, 1113		AT	334, 1282, 1284, 1287, 1305
	W	187, 1113		OT	1129, 1244
	ZE	756, 1035A	N III	EL	525, 691
	Hfs	407, 621, 756, 800, 846		CL	525, 691
	IP	241, 1113		W	169, 391, 392, 525, 691, 968A
	PT	327, 334, 339		IP	143
	AT	110, 200, 322, 327, 334, 407, 784, 846, 1206, 1248, 1284, 1285, 1305		PT	309
	OT	241, 1129, 1244, 1292		AT	1049A, 1284, 1287
C II	EL	1113		OT	143, 1244
	CL	1113	N IV	EL	691, 1117
	W	1113		ND	691, 1117
	Hfs	1282		CL	691, 1117
	IP	143, 1113		W	392, 691, 968A, 1117
	PT	309		ZE	967A
	AT	110, 1049A, 1282, 1284, 1305		IP	876, 1117
	OT	143, 1244		SF	876
C III	EL	1113		PT	626
	CL	1113		AT	9, 299, 1284, 1287
	W	1113		OT	1244
	IP	876, 1113	N V	EL	627, 1169
	SF	876		CL	148, 627, 1070A, 1169
	AT	9, 299, 1127, 1284		W	148, 392, 627, 968A, 1070A, 1169
	OT	1244		Hfs	656, 1301
C IV	EL	426, 627, 1113, 1169, 1170		AT	900, 1301
	CL	426, 627, 1113, 1169, 1170	N VI	EL	586, 1169
	W	426, 627, 1113, 1169, 1170		CL	148, 1169
	Hfs	656		W	148, 1169
	IS	1301		TE	682, 887
	IP	1113		AT	500, 574, 586
	AT	900, 1127, 1301		OT	682, 887
C V	EL	586, 622, 663, 1011A, 1113, 1169, 1170	N VII	EL	1169
	CL	148, 622, 663, 1011A, 1113, 1169, 1170		CL	1169
	W	148, 490, 622, 663, 1011A, 1113, 1169, 1170		W	905, 906, 1169
	IP	663, 1113	O ⁻	EL	978A, 1006A
	SF	663		Hfs	1282
	TE	663, 682, 887		AT	1282, 1284, 1285, 1287, 1305
	AT	500, 574, 586	O I	EL	13, 74, 174, 978A
	OT	682, 887		CL	13, 74, 174, 567, 901, 1213
C VI	EL	151, 1113, 1169, 1170		W	13, 74, 174, 567, 901, 1213
	CL	148, 151, 1113, 1169, 1170		ZE	364
	W	148, 151, 1113, 1169, 1170		SE	174, 422
	Hfs	878, 1024A		Hfs	407, 412, 621
	IP	1113		IP	241
C IX	PT	637		TE	13
C	W	625		PT	334, 600, 637
				AT	13, 200, 334, 407, 412, 1206, 1284,

2.2. Reference Numbers for Individual Spectra—Continued

O I—Continued			SF	369	
		1285, 1305	PT	334, 369, 600, 637	
	OT	241, 1128, 1292	AT	334, 1282, 1284, 1305	
			OT	1128	
O II	CL	528, 929	F III	EL	767
	W	528, 903, 929		CL	767
	SE	174		W	767
	Hfs	1282		IP	767
	PT	331, 333, 815		SF	767
	AT	333, 849, 1282, 1284, 1287, 1305		PT	767
				AT	1284
O III	EL	525	F IV	EL	525
	CL	525, 929		CL	525
	W	525, 903, 929		W	525
	PT	334		PT	334
	AT	334, 1284, 1287		AT	334, 1284
	OT	1129, 1221, 1244		OT	1244
O IV	EL	648, 929	F V	EL	525
	ND	528, 648, 929		CL	525
	CL	528, 648, 929		W	525
	W	648		IP	143
	IP	143, 648		PT	309
	SF	648		AT	1049A, 1284
	PT	87, 309		OT	143, 1244
	AT	1049A, 1284, 1287	F VI	AT	299
	OT	143, 1244		OT	525, 1244
O V	EL	552	F VII	EL	627
	CL	148, 528, 552		CL	627
	W	148, 528, 552		W	627, 1016A
	IP	552		Hfs	656, 1301
	AT	9, 299, 1284, 1287		AT	900, 1301
	OT	1244	F VIII	TE	682, 887
O VI	EL	138, 627, 1169, 1170, 1207		AT	500, 574
	ND	138		OT	682, 887
	CL	138, 148, 627, 1169, 1170, 1207	Ne I	EL	36, 235, 370, 653, 943
	W	138, 148, 627, 1016A, 1169, 1170, 1207		ND	36
	Hfs	656, 1301		CL	36, 370, 653, 943
	AT	900, 1301		W	36, 370, 653, 818, 943, 1050A
O VII	EL	586, 1169, 1170		ZE	216, 967A, 1021A, 1108
	CL	804, 1169, 1170		Hfs	1023A, 1095A
	W	490, 804, 905, 906, 1169, 1170		IP	241
	TE	682, 887		PT	48, 85, 370, 916
	AT	188, 500, 574, 586, 609		AT	25, 679, 886, 1249, 1285, 1304, 1305
	OT	682, 887		OT	241, 1171, 1299
O VIII	EL	1169, 1170	Ne II	EL	36, 288
	CL	1169, 1170		ND	36
	W	1169, 1170		CL	36, 288, 734
F ⁻	AT	886, 1285, 1287, 1305		W	36, 288, 734, 909, 939, 1077A
F I	EL	484		ZE	967A, 1021A
	ND	484		Hfs	1282
	CL	484		PT	331, 1124
	W	484		AT	886, 1088A, 1282, 1284, 1305
	ZE	164, 405		OT	1299
	Hfs	164, 405, 407, 621, 890	Ne III	CL	729
	IP	67, 241		W	729, 909, 1077A
	AT	407, 886, 1206, 1284, 1285, 1305		ZE	967A, 1021A
	OT	241, 1292		PT	334, 600, 637
				AT	334, 1284
				OT	1128
F II	EL	369	Ne IV	CL	729
	ND	369		W	729, 909, 1077A
	CL	369		PT	347
	W	369			
	Hfs	1282			
	IP	369			

2.2. Reference Numbers for Individual Spectra—Continued

Ne iv—Continued			W	1168
	AT	1284	PT	334, 600, 637
Ne v	CL	729	AT	334, 1284
	W	729, 909, 1077A	OT	1128
	PT	334		
	AT	334, 1284	Na v	EL 1168
	OT	525, 1129, 1244		CL 1168
Ne vi	EL	1169		W 1168
	CL	729, 1169		AT 1284
	W	729, 909, 1169	Na vi	PT 334
	IP	143		AT 334, 1284
	AT	900, 1049A, 1284		OT 1129
	OT	143, 525, 1244	Na vii	EL 654
Ne vii	EL	919, 1169		CL 654
	CL	919, 1169		W 654
	W	919, 1169		IP 143
	IP	919		PT 309
	AT	299, 679		AT 900, 1049A, 1284
	OT	525, 1244		OT 143
Ne viii	EL	627, 919, 1169, 1170	Na viii	EL 654
	CL	627, 724, 919, 1169, 1170		CL 654
	W	627, 724, 919, 1169, 1170		W 654
	Hfs	656		AT 299
	IP	919		OT 525
	AT	900	Na ix	EL 627, 654
Ne ix	EL	1169, 1170		CL 627, 654
	CL	724, 804, 1169, 1170		W 627, 654
	W	500, 724, 804, 905, 906, 1169, 1170		AT 900
	IP	724	Na x	W 905
	TE	682, 887		AT 574
	AT	500, 574, 679	Na xi	W 905
	OT	682, 887	Na	W 390
Ne x	W	905, 906	Mg i	EL 133, 1184
Ne	W	397		ND 133
Na i	EL	308, 873, 1181		CL 481, 535, 1184
	CL	873, 1181		W 481, 535, 1184
	W	308, 873, 1168, 1181		Hfs 340, 1046A, 1068A
	ZE	215		IP 241, 1184
	SE	599, 721, 841, 1054A, 1165		PT 340
	Hfs	209, 251, 321, 439, 621, 641, 685, 706, 813, 843, 890, 984A 1033A, 1045A, 1137, 1220, 1238		AT 16, 133, 134, 167, 590
	IP	241, 1181		OT 241, 918
	SF	873	Mg ii	CL 535
	PT	1181		W 481, 535, 612
	AT	1181, 1242, 1285		OT 918
	OT	241, 918	Mg iii	EL 612, 1096A, 1099A
Na ii	EL	914		CL 612, 1096A, 1099A
	CL	914		W 612, 1096A, 1099A
	W	914, 1168		IP 1099A
	IP	914		PT 85
	SF	914		AT 25
	PT	85, 914		OT 612
	AT	25, 1305	Mg iv	EL 1096A
	OT	1245		CL 1096A
Na iii	EL	730, 1096A, 1099A, 1168		W 612, 1096A
	CL	730, 1096A, 1099A, 1168	Mg v	PT 334, 600, 637
	W	730, 1096A, 1099A, 1168		AT 334
	AT	1284		OT 1128
Na iv	EL	1168	Mg vi	EL 654
	CL	1168		CL 654
				W 654

2.2. Reference Numbers for Individual Spectra—Continued

Mg vii	EL	654	Al ix	PT	334
	CL	654		AT	334
	W	654		OT	1176
	PT	334		EL	654, 927
	AT	334		CL	654, 927
	OT	1129, 1176		W	654, 927
Mg viii	EL	654, 927	Al x	IP	143, 927
	CL	526, 654, 927		PT	309
	W	654, 927		AT	900, 1049A
	IP	143, 927		OT	143
	PT	309		EL	654, 753
	AT	900, 1049A		CL	654, 753
Mg ix	OT	143, 526		W	654, 753
	EL	654, 753	Al xi	IP	753
	CL	654, 753		AT	299
	W	654, 753, 999A		EL	627, 654, 695, 1160
	IP	753		CL	627, 654, 695, 1160
	AT	299		W	627, 654, 695, 1160
Mg x	OT	525		AT	900
	EL	627, 654, 695, 1160		OT	1160
	CL	627, 654, 695, 1160	Al xii	CL	804
	W	627, 654, 695, 999A, 1122, 1160		W	804
	AT	900		AT	574
	OT	1160		CL	804
Mg xi	EL	1160		W	804
	CL	804, 1160	Al	W	668
	W	804, 905, 906, 1160		EL	1112
	AT	574, 609		CL	1112
	OT	1160		W	1112
	EL	1160		SE	258
Mg xii	CL	804		Hfs	258
	W	804, 905	Si i	IP	165, 241, 1112
	EL	531		PT	20, 327, 334, 338, 735
	ND	1155		AT	165, 200, 327
	ZE	283		OT	241
	SE	283, 428, 1146	Si ii	EL	1232
Al i	Hfs	283, 428, 1146		ND	1155
	IP	241, 1111		CL	1232
	AT	16, 271, 493, 531		W	1232
	OT	7, 241, 531, 1111, 1155		IP	165, 1111, 1232
	EL	133		PT	345, 664
	ND	133	Si iii	AT	16, 75, 165, 271
Al ii	CL	1152		OT	1111, 1155
	W	261, 1152		EL	133, 1232
	Hfs	1152		ND	133
	AT	16, 133, 134, 167, 590		CL	1232
	OT	918		W	1232
	W	261		IP	1232
Al iii	AT	1303	Si iv	AT	16, 133, 134, 167, 445, 590
	OT	918		OT	918
	PT	85		EL	1232
Al iv	AT	25		CL	1232
	PT	334, 600, 637		W	1232
	AT	334		IP	1232
Al vi	OT	1128		OT	918
	EL	654, 814	Si v	PT	85
	ND	814		AT	25
	CL	654, 814		PT	334, 600, 637
Al vii	W	654, 814	Si vii	AT	334
	EL	654, 814		OT	1128
	CL	654, 814			
Al viii	W	654, 814			
	EL	654, 814			
	CL	654, 814			
	W	654, 814			

2.2. Reference Numbers for Individual Spectra—Continued

Si viii	EL	654	P viii	W	697
	CL	654, 1090A		PT	334, 600, 637
	W	654, 1090A		AT	334
				OT	1128
Si ix	EL	654	P ix	EL	654
	ND	1128		CL	654
	CL	654, 1128		W	654, 697
	W	654	P x	EL	654, 697
	PT	334		CL	654, 697
	AT	334		W	654, 697
	OT	1129, 1176, 1221		PT	334
Si x	EL	654, 697, 927		AT	334
	CL	526, 654, 697, 927		OT	1176
	W	654, 697, 927	P xi	EL	654, 697
	IP	143, 927		CL	654, 697
	PT	309, 337		W	654, 697
	AT	900, 1049A		IP	143
	OT	143, 526		PT	309
Si xi	EL	138, 571, 654, 697, 753, 1122		AT	900, 1049A
	ND	138		OT	143
	CL	138, 571, 654, 697, 753, 1122	P xii	EL	654, 697
	W	138, 571, 654, 697, 753, 1122		CL	654, 697
	AT	299		W	654, 697
Si xii	EL	571, 654, 695, 1160		AT	299
	CL	571, 654, 695, 1160	P xiii	EL	654, 697
	W	571, 654, 695, 1122, 1160		CL	654, 697
	AT	900		W	654, 697
	OT	1160		AT	900
Si xiii	EL	860	P xiv	AT	574
	CL	804, 860	S ⁻	EL	823
	W	804, 860	S i	EL	236
	AT	574		CL	115, 158, 583, 901
Si xiv	EL	996A		W	583, 901
	CL	804		IP	165, 241
	W	804		PT	20, 236, 334
Si xvi	EL	996A		AT	165, 200, 372
P i	Hfs	95, 1220		OT	241, 693
	IP	241	S ii	CL	583
	PT	20		W	324, 583
	AT	98		IP	165
	OT	241		PT	331, 333
P ii	PT	334		AT	165, 333, 372
P iii	EL	1155	S iii	EL	1122
	CL	1241		CL	583, 1122
	W	1241		W	324, 583, 1122
	IP	1111		IP	165, 1111
	AT	271		SF	1111
	OT	1111, 1155		PT	334
P iv	EL	133		AT	165
	ND	133		OT	1111
	CL	1241	S iv	EL	741, 1111, 1122
	W	1241		CL	583, 1111, 1122
	AT	16, 133, 134		W	583, 741, 1122
	OT	918		IP	1111
P v	CL	1241		AT	271
	W	1241		OT	1111
	OT	918	S v	EL	1122
P vi	W	697		CL	583, 1122
	PT	85		W	583, 1122
	AT	25		OT	918
P vii	W	697			

2.2. Reference Numbers for Individual Spectra—Continued

S vi	CL	583	CL	761	
	W	583	W	761	
	OT	918	IP	1111	
S vii	PT	85	AT	271	
	AT	25	OT	1111	
S viii	ND	1128	Cl vi	EL	761
	CL	526, 1128		CL	761
	IP	581		W	761
	OT	526, 581		AT	16
S ix	EL	1231A		OT	918
	ND	1231A	Cl vii	OT	918
	CL	1231A	Cl viii	PT	85
	W	1231A		AT	25
	IP	581	Cl ix	EL	1231A
	PT	334, 600, 637		ND	1128, 1231A
	AT	334		CL	1128, 1231A
	OT	581, 1128		W	1231A
S x	EL	697, 1231A	Cl x	EL	1231A
	ND	1231A		ND	1128, 1231A
	CL	697, 1231A		CL	1128, 1231A
	W	697, 1231A		W	1231A
S xi	EL	654, 697, 1231A		PT	600
	ND	1231A		OT	1128
	CL	654, 697, 1090A, 1231A	Cl xi	EL	654, 1231A
	W	654, 697, 1090A, 1231A		ND	1231A
	IP	581		CL	654, 1231A
	OT	581, 1129, 1176		W	654, 1231A
S xii	EL	654, 697, 1231A	Cl xii	EL	654, 1231A
	ND	1231A		ND	1231A
	CL	526, 654, 697, 1231A		CL	654, 1231A
	W	654, 697, 1231A		W	654, 1231A
	IP	143, 581		OT	1176
	AT	900	Cl xiii	EL	654, 1231A
	OT	143, 526, 581		ND	1231A
S xiii	EL	654, 697		CL	654, 1231A
	CL	654, 697		W	654, 1231A
	W	654, 697		IP	143
S xiv	EL	654, 697, 1160		AT	900
	CL	654, 697, 1160		OT	143
	W	654, 697, 1160	Cl xiv	EL	654
	AT	900		CL	654
	OT	1160		W	654
S xv	EL	860	Cl xv	EL	654
	CL	804, 860		CL	654
	W	804, 860		W	654
	AT	574, 609		AT	900
S xvi	CL	804	Ar i	EL	234, 255, 363, 514, 653, 733
	W	804		CL	234, 255, 363, 653, 733
Cl i	EL	24, 298, 821		W	234, 255, 363, 514, 653, 733, 818, 1050A
	ND	298		SE	866
	CL	24, 298, 821		Hfs	201
	W	24, 298, 821		IS	201
	Hfs	890, 1064A		IP	165, 241, 733
	IP	59, 67, 241, 298, 821		PT	85, 234, 344, 1123
	PT	20, 298, 821		AT	165, 234, 1304
	OT	7, 241		OT	241, 832, 1171
Cl ii	EL	236	Ar ii	EL	448
	PT	236, 334, 735		CL	603, 638, 655, 724
Cl iv	PT	334		W	448, 603, 638, 655, 724, 998A, 1050A
Cl v	EL	761		IP	165

2.2. Reference Numbers for Individual Spectra—Continued

Ar II—Continued			CL	526, 724, 1158, 1169	
	PT	331	W	724, 1158, 1169	
	AT	165	IP	143, 581	
Ar III	EL	78	AT	900, 1158	
	CL	78	OT	143, 526, 581	
	W	78, 741, 998A			
	IP	165			
	PT	334, 735			
	AT	78, 165			
Ar IV	EL	1111	Ar XV	EL	1158
	ND	1111		CL	724, 1158
	CL	78, 1111		W	724, 1158
	W	78, 998A, 1111		AT	1158
	IP	165			
	AT	165, 936			
Ar V	EL	1111	Ar XVI	EL	1158
	CL	1111		CL	724, 1158
	W	998A		W	724, 1158
	IP	165		AT	900, 1158
	AT	165			
Ar VI	EL	1111	Ar XVII	EL	860, 1158, 1180
	CL	1111		CL	724, 860, 1158, 1180
	W	998A		W	724, 860, 1158, 1180
	IP	1111		IP	724
	AT	271	AT	1158	
	OT	1111			
Ar VII	W	998A	Ar XVIII	EL	996A, 1158, 1180
	OT	918		CL	724, 1158, 1180
Ar IX	CL	724		W	724, 1158, 1180
	W	724		AT	1158
	PT	85	Ar	W	1170
	AT	25			
	OT	918			
Ar X	EL	1158, 1231A		K I	EL
	ND	1231A	ND		354
	CL	526, 1158, 1231A	CL		205, 873
	W	1158, 1231A	W		205, 308, 873
	IP	581	ZE	212, 215	
	AT	1158	SE	362, 599, 708, 841, 1165	
	OT	526, 581	Hfs	198, 212, 430, 432, 439, 532, 540, 641, 813, 843, 890, 984A 1136, 1210	
Ar XI	EL	1128, 1158, 1169, 1231A	IS	1149	
	ND	1231A	IP	241	
	CL	1128, 1158, 1169, 1231A	SF	873	
	W	1158, 1169, 1231A	PT	354	
	IP	581	AT	109, 1166	
	PT	600, 637	OT	241	
	AT	1158	K II	EL	1099A
	OT	581, 1128		PT	85
Ar XII	EL	1158, 1169, 1183, 1231A		AT	1087A, 1153
	ND	1231A		OT	1245
	CL	724, 1158, 1169, 1231A	K III	EL	64
	W	724, 1158, 1169, 1231A		CL	64
	AT	1158		W	64
Ar XIII	EL	1158, 1169, 1231A		IP	64
	ND	1231A	OT	64	
	CL	1158, 1169, 1231A	K IV	EL	64
	W	1158, 1169, 1231A		CL	64
	IP	581		W	64
	AT	1158		IP	64
	OT	581, 1129, 1176	PT	334, 735	
Ar XIV	EL	1158, 1169	OT	64	
			K V	EL	1111
		ND		1111	
		CL		1111	
		W		1111	
			AT	936	
			K VI	EL	761, 1111
				CL	761, 1111
				W	761, 1111
				IP	1111

2.2. Reference Numbers for Individual Spectra—Continued

K vi—Continued			AT	41, 109, 1303
	OT	1111	Ca iii	EL 262, 1099A
K vii	EL	761, 1111		CL 262, 1099A
	CL	1111		W 262, 1099A
	W	761, 1111		IP 165, 262, 1099A
	IP	1111		PT 85, 1192
	AT	271		AT 165, 1087A
	OT	1111	Ca iv	EL 64
K viii	EL	761		CL 64
	CL	761		W 64
	W	761		IP 64, 165
	AT	16		AT 165
	OT	918		OT 64
K ix	OT	918	Ca v	EL 64
K x	PT	85		CL 64
	AT	25		W 64
K xi	EL	1231A		IP 64, 165
	ND	1231A		PT 334, 735
	CL	1231A		AT 165
	W	1231A		OT 64
	IP	581	Ca vi	EL 761, 1111
	OT	581		CL 761, 1111
K xii	EL	1231A		W 761, 1111
	ND	1231A		IP 165
	CL	1231A		AT 165, 936
	W	1231A	Ca vii	EL 761, 1111
	IP	581		ND 1111
	PT	600, 637		CL 761, 1111
	OT	581, 1128		W 761, 1111
K xiii	EL	654, 1120, 1231A		IP 165, 1111
	ND	1231A		AT 165
	CL	654, 1120, 1231A		OT 1111
	W	654, 1120, 1231A	Ca viii	EL 1111
K xiv	EL	1120		CL 1111
	CL	1120		W 761, 1111
	W	1120		IP 1111
	IP	581		AT 271
	OT	581, 1176		OT 1111
K xv	EL	1120	Ca ix	EL 761
	CL	1120		CL 761
	W	1120		W 761
	IP	143, 581		AT 134
	AT	900		OT 918
	OT	143, 581	Ca x	W 170
K xvii	AT	900		OT 918
Ca i	EL	82, 433	Ca xi	W 170
	ND	433		PT 85
	CL	82		AT 25
	W	82	Ca xii	CL 526
	ZE	696		W 170
	SE	726		IP 581
	Hfs	465, 1046A, 1132		OT 526, 581
	IS	257, 469	Ca xiii	W 32, 170
	IP	241		IP 32, 581
	PT	433, 513, 572, 696, 1243		PT 600, 637
	AT	41, 590, 747, 1166		OT 581, 1128
	OT	241	Ca xiv	EL 138, 654, 1231A
Ca ii	CL	103		ND 138
	W	103		CL 138, 654
	IS	1133		W 32, 138, 170, 654, 906
	PT	330		IP 32

2.2. Reference Numbers for Individual Spectra—Continued

Ca xv	EL	533, 1231A	Sc ix	EL	761, 1111
	CL	533		CL	761, 1111
	W	32, 170, 533		W	761, 1111
	IP	32, 581		IP	1111
	OT	581, 1129, 1176		AT	271
Ca xvi	W	32, 170		OT	1111
	IP	32, 143, 581	Sc x	EL	761
	AT	900		CL	761
	OT	143, 581		W	761
Ca xviii	Hfs	656		AT	16
	AT	900		OT	918
Ca xix	EL	1159	Sc xi	EL	761
	CL	1159		CL	761
	W	1159		W	761
Sc i	EL	433		OT	918
	ND	433	Sc xii	PT	85
	SE	1073A		AT	25
	Hfs	194, 578, 813, 848, 1073A, 1130	Sc xiv	EL	1128
	IS	864		CL	1128
	IP	241		W	1128
	PT	433, 1243		PT	600, 637
	AT	41, 747, 864, 892		OT	1128
	OT	241	Sc xvii	AT	900
Sc ii	PT	329, 330, 517, 1243		Sc xix	AT
	AT	41, 747	Sc xx	AT	609
Sc iii	ND	328		Sc	W
	PT	71, 328		W	761
	AT	109	Ti i	EL	433, 450
Sc iv	EL	64, 78		ND	297, 433
	CL	64, 78		CL	450
	W	64, 78		W	450
	IP	64		ZE	1031A
	PT	85		Hfs	194, 1130
	AT	78, 1153		IS	469, 864
	OT	64		IP	241
Sc v	EL	64, 78		PT	297, 433, 1243
	CL	64, 78		AT	41, 417, 747, 864, 1166
	W	64, 78		OT	241
	IP	64	Ti ii	ND	329
	AT	78		W	450
	OT	64		PT	129, 329, 330, 1243
Sc vi	EL	64, 78		AT	41, 140, 417, 747, 1295
	CL	64, 78	Ti iii	ND	328
	W	64, 78		PT	71, 230, 328, 342, 517, 780, 1110, 1243
	IP	64		AT	141, 200, 747, 780
	PT	334, 735	Ti v	EL	64, 78
	AT	78		CL	64, 78
Sc vii	OT	64		W	64, 78, 740
	EL	64, 761, 1111		IP	64, 165
	ND	1111		SF	64
	CL	64, 761, 1111		PT	85, 1192
	W	64, 761, 1111		AT	78, 165
	IP	64		OT	64
	AT	936	Ti vi	EL	64, 78
Sc viii	OT	64		CL	64, 78
	EL	761, 1111		W	64, 78, 740
	ND	1111		IP	64, 165
	CL	761, 1111		SF	64
	W	761, 1111		AT	78, 165
	IP	1111	Ti vii	OT	64
	OT	1111		EL	64, 78

2.2. Reference Numbers for Individual Spectra—Continued

Ti vii—Continued		ND	329, 330, 456
	CL	CL	456
	W	W	456
	IP	IP	456
	SF	PT	329, 330, 534, 1110, 1243
	PT	AT	41, 417, 559, 747, 1295
	AT	OT	456, 1298
	OT		
Ti viii		V iii	EL 704, 842
	EL	ND	328, 704
	CL	CL	704
	W	W	704
	IP	IP	704
	AT	PT	71, 230, 328, 780, 842, 1110, 1243
		AT	140, 200, 417, 747, 780
Ti ix		V iv	EL 147
	EL	CL	147
	CL	W	147
	W	IP	147
	IP	PT	517, 780, 842, 1243
	AT	AT	141, 200, 747, 780
	OT		
Ti x		V v	EL 147, 761
	EL	CL	147, 761
	CL	W	147, 761
	W	IP	147
	IP		
	AT	V vi	EL 78, 1192
	OT	CL	78, 1192
		W	78, 1192
Ti xi		PT	85, 1192
	EL	AT	78
	CL		
	W	V vii	EL 78
	OT	CL	78
		W	78
Ti xii		IP	581
	EL	AT	78
	CL	OT	581
	W		
	OT	V viii	EL 761
		CL	761
Ti xiii		W	761
	AT	IP	581
		PT	334, 735
Ti xv		OT	581, 1209
	EL	V ix	EL 761
	CL	CL	761
	W	W	761
	PT	AT	936
	OT	OT	1209
Ti xviii		V x	EL 761
	AT	CL	761
		W	761
Ti xx		IP	581
	EL	OT	581, 761, 1209
	CL		
	W	V xi	EL 761
	AT	CL	761
		W	761
Ti xxi		IP	581
	EL	AT	271
	CL	OT	581
	W		
Ti xxii		V xii	EL 761
	EL	CL	761
	CL	W	761
	W	OT	761, 918
Ti			
	W		
V i			
	EL		
	ND		
	Hfs		
	IS		
	IP		
	PT		
	AT		
	OT		
V ii			
	EL		

2.2. Reference Numbers for Individual Spectra—Continued

V xiii	EL	225	AT	165, 936
	CL	225	OT	1209
	W	225		
	OT	918	Cr xi	EL 761
V xiv	AT	25		CL 761, 1209
V xvi	EL	1128		W 761
	CL	1128		IP 165, 581
	W	1128		AT 165
	PT	600, 637		OT 581, 761, 1209
	OT	1128	Cr xii	EL 761
V xix	AT	900		CL 761
V xxi	AT	900		W 761
Cr i	EL	676		IP 581
	ND	503, 676		AT 271
	Hfs	194, 712, 1130		OT 581, 761
	IS	469, 864, 1133	Cr xiii	EL 761
	IP	241		CL 761
	PT	676, 1243		W 761
	AT	29, 41, 503, 746, 864, 1295		OT 761, 918
	OT	241	Cr xiv	EL 225
Cr ii	ND	330, 504		CL 225
	PT	330, 504, 1243		W 225
	AT	29, 41, 504, 746, 805, 1295		OT 918
	OT	1298	Cr xv	AT 25
Cr iii	ND	328	Cr xvii	PT 600, 637
	PT	71, 230, 328, 1110, 1243	Cr xx	AT 900
	AT	29, 200, 417, 559, 747, 1295	Cr xxii	AT 900
	OT	1298	Mn i	EL 1097A
Cr iv	PT	780, 1110, 1243		ND 738
	AT	29, 141, 417, 747, 780, 1295		CL 553, 1097A
Cr v	PT	517, 780		W 553, 1097A
	AT	29, 780, 1295		ZE 1135
Cr vi	EL	761		Hfs 194, 790, 1014A, 1060A, 1130, 1135,
	CL	761		1148, 1216
	W	761		IS 864
	IP	165		IP 241
	AT	29, 165, 1295		PT 738, 1243
Cr vii	EL	1192		AT 41, 746, 864
	CL	1192		OT 241
	W	1192	Mn ii	ND 330, 503
	IP	165		ZE 705
	PT	85, 401, 1192		PT 330, 1243
	AT	165, 401, 1153		AT 41, 503, 746, 1295
Cr viii	EL	761		OT 1298
	CL	761	Mn iii	EL 457, 1179
	W	761		ND 328, 504, 1179
	IP	165, 581		CL 457, 1179
	AT	165		W 457, 1179
	OT	581		Hfs 93
Cr ix	EL	761		IP 457
	CL	761, 1209		PT 71, 93, 230, 328, 504, 1110, 1243
	W	761		AT 504, 746, 805, 837
	IP	165, 581		OT 1298
	PT	735	Mn iv	PT 1110, 1243
	AT	165		AT 29, 200, 1295
	OT	581, 1209	Mn v	PT 780
Cr x	EL	761		AT 780
	CL	761, 1209	Mn vi	PT 342, 517, 780
	W	761		AT 780
	IP	165	Mn viii	EL 1192

2.2. Reference Numbers for Individual Spectra—Continued

Mn viii—Continued			Fe iii	ND	328, 503, 698
	CL	1192		PT	71, 230, 328, 698, 1110, 1243
	W	1192		AT	200, 503, 746
	PT	85, 401, 1192		OT	1298
	AT	401			
Mn ix	EL	78	Fe iv	EL	516
	CL	78		CL	516
	W	78, 761		W	385, 516
	IP	581		PT	879, 1110, 1243
	AT	78		AT	29, 1295
	OT	581		OT	1298
Mn x	EL	78, 761	Fe v	W	385
	CL	78, 761		PT	884
	W	78, 761		AT	200
	IP	581			
	PT	735	Fe vi	W	385, 742
	AT	78		PT	780
	OT	581, 761, 1209		AT	780
Mn xi	EL	761	Fe vii	ND	517
	CL	761		W	742
	W	761		PT	517, 780
	AT	936		AT	780
	OT	761, 1209		OT	931
Mn xii	EL	761	Fe viii	W	742
	CL	761, 1209		IP	165
	W	761		AT	165
	IP	581			
	OT	581, 761, 1209	Fe ix	EL	1192
Mn xiii	EL	761		CL	526, 1192
	CL	761		W	78, 1090A, 1192
	W	761		IP	165
	IP	581		PT	85, 401, 1192
	AT	271		AT	78, 165, 401, 526, 1153
	OT	581, 761	Fe x	EL	78, 915
Mn xiv	EL	761		CL	78, 526, 915
	CL	761		W	78, 1090A, 1114
	W	761		IP	165, 581
	OT	761, 918		AT	78, 165, 526, 859
Mn xv	EL	225		OT	581, 761
	CL	225	Fe xi	EL	78, 761, 915
	W	225		CL	78, 526, 761, 915, 1209
	AT	900		W	78, 761, 1114, 1122
	OT	918		IP	165, 581
Mn xvi	AT	25		PT	735
Mn xviii	PT	600, 637		AT	78, 165, 526, 859
Mn xxi	AT	900		OT	581, 761, 1209
Mn xxiii	AT	900	Fe xii	EL	761, 915, 1090A
Fe i	EL	675		CL	761, 915, 1090A, 1209
	ND	675		W	78, 761, 1114, 1122
	CL	58		IP	165
	SE	802		AT	78, 165, 859, 936
	Hfs	194, 845, 1130, 1219		OT	761, 810, 1090A, 1209
	IS	469, 864, 1133	Fe xiii	EL	761, 915
	IP	241		CL	761, 915, 1209
	PT	534, 675, 1243		W	78, 761, 809, 1114
	AT	41, 502, 506, 560, 747, 864		IP	165, 581
	OT	241		AT	78, 165, 859
Fe ii	ND	330, 728		OT	581, 761, 1209
	PT	330, 728, 816, 1243	Fe xiv	EL	707, 761, 915
	AT	41, 560, 746, 788, 805, 1295		ND	917
				CL	707, 761, 915, 917
				W	78, 707, 761, 917, 1114
				IP	165, 581
				AT	78, 165, 271, 859

2.2. Reference Numbers for Individual Spectra—Continued

Fe xiv—Continued	OT	581, 654, 707, 761	AT	384, 859, 900
Fe xv	EL	707, 761, 915, 917	Fe xxv	EL 739, 993A, 1161
	ND	917		CL 739, 993A, 1161
	CL	707, 761, 819, 915, 917		W 719, 739, 993A, 1161
	W	78, 707, 761, 819, 917, 1114		PT 658
	IP	165		AT 384, 500, 609
	AT	78, 165, 859	Fe xxvi	EL 1161
	OT	654, 707, 761, 918		CL 1161
Fe xvi	EL	225, 707, 819, 915, 917		W 1161
	ND	917	Fe	W 857, 948
	CL	225, 707, 819, 915, 917	Co I	ND 758
	W	78, 225, 707, 819, 917		ZE 14
	IP	165, 819, 872		SE 802
	AT	78, 165, 859, 900		Hfs 14, 194, 751, 1130
	OT	654, 707, 872, 918		IS 864
Fe xvii	EL	707, 915, 917		IP 241
	ND	917		PT 14, 758, 1243
	CL	707, 915, 917		AT 41, 139, 747, 864
	W	170, 707, 905, 906, 917		OT 241
	PT	85	Co II	PT 330, 1243
	AT	25, 859, 1182		AT 41, 141, 502, 506, 559, 560, 747, 1295
	OT	654, 707, 1182	Co III	ND 328
Fe xviii	EL	707, 915, 917, 1120		PT 71, 230, 328, 1110, 1243
	ND	707, 917		AT 200, 560, 746, 788, 805
	CL	707, 915, 917, 1120		OT 1298
	W	707, 905, 917, 1120	Co IV	EL 1103A
	AT	859, 1182		CL 1103A
	OT	654, 707, 1182		W 1103A
Fe xix	EL	707, 915, 917		PT 1110
	ND	707, 917	Co VII	PT 780
	CL	707, 915, 917		AT 780
	W	707, 917	Co VIII	PT 517
	PT	600, 637	Co IX	EL 522, 856
	AT	859, 1182		CL 522, 856
	OT	654, 707, 1182		W 522, 856
Fe xx	EL	707, 915, 917		OT 856
	ND	707, 917	Co x	ND 522
	CL	707, 915, 917		CL 522
	W	707, 719, 917		W 522
	AT	859, 1182		PT 401
	OT	654, 707, 1182		AT 401
Fe xxi	EL	707, 915	Co xi	EL 522
	ND	917		CL 522
	CL	707, 915, 917		W 522
	W	707, 719, 917		IP 581
	AT	859, 1182		OT 581
	OT	654, 707, 1129, 1182	Co xii	CL 522
Fe xxii	EL	915		W 522
	CL	915		IP 581
	W	719		PT 735
	AT	384, 859, 900, 1182		OT 581, 1209
	OT	654, 1182	Co xiii	OT 1209
Fe xxiii	EL	739, 915	Co xiv	IP 581
	CL	739, 915		OT 581, 1209
	W	719, 739	Co xv	IP 581
	PT	658		OT 581
	AT	384, 859	Co xvi	CL 819
Fe xxiv	EL	739, 915, 993A, 1161		W 819
	ND	707		
	CL	739, 915, 993A, 1161		
	W	719, 739, 993A, 1161		

2.2. Reference Numbers for Individual Spectra—Continued

Co xvi—Continued					IP	165
	OT	918			AT	165
Co xvii	EL	225, 819			OT	1209
	CL	225, 819		Ni xv	CL	1090A, 1209
	W	225, 819			W	1090A
	IP	819, 872			IP	165, 581
	AT	900			AT	165
	OT	872, 918			OT	581, 1209
Co xviii	CL	270		Ni xvi	IP	581
	W	270			OT	581
Co xxiii	AT	900		Ni xvii	EL	819
Co xxv	AT	900			CL	819
Ni i					W	819
	ND	759			OT	918
	W	803		Ni xviii	EL	225, 819
	ZE	38			CL	225, 819
	SE	258, 802			W	225, 819
	Hfs	38, 194, 258, 1130			IP	819, 872
	IS	469, 479, 530, 647, 864			AT	900
	IP	241			OT	872, 918
	PT	479, 647, 759, 1243		Ni xxiv	AT	900
	AT	41, 530, 747, 864, 1189		Ni xxvi	AT	900
	OT	241				
Ni ii	EL	897		Cu i	ND	639
	ND	897			W	1047A
	CL	897			ZE	406
	W	897			SE	453, 802
	IP	897			Hfs	66, 194, 394, 406, 770, 787, 813, 848, 1130, 1217
	PT	330, 897, 1030A, 1243			IS	469, 530, 864
	AT	41, 139, 747, 1295			IP	241
					PT	394, 415, 418, 639, 787, 1243
Ni iii	ND	328			AT	41, 415, 530, 864
	PT	71, 230, 328, 1110, 1243			OT	241
	AT	141, 200, 502, 506, 559, 560, 747		Cu ii	EL	722, 869
Ni iv	EL	247, 249, 454, 1103A			ND	330, 722, 869
	CL	247, 249, 454, 1103A			CL	869
	W	247, 249, 454			W	869
	PT	319, 657, 1110			Hfs	594
	AT	560			IS	530
Ni viii	PT	780			IP	869
	AT	780			PT	330, 594, 722, 1030A, 1243
Ni x	EL	856			AT	41, 530, 747, 1288
	CL	856, 858			OT	1245, 1288
	W	856, 858		Cu iii	ND	328
	OT	856			PT	71, 328, 1243
Ni xi	CL	526, 1192			AT	139, 747
	W	1114		Cu iv	EL	607, 797
	IP	165			CL	607, 797
	PT	401, 1192			W	607, 797
	AT	165, 401, 526, 1153			IP	607, 797
Ni xii	EL	858			PT	607, 797, 1110
	CL	526, 858			AT	141
	W	858			OT	607
	IP	165, 581		Cu xi	EL	856
	AT	165, 526			CL	856, 858
	OT	581			W	856, 858
Ni xiii	CL	526, 1209			OT	856
	IP	165, 581		Cu xii	EL	858
	PT	735			CL	858
	AT	165, 526			W	858
Ni xiv	OT	581, 1209			PT	401
	CL	1209				

2.2. Reference Numbers for Individual Spectra—Continued

Cu XII—Continued			Ga III	PT	71
	AT	401	Ga IV	ND	928
Cu XIII	EL	858		PT	1243
	CL	858		OT	928
	W	858	Ga V	AT	429, 505, 747
Cu XIV	PT	735	Ga XXI	AT	900
Cu XVIII	EL	819	Ga XXVII	AT	900
	CL	819	Ga XXX	AT	609
	W	819	Ge I	Hfs	548, 955A, 972A, 1118, 1119
Cu XIX	EL	225, 819		PT	172, 342, 343, 1283
	CL	225, 819		AT	120, 200, 313, 548
	W	225, 819	Ge II	EL	187
	IP	819		CL	187
	AT	900		W	187
Cu XXV	AT	900	Ge V	ND	928
Cu XXVII	EL	1161		OT	928
	CL	1161	Ge VI	AT	429, 505, 747
	W	1161	Ge XXII	AT	900
	AT	900	Ge XXVIII	AT	900
Cu XXVIII	EL	1161	As I	EL	1012A
	CL	1161		CL	1012A
	W	1161		W	1012A
Zn I	EL	145, 242, 400, 736		Hfs	1226
	ND	145, 400		IP	1012A
	CL	145, 242, 400		PT	342
	W	145, 242, 400, 736		AT	313, 1166, 1226
	SE	310	As II	EL	820
	Hfs	305		ND	820
	IP	145, 241		CL	820
	PT	400, 736		W	820
	AT	41, 590, 736, 788		ZE	820
	OT	241		IP	820
Zn II	EL	418, 639, 640		SF	820
	ND	639		AT	120
	CL	418, 639, 640	As VI	ND	928
	W	418, 640, 811, 924		OT	928
	IS	1208	As VII	EL	60
	IP	640		CL	60
	PT	330, 418, 639, 1243		W	60
	AT	41		AT	429
Zn III	ND	328	As XXIII	AT	900
	W	811, 924	As XXIX	AT	900
	PT	71, 328, 1243	Se I	Hfs	548
	AT	747		PT	342
Zn IV	AT	429, 505, 747		AT	200, 313, 548
Zn XII	CL	858	Se IV	EL	925
	W	858		CL	925
Zn XIII	EL	858		W	925
	CL	858		IP	925
	W	858	Se VII	OT	928
Zn XX	AT	900	Se VIII	EL	60
Zn XXVI	AT	900		CL	60
Zn XXVIII	Hfs	656		W	60
	AT	900		AT	429
Ga I	ZE	659	Se XXIV	AT	900
	SE	963A			
	Hfs	224, 548, 659, 813, 848			
	AT	548			

2.2. Reference Numbers for Individual Spectra—Continued

Se xxx	AT	900			953A, 976A, 1069A 1139
Br ⁻	EL	1150		SE	279, 488, 599, 970A, 1131, 1165
	CL	1150		Hfs	31, 69, 218, 222, 260, 641, 813, 881, 890, 953A, 1044A, 1069A, 1234A, 1236
	W	1150		IS	222, 881, 1234A
				IP	145
Br I	W	821		AT	873, 1303
	Hfs	548, 848, 861, 890, 1064A			
	IP	821			
	PT	821			
	AT	313, 548			
Br II	PT	342			
Br III	EL	981A		Rb II	EL 145, 962A, 965A
	ND	981A		ND	145
	CL	981A		CL	145, 962A, 965A
	W	981A		W	145, 259, 962A, 965A
Br IV	EL	930, 981A, 1157		ZE	259, 965A
	ND	981A, 1157		IP	145, 965A
	CL	981A, 1157		PT	1116
	W	981A, 1157		AT	1087A
	IP	1157		OT	962A, 1245
Br V	EL	930, 981A			
	ND	981A			
	CL	930, 981A			
	W	930, 981A, 1157			
	IP	930			
Br VI	EL	981A		Rb III	EL 145
	ND	981A		ND	145, 766
	CL	981A		CL	145
	W	981A		W	145
Br VIII	OT	928		IP	145
Br XXV	AT	900		Rb XXVII	AT 900
Br XXXI	AT	900			
Kr I	EL	255, 521, 605, 610, 653, 983A		Sr I	CL 413
	CL	255, 521, 605, 653, 983A		W	413
	W	255, 521, 564, 605, 610, 628, 653, 818, 983A		ZE	696
	AT	313, 1304		SE	727, 802
	OT	832, 1171		Hfs	1046A, 1132
Kr II	IS	419, 469		IS	419, 469
	EL	353, 933		PT	696
	ND	353			
	CL	353		Sr II	IS 419, 1133
	W	353, 933		IP	674
Kr III	IP	353			
	EL	353		Sr III	EL 962A, 1079A, 1102A, 1229
	W	353		CL	962A, 1079A, 1102A
	PT	342		W	674, 962A, 1079A, 1102A
				IP	674, 1079A, 1102A, 1229
Kr VII	W	968A		PT	1102A
				OT	962A
Kr VIII	W	968A			
Kr X	W	968A		Sr IV	ND 766
Kr XXVI	AT	900		IP	674
Kr XXXIV	Hfs	656			
Rb I	EL	145, 308, 620, 873, 971A		Sr V	IP 674
	ND	145, 620		Sr VI	IP 674
	CL	145, 620, 873			
	W	145, 259, 308, 620, 873, 1234A		Sr XXVIII	AT 900
	ZE	31, 69, 123, 215, 259, 260, 714, 921,			
				Y I	SE 1147
				Hfs	813, 1147
				Y II	AT 204
				Y III	EL 990A
				CL	990A
				W	990A
				IP	990A
				Y IV	EL 1078A, 1079A
				CL	1078A, 1079A
				W	1078A, 1079A
				IP	1078A, 1079A
				AT	1078A
				Y V	EL 524
				CL	524
				W	524

2.2. Reference Numbers for Individual Spectra—Continued

Y v—Continued			Zr xiii	EL	928
	OT	766		CL	928
Y ix	EL	928		W	928
	CL	928		OT	928
	W	928	Zr xiv	EL	928
Y x	EL	928		CL	928
	CL	928		W	928
	W	928	Zr xxx	AT	900
Y xi	EL	928	Nb i	PT	865
	CL	928	Nb ii	PT	534, 865
	W	928	Nb iii	PT	865
Y xii	EL	928	Nb vi	EL	395, 794, 1079A
	CL	928		ND	1079A
	W	928		CL	794, 1079A
	OT	928		W	794, 1079A
Y xiii	EL	928		IP	395, 794, 1079A
	CL	928		OT	794
	W	928	Nb vii	EL	395, 766
Y xxix	AT	900		ND	395, 766
				CL	766
Zr i	IS	419, 469, 1133		W	766
	PT	865	Nb viii	EL	395, 765
Zr ii	PT	865		CL	765
				W	765
Zr iii	PT	865	Nb xi	EL	928
	AT	200		CL	928
Zr iv	IP	165		W	928
	AT	165	Nb xii	EL	928
Zr v	EL	395, 794, 1079A		CL	928
	ND	1079A		W	928
	CL	794, 1079A	Nb xiii	EL	928
	W	794, 1079A		CL	928
	IP	165, 395, 794, 1079A		W	928
	AT	165		IP	928
	OT	794	Nb xiv	EL	928
Zr vi	EL	395, 766		CL	928
	ND	395, 766		W	928
	CL	766		OT	928
	W	766	Nb xv	EL	928
	IP	165		CL	928
	AT	165		W	928
			Nb xxxi	AT	900
Zr vii	EL	395, 765	Mo i	ZE	1101A
	CL	765		Hfs	1101A
	W	765		IS	419, 469, 1067A
	IP	165		PT	865
	AT	165	Mo ii	PT	865
Zr viii	IP	165	Mo iii	PT	865
	AT	165	Mo vi	EL	565
Zr ix	IP	165		CL	565
	AT	165		W	565
				IP	165
Zr x	EL	928		AT	165
	CL	928	Mo vii	EL	395, 794, 1079A
	W	928		ND	1079A
Zr xi	EL	928		CL	794, 1079A
	CL	928		W	794, 1079A
	W	928			
Zr xii	EL	928			
	CL	928			
	W	928			

2.2. Reference Numbers for Individual Spectra—Continued

Mo vii—Continued			Pd i	Hfs	265, 651, 1107A
	IP	165, 395, 794, 1079A		IS	419
	AT	165		PT	863, 865
	OT	794	Pd ii	PT	865
Mo viii	EL	395, 766	Pd iii	PT	865
	ND	395, 766		AT	200
	CL	766	Ag i	EL	418, 639, 1047A
	W	766		ND	418, 639
	IP	165		CL	639, 1047A
	AT	165		W	1047A
Mo ix	EL	395, 765		SE	1076A
	CL	765		Hfs	227, 463, 641, 813, 817, 1076A
	W	765		IS	227, 463
	IP	165		PT	418, 639, 865
	AT	165	Ag ii	PT	865
Mo x	IP	165		AT	1289
	AT	165		OT	1245
Mo xi	IP	165	Ag iii	CL	926
	AT	165		W	926
Mo xii	EL	928		PT	865
	CL	928	Cd i	EL	145, 400, 1173
	W	928		ND	145, 400
Mo xiii	EL	928		CL	145, 400, 486
	CL	928		W	84, 145, 400, 486, 1173
	W	928		ZE	315
Mo xiv	EL	928		SE	310, 491
	CL	928		Hfs	282, 304, 306, 315, 316, 317, 318, 359, 512, 1228
	W	928		IS	419
	IP	928		IP	145, 486
Mo xv	EL	928		PT	400
	CL	928		AT	112
	W	928	Cd ii	ND	418
	OT	928		SE	491
Mo xvi	EL	928		IS	446, 576, 952A, 1052A
	CL	928		PT	418
	W	928	In i	W	1143A
Mo xxxii	AT	900		SE	431, 579, 686, 801, 1003A
Tc i	EL	149		Hfs	431, 443, 579, 801, 813
	CL	149	In ii	W	1143A
	W	149	In iii	EL	1143A
	PT	865		ND	1143A
Tc ii	PT	865		CL	1143A
Tc iii	PT	865		W	1143A
Tc xxxiii	AT	900		IP	1143A
Ru i	IS	419	In iv	EL	1143A
	PT	865		ND	1143A
Ru ii	PT	865		CL	1143A
Ru iii	PT	865		W	1143A
Ru xxxiv	AT	900		IP	1143A
Rh i	ZE	192	In v	W	1143A
	Hfs	192	Sn i	SE	266
	PT	192, 865		Hfs	542, 1163
Rh ii	PT	865		IS	419, 542, 592, 806, 1061A
Rh iii	PT	865		PT	172, 342, 1283
Rh xxxv	AT	900		AT	120
			Sn iv	IS	1052A
			Sb i	Hfs	197, 1032A
				IS	1032A

2.2. Reference Numbers for Individual Spectra—Continued

Sb I—Continued			AT	245, 1166
	PT	342		
Sb II	AT	120	Cs II	EL 145
Te I	EL	485		ND 145
	W	485		CL 145
	ZE	485, 1082A		W 145
	IS	419		SE 131
	PT	342		Hfs 131
Te II	W	136		IP 145
I ⁻	AT	1291		OT 1245
I I	EL	821	Cs III	AT 1166
	CL	743, 821	Ba I	EL 570
	W	743, 821		CL 570, 862
	ZE	743		W 570, 862
	Hfs	890		ZE 246, 389, 577, 1141, 1218
	IP	59, 821		SE 725, 802
	PT	821		Hfs 1046A, 1132
	AT	1291		IS 419
I II	CL	743		IP 570
	W	743		SF 570
	ZE	743		PT 172, 513, 570, 585
	PT	342		AT 1166
	AT	1291		OT 585, 832
I III	AT	1291	Ba II	CL 862
I IV	AT	1291		W 862
I V	AT	1291		Hfs 214, 463, 752, 813, 1004A
I VI	AT	1291		IS 214, 463, 1081A
I VII	AT	1291		PT 183, 245
I VIII	AT	1291		AT 245, 1166
Xe I	EL	255, 653, 763, 983A, 1026A	Ba III	AT 1166
	CL	255, 653, 763, 983A, 1026A	La I	ZE 891, 942
	W	255, 653, 763, 818, 941, 983A, 1026A		SE 920
	ZE	424, 568, 1039A		Hfs 750, 813, 891, 920, 938, 1080A
	Hfs	371, 776, 1059A, 1089A		IP 276
	IS	419, 475, 554, 561, 591, 778, 922, 1058A, 1081A, 1154		PT 938
	PT	371, 940, 1123		AT 892, 1166
	AT	1304	La II	ND 278
	OT	832, 1171		PT 278, 327, 604, 987A
Xe II	EL	754		AT 327
	CL	90	La III	EL 245
	W	90, 754, 939, 941		CL 245
Xe III	EL	941		W 245
	W	941		Hfs 245
	PT	342		IP 245
	AT	228, 273		PT 183, 245
Cs I	EL	145, 308, 619, 793, 873, 992A, 1019A		AT 245
	ND	145, 619	La IV	PT 1121
	CL	145, 619, 873, 992A	La V	EL 960A
	W	104, 145, 308, 619, 793, 873, 992A		CL 960A
	ZE	215, 434, 714, 791, 1038A, 1139		W 960A
	SE	163, 279, 425, 488, 599, 708, 718, 1165		Hfs 960A
	Hfs	243, 434, 436, 442, 463, 641, 791, 813, 890, 1038A, 1138, 1140, 1175	Ce I	EL 681, 1185
	IS	233, 243, 361, 451, 463, 467		CL 1048A
	IP	145, 793		W 1048A
	SF	873		ZE 681, 1185
	PT	183, 245		IS 470, 678
				IP 276, 301, 764
				PT 278, 604
			Ce II	ND 278
				CL 278, 1048A
				W 1048A
				IS 419, 470, 678

2.2. Reference Numbers for Individual Spectra—Continued

Ce II—Continued					
	PT	278		CL	438, 769, 795
Ce III	ND	278		W	438, 769, 795
	PT	278, 327, 987A		ZE	283, 438, 795
	AT	142, 327, 1167		SE	258, 283
Ce IV	IS	223, 1052A		Hfs	250, 258, 283, 466, 624
	PT	183, 1121		IS	419, 479, 647, 795
	AT	1017A, 1018A		IP	276
Pr I				PT	479
	ZE	997A		AT	1189
	Hfs	997A, 1057A			
	IP	276		Sm II	EL 438, 795, 1134
Pr III	PT	1057A		ND	1224
	EL	365		CL	438, 769, 795, 1134
	ND	278, 365		W	438, 769, 795, 1134
	CL	365		ZE	438, 795, 1134
	W	365		IS	419, 795, 1134
	IP	365		PT	1224
	PT	230, 278, 327, 335, 365, 1174		Sm III	EL 144
	AT	142, 327, 1167, 1212		AT	1167
Pr IV				Sm IV	PT 101, 105
	EL	144, 1178		AT	200, 1167
	CL	1178		Eu I	EL 702, 755, 1010A, 1191
	W	1178		ND	755, 1109
	IP	1178		CL	702, 1010A, 1191
	PT	101, 105, 230, 278, 327, 604, 987A, 1178		W	702, 1010A, 1191
	AT	142, 200, 327, 527, 636, 1017A, 1018A, 1167, 1212, 1223		ZE	283, 1135
Pr V	PT	183		SE	283
Nd I				Hfs	283, 785, 792, 1041A, 1042A, 1100A, 1135, 1172
	EL	441, 468, 748		IS	792, 1046A, 1100A, 1300
	ND	748		IP	276, 1010A, 1191
	CL	748, 769		PT	585, 702, 755, 1109
	W	441, 748, 769		OT	585
	ZE	441, 468, 748, 985A		Eu II	Hfs 135, 471
	Hfs	985A		PT	604
	IS	238, 419, 608, 672, 798, 1029A, 1052A, 1151, 1233		Eu III	Hfs 785
	IP	276		AT	1018A, 1167
	PT	441, 468		Eu IV	PT 101, 108
Nd II				AT	1018A, 1167
	EL	441, 748		Gd I	EL 645, 646, 1125, 1156
	ND	899		CL	1156
	CL	748, 769		W	854, 913, 1125, 1156
	W	441, 748, 769		ZE	645, 646, 1156
	ZE	441, 748		Hfs	253
	IS	419, 798, 1040A		IP	276, 764
Nd III	PT	441, 899		PT	604, 799
	EL	988A		Gd II	EL 352, 701, 1156
	CL	988A		ND	278, 352, 701, 855, 1109, 1224
	W	988A		CL	701, 855, 1156, 1224
	PT	988A		W	701, 854, 913, 1156
	AT	1167		ZE	352, 1156
Nd IV				IS	419
	EL	692, 988A		PT	278, 701, 799, 1109, 1224
	CL	692, 988A		Gd III	W 913
	W	692, 988A		AT	1167
	PT	101, 105, 692, 988A		Gd IV	EL 584, 913
Pm I	AT	200, 527, 635, 1017A, 1018A, 1167		CL	584, 913
	IP	276		W	584, 913
Pm III	AT	1167		PT	101, 584, 913
Pm IV				AT	1167
	PT	101, 105		Tb I	EL 285, 550, 902
Sm I	AT	1167		ND	550, 902
	EL	438, 795			

2.2. Reference Numbers for Individual Spectra—Continued

Tb I—Continued			Er III	AT	1167
	CL	285, 550, 902	Er IV	EL	144
	W	285, 550, 902		PT	101, 105, 230, 1121
	ZE	285, 325, 550, 834, 902		AT	200, 527, 1167
	Hfs	325, 834	Tm I	EL	437, 946, 1010A, 1191
	IP	276		ND	946
	PT	834		CL	437, 946, 1010A, 1191
Tb II	EL	537, 616, 723		W	437, 946, 1010A, 1191
	ND	1224		ZE	437, 715, 946
	CL	537		Hfs	437, 466, 1041A, 1172
	W	537		IP	276, 946, 1010A, 1191
	ZE	723		SF	946
	Hfs	536, 537, 616, 723		PT	923, 946
	PT	723, 1224	Tm II	EL	437, 946
Tb III	EL	1098A		ND	946
	CL	1098A		CL	437, 946
	W	1098A		W	437, 946
	AT	1167		ZE	437, 946
Tb IV	PT	101		Hfs	437
	AT	200, 1167		IP	946
Dy I	EL	749, 1106A, 1177		PT	278, 946
	CL	749, 1106A, 1177	Tm III	EL	587
	W	749, 779, 1106A, 1177		CL	587
	ZE	749, 851, 1106A, 1177		W	587
	Hfs	851		IP	587
	IS	171, 220, 419, 1002A		PT	587
	IP	276		OT	587
	PT	749, 1106A, 1177	Tm IV	PT	101, 105, 327, 1121
Dy II	EL	749, 944, 966A, 1106A, 1177		AT	200, 327, 527, 1017A, 1167
	ND	731	Yb I	EL	91, 563, 585, 946
	CL	749, 966A, 1106A, 1177		ND	946
	W	749, 779, 1106A, 1177		CL	91, 563, 946
	ZE	731, 749, 944, 1106A, 1177		W	91, 563, 946
	IS	455		ZE	213, 946, 1043A, 1046A
	PT	749, 944, 1106A, 1177		Hfs	27, 155, 355, 421, 541, 827, 1132
Dy III	AT	634, 1167		IS	155, 419, 969A
Dy IV	PT	101, 105		IP	91, 276, 563, 585, 946
	AT	200, 1167		SF	563, 946
Ho I	W	950		PT	585, 946
	IP	276		OT	585
Ho II	W	950	Yb II	ND	278
Ho III	EL	144		Hfs	155, 278
	AT	1167		IS	155, 419, 969A
Ho IV	EL	144		IP	642
	PT	101, 105		PT	278
	AT	200, 1167	Yb III	EL	589
Er I	CL	1065A		CL	589
	ND	278		PT	278, 589, 987A
	W	1065A	Yb IV	PT	101
	ZE	73, 420	Lu I	EL	946
	IS	171, 419, 969A, 1063A		CL	946
	IP	276		W	946
	PT	278		ZE	629
Er II	EL	523, 966A, 1065A		Hfs	356, 813, 1086A, 1198
	ND	278		IP	276, 946
	CL	523, 966A, 1065A		SF	946
	W	966A, 1065A	Lu II	PT	278
	ZE	523	Lu III	EL	958A
	IS	969A, 1063A		CL	958A
	PT	278		W	958A

2.2. Reference Numbers for Individual Spectra—Continued

Lu iv	EL	958A	Hfs	100, 106, 219, 231, 281, 282, 340, 402, 452, 464, 474, 651, 937, 986A, 1007A, 1008A, 1036A, 1046A, 1075A, 1104A
	CL	958A		
	W	958A		
Lu v	EL	958A	IS	106, 219, 267, 419, 452, 454, 602, 986A, 1007A, 1046A, 1075A
	CL	958A		
	W	958A		
Hf i	CL	1048A	IP	145, 289
	W	1048A		172, 340, 400
	IS	171, 419, 713		399, 1291
Hf ii	EL	408	Hg ii	IS 419, 673
	ND	408		IP 289
	CL	408		AT 399, 1291
	W	408		
	PT	278, 408		
Ta i	CL	744	Hg iii	IP 289
	W	744		
	ZE	1034A, 1211		
	Hfs	1034A, 1211		
Ta ii	CL	744	Hg iv	IP 289
	W	744		
W i	EL	153, 416	Hg v	IP 289
	CL	153, 416		
	W	153		
	IS	419		
	PT	252		
Re i	Hfs	871, 1028A	Hg vi	IP 289
	IS	1028A		
Re iii	Hfs	871	Hg vii	IP 289
Os i	Hfs	471		
	IS	419, 479, 647	Hg viii	IP 289
	PT	479, 534		
	AT	1166, 1189		
Os ii	EL	1092A		
	CL	1092A	Hg ix	IP 289
	W	1092A		
Ir ii	EL	1027A, 1092A	Tl i	EL 145, 1083A
	CL	1092A		ND 145
	W	1092A		CL 145, 1083A
	ZE	1027A		W 145, 1083A
Pt i	Hfs	1022A		ZE 659
	IS	419, 1062A, 1214		SE 435, 623, 686, 949
Au i	EL	980A	Hfs	435, 623, 659, 673, 716, 813, 949
	ND	980A		IS 716
	CL	980A		IP 145
	W	980A, 1047A		
	Hfs	427, 641, 813, 980A, 1001A		
Au ii	EL	980A	Tl ii	EL 145, 1202A
	ND	980A		ND 145
	CL	980A		CL 145, 1202A
	W	980A		W 145, 1202A
	Hfs	980A		Hfs 665, 673
Hg i	OT	1245		IS 665, 673
	EL	145, 399, 400		IP 145
	ND	145, 400		AT 373
	CL	145, 400	Tl iii	EL 418, 1202A
	W	84, 145, 400		ND 418
	ZE	106, 156, 219, 402, 452, 464, 566, 720, 867, 1037A		CL 1202A
	SE	279, 310, 802		W 1202A
				Hfs 673
				IS 673
				IP 1202A
				PT 418
			Tl iv	EL 1202A
				CL 1202A
				W 1202A
				IP 1202A
			Pb i	EL 487
				CL 487
				W 487
				ZE 700
				SE 802
			Hfs	651, 700
				IS 221
				PT 172, 342, 868, 1283
				AT 120
			Pb ii	Hfs 651, 813
				IS 419

2.2. Reference Numbers for Individual Spectra—Continued

Pb iv	EL	1202A	Pa v	PT	618	
	CL	1202A		AT	618	
	W	1202A		U i	EL	959A, 1074A
	IS	673			CL	769, 959A, 1074A
	IP	1202A			W	769, 959A, 964A, 1074A
Pb v	EL	1202A			ZE	959A, 1074A
	CL	1202A			Hfs	473, 961A, 1084A
	W	1202A			IS	419, 959A, 1074A
Bi i	ZE	683			IP	777, 959A
	Hfs	196, 326, 596, 683, 703, 880, 1205		PT	1074A, 1174	
	IS	326, 880		AT	1304	
	PT	342, 683		U ii	EL	472, 959A, 1074A
Bi ii	CL	786			CL	769, 959A, 1074A
	W	786			W	769, 959A, 964A, 1074A
	Hfs	231, 786			ZE	959A
	AT	120			Hfs	961A
Bi iii	Hfs	786, 813			IS	419, 959A
					IP	959A
Bi iv	EL	786	U iii	PT	618	
	CL	786		AT	618	
	W	786	U iv	PT	618, 771	
	Hfs	786		AT	618	
Bi v	Hfs	786	U v	PT	618	
Po i	PT	342		AT	618	
Rn i	AT	1304	U vi	PT	618	
Fr ii	OT	1245		AT	618	
Ra i	AT	1304	U vii	AT	1307	
Ac i	AT	1166		Np iii	PT	618
Th i	EL	1056A	AT		618	
	CL	1056A	Np iv	PT	618	
	W	396, 588, 775, 1056A, 1126		AT	618	
	IS	667	Np v	PT	618, 771	
	IP	398		AT	618	
Th ii	EL	1056A	Np vi	PT	618	
	CL	1056A		AT	618	
	W	588, 775, 1056A, 1126	Np vii	PT	618	
	IS	419, 667		AT	618	
Th iii	W	956A	Pu i	EL	1053A	
	PT	618, 987A		ZE	1053A	
	AT	618		Hfs	414	
Th iv	W	956A		IS	419, 1053A	
	PT	618		AT	111, 1291	
	AT	618	Pu ii	EL	1053A	
Pa i	EL	290, 1055A		ZE	1053A	
	CL	1055A		Hfs	55, 414	
	W	1055A		IS	419, 1053A	
	ZE	1055A		PT	1222	
	Hfs	1055A		AT	111, 1222, 1291	
Pa ii	EL	1055A	Pu iii	PT	618	
	CL	1055A		AT	618	
	W	1055A	Pu iv	PT	618, 1222	
	ZE	1055A		AT	618, 1222	
	Hfs	1055A	Pu v	PT	618	
Pa iii	PT	618		AT	618	
	AT	618	Pu vi	PT	618, 771	
Pa iv	PT	618		AT	618	
	AT	618	Pu vii	PT	618	

2.2. Reference Numbers for Individual Spectra—Continued

Pu vii—Continued					AT	618
	AT	618				
Pu viii	PT	618		Cf v	PT	618
	AT	618			AT	618
Am i	IS	419		Cf vi	PT	618
					AT	618
Am iii	PT	618		Cf vii	PT	618
	AT	618			AT	618
Am iv	PT	618		Es i	W	762
	AT	618		Es ii	EL	762, 957A
Am v	PT	618			CL	762, 957A
	AT	618			W	762, 957A
Am vi	PT	618			Hfs	762
	AT	618			PT	762
Am vii	PT	618		Es iii	PT	618
	AT	618			AT	618
Cm i	IS	419		Es iv	PT	618
	IP	898			AT	618
Cm iii	PT	618		Es v	PT	618
	AT	618			AT	618
Cm iv	PT	618		Es vi	PT	618
	AT	618			AT	618
Cm v	PT	618		Es vii	PT	618
	AT	618			AT	618
Cm vi	PT	618		Fm iii	PT	618
	AT	618			AT	618
Cm vii	PT	618		Fm iv	PT	618
	AT	618			AT	618
Bk i	EL	957A		Fm v	PT	618
	CL	957A			AT	618
	W	957A		Fm vi	PT	618
Bk ii	EL	957A			AT	618
	CL	957A		Fm vii	PT	618
	W	957A			AT	618
Bk iii	PT	618		Md iii	PT	618
	AT	618			AT	618
Bk iv	PT	618		Md iv	PT	618
	AT	618			AT	618
Bk v	PT	618		Md v	PT	618
	AT	618			AT	618
Bk vi	PT	618		Md vi	PT	618
	AT	618			AT	618
Bk vii	PT	618		Md vii	PT	618
	AT	618			AT	618
Cf i	EL	737, 957A		No iv	PT	618
	CL	737, 957A			AT	618
	W	737, 957A		No v	PT	618
	ZE	737			AT	618
Cf ii	EL	737, 957A		No vi	PT	618
	CL	737, 957A			AT	618
	W	737, 957A		No vii	PT	618
	ZE	737			AT	618
Cf iii	PT	618		Lr v	PT	618
	AT	618			AT	618
Cf iv	PT	618		Trans Lr	Hfs	1215
					AT	159, 239, 377, 378, 1297



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Ag I – La I, Nd I, Sm I – Gd I, Dy I: Hfs
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V II – Zn IX, Mn II – Zn VII: AT
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