

Table 1

## Transition probabilities for HI

$k - i$	$\lambda_{ki}, \text{\AA}$	$A_{ki}, \text{s}^{-1}$	$k - i$	$\lambda_{ki}, \text{\AA}$	$A_{ki}, \text{s}^{-1}$
1 - 2	1215.67	4.699+8	2 - 8	3889.05	2.215+5
1 - 3	1025.72	5.575+7	2 - 9	3835.38	1.216+5
1 - 4	972.537	1.278+7	2 - 10	3797.90	7.122+4
1 - 5	949.743	4.125+6	2 - 11	3770.63	4.397+4
1 - 6	937.803	1.644+6	2 - 12	3750.15	2.834+4
1 - 7	930.748	7.568+5	2 - 13	3734.37	1.893+4
1 - 8	926.226	3.869+5	2 - 14	3721.94	1.303+4
1 - 9	923.150	2.143+5	2 - 15	3711.97	9.210+3
1 - 10	920.963	1.263+5	2 - 16	3703.85	6.658+3
1 - 11	919.351	7.834+4	2 - 17	3697.15	4.910+3
1 - 12	918.129	5.068+4	2 - 18	3691.55	3.685+3
1 - 13	917.181	3.393+4	2 - 19	3686.83	2.809+3
1 - 14	916.429	2.341+4	2 - 20	3682.81	2.172+3
1 - 15	915.824	1.657+4	3 - 4	18751.0	8.966+6
1 - 16	915.329	1.200+4	3 - 5	12818.1	2.201+6
1 - 17	914.919	8.858+3	3 - 6	10938.1	7.783+5
1 - 18	914.576	6.654+3	3 - 7	10049.4	3.358+5
1 - 19	914.286	5.077+3	3 - 8	9545.97	1.651+5
1 - 20	914.039	3.928+3	3 - 9	9229.02	8.905+4
2 - 3	6562.80	4.410+7	3 - 10	9014.91	5.156+4
2 - 4	4861.32	8.419+6	3 - 11	8862.79	3.156+4
2 - 5	4340.46	2.530+6	3 - 12	8750.48	2.021+4
2 - 6	4101.73	9.732+5	3 - 13	8665.02	1.343+4
2 - 7	3970.07	4.389+5	3 - 14	8598.40	9.211+3
			3 - 15	8545.39	6.490+3

Table 2

## Transition probabilities for HeI

Transition	$\lambda_{ki}, \text{\AA}$	$A_{ki}, s^{-1}$	Transition	$\lambda_{ki}, \text{\AA}$	$A_{ki}, s^{-1}$
$1s^1S - 2p^1P$	584.33	1.8000+9	$3p^1P - 6d^1D$	11048.01	1.8466+6
$1s^1S - 3p^1P$	537.03	5.6539+8	$4p^1P - 5d^1D$	41227.23	1.5250+6
$1s^1S - 4p^1P$	522.21	2.4300+8	$4p^1P - 6d^1D$	26538.84	8.6835+5
$1s^1S - 5p^1P$	515.62	1.2541+8	$5p^1P - 6d^1D$	75855.03	4.6592+5
$1s^1S - 6p^1P$	512.10	7.2939+7	$3d^1D - 3p^1P$	957880.50	1.5399+2
$2s^1S - 2p^1P$	20586.90	1.9688+6	$3d^1D - 4p^1P$	18560.66	2.9581+5
$2s^1S - 3p^1P$	5017.08	1.3153+7	$3d^1D - 5p^1P$	12759.17	1.2731+5
$2s^1S - 4p^1P$	3965.85	6.8331+6	$3d^1D - 6p^1P$	10905.16	6.6464+4
$2s^1S - 5p^1P$	3614.67	3.7368+6	$4d^1D - 4p^1P$	2162022.00	5.7302+1
$2s^1S - 6p^1P$	3448.57	2.2295+6	$4d^1D - 4p^1P$	40063.93	1.6316+5
$3s^1S - 3p^1P$	74375.16	2.5146+5	$4d^1D - 6p^1P$	26120.02	8.1814+4
$3s^1S - 4p^1P$	15087.78	1.3995+6	$5d^1D - 5p^1P$	4136180.00	2.2412+1
$3s^1S - 5p^1P$	11016.08	9.2043+5	$5d^1D - 6p^1P$	73711.16	8.3902+4
$3s^1S - 6p^1P$	9606.05	5.7975+5	$6d^1D - 6p^1P$	7059355.00	9.9013+0
$4s^1S - 4p^1P$	181001.70	5.8240+4			
$4s^1S - 5p^1P$	33308.48	2.9262+5	$2s^3S - 2p^3P$	10833.15	1.0183+7
$4s^1S - 6p^1P$	23069.61	2.1991+5	$2s^3S - 3p^3P$	3889.75	9.1179+6
$5s^1S - 5p^1P$	358496.30	1.8738+4	$2s^3S - 4p^3P$	3188.67	5.4238+6
$5s^1S - 6p^1P$	62057.34	8.8001+4	$2s^3S - 5p^3P$	2945.96	3.0791+6
$6s^1S - 6p^1P$	624843.80	8.8001+4	$2s^3S - 6p^3P$	2829.91	1.8639+6
$2p^1P - 3s^1S$	7283.36	1.8084+7	$3s^3S - 3p^3P$	42958.96	1.0703+6
$2p^1P - 4s^1S$	5049.15	6.6665+6	$3s^3S - 4p^3P$	12530.94	7.0306+5
$2p^1P - 5s^1S$	4438.80	3.2118+6	$3s^3S - 5p^3P$	9466.18	5.6331+5
$2p^1P - 6s^1S$	4170.14	1.7956+6	$3s^3S - 6p^3P$	8363.99	3.7725+5
$3p^1P - 4s^1S$	21137.79	4.5819+6	$4s^3S - 4p^3P$	108823.00	2.2783+5
$3p^1P - 5s^1S$	13415.33	2.0509+6	$4s^3S - 5p^3P$	28550.27	1.2031+5
$3p^1P - 6s^1S$	11228.98	1.1127+6	$4s^3S - 6p^3P$	20430.30	1.1475+5
$4p^1P - 5s^1S$	46065.65	1.4946+6	$5s^3S - 5p^3P$	220402.40	6.9994+4
$4p^1P - 6s^1S$	27607.62	7.5348+5	$5s^3S - 6p^3P$	54176.60	3.1375+4
$5p^1P - 6s^1S$	85292.94	5.9282+5	$6s^3S - 6p^3P$	389579.90	2.6970+4
$2p^1P - 3d^1D$	6679.99	6.3712+7	$2p^3P - 3s^3S$	7067.20	2.7375+7
$2p^1P - 4d^1D$	4923.30	1.9932+7	$2p^3P - 4s^3S$	4714.49	9.3052+6
$2p^1P - 5d^1D$	4389.16	9.0365+6	$2p^3P - 5s^3S$	4122.00	4.3396+6
$2p^1P - 6d^1D$	4144.93	4.9126+6	$2p^3P - 6s^3S$	3868.59	2.3805+6
$3p^1P - 4d^1D$	19094.57	7.1137+6	$3p^3P - 4s^3S$	21125.93	6.4846+6
$3p^1P - 5d^1D$	12971.98	3.3620+6	$3p^3P - 5s^3S$	12849.51	2.7173+6

Table 2 (Continuation)

Transition	$\lambda_{ki}, \text{\AA}$	$A_{ki}, s^{-1}$	Transition	$\lambda_{ki}, \text{\AA}$	$A_{ki}, s^{-1}$
$3p^3P - 6s^3S$	10670.62	1.4384+6	$4p^3P - 4d^3D$	439661.50	4.1607+3
$4p^3P - 5s^3S$	46949.36	2.0189+6	$4p^3P - 5d^3D$	37035.60	1.2776+6
$4p^3P - 6s^3S$	26888.35	9.5711+5	$4p^3P - 6d^3D$	24733.94	8.1001+5
$5p^3P - 6s^3S$	88073.67	7.7595+5	$5p^3P - 5d^3D$	858850.60	1.5199+3
$2p^3P - 3d^3D$	5877.29	7.0483+7	$5p^3P - 6d^3D$	68523.34	3.6572+5
$2p^3P - 4d^3D$	4472.76	2.4571+7	$6p^3P - 6d^3D$	1486839.00	6.4106+2
$2p^3P - 5d^3D$	4027.35	1.1612+7	$3d^3D - 4p^3P$	19548.49	6.4390+5
$2p^3P - 6d^3D$	3820.71	6.4472+6	$3d^3D - 5p^3P$	12988.44	2.7216+5
$3p^3P - 3d^3D$	186233.70	1.2923+4	$3d^3D - 6p^3P$	10999.58	1.4200+5
$3p^3P - 4d^3D$	17007.12	6.5950+6	$4d^3D - 5p^3P$	42440.82	3.2689+5
$3p^3P - 5d^3D$	11972.39	3.4722+6	$4d^3D - 6p^3P$	26678.60	1.5958+5
$3p^3P - 6d^3D$	10314.09	1.9917+6	$5d^3D - 6p^3P$	78390.48	1.5946+5

Table 3

Parameters of photoionization cross-section from the ground and excited states

Ion	Transition	$\sigma_o$	$a$	$b$	$c$	$s$	Ref
H <sup>0</sup>	H <sup>0</sup> ( <sup>2</sup> S) – H <sup>+</sup> ( <sup>1</sup> S)	6.3	1.34	-0.34	0	2.99	074
He <sup>0</sup>	He <sup>0</sup> ( <sup>1</sup> S) – He <sup>+</sup> ( <sup>2</sup> S)	7.83	1.66	-0.66	0	2.05	074
He <sup>+</sup>	He <sup>+</sup> ( <sup>2</sup> S) – He <sup>2+</sup> ( <sup>1</sup> S)	1.58	1.34	-0.34	0	2.99	074
Li <sup>0</sup>	Li <sup>0</sup> ( <sup>2</sup> S) – Li <sup>+</sup> ( <sup>1</sup> S)	1.3	3.5	-2.5	0	1.4	F67
Be <sup>0</sup>	Be <sup>0</sup> ( <sup>1</sup> S) – Be <sup>+</sup> ( <sup>2</sup> S)	1.93	0.027	-0.373	1.345	2.25	RM79
Be <sup>+</sup>	Be <sup>+</sup> ( <sup>2</sup> S) – Be <sup>2+</sup> ( <sup>1</sup> S)	1.4	2.2	-1.2	0	2.0	F67
B <sup>0</sup>	B <sup>0</sup> ( <sup>2</sup> P) – B <sup>+</sup> ( <sup>1</sup> S)	8.94	-0.020	0.075	0.945	1.0	RM79
B <sup>+</sup>	B <sup>+</sup> ( <sup>1</sup> S) – B <sup>2+</sup> ( <sup>2</sup> S)	3.0	2.6	-1.6	0	3.0	F67
B <sup>2+</sup>	B <sup>2+</sup> ( <sup>2</sup> S) – B <sup>3+</sup> ( <sup>1</sup> S)	0.98	1.0	0	0	1.8	F67
C <sup>0</sup>	C <sup>0</sup> ( <sup>3</sup> P) – C <sup>+</sup> ( <sup>2</sup> P)	12.2	3.317	-2.317	0	2.0	H70
	<sup>1</sup> D – <sup>2</sup> P	10.3	2.789	-1.789	0	1.5	H70
	<sup>1</sup> S – <sup>2</sup> P	9.59	3.501	-2.501	0	1.5	H70
C <sup>+</sup>	C <sup>+</sup> ( <sup>2</sup> P) – C <sup>2+</sup> ( <sup>1</sup> S)	4.60	1.95	-0.95	0	3.0	H70
C <sup>2+</sup>	C <sup>2+</sup> ( <sup>1</sup> S) – C <sup>3+</sup> ( <sup>2</sup> S)	1.84	3.0	-2.0	0	2.6	SB71
	2s2p <sup>3</sup> P <sup>0</sup> – <sup>2</sup> S	2.15	1.0	0	0	2.45	SW78
	2p <sup>2</sup> <sup>3</sup> P – <sup>2</sup> S	4.22	1.0	0	0	2.27	SW78
	2s3s <sup>3</sup> S – <sup>2</sup> S	0.95	1.0	0	0	1.19	SW78
	2s3p <sup>3</sup> P <sup>0</sup> – <sup>2</sup> S	3.09	1.0	0	0	2.10	SW78
	2s3d <sup>3</sup> D – <sup>2</sup> S	2.90	1.0	0	0	3.22	SW78
	2p3s <sup>3</sup> P <sup>0</sup> – <sup>2</sup> S	1.21	1.0	0	0	1.57	SW78
	2s4s <sup>3</sup> S – <sup>2</sup> S	1.22	1.0	0	0	1.37	SW78
	2s4p <sup>3</sup> P <sup>0</sup> – <sup>2</sup> S	4.13	1.0	0	0	2.03	SW78
	2s4d <sup>3</sup> D – <sup>2</sup> S	3.42	1.0	0	0	2.60	SW78
	2s4f <sup>3</sup> F <sup>0</sup> – <sup>2</sup> S	2.66	1.0	0	0	3.61	SW78
	2p3p <sup>3</sup> S – <sup>2</sup> S	2.47	1.0	0	0	2.33	SW78
	2p3p <sup>3</sup> P – <sup>2</sup> S	3.40	1.0	0	0	2.12	SW78
	2p3d <sup>3</sup> F <sup>0</sup> – <sup>2</sup> S	2.05	1.0	0	0	3.08	SW78
	2p3d <sup>3</sup> D <sup>0</sup> – <sup>2</sup> S	2.34	1.0	0	0	3.36	SW78
	2p3d <sup>3</sup> P <sup>0</sup> – <sup>2</sup> S	2.06	1.0	0	0	3.29	SW78
	2p5g <sup>3</sup> G – <sup>2</sup> S	1.96	1.0	0	0	4.41	SW78
C <sup>3+</sup>	C <sup>3+</sup> ( <sup>2</sup> S) – C <sup>4+</sup> ( <sup>1</sup> S)	0.71	2.7	-1.7	0	2.2	SB71
	2p <sup>2</sup> P <sup>0</sup> – <sup>1</sup> S	0.93	1.5	-0.5	0	3.5	L72
N <sup>0</sup>	N <sup>0</sup> ( <sup>4</sup> S) – N <sup>+</sup> ( <sup>3</sup> P)	11.42	4.287	-3.287	0	2.0	H70
	<sup>2</sup> D – <sup>3</sup> P	4.41	3.847	-2.847	0	1.5	H70
	<sup>2</sup> D – <sup>1</sup> D	5.02	4.826	-3.826	0	2.0	H70
	<sup>2</sup> P – <sup>3</sup> P	4.20	4.337	-3.337	0	1.5	H70
	<sup>2</sup> P – <sup>1</sup> D	2.87	5.112	-4.112	0	2.0	H70
	<sup>2</sup> P – <sup>1</sup> S	4.03	4.727	-3.727	0	2.0	H70

Table 3 (Continuation)

Ion	Transition	$\sigma_o$	$a$	$b$	$c$	$s$	Ref
N <sup>+</sup>	N <sup>+</sup> ( <sup>3</sup> P) – N <sup>2+</sup> ( <sup>2</sup> P)	6.65	2.860	-1.860	0	3.0	H70
	<sup>1</sup> D – <sup>2</sup> P	6.65	2.789	-1.789	0	2.5	H70
	<sup>1</sup> S – <sup>2</sup> P	6.75	3.101	-2.101	0	2.5	H70
N <sup>2+</sup>	N <sup>2+</sup> ( <sup>2</sup> P) – N <sup>3+</sup> ( <sup>1</sup> S)	2.0	0.9	0.1	0	2.0	S58
N <sup>3+</sup>	N <sup>3+</sup> ( <sup>1</sup> S) – N <sup>4+</sup> ( <sup>2</sup> S)	1.08	-0.108	1.63	-0.522	0.93	RM79
N <sup>4+</sup>	N <sup>4+</sup> ( <sup>2</sup> S) – N <sup>5+</sup> ( <sup>1</sup> S)	0.91	-0.081	1.70	-0.62	1.21	RM79
O <sup>0</sup>	O <sup>0</sup> ( <sup>3</sup> P) – O <sup>+</sup> ( <sup>4</sup> S)	2.94	2.661	-1.661	0	1.0	H70
	<sup>3</sup> P – <sup>2</sup> D	3.85	4.378	-3.378	0	1.5	H70
	<sup>3</sup> P – <sup>2</sup> P	2.26	4.311	-3.311	0	1.5	H70
	<sup>1</sup> D – <sup>2</sup> D	4.64	6.829	-5.829	0	1.5	H70
	<sup>1</sup> D – <sup>2</sup> P	1.95	4.800	-3.800	0	1.5	H70
	<sup>1</sup> S – <sup>2</sup> P	7.65	5.124	-4.124	0	1.5	H70
	O <sup>+</sup>	O <sup>+</sup> ( <sup>4</sup> S) – O <sup>2+</sup> ( <sup>3</sup> P)	7.32	3.837	-2.837	0	2.5
<sup>2</sup> D – <sup>3</sup> P		3.53	3.808	-2.808	0	2.5	H70
<sup>2</sup> D – <sup>1</sup> D		3.97	3.033	-2.033	0	2.5	H70
<sup>2</sup> P – <sup>3</sup> P		3.43	4.174	-3.174	0	2.5	H70
<sup>2</sup> P – <sup>1</sup> D		2.32	3.110	-2.110	0	2.5	H70
<sup>2</sup> P – <sup>1</sup> S		1.68	3.751	-2.751	0	2.5	H70
O <sup>2+</sup>		O <sup>2+</sup> ( <sup>3</sup> P) – O <sup>3+</sup> ( <sup>2</sup> P)	3.65	2.014	-1.014	0	3.0
	<sup>1</sup> D – <sup>2</sup> P	3.79	2.777	-1.777	0	3.0	H70
	<sup>1</sup> S – <sup>2</sup> P	3.97	2.780	-1.780	0	3.0	H70
O <sup>3+</sup>	O <sup>3+</sup> ( <sup>2</sup> P) – O <sup>4+</sup> ( <sup>1</sup> S)	1.20	1.82	-0.82	0	3.0	S58
O <sup>4+</sup>	O <sup>4+</sup> ( <sup>1</sup> S) – O <sup>5+</sup> ( <sup>2</sup> S)	0.77	-0.104	1.647	-0.543	1.02	RM79
F <sup>0</sup>	F <sup>0</sup> ( <sup>2</sup> P) – F <sup>+</sup> ( <sup>3</sup> P)	3.7	4.1	-3.1	0	1.0	S58
F <sup>+</sup>	F <sup>+</sup> ( <sup>3</sup> P) – F <sup>2+</sup> ( <sup>4</sup> S)	2.84	3.1	-2.1	0	2.0	S58
F <sup>2+</sup>	F <sup>2+</sup> ( <sup>4</sup> S) – F <sup>3+</sup> ( <sup>3</sup> P)	4.5	1.7	-0.7	0	2.0	S58
F <sup>3+</sup>	F <sup>3+</sup> ( <sup>3</sup> P) – F <sup>4+</sup> ( <sup>2</sup> P)	2.06	1.0	0	0	2.0	S58
F <sup>4+</sup>	F <sup>4+</sup> ( <sup>2</sup> P) – F <sup>5+</sup> ( <sup>1</sup> S)	0.8	1.0	0	0	2.3	S58
F <sup>5+</sup>	F <sup>5+</sup> ( <sup>1</sup> S) – F <sup>6+</sup> ( <sup>2</sup> S)	0.58	2.6	-1.6	0	3.0	F67
Ne <sup>0</sup>	Ne <sup>0</sup> ( <sup>1</sup> S) – Ne <sup>+</sup> ( <sup>2</sup> P)	5.35	3.769	-2.769	0	1.0	H70
Ne <sup>+</sup>	Ne <sup>+</sup> ( <sup>2</sup> P) – Ne <sup>2+</sup> ( <sup>3</sup> P)	4.16	2.717	-1.717	0	1.5	H70
	<sup>2</sup> P – <sup>1</sup> D	2.71	2.148	-1.148	0	1.5	H70
	<sup>2</sup> P – <sup>1</sup> S	0.52	2.126	-1.126	0	1.5	H70
	Ne <sup>2+</sup>	Ne <sup>2+</sup> ( <sup>3</sup> P) – Ne <sup>3+</sup> ( <sup>4</sup> S)	1.80	2.277	-1.277	0	2.0
<sup>3</sup> P – <sup>2</sup> D		2.50	2.346	-1.346	0	2.5	H70
<sup>3</sup> P – <sup>2</sup> P		1.48	2.225	-1.225	0	2.5	H70
<sup>1</sup> D – <sup>2</sup> D		4.17	2.074	-1.074	0	2.0	H70
<sup>1</sup> D – <sup>2</sup> P		1.39	2.792	-1.792	0	2.5	H70
<sup>1</sup> S – <sup>2</sup> P		5.49	3.000	-2.000	0	2.5	H70
Ne <sup>3+</sup>		Ne <sup>3+</sup> ( <sup>4</sup> S) – Ne <sup>4+</sup> ( <sup>3</sup> P)	3.11	1.963	-0.963	0	3.0
	<sup>2</sup> D – <sup>3</sup> P	1.69	1.841	-0.841	0	2.5	H70
	<sup>2</sup> D – <sup>1</sup> D	1.65	2.277	-1.277	0	3.0	H70
	<sup>2</sup> P – <sup>3</sup> P	1.69	1.937	-0.937	0	2.5	H70

Table 3 (Continuation)

Ion	Transition	$\sigma_o$	$a$	$b$	$c$	$s$	Ref
Ne <sup>4+</sup>	<sup>2</sup> P – <sup>1</sup> D	0.93	2.455	-1.455	0	3.0	H70
	<sup>2</sup> P – <sup>1</sup> S	0.73	1.486	-0.486	0	2.5	H70
	Ne <sup>4+</sup> ( <sup>3</sup> P) – Ne <sup>5+</sup> ( <sup>2</sup> P)	1.40	1.471	-0.471	0	3.0	H70
	<sup>1</sup> D – <sup>2</sup> P	1.53	2.021	-1.021	0	3.0	H70
Ne <sup>5+</sup>	<sup>1</sup> S – <sup>2</sup> P	1.54	2.104	-1.104	0	3.0	H70
	Ne <sup>5+</sup> ( <sup>2</sup> P) – Ne <sup>6+</sup> ( <sup>1</sup> S)	0.49	1.145	-0.145	0	3.0	H70
Na <sup>0</sup>	Na <sup>0</sup> ( <sup>2</sup> S) – Na <sup>+</sup> ( <sup>1</sup> S)	1.560	1.000	-2.55	1.62	1.35	Kh95
Na <sup>+</sup>	Na <sup>+</sup> ( <sup>1</sup> S) – Na <sup>2+</sup> ( <sup>2</sup> P)	8.0	4.2	-3.2	0	2.0	S58
Na <sup>2+</sup>	Na <sup>2+</sup> ( <sup>2</sup> P) – Na <sup>3+</sup> ( <sup>3</sup> P)	3.2	2.4	-1.4	0	2.0	S58
Na <sup>3+</sup>	Na <sup>3+</sup> ( <sup>3</sup> P) – Na <sup>4+</sup> ( <sup>4</sup> S)	1.2	1.0	0	0	2.0	S58
Na <sup>4+</sup>	Na <sup>4+</sup> ( <sup>4</sup> S) – Na <sup>5+</sup> ( <sup>3</sup> P)	2.0	1.0	0	0	2.3	S58
Mg <sup>0</sup>	Mg <sup>0</sup> ( <sup>1</sup> S) – Mg <sup>+</sup> ( <sup>2</sup> S)	1.2	3.0	-2.0	0	14	DM53
Mg <sup>+</sup>	Mg <sup>+</sup> ( <sup>2</sup> S) – Mg <sup>2+</sup> ( <sup>1</sup> S)	0.24	3.71	-2.71	0	0.91	DM53
Mg <sup>2+</sup>	Mg <sup>2+</sup> ( <sup>1</sup> S) – Mg <sup>3+</sup> ( <sup>2</sup> P)	5.2	2.65	-1.65	0	2.0	S58
Mg <sup>3+</sup>	Mg <sup>3+</sup> ( <sup>2</sup> P) – Mg <sup>4+</sup> ( <sup>3</sup> P)	3.74	1.225	3.39	-3.62	2.25	RM79
Mg <sup>4+</sup>	Mg <sup>4+</sup> ( <sup>3</sup> P) – Mg <sup>5+</sup> ( <sup>4</sup> S)	2.84	0.726	2.42	-2.14	2.22	RM79
Al <sup>0</sup>	Al <sup>0</sup> ( <sup>2</sup> P) – Al <sup>+</sup> ( <sup>1</sup> S)	28.2	0.049	-0.529	1.48	1.0	CH72
Al <sup>+</sup>	Al <sup>+</sup> ( <sup>1</sup> S) – Al <sup>2+</sup> ( <sup>2</sup> S)	4.65	2.6	-1.6	0	2.7	SB71
Al <sup>2+</sup>	Al <sup>2+</sup> ( <sup>2</sup> S) – Al <sup>3+</sup> ( <sup>1</sup> S)	1.36	2.4	-1.4	0	2.1	SB71
Al <sup>3+</sup>	Al <sup>3+</sup> ( <sup>1</sup> S) – Al <sup>4+</sup> ( <sup>2</sup> P)	3.8	1.0	0	0	2.0	S58
Al <sup>4+</sup>	Al <sup>4+</sup> ( <sup>2</sup> P) – Al <sup>5+</sup> ( <sup>3</sup> P)	1.8	1.0	0	0	2.3	S58
Si <sup>0</sup>	Si <sup>0</sup> ( <sup>3</sup> P) – Si <sup>+</sup> ( <sup>2</sup> P)	39.2	4.42	0.094	-3.51	5.0	CH72
	<sup>1</sup> D – <sup>2</sup> P	34.5	6.46	-7.78	2.32	3.0	CH72
	<sup>1</sup> S – <sup>2</sup> P	33.6	10.01	-14.53	5.52	3.0	CH72
Si <sup>+</sup>	Si <sup>+</sup> ( <sup>2</sup> P) – Si <sup>2+</sup> ( <sup>1</sup> S)	1.41	2.31	-6.72	5.41	1.5	CH72
Si <sup>2+</sup>	Si <sup>2+</sup> ( <sup>1</sup> S) – Si <sup>3+</sup> ( <sup>2</sup> S)	0.62	0.064	-0.549	1.485	1.70	RM79
Si <sup>3+</sup>	Si <sup>3+</sup> ( <sup>2</sup> S) – Si <sup>4+</sup> ( <sup>1</sup> S)	0.32	0.083	-0.611	1.528	1.34	RM79
Si <sup>4+</sup>	Si <sup>4+</sup> ( <sup>1</sup> S) – Si <sup>5+</sup> ( <sup>2</sup> P)	3.81	0.928	1.89	-1.82	2.30	RM79
S <sup>0</sup>	S <sup>0</sup> ( <sup>3</sup> P) – S <sup>+</sup> ( <sup>4</sup> S)	12.6	21.6	-40.1	19.5	3.0	CH71
	<sup>3</sup> P – <sup>2</sup> D	19.1	0.135	5.365	-4.5	2.5	CH71
	<sup>3</sup> P – <sup>2</sup> P	12.7	1.16	2.425	-2.585	3.0	CH71
	<sup>1</sup> D – <sup>2</sup> D	21.0	0.66	4.875	-4.535	1.5	CH71
	<sup>1</sup> D – <sup>2</sup> P	7.87	0.543	6.347	-5.89	2.0	CH71
	<sup>1</sup> S – <sup>2</sup> P	22.6	-1.148	9.27	-7.122	1.0	CH71
S <sup>+</sup>	S <sup>+</sup> ( <sup>4</sup> S) – S <sup>2+</sup> ( <sup>3</sup> P)	0.93	-0.21	1.86	-0.65	1.05	RM79
	<sup>2</sup> D – <sup>3</sup> P	16.1	0.562	-2.574	3.012	1.0	CH71
	<sup>2</sup> D – <sup>1</sup> D	7.25	1.064	-3.936	3.872	1.5	CH71
	<sup>2</sup> P – <sup>3</sup> P	16.0	0.530	-2.492	2.962	1.0	CH71
	<sup>2</sup> P – <sup>1</sup> D	3.81	0.868	-3.421	3.553	1.0	CH71
	<sup>2</sup> P – <sup>1</sup> S	2.53	1.286	-3.917	3.631	1.0	CH71
S <sup>2+</sup>	S <sup>2+</sup> ( <sup>3</sup> P) – S <sup>3+</sup> ( <sup>2</sup> P)	6.38	18.43	-36.26	18.83	2.0	CH71

Table 3 (Continuation)

Ion	Transition	$\sigma_o$	$a$	$b$	$c$	$s$	Ref
	$^1D - ^2P$	0.98	10.06	-23.39	14.33	2.0	CH71
	$^1S - ^2P$	0.75	14.65	-33.40	19.75	2.0	CH71
S <sup>3+</sup>	S <sup>3+</sup> ( <sup>2P</sup> ) - S <sup>4+</sup> ( <sup>1S</sup> )	0.76	2.8	-1.8	0	2.4	SB71
S <sup>4+</sup>	S <sup>4+</sup> ( <sup>1S</sup> ) - S <sup>5+</sup> ( <sup>2S</sup> )	5.18	-0.073	1.539	-0.466	0.59	RM79
Ar <sup>0</sup>	Ar <sup>0</sup> ( <sup>1S</sup> ) - Ar <sup>+</sup> ( <sup>2P</sup> )	32.7	4.2	-3.2	0	1.6	SB71
Ar <sup>+</sup>	Ar <sup>+</sup> ( <sup>2P</sup> ) - Ar <sup>2+</sup> ( <sup>3P</sup> )	28.6	0.082	-0.83	1.75	0.5	CH72
	$^2P - ^1D$	15.3	0.623	-2.77	3.15	1.0	CH72
	$^2P - ^1S$	3.07	0.570	-2.59	3.02	1.0	CH72
Ar <sup>2+</sup>	Ar <sup>2+</sup> ( <sup>3P</sup> ) - Ar <sup>3+</sup> ( <sup>4S</sup> )	2.23	5.93	-16.09	11.16	2.5	CH72
	$^3P - ^2D$	0.86	9.375	-22.95	14.58	2.0	CH72
	$^3P - ^2P$	0.92	7.825	-19.74	12.92	2.5	CH72
	$^1D - ^2D$	5.43	5.403	-14.84	10.44	2.5	CH72
	$^1D - ^2P$	2.01	4.823	-13.44	9.62	2.5	CH72
	$^1S - ^2P$	8.75	4.861	-13.68	9.82	2.5	CH72
Ar <sup>3+</sup>	Ar <sup>3+</sup> ( <sup>4S</sup> ) - Ar <sup>4+</sup> ( <sup>3P</sup> )	0.59	10.80	-15.91	6.11	2.0	CH72
	$^2D - ^3P$	0.23	32.56	-63.76	32.20	2.5	CH72
	$^2D - ^1D$	0.28	23.10	-42.98	20.88	2.5	CH72
	$^2P - ^3P$	0.25	34.23	-68.38	35.15	2.5	CH72
	$^2P - ^1D$	0.11	20.70	-33.46	13.76	2.0	CH72
	$^2P - ^1S$	0.11	25.39	-47.60	23.21	2.5	CH72
Ar <sup>4+</sup>	Ar <sup>4+</sup> ( <sup>3P</sup> ) - Ar <sup>5+</sup> ( <sup>2P</sup> )	0.63	7.45	-10.67	4.22	2.5	CH72
	$^1D - ^2P$	0.56	10.11	-15.35	6.24	2.5	CH72
	$^1S - ^2P$	0.55	11.84	-18.55	7.71	2.5	CH72
Ar <sup>5+</sup>	Ar <sup>5+</sup> ( <sup>2P</sup> ) - Ar <sup>6+</sup> ( <sup>1S</sup> )	0.34	2.438	-1.639	0.201	2.0	CH72
Ca <sup>0</sup>	Ca <sup>0</sup> ( <sup>1S</sup> ) - Ca <sup>+</sup> ( <sup>2S</sup> )	14.4	1.000	0.000	0.000	4.0	Kh95
Ca <sup>+</sup>	Ca <sup>+</sup> ( <sup>2S</sup> ) - Ca <sup>2+</sup> ( <sup>1S</sup> )	0.1	6.680	-3.240	-1.350	1.5	Kh95

## References

- DM53 – Ditchburn & Marr (1953),
- CH71, CH72 – Chapman & Henry (1971, 1972),
- F67 – Flower (1967),
- H70 – Henry (1970),
- Kh95 – Kholtygin et al. (1995),
- L72 – Leibowitz (1972),
- O74 – Osterbrock (1974),
- RM79 – Reilman & Manson (1979),
- SW78 – Sakhbullin & Willis (1978),
- S58 – Seaton (1958),

- SB71 – Silk & Brown (1971)

Table 4

Parameters of photoionization cross-section from the K - shell

Ion	$E_0, \text{eV}$	$\sigma_o, 10^{-18} \text{cm}^2$	$\alpha$	$s$
CI	280	1.06	1	2.47
CII	296	0.997	1	2.48
CIII	317	0.930	1	2.49
CIV	347	0.850	1	2.51
CV	392	0.526	1.325	2.76
CVI	490	0.194	1.287	2.95
NI	395	0.747	1	2.53
NI	415	0.717	1	2.54
NI	433	0.683	1	2.54
NI	459	0.643	1	2.55
NV	496	0.595	1	2.57
NVI	552	0.371	1.314	2.79
NVII	666	0.142	1.287	2.95
OI	533	0.554	1	2.58
OII	550	0.537	1	2.59
OIII	570	0.518	1	2.60
OIV	595	0.496	1	2.61
OV	627	0.470	1	2.62
OVI	672	0.439	1	2.62
OVII	739	0.275	1.308	2.81
OVIII	870	0.109	1.287	2.95
NeI	878	0.336	1	2.67
NeII	896	0.329	1	2.68
NeIII	916	0.322	1	2.68
NeIV	940	0.314	1	2.69
NeV	968	0.305	1	2.69
NeVI	1000	0.295	1	2.70
NeVII	1050	0.282	1	2.71
NeVIII	1100	0.267	1	2.72
NeIX	1195	0.180	1.28	2.95
NeX	1360	0.075	1.25	2.90



Table 5

Parameters of approximation for the collisional ionization,  
radiative and dielectronic recombination

Ion	$A_{col}$	$T_{col}$	$A_{rad}$	$\chi_{rad}$	$A_{di}$	$B_{di}$	$T_0$	$T_1$
C	1.44-10	1.31+5	4.70-13	0.624	2.54-3	4.42-2	1.57+5	3.74+5
C <sup>+</sup>	4.20-11	2.83+5	2.30-12	0.645	6.15-3	5.88-2	1.41+5	1.41+5
C <sup>2+</sup>	1.92-11	5.56+5	3.20-12	0.770	1.62-3	3.43-1	8.19+4	1.59+5
C <sup>3+</sup>	5.32-12	7.48+5	7.50-12	0.817	4.78-2	3.62-1	3.44+6	5.87+5
C <sup>4+</sup>	2.87-13	4.55+6	1.70-11	0.721	3.22-2	3.15-1	4.06+6	8.31+5
C <sup>5+</sup>	9.16-14	5.68+6	1.47-11	0.726	0	0	0	0
N	7.08-11	1.68+5	4.10-13	0.608	2.98-3	0	2.20+5	0
N <sup>+</sup>	4.55-11	3.43+5	2.20-12	0.639	7.41-4	7.64-2	2.01+5	7.37+4
N <sup>2+</sup>	1.83-11	5.50+5	5.00-12	0.676	1.13-2	1.64-1	1.72+5	2.25+5
N <sup>3+</sup>	7.16-12	8.99+5	6.50-12	0.743	2.62-3	2.43-1	1.02+5	1.25+5
N <sup>4+</sup>	2.30-12	1.14+6	1.50-11	0.850	7.50-2	3.50-1	4.75+6	8.35+5
N <sup>5+</sup>	1.44-13	6.41+6	2.90-11	0.750	4.61-2	3.09-1	5.44+6	1.14+6
N <sup>6+</sup>	4.93-14	7.74+6	2.00-11	0.726	0	0	0	0
O	1.09-10	1.58+5	3.10-13	0.678	1.11-3	9.25-2	1.75+5	1.45+5
O <sup>+</sup>	3.96-11	4.07+5	2.00-12	0.646	5.07-3	1.81-1	1.98+5	3.35+5
O <sup>2+</sup>	1.67-11	6.37+5	5.10-12	0.660	1.48-2	3.05-1	2.41+5	2.83+5
O <sup>3+</sup>	7.60-12	8.98+5	9.60-12	0.670	1.84-2	1.00-1	2.12+5	2.83+5
O <sup>4+</sup>	3.33-12	1.32+6	1.20-11	0.779	4.13-3	1.62-1	1.25+5	2.27+5
O <sup>5+</sup>	1.15-12	1.60+6	2.30-11	0.802	1.06-1	3.40-1	6.25+6	1.12+6
O <sup>6+</sup>	7.90-14	8.57+6	4.10-11	0.742	6.23-2	3.04-1	7.01+6	1.47+6
O <sup>7+</sup>	2.89-14	1.01+7	2.62-11	0.726	0	0	0	0
Ne	3.03-11	2.50+5	2.20-13	0.759	9.77-4	7.30-2	3.11+5	2.06+5
Ne <sup>+</sup>	1.79-11	4.76+5	1.50-12	0.693	2.65-3	2.42-1	2.84+5	3.07+5
Ne <sup>2+</sup>	1.61-11	7.37+5	4.40-12	0.675	3.69-3	1.01	2.24+5	2.94+5
Ne <sup>3+</sup>	9.76-12	1.13+6	9.10-12	0.668	1.18-2	3.91-1	2.70+5	5.50+5
Ne <sup>4+</sup>	4.48-12	1.47+6	1.50-11	0.684	2.44-2	2.52	3.09+5	9.91+5
Ne <sup>5+</sup>	2.03-12	1.83+6	2.30-11	0.704	3.02-2	4.45-1	2.83+5	1.73+6
Ne <sup>6+</sup>	1.02-12	2.40+6	2.80-11	0.771	6.10-3	2.54-1	1.68+5	6.13+5
Ne <sup>7+</sup>	3.84-12	2.77+6	5.00-11	0.832	2.52-1	3.04-1	1.40+7	1.80+6
Ne <sup>8+</sup>	3.05-14	1.39+7	8.60-11	0.769	1.44-1	2.96-1	1.50+7	2.24+6
Ne <sup>9+</sup>	1.17-14	1.58+7	4.09-11	0.726	0	0	0	0
Mg	8.90-11	8.87+4	1.40-13	0.855	4.49-4	2.10-2	5.01+4	2.81+4
Mg <sup>+</sup>	5.90-11	1.74+5	8.80-13	0.838	1.95-3	7.40-2	6.06+5	1.44+6
Mg <sup>2+</sup>	1.10-11	9.30+5	3.50-12	0.734	5.12-3	3.23-1	4.69+5	7.55+5
Mg <sup>3+</sup>	9.14-12	1.26+6	7.70-12	0.718	7.74-3	6.36-1	3.74+5	7.88+5
Mg <sup>4+</sup>	5.02-12	1.64+6	1.40-11	0.716	1.17-2	8.07-1	3.28+5	1.02+6
Mg <sup>5+</sup>	2.73-12	2.17+6	2.30-11	0.695	3.69-2	3.51-1	4.80+5	9.73+5
Mg <sup>6+</sup>	1.47-12	2.61+6	3.20-11	0.691	3.63-2	5.48-1	3.88+5	7.38+5
Mg <sup>7+</sup>	7.35-13	3.09+6	4.60-11	0.711	4.15-2	2.33-1	3.39+5	3.82+5
Mg <sup>8+</sup>	4.11-13	3.81+6	5.80-11	0.804	8.86-3	3.18-1	2.11+5	1.54+6
Mg <sup>9+</sup>	1.64-13	4.25+6	9.10-11	0.830	2.52-1	3.15-1	1.40+7	2.64+6
Mg <sup>10+</sup>	1.42-14	2.07+7	1.50-10	0.779	1.44-1	2.91-1	1.50+7	3.09+6
Mg <sup>11+</sup>	5.74-15	2.27+7	5.89-11	0.726	0	0	0	0

Table 5 (Continuation)

Ion	$A_{col}$	$T_{col}$	$A_{rad}$	$\chi_{rad}$	$A_{di}$	$B_{di}$	$T_0$	$T_1$
Si	3.92-10	9.46+4	5.90-13	0.601	1.10-3	0	7.70+4	0
Si <sup>+</sup>	4.87-11	1.90+5	1.00-12	0.786	5.87-3	7.53-1	9.63+4	6.46+4
Si <sup>2+</sup>	2.32-11	3.88+5	3.70-12	0.693	5.03-1	1.88-1	8.75+4	4.71+4
Si <sup>3+</sup>	6.20-12	5.24+5	5.50-12	0.821	5.43-3	4.50-1	1.05+6	7.98+5
Si <sup>4+</sup>	4.86-12	1.93+6	1.20-11	0.735	8.86-3	0	1.14+6	0
Si <sup>5+</sup>	2.60-12	2.38+6	2.11-11	0.716	1.68-2	1.80	4.85+5	1.03+6
Si <sup>6+</sup>	1.65-12	2.86+6	3.00-11	0.702	2.49-2	1.88	4.15+5	1.91+6
Si <sup>7+</sup>	1.03-12	3.52+6	4.30-11	0.688	3.13-2	2.01	3.66+5	2.11+6
Si <sup>8+</sup>	6.02-13	4.07+6	5.80-11	0.703	4.25-1	1.22	3.63+5	2.14+6
Si <sup>9+</sup>	3.23-13	4.66+6	7.70-11	0.714	6.18-2	3.03-1	3.88+5	1.12+6
Si <sup>10+</sup>	1.95-13	5.52+6	1.20-11	0.855	1.38-2	1.42	2.51+5	3.93+6
Si <sup>11+</sup>	8.08-14	6.07+6	1.50-10	0.831	3.27-1	3.06-1	1.88+7	3.60+6
Si <sup>12+</sup>	7.44-15	2.83+7	2.10-10	0.765	1.89-1	2.86-1	1.99+7	4.14+6
Si <sup>13+</sup>	3.09-15	3.10+7	8.02-11	0.726	0	0	0	0
S	1.45-10	1.20+5	4.10-13	0.630	1.62-3	0	1.25+5	0
S <sup>+</sup>	7.11-11	2.71+5	1.80-12	0.686	1.09-2	1.20-2	1.92+5	1.80+4
S <sup>2+</sup>	2.12-11	4.06+5	2.70-12	0.745	3.35-2	6.59-2	1.89+5	1.59+5
S <sup>3+</sup>	6.39-12	5.49+5	5.70-12	0.755	3.14-2	6.89-2	1.68+5	8.04+4
S <sup>4+</sup>	6.43-12	8.47+5	1.20-11	0.701	1.27-2	1.87-1	1.38+5	1.71+5
S <sup>5+</sup>	1.85-12	1.02+6	1.70-11	0.849	1.47-2	1.29-1	1.80+6	1.75+6
S <sup>6+</sup>	1.71-12	3.26+6	2.70-11	0.733	1.34-2	1.04	6.90+5	2.15+6
S <sup>7+</sup>	1.01-12	3.81+6	4.00-11	0.696	2.38-2	1.12	5.84+5	2.59+6
S <sup>8+</sup>	6.97-13	4.40+6	5.50-11	0.711	3.19-2	1.40	5.17+5	2.91+6
S <sup>9+</sup>	4.75-13	5.19+6	7.40-11	0.716	7.13-2	1.00	6.66+5	2.32+6
S <sup>10+</sup>	2.90-13	5.86+6	9.20-11	0.714	8.00-2	5.55-1	6.00+5	2.41+6
S <sup>11+</sup>	1.63-13	6.55+6	1.40-10	0.755	7.96-2	1.63	5.09+5	6.37+6
S <sup>12+</sup>	1.04-13	7.56+6	1.70-10	0.832	1.34-2	3.04-1	2.91+5	1.04+6
S <sup>13+</sup>	4.42-14	8.02+6	2.50-10	0.852	4.02-1	2.98-1	2.41+7	4.67+6
S <sup>14+</sup>	4.25-15	3.74+7	3.30-10	0.783	2.41-1	2.81-1	2.54+7	5.30+6
S <sup>15+</sup>	1.81-15	4.05+7	1.05-10	0.726	0	0	0	0
Ar	2.20-10	1.83+5	3.77-13	0.651	1.00-3	5.00-3	3.20+5	3.10+5
Ar <sup>+</sup>	1.20-10	3.21+5	1.95-12	0.752	1.10-2	4.50-2	2.90+5	5.50+5
Ar <sup>2+</sup>	3.50-11	4.75+5	3.23-12	0.869	3.40-2	5.70-2	2.39+5	6.00+5
Ar <sup>3+</sup>	3.80-11	6.94+5	6.03-12	0.812	6.85-2	8.70-2	2.56+5	3.81+5
Ar <sup>4+</sup>	6.47-12	8.70+5	9.12-12	0.811	9.00-2	7.69-2	2.50+5	3.30+5
Ar <sup>5+</sup>	1.72-12	1.06+6	1.58-11	0.793	6.35-2	1.40-1	2.10+5	2.15+5
Ar <sup>6+</sup>	2.20-12	1.44+6	2.69-11	0.744	2.60-2	1.20-1	1.80+5	2.15+5
Ar <sup>7+</sup>	6.95-13	1.66+6	3.55-11	0.910	1.70-2	1.00-1	2.70+6	3.30+6
Ar <sup>8+</sup>	7.57-13	4.90+6	4.90-11	0.801	2.10-2	1.92	8.30+5	3.50+6
Ar <sup>9+</sup>	4.75-13	5.56+6	6.92-11	0.811	3.50-2	1.66	6.95+5	3.60+6
Ar <sup>10+</sup>	3.45-13	6.25+6	9.55-11	0.793	4.30-2	1.67	6.05+5	3.80+6
Ar <sup>11+</sup>	2.48-13	7.17+6	1.23-10	0.702	7.13-2	1.40	6.68+5	2.90+6
Ar <sup>12+</sup>	1.57-13	7.96+6	1.58-10	0.790	9.60-2	1.31	6.50+5	3.60+6
Ar <sup>13+</sup>	9.10-14	8.77+6	2.14-10	0.774	8.50-2	1.02	5.30+5	2.80+6
Ar <sup>14+</sup>	6.05-14	9.92+6	2.63-10	0.907	1.70-2	2.45-1	3.55+5	1.10+6
Ar <sup>15+</sup>	2.62-14	1.07+7	3.72-10	0.899	4.76-1	2.94-1	3.01+7	6.05+6
Ar <sup>16+</sup>	2.60-15	4.78+7	4.95-10	0.816	2.97-1	2.77-1	3.13+7	6.54+6
Ar <sup>17+</sup>	1.13-15	5.14+7	1.35-10	0.726	0	0	0	0

Table 5 (Continuation)

Ion	$A_{col}$	$T_{col}$	$A_{rad}$	$\chi_{rad}$	$A_{di}$	$B_{di}$	$T_0$	$T_1$
Ca	2.09-10	7.09+4	1.12-13	0.900	3.28-4	9.07-2	3.46+4	1.64+4
Ca <sup>+</sup>	9.00-11	1.38+5	6.78-13	0.800	5.84-2	1.10-1	3.85+5	2.45+5
Ca <sup>2+</sup>	5.35-11	5.94+5	3.96-12	0.700	1.12-1	1.74-2	4.08+5	4.27+5
Ca <sup>3+</sup>	2.58-11	7.81+5	7.08-12	0.780	1.32-1	1.32-1	3.82+5	6.92+5
Ca <sup>4+</sup>	1.31-11	9.79+5	1.07-11	0.840	1.33-1	1.14-1	3.53+5	8.78+5
Ca <sup>5+</sup>	5.91-12	1.27+6	1.80-11	0.820	1.26-1	1.62-1	3.19+5	7.43+5
Ca <sup>6+</sup>	2.86-12	1.49+6	2.40-11	0.820	1.39-1	8.78-2	3.22+5	6.99+5
Ca <sup>7+</sup>	6.96-13	1.66+6	3.76-11	0.810	9.55-2	2.63-1	2.47+5	4.43+5
Ca <sup>8+</sup>	9.56-13	2.18+6	5.04-11	0.780	4.02-1	6.27-2	2.29+5	2.81+5
Ca <sup>9+</sup>	3.20-13	2.45+6	6.46-11	0.900	4.19-2	6.16-2	3.73+6	5.84+6
Ca <sup>10+</sup>	3.86-13	6.87+6	8.51-13	0.820	2.57-2	2.77	9.26+5	4.89+6
Ca <sup>11+</sup>	2.54-13	7.61+6	1.18-10	0.810	4.45-2	2.23	7.96+5	4.62+6
Ca <sup>12+</sup>	1.90-13	8.43+6	1.58-10	0.800	5.48-2	2.00	6.90+5	4.52+6
Ca <sup>13+</sup>	1.42-13	9.48+6	2.04-10	0.730	7.13-2	1.82	6.70+5	3.32+6
Ca <sup>14+</sup>	9.25-14	1.04+7	2.60-10	0.800	9.03-2	4.24-1	4.72+5	1.37+6
Ca <sup>15+</sup>	5.48-14	1.13+7	3.24-10	0.780	1.10-1	2.43-1	5.67+5	4.41+6
Ca <sup>16+</sup>	3.74-14	1.26+7	3.81-10	0.850	2.05-2	1.85-1	4.21+5	2.27+6
Ca <sup>17+</sup>	1.65-14	1.34+7	5.13-10	0.850	5.49-1	2.92-1	3.65+7	7.25+6
Ca <sup>18+</sup>	1.68-15	5.95+7	6.46-10	0.830	3.55-1	2.75-1	3.78+7	7.68+6
Ca <sup>19+</sup>	7.39-16	6.35+7	1.64-10	0.726	0	0	0	0
Fe	1.26-10	9.13+4	1.42-13	0.891	1.58-3	4.56-1	6.00+4	8.97+4
Fe <sup>+</sup>	4.97-11	1.88+5	1.02-12	0.843	8.38-3	3.23-1	1.94+5	1.71+5
Fe <sup>2+</sup>	1.49-10	3.56+5	3.32-12	0.746	1.54-2	3.10-1	3.31+5	2.73+5
Fe <sup>3+</sup>	3.90-11	6.36+5	7.80-12	0.682	3.75-2	4.11-1	4.32+5	3.49+5
Fe <sup>4+</sup>	1.66-11	8.70+5	1.51-11	0.699	1.17-1	3.59-1	6.28+5	5.29+5
Fe <sup>5+</sup>	7.16-12	1.15+6	2.62-11	0.728	2.54-1	9.75-2	7.50+5	4.69+5
Fe <sup>6+</sup>	3.00-12	1.45+6	4.12-11	0.759	2.91-1	2.29-1	7.73+5	6.54+5
Fe <sup>7+</sup>	1.02-12	1.75+6	6.05-11	0.790	1.50-1	4.20	2.62+5	1.32+6
Fe <sup>8+</sup>	2.54-12	2.73+6	8.13-11	0.810	1.40-1	3.30	2.50+5	1.33+6
Fe <sup>9+</sup>	1.70-12	3.04+6	1.09-10	0.829	1.00-1	5.30	2.57+5	1.41+6
Fe <sup>10+</sup>	1.11-12	3.37+6	1.33-10	0.828	2.00-1	1.50	2.84+5	1.52+6
Fe <sup>11+</sup>	6.42-13	3.84+6	1.64-10	0.834	2.40-1	7.00-1	8.69+5	1.51+6
Fe <sup>12+</sup>	3.59-13	4.19+6	2.00-10	0.836	2.60-1	6.00-1	4.21+5	1.82+6
Fe <sup>13+</sup>	9.30-14	4.55+6	2.41-10	0.840	1.90-1	5.00-1	4.57+5	1.84+6
Fe <sup>14+</sup>	1.62-14	5.30+6	2.89-10	0.846	1.20-1	1.00	2.85+5	2.31+6
Fe <sup>15+</sup>	5.97-14	5.68+6	3.42-10	0.850	3.50-1	0	8.18+5	0
Fe <sup>16+</sup>	8.44-14	1.47+7	3.87-10	0.836	6.60-2	7.80	1.51+6	9.98+6
Fe <sup>17+</sup>	5.92-14	1.58+7	4.52-10	0.824	1.00-1	6.30	1.30+6	9.98+6
Fe <sup>18+</sup>	4.72-14	1.69+7	5.25-10	0.816	1.30-1	5.50	1.19+6	1.00+7
Fe <sup>19+</sup>	3.79-14	1.84+7	6.07-10	0.811	2.30-1	3.60	1.09+6	1.10+7
Fe <sup>20+</sup>	2.60-14	1.96+7	6.98-10	0.808	1.40-1	4.90	9.62+5	8.34+6
Fe <sup>21+</sup>	1.61-14	2.09+7	7.72-10	0.800	1.10-1	1.60	7.23+5	1.01+7
Fe <sup>22+</sup>	1.16-14	2.26+7	7.86-10	0.718	4.10-2	4.20	4.23+5	1.07+7
Fe <sup>23+</sup>	5.39-15	2.35+7	8.57-10	0.677	7.47-1	2.84-1	5.87+7	1.17+6
Fe <sup>24+</sup>	5.67-16	1.02+8	9.46-10	0.732	5.19-1	2.79-1	6.01+7	9.97+6
Fe <sup>25+</sup>	2.57-16	1.08+8	2.76-10	0.726	0	0	0	0

Table 5 (Continuation)

Ion	$A_{col}$	$T_{col}$	$A_{rad}$	$\chi_{rad}$	$A_{di}$	$B_{di}$	$T_0$	$T_1$
Ni	1.34-10	8.86+4	3.60-13	0.700	1.41-3	4.69-1	9.82+4	1.01+5
Ni <sup>+</sup>	6.38-10	2.11+5	1.00-12	0.700	5.20-3	3.57-1	2.01+5	1.91+5
Ni <sup>2+</sup>	1.51-10	4.08+5	1.40-12	0.700	1.38-2	2.81-1	3.05+5	2.32+5
Ni <sup>3+</sup>	5.43-11	6.37+5	1.60-12	0.700	2.30-2	1.28-1	4.20+5	3.18+5
Ni <sup>4+</sup>	2.46-11	8.76+5	3.85-12	0.746	4.19-2	4.17-2	5.56+5	4.55+5
Ni <sup>5+</sup>	1.00-11	1.25+6	9.05-12	0.682	6.83-2	5.58-2	6.72+5	5.51+5
Ni <sup>6+</sup>	5.29-11	1.54+6	1.75-11	0.699	1.22-1	3.46-2	7.93+5	5.28+5
Ni <sup>7+</sup>	2.67-12	1.88+6	3.04-11	0.728	3.00-1	0	9.00+5	0
Ni <sup>8+</sup>	1.26-12	2.24+6	8.91-11	0.759	1.50-1	1.90	1.00+6	5.50+5
Ni <sup>9+</sup>	4.66-13	2.60+6	1.19-10	0.790	6.97-1	2.77-1	7.81+5	8.87+5
Ni <sup>10+</sup>	1.36-12	3.73+6	1.50-10	0.810	7.09-1	1.35-1	7.64+5	1.80+6
Ni <sup>11+</sup>	9.44-13	4.09+6	1.91-10	0.829	6.44-1	1.34-1	7.44+5	1.25+6
Ni <sup>12+</sup>	6.35-13	4.46+6	2.29-10	0.828	5.25-1	1.92-1	6.65+5	1.89+6
Ni <sup>13+</sup>	3.80-13	4.99+6	2.63-10	0.834	4.46-1	3.22-1	5.97+5	8.84+5
Ni <sup>14+</sup>	2.17-13	5.39+6	3.16-10	0.836	3.63-1	3.37-1	5.24+5	1.29+6
Ni <sup>15+</sup>	5.74-13	5.79+6	3.63-10	0.840	3.02-1	1.21-1	4.96+5	6.24+5
Ni <sup>16+</sup>	1.04-13	6.63+6	4.03-10	0.846	1.02-1	5.14-2	4.46+5	1.59+6
Ni <sup>17+</sup>	3.88-14	7.04+6	4.73-10	0.850	2.70-1	1.83-1	8.49+5	8.01+6
Ni <sup>18+</sup>	5.65-14	1.80+7	5.25-10	0.836	4.67-2	7.56	1.36+6	9.32+6
Ni <sup>19+</sup>	4.02-14	1.91+7	5.75-10	0.824	8.35-2	4.55	1.23+6	9.45+6
Ni <sup>20+</sup>	3.25-14	2.04+7	6.38-10	0.816	9.96-2	4.87	1.06+6	9.45+6
Ni <sup>21+</sup>	2.65-14	2.20+7	7.08-10	0.811	1.99-1	2.19	1.25+6	8.01+6
Ni <sup>22+</sup>	1.83-14	2.33+7	7.94-10	0.808	2.40-1	1.15	1.23+6	7.57+6
Ni <sup>23+</sup>	1.15-14	2.47+7	8.71-10	0.800	1.15-1	1.23	3.32+5	2.64+6
Ni <sup>24+</sup>	8.39-15	2.66+7	8.91-10	0.718	3.16-2	1.32-1	6.45+5	1.93+6
Ni <sup>25+</sup>	3.84-15	2.78+7	9.14-10	0.677	8.03-1	2.89-1	6.65+7	1.19+7
Ni <sup>26+</sup>	4.21-16	1.19+8	1.06-09	0.732	5.75-1	2.86-1	6.81+7	9.08+6
Ni <sup>27+</sup>	1.91-16	1.25+8	3.21-10	0.726	0	0	0	0

Table 6

## Radiative recombination rates on the HeI ion levels

Levels	5000 K	10000 K	15000 K	20000 K
$1^1S$	2.23-13	1.62-13	1.14-13	1.15-13
$2^1S$	7.64-15	5.43-15	4.06-15	3.99-15
$2^1P$	2.11-14	1.32-14	8.16-15	7.95-15
$3^1S$	2.23-15	1.63-15	1.19-15	1.16-15
$3^1P$	8.92-15	5.65-15	3.34-15	3.16-15
$3^1D$	9.23-15	5.28-15	2.70-15	2.29-15
$\alpha^B(n^1l)$	9.96-14	6.27-14	3.46-14	
$2^3S$	1.98-14	1.46-15	1.13-14	1.11-14
$2^3P$	8.78-14	5.77-14	3.59-14	3.59-14
$3^3S$	4.88-15	3.73-15	2.97-15	3.00-15
$3^3P$	3.20-14	1.95-14	1.30-14	1.25-14
$3^3D$	2.84-14	1.30-14	8.46-15	6.92-15
$\alpha^B(n^3l)$	3.26-13	2.10-13	1.29-13	
$\alpha^B(\text{He}^+)$	4.26-13	2.73-13	1.55-13	

Comments: data for  $T_e = 5000 - 15000$  K are taken from a paper by Osterbrock (1974), for  $T_e = 20000$  K and 10000 K ( $1^1S$ ,  $2^1S$ ,  $2^1P$ ,  $2^3S$ ,  $2^3P$ )– from a paper by Ilmas & Nugis (1982)

Table 7

Photoheating rates  $G_{nc}$ (erg/s) for HI and HeII levels  
 ionized by the Planckien radiation field ( $I_\nu = B_\nu(T_*)$ )  
 at optical depth  $\tau = 0$  and  $W = 1$ ,  
 $T_*$  is expressed in  $10^4\text{K}$

$T_*$	HI				HeII			
	$n = 1$	$n = 2$	$n = 3$	$n = 4$	$n = 1$	$n = 2$	$n = 3$	$n = 4$
0.1	0.00+00	0.00+00	5.36-15	4.52-12	0.00+00	0.00+00	0.00+00	0.00+00
0.5	2.57-18	5.94-09	1.27-07	2.12-07	0.00+00	1.40-18	1.75-11	3.14-09
1.0	7.09-11	1.08-06	2.43-06	1.85-06	0.00+00	3.83-11	7.05-08	5.65-07
2.0	7.09-07	2.63-05	1.89-05	9.54-06	1.64-16	3.80-07	8.10-06	1.36-05
3.0	2.08-05	1.02-04	4.97-05	2.15-05	1.35-11	1.11-05	5.28-05	5.24-05
4.0	1.31-04	2.33-04	9.18-05	3.66-05	4.53-09	6.91-05	1.55-04	1.18-04
5.0	4.30-04	4.13-04	1.43-04	5.41-05	1.63-07	2.26-04	3.23-04	2.10-04
6.0	1.01-03	6.40-04	2.02-04	7.36-05	1.90-06	5.27-04	5.57-04	3.23-04
7.0	1.93-03	9.07-04	2.68-04	9.49-05	1.14-05	1.01-03	8.54-04	4.58-04
8.0	3.24-03	1.21-03	3.40-04	1.18-04	4.53-05	1.68-03	1.21-03	6.10-04
9.0	4.97-03	1.55-03	4.17-04	1.42-04	1.36-04	2.57-03	1.63-03	7.80-04
10.0	7.12-03	1.92-03	4.98-04	1.67-04	3.33-04	3.68-03	2.09-03	9.65-04
12.0	1.27-02	2.75-03	6.74-04	2.20-04	1.33-03	6.55-03	3.18-03	1.38-03
15.0	2.44-02	4.17-03	9.65-04	3.07-04	5.73-03	1.25-02	5.14-03	2.08-03
20.0	5.21-02	6.95-03	1.51-03	4.65-04	2.75-02	2.64-02	9.16-03	3.46-03
30.0	1.34-01	1.37-02	2.75-03	8.19-04	1.62-01	6.75-02	1.94-02	6.79-03
50.0	3.81-01	3.03-02	5.66-03	1.63-03	9.23-01	1.90-01	4.61-02	1.50-02
100.0	1.31+00	8.27-02	1.44-02	4.00-03	5.69+00	6.49-01	1.35-01	4.07-02

Table 8

Dependence of heating rate parameter  $k_1(\tau)$  in  $G_{1c}$  of Eq. (2.21)  
on  $\tau_n^o$  and  $(T_*)$  in Planckian radiation

<b>HI</b>						
$lg(1 + \tau) \setminus T_*, K$	5000	10000	15000	20000	30000	50000
0.0	0.8576	0.7531	0.6724	0.6080	0.5112	0.3902
0.2	0.8554	0.7476	0.6644	0.5981	0.4992	0.3774
0.4	0.8517	0.7386	0.6513	0.5823	0.4807	0.3582
0.6	0.8454	0.7236	0.6300	0.5572	0.4527	0.3311
0.8	0.8344	0.6980	0.5957	0.5189	0.4129	0.2955
1.0	0.8143	0.6552	0.5437	0.4648	0.3619	0.2540
1.2	0.7760	0.5893	0.4745	0.3988	0.3050	0.2109
1.4	0.7076	0.5051	0.3969	0.3295	0.2489	0.1705
1.6	0.6108	0.4157	0.3213	0.2645	0.1981	0.1349
1.8	0.5042	0.3328	0.2538	0.2076	0.1547	0.1049
2.0	0.4032	0.2596	0.1968	0.1604	0.1190	0.0805
2.2	0.3150	0.1996	0.1504	0.1222	0.0904	0.0611
2.4	0.2420	0.1514	0.1136	0.0921	0.0680	0.0459
2.6	0.1834	0.1137	0.0850	0.0688	0.0508	0.0343
2.8	0.1375	0.0846	0.0631	0.0510	0.0376	0.0254
3.0	0.1022	0.0626	0.0465	0.0376	0.0277	0.0187
3.2	0.0755	0.0460	0.0342	0.0276	0.0203	0.0137
3.4	0.0554	0.0336	0.0249	0.0201	0.0148	0.0100
3.6	0.0405	0.0245	0.0181	0.0146	0.0108	0.0073
3.8	0.0294	0.0178	0.0132	0.0106	0.0078	0.0053
4.0	0.0213	0.0128	0.0095	0.0077	0.0056	0.0038

  

<b>HeII</b>						
$lg(1 + \tau) \setminus T_*, K$	25000	35000	50000	75000	100000	150000
0.0	0.8287	0.7766	0.7104	0.6229	0.5552	0.4574
0.2	0.8256	0.7719	0.7035	0.6134	0.5441	0.4448
0.4	0.8205	0.7642	0.6923	0.5982	0.5266	0.4256
0.6	0.8119	0.7511	0.6738	0.5739	0.4995	0.3974
0.8	0.7969	0.7287	0.6431	0.5362	0.4597	0.3588
1.0	0.7697	0.6901	0.5944	0.4823	0.4066	0.3114
1.2	0.7208	0.6278	0.5254	0.4153	0.3452	0.2606
1.4	0.6426	0.5434	0.4439	0.3439	0.2831	0.2116
1.6	0.5445	0.4504	0.3617	0.2765	0.2261	0.1679
1.8	0.4438	0.3616	0.2870	0.2174	0.1769	0.1309
2.0	0.3518	0.2836	0.2233	0.1680	0.1363	0.1005
2.2	0.2731	0.2186	0.1710	0.1281	0.1037	0.0763
2.4	0.2088	0.1661	0.1294	0.0966	0.0780	0.0574
2.6	0.1576	0.1249	0.0970	0.0722	0.0583	0.0428
2.8	0.1178	0.0931	0.0721	0.0535	0.0432	0.0317
3.0	0.0874	0.0689	0.0532	0.0395	0.0318	0.0234
3.2	0.0644	0.0506	0.0391	0.0289	0.0233	0.0171
3.4	0.0472	0.0370	0.0285	0.0211	0.0170	0.0125
3.6	0.0345	0.0270	0.0208	0.0154	0.0124	0.0091
3.8	0.0250	0.0196	0.0151	0.0111	0.0090	0.0066
4.0	0.0195	0.0142	0.0109	0.0080	0.0065	0.0048

Table 9

Total cooling rates for spontaneous and stimulated recombination of HI and HeII in units  $10^{-25}$ erg/s

		<b>HI</b>			
		Spontaneous	Stimulated		
$T_e, \text{K} \setminus$	$T_*, 10^4 \text{K}$	1.00	2.00	5.00	10.00
5000	3.78	1.48	2.03	2.81	3.48
10000	4.49	1.40	2.07	3.10	4.02
15000	4.90	1.30	2.03	3.20	4.30
20000	5.18	1.22	1.96	3.23	4.47
25000	5.39	1.14	1.89	3.23	4.57
30000	5.55	1.08	1.82	3.21	4.64
		<b>HeII</b>			
5000	20.26	6.03	8.30	11.56	13.98
10000	24.95	5.67	8.43	12.75	16.06
15000	27.96	5.26	8.25	13.15	17.08
20000	30.33	4.93	7.97	13.27	17.68
25000	31.98	4.63	7.67	13.25	18.03
30000	33.48	4.38	7.45	13.16	18.24



Table 10

Parameters for the electron collision ionization (Eq. 3.3)

Sequence	Ion	Shell	$I_j$ (eV)	$A_j$	$B_j$	$C_j$	$D_j$
H	H <sup>0</sup>	1s	13.6	22.8	-12.0	1.9	-22.6
	He <sup>1+</sup>	1s	54.4	14.4	-5.6	1.9	-13.3
	C <sup>5+</sup>	1s	490.0	12.2	-3.9	1.9	-10.3
	N <sup>6+</sup>	1s	667.0	12.3	-4.0	1.9	-10.3
	O <sup>7+</sup>	1s	871.0	12.3	-4.0	1.9	-10.3
	Ne <sup>9+</sup>	1s	1362.0	12.5	-4.1	1.9	-10.4
	Na <sup>10+</sup>	1s	1649.0	12.5	-4.1	1.9	-10.4
	Mg <sup>11+</sup>	1s	1963.0	12.6	-4.2	1.9	-10.4
	Al <sup>12+</sup>	1s	2304.0	12.6	-4.2	1.9	-10.4
	Si <sup>13+</sup>	1s	2673.0	12.7	-4.3	1.9	-10.4
	S <sup>15+</sup>	1s	3493.0	12.8	-4.3	1.9	-10.4
	Ar <sup>17+</sup>	1s	4426.0	12.8	-4.4	1.9	-10.5
	Ca <sup>19+</sup>	1s	5470.0	12.9	-4.4	1.9	-10.5
	Fe <sup>25+</sup>	1s	9278.0	13.0	-4.5	1.9	-10.6
Ni <sup>27+</sup>	1s	10790.0	13.0	-4.5	1.9	-10.6	
He	He <sup>0</sup>	1s <sup>2</sup>	24.6	17.8	-11.0	7.0	-23.2
	C <sup>4+</sup>	1s <sup>2</sup>	392.0	20.4	-6.1	4.5	-18.0
	N <sup>5+</sup>	1s <sup>2</sup>	552.0	20.8	-6.3	4.4	-18.2
	O <sup>6+</sup>	1s <sup>2</sup>	739.0	21.2	-6.5	4.3	-18.4
	Ne <sup>8+</sup>	1s <sup>2</sup>	1196.0	21.9	-6.8	4.2	-18.7
	Na <sup>9+</sup>	1s <sup>2</sup>	1465.0	22.2	-7.0	4.2	-18.8
	Mg <sup>10+</sup>	1s <sup>2</sup>	1762.0	22.4	-7.1	4.1	-18.9
	Al <sup>11+</sup>	1s <sup>2</sup>	2086.0	22.7	-7.2	4.1	-19.0
	Si <sup>12+</sup>	1s <sup>2</sup>	2438.0	22.9	-7.3	4.0	-19.1
	S <sup>14+</sup>	1s <sup>2</sup>	3224.0	23.3	-7.6	4.0	-19.3
	Ar <sup>16+</sup>	1s <sup>2</sup>	4121.0	23.7	-7.8	3.9	-19.5
	Ca <sup>18+</sup>	1s <sup>2</sup>	5129.0	24.0	-7.9	3.9	-19.6
	Fe <sup>24+</sup>	1s <sup>2</sup>	8828.0	24.8	-8.4	3.8	-20.0
	Ni <sup>26+</sup>	1s <sup>2</sup>	10280.0	25.0	-8.5	3.7	-20.1
Li	C <sup>3+</sup>	2s	64.5	8.2	-2.7	1.4	-6.6
		1s <sup>2</sup>	343.0	20.0	-5.6	4.1	-18.0
	N <sup>4+</sup>	2s	97.9	10.5	-3.3	1.4	-7.7
		1s <sup>2</sup>	493.0	20.5	-5.8	4.1	-18.0
	O <sup>5+</sup>	2s	138.0	10.4	-3.3	1.4	-7.4
		1s <sup>2</sup>	670.0	20.8	-6.0	4.1	-18.0
	Ne <sup>7+</sup>	2s	239.0	10.1	-3.1	1.4	-7.1
		1s <sup>2</sup>	1107.0	21.5	-6.4	4.1	-18.0
	Na <sup>8+</sup>	2s	300.0	10.0	-3.0	1.4	-6.9
		1s <sup>2</sup>	1366.0	21.7	-6.5	4.1	-18.0
	Mg <sup>9+</sup>	2s	367.0	10.0	-3.0	1.4	-6.8
		1s <sup>2</sup>	1653.0	22.0	-6.7	4.1	-18.0
	Al <sup>10+</sup>	2s	442.0	9.9	-3.0	1.4	-6.7
		1s <sup>2</sup>	1967.0	22.2	-6.8	4.1	-18.0

Table 10 (Continuation)

Sequence	Ion	Shell	$I_j$ (eV)	$A_j$	$B_j$	$C_j$	$D_j$
Li	Si <sup>11+</sup>	2s	523.0	9.8	-2.9	1.4	-6.6
		1s <sup>2</sup>	2309.0	22.4	-6.9	4.1	-18.0
	S <sup>13+</sup>	2s	707.0	9.7	-2.8	1.4	-6.4
		1s <sup>2</sup>	3075.0	22.8	-7.1	4.1	-18.0
	Ar <sup>15+</sup>	2s	918.0	9.6	-2.8	1.4	-6.2
		1s <sup>2</sup>	3951.0	23.1	-7.3	4.1	-18.0
	Ca <sup>17+</sup>	2s	1157.0	9.5	-2.7	1.4	-6.1
		1s <sup>2</sup>	4939.0	23.4	-7.4	4.1	-18.0
	Fe <sup>23+</sup>	2s	2045.0	9.3	-2.6	1.4	-5.8
		1s <sup>2</sup>	8580.0	24.1	-7.9	4.1	-18.0
	Ni <sup>25+</sup>	2s	2399.0	9.2	-2.6	1.4	-5.7
		1s <sup>2</sup>	10020.0	24.3	-8.0	4.1	-18.0
Be	C <sup>2+</sup>	2s <sup>2</sup>	47.9	23.2	-7.4	2.5	-19.4
		1s <sup>2</sup>	325.0	20.0	-5.6	4.1	-18.0
	N <sup>3+</sup>	2s <sup>2</sup>	77.5	17.6	-3.8	2.8	-13.6
		1s <sup>2</sup>	471.0	20.5	-5.8	4.1	-18.0
	O <sup>4+</sup>	2s <sup>2</sup>	114.0	16.4	-3.0	2.9	-12.0
		1s <sup>2</sup>	644.0	20.8	-6.0	4.1	-18.0
	Ne <sup>6+</sup>	2s <sup>2</sup>	207.0	16.5	-3.1	2.8	-11.4
		1s <sup>2</sup>	1073.0	21.5	-6.4	4.1	-18.0
	Na <sup>7+</sup>	2s <sup>2</sup>	264.0	16.8	-3.4	2.8	-11.4
		1s <sup>2</sup>	1328.0	21.7	-6.5	4.1	-18.0
	Mg <sup>8+</sup>	2s <sup>2</sup>	328.0	17.1	-3.6	2.7	-11.5
		1s <sup>2</sup>	1611.0	22.0	-6.7	4.1	-18.0
	Al <sup>9+</sup>	2s <sup>2</sup>	399.0	17.4	-3.8	2.7	-11.6
		1s <sup>2</sup>	1921.0	22.2	-6.8	4.1	-18.0
	Si <sup>10+</sup>	2s <sup>2</sup>	476.0	17.7	-4.0	2.7	-11.7
		1s <sup>2</sup>	2259.0	22.4	-6.9	4.1	-18.0
	S <sup>12+</sup>	2s <sup>2</sup>	652.0	18.1	-4.4	2.7	-11.8
		1s <sup>2</sup>	3017.0	22.8	-7.1	4.1	-18.0
	Ar <sup>14+</sup>	2s <sup>2</sup>	855.0	18.4	-4.6	2.7	-12.0
		1s <sup>2</sup>	3885.0	23.1	-7.3	4.1	-18.0
	Ca <sup>16+</sup>	2s <sup>2</sup>	1087.0	18.6	-4.6	2.7	-12.1
		1s <sup>2</sup>	4865.0	23.4	-7.4	4.1	-18.0
	Fe <sup>22+</sup>	2s <sup>2</sup>	1950.0	19.2	-5.3	2.7	-12.3
		1s <sup>2</sup>	8482.0	24.1	-7.9	4.1	-18.0
Ni <sup>24+</sup>	2s <sup>2</sup>	2295.0	19.3	-5.4	2.7	-12.3	
	1s <sup>2</sup>	9914.0	24.3	-8.0	4.1	-18.0	
B	C <sup>1+</sup>	2p	24.4	16.0	-9.0	2.5	-10.5
		2s <sup>2</sup>	30.9	23.7	-7.6	2.5	-21.7
	N <sup>2+</sup>	2p	47.4	16.0	-7.5	2.3	-10.0
		2s <sup>2</sup>	55.8	18.1	-4.0	2.8	-15.8
	O <sup>3+</sup>	2p	77.4	15.0	-5.0	2.2	-10.5
		2s <sup>2</sup>	87.6	16.8	-3.3	2.8	-14.1
	Ne <sup>5+</sup>	2p	158.0	14.5	-4.6	1.9	-8.5
		2s <sup>2</sup>	172.0	16.9	-3.4	2.8	-13.2

Table 10 (Continuation)

Sequence	Ion	Shell	$I_j$ (eV)	$A_j$	$B_j$	$C_j$	$D_j$
B	Na <sup>6+</sup>	2p	208.0	14.5	-4.6	1.8	-8.5
		2s <sup>2</sup>	224.0	17.2	-3.7	2.8	-13.1
	Mg <sup>7+</sup>	2p	266.0	14.5	-4.6	1.8	-8.5
		2s <sup>2</sup>	283.0	17.5	-4.0	2.8	-13.0
	Al <sup>8+</sup>	2p	330.0	14.0	-4.6	1.7	-8.5
		2s <sup>2</sup>	350.0	17.9	-4.1	2.8	-13.0
	Si <sup>9+</sup>	2p	401.0	14.0	-4.6	1.6	-8.5
		2s <sup>2</sup>	423.0	18.0	-4.3	2.8	-12.9
	S <sup>11+</sup>	2p	564.0	14.0	-4.6	1.5	-8.5
		2s <sup>2</sup>	589.0	18.3	-4.7	2.8	-12.8
	Ar <sup>13+</sup>	2p	755.0	14.0	-4.6	1.4	-8.5
		2s <sup>2</sup>	784.0	18.5	-5.0	2.8	-12.6
	Ca <sup>15+</sup>	2p	974.0	14.0	-4.6	1.3	-8.5
		2s <sup>2</sup>	1006.0	18.7	-5.3	2.8	-12.4
	Fe <sup>21+</sup>	2p	1799.0	13.7	-4.4	1.0	-8.3
		2s <sup>2</sup>	1842.0	19.2	-5.5	2.8	-12.3
	Ni <sup>23+</sup>	2p	2131.0	13.7	-4.4	1.0	-8.3
		2s <sup>2</sup>	2178.0	19.4	-5.7	2.8	-12.3
C	C <sup>0</sup>	2p <sup>2</sup>	11.3	6.0	-16.0	12.0	-15.1
		2s <sup>2</sup>	16.6	24.3	-7.8	2.5	-24.0
	N <sup>1+</sup>	2p <sup>2</sup>	29.6	21.0	-9.0	5.3	-22.5
		2s <sup>2</sup>	36.7	18.5	-4.3	2.8	-18.0
	O <sup>2+</sup>	2p <sup>2</sup>	54.9	25.0	-7.0	5.0	-18.0
		2s <sup>2</sup>	63.8	17.3	-3.5	2.9	-16.1
	Ne <sup>4+</sup>	2p <sup>2</sup>	126.0	25.5	-8.5	4.5	-16.8
		2s <sup>2</sup>	139.0	17.4	-3.8	2.8	-14.9
	Na <sup>5+</sup>	2p <sup>2</sup>	172.0	25.5	-8.5	4.2	-16.8
		2s <sup>2</sup>	186.0	17.6	-4.0	2.8	-14.7
	Mg <sup>6+</sup>	2p <sup>2</sup>	225.0	25.5	-8.5	4.1	-16.8
		2s <sup>2</sup>	241.0	18.0	-4.3	2.8	-14.5
	Al <sup>7+</sup>	2p <sup>2</sup>	285.0	27.0	-8.5	3.9	-16.8
		2s <sup>2</sup>	302.0	18.2	-4.5	2.8	-14.3
	Si <sup>8+</sup>	2p <sup>2</sup>	351.0	27.0	-8.5	3.8	-16.8
		2s <sup>2</sup>	371.0	18.3	-4.7	2.8	-14.1
	S <sup>10+</sup>	2p <sup>2</sup>	505.0	27.0	-8.5	3.3	-16.8
		2s <sup>2</sup>	528.0	18.6	-5.1	2.8	-13.7
	Ar <sup>12+</sup>	2p <sup>2</sup>	686.0	27.0	-8.5	3.0	-16.8
		2s <sup>2</sup>	713.0	18.7	-5.4	2.8	-13.3
	Ca <sup>14+</sup>	2p <sup>2</sup>	894.0	27.0	-8.5	2.7	-16.8
		2s <sup>2</sup>	925.0	18.9	-5.8	2.8	-12.8
	Fe <sup>20+</sup>	2p <sup>2</sup>	1689.0	27.4	-8.8	2.0	-16.6
		2s <sup>2</sup>	1731.0	19.2	-5.5	2.8	-12.3
Ni <sup>22+</sup>	2p <sup>2</sup>	2011.0	27.4	-8.8	2.0	-16.6	
	2s <sup>2</sup>	2056.0	19.4	-5.7	2.8	-12.3	

Table 10 (Continuation)

Sequence	Ion	Shell	$I_j$ (eV)	$A_j$	$B_j$	$C_j$	$D_j$
N	N <sup>0</sup>	$2p^3$	14.5	19.5	-30.5	15.0	-29.0
		$2s^2$	20.3	19.0	-4.5	2.8	-20.2
	O <sup>1+</sup>	$2p^3$	35.1	25.0	-8.0	8.4	-29.5
		$2s^2$	42.6	17.8	-3.8	2.9	-18.1
	Ne <sup>3+</sup>	$2p^3$	97.1	34.0	-10.0	7.5	-25.0
		$2s^2$	108.0	17.8	-4.0	2.8	-16.7
	Na <sup>4+</sup>	$2p^3$	138.0	35.1	-12.4	7.2	-25.1
		$2s^2$	151.0	18.0	-4.3	2.8	-16.3
	Mg <sup>5+</sup>	$2p^3$	187.0	35.1	-12.4	6.9	-25.1
		$2s^2$	201.0	18.2	-4.6	2.8	-16.0
	Al <sup>6+</sup>	$2p^3$	241.0	38.3	-12.4	6.7	-25.1
		$2s^2$	258.0	18.4	-4.8	2.8	-15.7
	Si <sup>7+</sup>	$2p^3$	303.0	38.3	-12.4	6.4	-25.1
		$2s^2$	321.0	18.6	-5.1	2.8	-15.4
	S <sup>9+</sup>	$2p^3$	447.0	38.3	-12.4	5.5	-25.1
		$2s^2$	469.0	18.8	-5.5	2.8	-14.7
	Ar <sup>11+</sup>	$2p^3$	618.0	38.3	-12.4	4.8	-25.1
		$2s^2$	644.0	18.9	-5.9	2.8	-14.0
	Ca <sup>13+</sup>	$2p^3$	818.0	38.3	-12.4	4.3	-25.1
		$2s^2$	847.0	19.0	-6.3	2.8	-13.2
Fe <sup>19+</sup>	$2p^3$	1582.0	41.1	-13.2	3.1	-24.9	
	$2s^2$	1622.0	19.2	-5.5	2.8	-12.3	
Ni <sup>21+</sup>	$2p^3$	1894.0	41.1	-13.2	2.9	-24.9	
	$2s^2$	1938.0	19.4	-5.7	2.8	-12.3	
O	O <sup>0</sup>	$2p^4$	13.6	9.5	-17.5	12.5	-19.5
		$2s^2$	28.5	18.2	-4.0	2.8	-20.2
	Ne <sup>2+</sup>	$2p^4$	63.5	33.0	-17.5	11.2	-33.0
		$2s^2$	86.2	18.2	-4.4	2.8	-18.4
	Na <sup>3+</sup>	$2p^4$	99.0	43.3	-16.3	10.7	-33.4
		$2s^2$	126.0	18.4	-4.7	2.8	-18.0
	Mg <sup>4+</sup>	$2p^4$	141.0	43.3	-16.3	10.3	-33.4
		$2s^2$	172.0	18.6	-4.9	2.8	-17.5
	Al <sup>5+</sup>	$2p^4$	190.0	49.5	-16.3	9.9	-33.4
		$2s^2$	225.0	18.9	-5.2	2.8	-17.1
	Si <sup>6+</sup>	$2p^4$	246.0	49.5	-16.3	9.6	-33.4
		$2s^2$	285.0	19.0	-5.4	2.8	-16.6
	S <sup>8+</sup>	$2p^4$	379.0	49.5	-16.3	8.0	-33.4
		$2s^2$	426.0	19.1	-5.9	2.8	-15.6
	Ar <sup>10+</sup>	$2p^4$	539.0	49.5	-16.3	6.9	-33.4
		$2s^2$	594.0	19.2	-6.4	2.8	-14.6
	Ca <sup>12+</sup>	$2p^4$	727.0	49.5	-16.3	6.1	-33.4
		$2s^2$	790.0	19.2	-6.8	2.8	-13.7
	Fe <sup>18+</sup>	$2p^4$	1456.0	54.8	-17.6	4.1	-33.2
		$2s^2$	1548.0	19.2	-5.5	2.8	-12.3

Table 10 (Continuation)

Sequence	Ion	Shell	$I_j$ (eV)	$A_j$	$B_j$	$C_j$	$D_j$
O	Ni <sup>20+</sup>	2 <i>p</i> <sup>4</sup>	1756.0	54.8	-17.6	3.9	-33.2
		2 <i>s</i> <sup>2</sup>	1858.0	19.4	-5.7	2.8	-12.3
F	Ne <sup>1+</sup>	2 <i>p</i> <sup>5</sup>	41.1	37.0	-33.0	15.5	-46.0
		2 <i>s</i> <sup>2</sup>	66.4	18.6	-4.6	2.8	-20.2
	Na <sup>2+</sup>	2 <i>p</i> <sup>5</sup>	71.7	50.1	-20.2	14.8	-41.7
		2 <i>s</i> <sup>2</sup>	102.0	18.8	-5.0	2.8	-19.6
	Mg <sup>3+</sup>	2 <i>p</i> <sup>5</sup>	109.0	50.1	-20.2	14.2	-41.7
		2 <i>s</i> <sup>2</sup>	144.0	19.0	-5.3	2.8	-19.0
	Al <sup>4+</sup>	2 <i>p</i> <sup>5</sup>	154.0	60.8	-20.2	13.7	-41.7
		2 <i>s</i> <sup>2</sup>	194.0	19.1	-5.5	2.8	-18.4
	Si <sup>5+</sup>	2 <i>p</i> <sup>5</sup>	205.0	60.8	-20.2	13.2	-41.7
		2 <i>s</i> <sup>2</sup>	250.0	19.3	-5.8	2.8	-17.8
	S <sup>7+</sup>	2 <i>p</i> <sup>5</sup>	328.0	60.8	-20.2	10.9	-41.7
		2 <i>s</i> <sup>2</sup>	384.0	19.3	-6.3	2.8	-16.6
	Ar <sup>9+</sup>	2 <i>p</i> <sup>5</sup>	479.0	60.8	-20.2	9.3	-41.7
		2 <i>s</i> <sup>2</sup>	545.0	19.4	-6.8	2.8	-15.3
	Ca <sup>11+</sup>	2 <i>p</i> <sup>5</sup>	657.0	60.8	-20.2	8.1	-41.7
		2 <i>s</i> <sup>2</sup>	734.0	19.4	-7.3	2.8	-14.1
	Fe <sup>17+</sup>	2 <i>p</i> <sup>5</sup>	1358.0	68.5	-22.0	5.1	-41.5
		2 <i>s</i> <sup>2</sup>	1471.0	19.2	-5.5	2.8	-12.3
	Ni <sup>19+</sup>	2 <i>p</i> <sup>5</sup>	1648.0	68.5	-22.0	4.9	-41.5
		2 <i>s</i> <sup>2</sup>	1775.0	19.4	-5.7	2.8	-12.3
Ne	Ne <sup>0</sup>	2 <i>p</i> <sup>6</sup>	21.6	40.0	-42.0	18.0	-56.0
		2 <i>s</i> <sup>2</sup>	48.5	19.0	-4.9	2.8	-22.0
	Na <sup>1+</sup>	2 <i>p</i> <sup>6</sup>	47.3	40.0	-28.0	19.4	-60.0
		2 <i>s</i> <sup>2</sup>	80.1	19.2	-5.3	2.8	-21.2
	Mg <sup>2+</sup>	2 <i>p</i> <sup>6</sup>	80.1	55.5	-24.1	18.7	-65.0
		2 <i>s</i> <sup>2</sup>	119.0	19.3	-5.6	2.8	-20.5
	Al <sup>3+</sup>	2 <i>p</i> <sup>6</sup>	120.0	72.0	-24.1	18.0	-50.0
		2 <i>s</i> <sup>2</sup>	164.0	19.5	-5.9	2.8	-19.8
	Si <sup>4+</sup>	2 <i>p</i> <sup>6</sup>	167.0	72.0	-24.1	17.4	-50.0
		2 <i>s</i> <sup>2</sup>	217.0	19.6	-6.2	2.8	-19.0
	S <sup>6+</sup>	2 <i>p</i> <sup>6</sup>	281.0	72.0	-24.1	14.2	-50.0
		2 <i>s</i> <sup>2</sup>	343.0	19.6	-6.8	2.8	-17.5
	Ar <sup>8+</sup>	2 <i>p</i> <sup>6</sup>	423.0	72.0	-24.1	11.9	-50.0
		2 <i>s</i> <sup>2</sup>	498.0	19.6	-7.3	2.8	-16.0
	Ca <sup>10+</sup>	2 <i>p</i> <sup>6</sup>	592.0	72.0	-24.1	10.3	-50.0
		2 <i>s</i> <sup>2</sup>	680.0	19.5	-7.8	2.8	-14.5
	Fe <sup>16+</sup>	2 <i>p</i> <sup>6</sup>	1265.0	82.2	-26.4	6.1	-49.8
		2 <i>s</i> <sup>2</sup>	1397.0	19.2	-5.5	2.8	-12.3
	Ni <sup>18+</sup>	2 <i>p</i> <sup>6</sup>	1546.0	82.2	-26.4	5.9	-49.8
		2 <i>s</i> <sup>2</sup>	1694.0	19.4	-5.7	2.8	-12.3

Table 10 (Continuation)

Sequence	Ion	Shell	$I_j$ (eV)	$A_j$	$B_j$	$C_j$	$D_j$	
Na	Na <sup>0</sup>	3s	5.1	16.0	-1.0	0.2	-13.5	
		2p <sup>6</sup>	34.0	63.9	-27.0	33.0	-80.0	
	Mg <sup>1+</sup>	3s	15.0	9.0	-3.6	0.3	-5.4	
		2p <sup>6</sup>	65.0	37.7	-30.0	24.8	-62.0	
		2s <sup>2</sup>	104.5	17.6	-5.2	3.3	-19.0	
	Al <sup>2+</sup>	3s	28.4	6.3	-2.4	0.5	-4.1	
		2p <sup>6</sup>	103.0	31.3	-22.7	21.0	-44.1	
		2s <sup>2</sup>	145.6	12.1	-3.5	3.3	-13.1	
	Si <sup>3+</sup>	3s	45.1	9.0	-3.0	0.6	-5.8	
		2p <sup>6</sup>	148.0	66.7	-24.8	18.7	-65.0	
		2s <sup>2</sup>	193.5	22.0	-7.2	3.3	-20.9	
	S <sup>5+</sup>	3s	88.1	9.0	-2.8	0.7	-5.4	
		2p <sup>6</sup>	257.0	73.2	-27.0	15.8	-61.1	
		2s <sup>2</sup>	309.7	23.1	-8.0	3.3	-19.5	
	Ar <sup>7+</sup>	3s	143.0	9.0	-2.7	0.8	-5.4	
		2p <sup>6</sup>	394.0	74.8	-27.0	14.1	-58.6	
		2s <sup>2</sup>	453.1	23.4	-8.3	3.3	-18.5	
	Ca <sup>9+</sup>	3s	211.0	9.0	-2.6	0.9	-5.4	
		2p <sup>6</sup>	559.0	76.1	-27.0	12.8	-56.6	
		2s <sup>2</sup>	623.7	23.5	-8.4	3.3	-17.8	
Fe <sup>15+</sup>	3s	490.0	9.0	-2.6	1.0	-5.4		
	2p <sup>6</sup>	1223.0	78.9	-27.0	10.6	-52.8		
	2s <sup>2</sup>	1298.6	23.5	-7.8	3.3	-16.5		
Ni <sup>17+</sup>	3s	608.0	9.0	-2.6	1.0	-5.4		
	2p <sup>6</sup>	1500.0	79.6	-27.0	10.1	-51.9		
	2s <sup>2</sup>	1578.0	23.5	-7.8	3.3	-16.2		
Mg	Mg <sup>0</sup>	3s <sup>2</sup>	7.6	18.0	-1.0	0.6	-4.0	
		2p <sup>6</sup>	54.0	37.7	-30.0	24.8	-62.0	
	Al <sup>1+</sup>	2s <sup>2</sup>	92.2	17.6	-5.2	3.3	-19.0	
		3s <sup>2</sup>	18.8	17.0	-6.0	1.0	-8.0	
		2p <sup>6</sup>	90.0	31.3	-22.7	21.0	-44.1	
	Si <sup>2+</sup>	2s <sup>2</sup>	131.0	12.1	-3.5	3.3	-13.1	
		3s <sup>2</sup>	33.5	19.8	-5.7	1.3	-11.9	
		2p <sup>6</sup>	133.0	66.7	-24.8	18.7	-65.0	
	S <sup>4+</sup>	2s <sup>2</sup>	176.6	22.0	-7.2	3.3	-20.9	
		3s <sup>2</sup>	72.7	19.8	-5.7	1.6	-11.9	
		2p <sup>6</sup>	239.0	73.2	-27.0	15.8	-61.1	
	Ar <sup>6+</sup>	2s <sup>2</sup>	288.2	23.1	-8.0	3.3	-19.5	
		3s <sup>2</sup>	125.0	19.8	-5.7	1.9	-11.9	
		2p <sup>6</sup>	373.0	74.8	-27.0	14.1	-58.6	
	Ca <sup>8+</sup>	2s <sup>2</sup>	427.0	23.4	-8.3	3.3	-18.5	
		3s <sup>2</sup>	189.0	19.8	-5.7	1.8	-11.9	
		2p <sup>6</sup>	534.0	76.1	-27.0	12.8	-56.6	
			2s <sup>2</sup>	593.1	23.5	-8.4	3.3	-17.8

Table 10 (Continuation)

Sequence	Ion	Shell	$I_j$ (eV)	$A_j$	$B_j$	$C_j$	$D_j$	
Mg	Fe <sup>14+</sup>	3s <sup>2</sup>	457.0	19.8	-5.7	2.1	-11.9	
		2p <sup>6</sup>	1185.0	78.9	-27.0	10.6	-52.8	
	Ni <sup>16+</sup>	2s <sup>2</sup>	1254.3	23.5	-7.8	3.3	-16.5	
		3s <sup>2</sup>	571.0	19.8	-5.7	2.2	-11.9	
		2p <sup>6</sup>	1458.0	79.6	-27.0	10.1	-51.9	
Al	Al <sup>0</sup>	2s <sup>2</sup>	1529.0	23.5	-7.8	3.3	-16.2	
		3p	6.0	47.0	-26.0	0.6	-39.0	
	Si <sup>1+</sup>	3s <sup>2</sup>	10.6	55.1	-37.2	1.4	-41.0	
		3p	16.3	50.4	-33.4	0.6	-36.9	
	S <sup>3+</sup>	3s <sup>2</sup>	22.9	55.1	-37.2	1.4	-41.0	
		3p	47.3	50.4	-33.4	0.6	-36.9	
	Ar <sup>5+</sup>	3s <sup>2</sup>	57.6	55.1	-37.2	1.4	-41.0	
		3p	91.2	50.4	-33.4	0.6	-36.9	
	Ca <sup>7+</sup>	3s <sup>2</sup>	105.0	55.1	-37.2	1.4	-41.0	
		3p	148.0	11.1	-3.4	1.3	-7.3	
	Fe <sup>13+</sup>	3s <sup>2</sup>	165.0	22.7	-8.6	1.9	-15.5	
		3p	392.0	9.1	-2.6	1.4	-5.6	
	Ni <sup>15+</sup>	3s <sup>2</sup>	421.0	28.2	-12.5	2.3	-19.4	
		3p	499.0	9.1	-2.6	1.4	-5.6	
	Si	Si <sup>0</sup>	3s <sup>2</sup>	531.0	28.2	-12.5	2.3	-19.4
3p <sup>2</sup>			8.1	74.5	-49.4	1.3	-54.6	
S <sup>2+</sup>		3s <sup>2</sup>	13.5	53.8	-35.8	1.4	-40.7	
		3p <sup>2</sup>	35.0	74.5	-49.4	1.3	-54.6	
Ar <sup>4+</sup>		3s <sup>2</sup>	43.8	53.8	-35.8	1.4	-40.7	
		3p <sup>2</sup>	75.2	74.5	-49.4	1.3	-54.6	
Ca <sup>6+</sup>		3s <sup>2</sup>	87.6	53.8	-35.8	1.4	-40.7	
		3p <sup>2</sup>	128.0	22.9	-7.4	2.8	-15.9	
Fe <sup>12+</sup>		3s <sup>2</sup>	144.0	21.9	-7.7	1.9	-14.9	
		3p <sup>2</sup>	361.0	21.3	-5.9	3.0	-12.6	
Ni <sup>14+</sup>		3s <sup>2</sup>	388.0	26.4	-11.2	2.3	-18.1	
		3p <sup>2</sup>	464.0	21.3	-5.9	3.0	-12.6	
P		S <sup>1+</sup>	3s <sup>2</sup>	494.0	26.4	-11.2	2.3	-18.1
			3p <sup>3</sup>	23.4	98.7	-65.4	1.9	-72.3
		Ar <sup>3+</sup>	3s <sup>2</sup>	30.7	52.5	-34.5	1.4	-40.5
	3p <sup>3</sup>		59.7	98.7	-65.4	1.9	-72.3	
	Ca <sup>5+</sup>	3s <sup>2</sup>	70.4	52.5	-34.5	1.4	-40.5	
		3p <sup>3</sup>	109.0	40.9	-13.6	3.4	-30.1	
	Fe <sup>11+</sup>	3s <sup>2</sup>	123.0	20.4	-6.3	2.1	-13.8	
		3p <sup>3</sup>	331.0	33.4	-9.7	4.6	-20.8	
	Ni <sup>13+</sup>	3s <sup>2</sup>	356.0	24.6	-9.8	2.3	-16.8	
		3p <sup>3</sup>	430.0	33.4	-9.7	4.6	-20.8	
			3s <sup>2</sup>	458.0	24.6	-9.8	2.3	-16.8

Table 10 (Continuation)

Sequence	Ion	Shell	$I_j$ (eV)	$A_j$	$B_j$	$C_j$	$D_j$
S	S <sup>0</sup>	$3p^4$	10.4	6.0	-22.0	20.0	-20.0
		$3s^2$	20.2	51.3	-33.2	1.4	-40.2
	Ar <sup>2+</sup>	$3p^4$	40.9	122.8	-81.4	2.6	-90.0
		$3s^2$	55.5	51.3	-33.2	1.4	-40.2
	Ca <sup>4+</sup>	$3p^4$	84.5	47.1	-14.5	4.8	-35.5
		$3s^2$	104.0	18.9	-5.1	1.6	-13.2
	Fe <sup>10+</sup>	$3p^4$	290.0	45.6	-13.9	6.2	-30.0
		$3s^2$	324.0	22.8	-8.4	2.3	-15.4
	Ni <sup>12+</sup>	$3p^4$	384.0	45.6	-13.9	6.2	-30.0
		$3s^2$	423.0	22.8	-8.4	2.3	-15.4
	Cl	Ar <sup>1+</sup>	$3p^5$	27.6	147.0	-97.4	3.2
$3s^2$			41.7	50.0	-31.8	1.4	-40.0
Ca <sup>3+</sup>		$3p^5$	67.3	55.8	-15.8	6.4	-44.5
		$3s^2$	86.4	16.2	-3.2	1.8	-11.6
Fe <sup>9+</sup>		$3p^5$	262.0	57.7	-18.6	7.8	-40.3
		$3s^2$	297.0	21.0	-7.1	2.3	-14.1
Ni <sup>11+</sup>	$3p^5$	352.0	57.7	-18.6	7.8	-40.3	
	$3s^2$	393.0	21.0	-7.1	2.3	-14.1	
Ar	Ar <sup>0</sup>	$3p^6$	15.8	171.1	-78.0	3.8	-169.0
		$3s^2$	29.2	48.7	-30.5	1.4	-39.7
	Ca <sup>2+</sup>	$3p^6$	51.2	74.3	-24.2	7.0	-63.0
		$3s^2$	70.1	17.6	-3.8	1.9	-13.8
	Fe <sup>8+</sup>	$3p^6$	235.0	69.9	-23.7	9.5	-51.7
		$3s^2$	271.0	19.2	-5.7	2.3	-12.7
Ni <sup>10+</sup>	$3p^6$	321.0	69.9	-23.7	9.5	-51.7	
	$3s^2$	363.0	19.2	-5.7	2.3	-12.7	
K	Ca <sup>1+</sup>	$4s$	11.9	7.9	-2.0	0.2	-6.0
		$3p^6$	37.0	74.3	-24.2	7.0	-63.0
		$3s^2$	45.2	17.6	-3.8	1.9	-13.8
	Fe <sup>7+</sup>	$3d$	151.0	11.6	-3.7	0.4	-5.6
		$3p^6$	213.0	69.9	-23.7	9.5	-51.7
		$3s^2$	249.0	19.2	-5.7	2.3	-12.7
Ni <sup>9+</sup>	$3d$	225.0	12.5	-4.0	0.4	-6.0	
	$3p^6$	296.0	69.9	-23.7	9.5	-51.7	
	$3s^2$	338.0	19.2	-5.7	2.3	-12.7	
Ca	Ca <sup>0</sup>	$4s^2$	6.1	2.5	-2.5	8.0	-5.5
		$3p^6$	28.0	74.3	-24.2	7.0	-63.0
		$3s^2$	40.3	17.6	-3.8	1.9	-13.8
	Fe <sup>6+</sup>	$3d^2$	125.0	22.1	-7.0	0.7	-10.7
		$3p^6$	190.0	69.9	-23.7	9.5	-51.7
		$3s^2$	227.0	19.2	-5.7	2.3	-12.7



Table 10 (Continuation)

Sequence	Ion	Shell	$I_j$ (eV)	$A_j$	$B_j$	$C_j$	$D_j$
Ca	$\text{Ni}^{8+}$	$3d^2$	193.0	24.1	-7.7	0.7	-11.7
		$3p^6$	271.0	69.9	-23.7	9.5	-51.7
		$3s^2$	313.0	19.2	-5.7	2.3	-12.7
Sc	$\text{Fe}^{5+}$	$3d^3$	99.0	30.6	-9.7	1.0	-14.8
		$3p^6$	169.0	69.9	-23.7	9.5	-51.7
		$3s^2$	205.0	19.2	-5.7	2.3	-12.7
	$\text{Ni}^{7+}$	$3d^3$	162.0	34.5	-10.9	1.1	-16.7
		$3p^6$	246.0	69.9	-23.7	9.5	-51.7
$3s^2$		288.0	19.2	-5.7	2.3	-12.7	
Ti	$\text{Fe}^{4+}$	$3d^4$	75.0	36.5	-11.6	1.1	-17.6
		$3p^6$	147.0	69.9	-23.7	9.5	-51.7
		$3s^2$	184.0	19.2	-5.7	2.3	-12.7
	$\text{Ni}^{6+}$	$3d^4$	133.0	43.2	-13.7	1.3	-20.9
		$3p^6$	221.0	69.9	-23.7	9.5	-51.7
$3s^2$		264.0	19.2	-5.7	2.3	-12.7	
V	$\text{Fe}^{3+}$	$3d^5$	54.8	39.9	-12.7	1.2	-19.3
		$3p^6$	125.0	69.9	-23.7	9.5	-51.7
		$3s^2$	162.0	19.2	-5.7	2.3	-12.7
	$\text{Ni}^{5+}$	$3d^5$	108.0	50.8	-16.1	1.6	-24.6
		$3p^6$	196.0	69.9	-23.7	9.5	-51.7
$3s^2$		239.0	19.2	-5.7	2.3	-12.7	
Cr	$\text{Fe}^{2+}$	$3d^6$	30.7	32.7	-10.4	1.0	-15.8
		$3p^6$	103.0	69.9	-23.7	9.5	-51.7
		$3s^2$	141.0	19.2	-5.7	2.3	-12.7
	$\text{Ni}^{4+}$	$3d^6$	75.5	49.9	-15.9	1.6	-24.1
		$3p^6$	171.0	69.9	-23.7	9.5	-51.7
$3s^2$		215.0	19.2	-5.7	2.3	-12.7	
Mn	$\text{Fe}^{1+}$	$4s$	16.2	90.0	-60.0	0.2	-86.0
		$3d^6$	17.5	18.6	-5.9	0.6	-0.9
		$3p^6$	81.0	69.9	-23.7	9.5	-51.7
	$\text{Ni}^{3+}$	$3d^7$	54.9	50.3	-16.0	1.6	-24.3
		$3p^6$	146.0	69.9	-23.7	9.5	-51.7
$3s^2$		190.0	19.2	-5.7	2.3	-12.7	
Fe	$\text{Fe}^0$	$4s^2$	7.9	3.9	-1.3	0.4	-1.9
		$3d^6$	9.0	9.6	-3.0	0.3	-4.6
		$3p^6$	59.0	69.9	-23.7	9.5	-51.7
	$\text{Ni}^{2+}$	$3d^8$	35.2	44.4	-14.1	1.4	-21.5
		$3p^6$	122.0	69.9	-23.7	9.5	-51.7
$3s^2$		166.0	19.2	-5.7	2.3	-12.7	
Co	$\text{Ni}^{1+}$	$3d^9$	18.2	32.0	-10.0	1.0	-15.4
		$3p^6$	97.0	69.9	-23.7	9.5	-51.7
		$3s^2_{25}$	142.0	19.2	-5.7	2.3	-12.7
Ni	$\text{Ni}^0$	$4s^2$	8.7	2.5	-0.8	0.2	-1.2
		$3d^8$	10.0	12.6	-4.0	0.4	-6.1
		$3p^6$	73.0	69.9	-23.7	9.5	-51.7

Table 11

Parameters  $A$  and  $\chi$  in Eq.(3.5) for the different shells

Type of Shell	Shell	$A$	$\chi$
outer shell	$1s^q$	5.08	0.477
	$2s^q$	5.23	0.594
	$2p^q$	6.23	0.697
	$3s^q$	4.85	0.640
	$3p^q$	5.33	0.738
	$4s^q$	4.15	0.720
inner shell	$1s^2$	4.81	0.393
	$2s^2$	5.13	0.562
	$2p^6$	6.33	0.666
	$3s^2$	4.98	0.652
	$3p^6$	5.33	0.734

Table 12

Parameters  $q_j$ ,  $I_j$  and  $\bar{C}$  in Eq. (3.6) for determination  
of the collisional ionization rates

Ion	Shell	$q_j$	$I_j, \text{eV}$	$\bar{C}$
B <sup>+3</sup> (a)	1s <sup>2</sup>	2	259.4	2.34±19%
C <sup>+4</sup> (a)	1s <sup>2</sup>	2	392.1	2.28±32%
N <sup>+5</sup> (a)	1s <sup>2</sup>	2	552.1	3.28±11%
C <sup>+3</sup> (b)	1s <sup>2</sup> 2s	2 (i) , 1	300, 64.5	1.82±7%
N <sup>+4</sup> (b)	1s <sup>2</sup> 2s	2 (i) , 1	420, 97.9	2.38±5%
O <sup>+5</sup> (b)	1s <sup>2</sup> 2s	2 (i) , 1	530, 138.1	2.61±10%
C <sup>+2</sup> (b)	2s <sup>2</sup>	2	47.9	2.56±10%
N <sup>+3</sup> (b)	2s <sup>2</sup>	2	77.5	2.44±12%
O <sup>+4</sup> (b)	1s <sup>2</sup> 2s <sup>2</sup>	2 (i) , 2	550, 113.9	2.87±3%
N <sup>+2</sup> (b)	2s <sup>2</sup> 2p	2 (ii) +1	47.4	2.18±3%
O <sup>+3</sup> (b)	2s <sup>2</sup> 2p	2 (ii) +1	77.4	2.25±5%
O <sup>+2</sup> (b)	2s <sup>2</sup> 2p <sup>2</sup>	2 (ii) +2	54.9	2.36±5%
Mg <sup>+2</sup> (b)	2s <sup>2</sup> 2p <sup>6</sup>	2 (i) , 6	105.1, 80.1	1.71±22%
Al <sup>+2</sup> (b)	2p <sup>6</sup> 3s	6 (i) , 1	80.0, 28.4	1.23±8%
Si <sup>+3</sup> (b)	2p <sup>6</sup> 3s	6 (i) , 1	112.0, 45.1	1.92±16%
Ar <sup>+</sup> (b)	3s <sup>2</sup> 3p <sup>5</sup>	2 (i) , 5	30.6, 27.6	1.86±11%
Ar <sup>+2</sup> (b)	3s <sup>2</sup> 3p <sup>4</sup>	2 (i) , 4	44.5, 40.7	2.40±20%
Ar <sup>+3</sup> (b)	3s <sup>2</sup> 3p <sup>3</sup>	2 (ii) +3	250.0, 59.8	2.11±12%
Ar <sup>+4</sup> (b)	3s <sup>2</sup> 3p <sup>2</sup>	2 (ii) +2	250.0, 75.0	2.40±15%
Ar <sup>+5</sup> (b)	3s <sup>2</sup> 3p	2 (ii) +1	250.0, 91.0	2.72±14%

Comments: the letter "a" has been added to the ion symbol if the contribution of autoionization is negligible and if it is essential then the letter "b", symbol (i) added to  $q_j$  values denotes presence of strong resonances in ionization cross sections for corresponding shells, but symbol (ii) denotes presence of large number of weak resonances.

Table 13

Coefficients of polynomial fit to the effective collision strengths for HI and HeII (Eq. 3.12). Low temperature ( $500 \text{ K} \leq T_e \leq 72000 \text{ K}$ ) coefficients for HI are listed in the first line, and the high temperature ones ( $55000 \text{ K} \leq T_e \leq 500000 \text{ K}$ ) below

Transition	$a$	$b$	$c$	$d$
$1s - 2s$	2.297-01 2.694-01	5.318-06 7.883-07	-1.180-10 -1.394-12	8.636-16 1.451-18
$1s - 2p$	3.435-01 3.162-01	1.297-05 1.472-05	2.178-12 -8.275-12	7.928-17 -8.794-19
$1s - 3s$	6.250-02 3.337-02	-1.299-06 2.223-07	2.666-11 -2.794-13	-1.596-16 1.516-19
$1s - 3p$	9.941-02 6.985-02	-3.714-07 2.538-06	6.134-11 -8.729-13	-3.973-16 -1.291-18
$1s - 3d$	5.030-02 5.051-02	7.514-07 7.876-07	-2.826-13 -2.072-12	-1.098-17 1.902-18
$1s - 4s$	1.909-04 2.867-03	1.983-07 1.222-07	-8.325-13 -2.323-13	1.128-18 1.865-19
$1s - 4p$	1.527-03 1.958-03	1.001-06 9.525-07	-2.192-12 -9.668-13	9.348-18 4.807-19
$1s - 4d$	1.339-03 1.007-02	6.470-07 3.508-07	-4.397-12 -8.024-13	1.736-17 6.764-19
$1s - 4f$	3.266-03 9.103-03	3.908-07 -6.105-09	-8.778-12 -6.191-15	6.171-17 1.268-20
$1s - 5$	2.035-02 2.002-02	6.076-07 6.325-07	-2.175-13 -7.070-13	-2.459-18 4.096-19
$1s - 6$	1.136-02 1.123-02	3.428-07 3.549-07	-1.467-13 -3.998-13	-1.300-18 2.331-19
$1s - 7$	6.999-03 6.940-03	2.126-07 2.194-07	-9.963-14 -2.483-13	-7.672-19 1.453-19
$1s - 8$	4.624-03 4.593-03	1.410-07 1.453-07	-6.969-14 -1.648-13	-4.927-19 9.667-20
$1s - 9$	3.217-03 3.199-03	9.836-08 1.012-07	-5.031-14 -1.150-13	-3.361-19 6.758-20
$1s - 10$	2.329-03 2.318-03	7.135-08 7.334-08	-3.737-14 -8.349-14	-2.400-19 4.910-20
$1s - 11$	1.741-03 1.727-03	5.342-08 5.493-08	-2.845-14 -6.270-14	-1.775-19 3.695-20
$1s - 12$	1.336-03 1.326-03	4.103-08 4.213-08	-2.213-14 -4.821-14	-1.351-19 2.844-20
$1s - 13$	1.048-03 1.040-03	3.220-08 3.310-08	-1.754-14 -3.786-14	-1.053-19 2.236-20
$1s - 14$	8.369-04 8.305-04	2.574-08 2.645-08	-1.413-14 -3.028-14	-8.368-20 1.790-20

Table 13 (Continuation)

Transition	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>
$1s - 15$	6.791-04 6.740-04	2.090-08 2.147-08	-1.154-14 -2.460-14	-6.763-20 1.455-20
$2s - 3s$	1.326+00 6.311-01	-1.727-05 2.881-05	8.914-10 -5.372-11	-6.101-15 4.095-17
$2s - 3p$	2.040+00 -1.334+00	-1.580-05 1.229-04	1.908-09 -9.676-11	-1.027-14 2.842-17
$2s - 3d$	6.342-01 5.567+00	3.090-04 1.494-04	-2.205-09 -3.692-10	8.592-15 3.280-16
$2s - 4s$	1.762-02 1.210-01	8.683-06 5.439-06	-4.800-11 -1.103-11	1.810-16 9.116-18
$2s - 4p$	6.398-02 -2.905-02	2.578-05 2.640-05	-8.551-11 -3.072-11	6.504-16 1.769-17
$2s - 4d$	1.125-01 9.485-01	4.732-05 1.785-05	-4.285-10 -4.590-11	1.971-15 4.181-17
$2s - 4f$	1.140-01 1.191+00	5.154-05 1.544-05	-4.757-10 -4.739-11	1.989-15 4.605-17
$2s - 5$	3.647-01 1.483+00	7.145-05 3.251-05	-5.516-10 -7.279-11	2.257-15 6.337-17
$2s - 6$	1.793-01 7.466-01	3.599-05 1.605-05	-2.848-10 -3.611-11	1.189-15 3.149-17
$2s - 7$	1.027-01 4.333-01	2.090-05 9.222-06	-1.675-10 -2.081-11	7.056-16 1.817-17
$2s - 8$	6.476-02 2.755-01	1.330-05 5.832-06	-1.073-10 -1.318-11	4.546-16 1.151-17
$2s - 9$	4.366-02 1.868-01	9.020-06 3.940-06	-7.313-11 -8.916-12	3.108-16 7.790-18
$2s - 10$	3.092-02 1.328-01	6.415-06 2.795-06	-5.217-11 -6.329-12	2.223-16 5.531-18
$2s - 11$	4.162-02 1.793-01	8.661-06 3.766-06	-7.060-11 -8.534-12	3.013-16 7.458-18
$2s - 12$	3.155-02 1.362-01	6.580-06 2.857-06	-5.373-11 -6.477-12	2.295-16 5.661-18
$2s - 13$	2.450-02 1.059-01	5.121-06 2.221-06	-4.186-11 -5.036-12	1.790-16 4.402-18
$2s - 14$	1.943-02 8.411-02	4.066-06 1.762-06	-3.327-11 -3.996-12	1.424-16 3.493-18
$2s - 15$	1.567-02 6.791-02	3.283-06 1.422-06	-2.689-11 -3.225-12	1.151-16 2.820-18
$2p - 3s$	1.690+00 2.325-00	4.563-05 1.361-05	-6.605-10 -2.702-11	4.445-15 2.397-17
$2p - 3p$	4.923+00 6.984+00	1.525-04 1.260-04	4.370-11 -3.014-10	-3.914-15 2.655-16

Table 13 (Continuation)

Transition	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>
$2p - 3d$	4.540+00 2.922+00	7.943-04 1.089-03	5.831-09 -1.705-09	-5.106-14 1.237-15
$2p - 4s$	5.237-02 4.788-01	2.123-05 5.979-06	-2.176-10 -1.667-11	1.027-15 1.605-17
$2p - 4p$	1.798-01 1.738+00	8.300-05 3.133-05	-6.927-10 -8.425-11	2.843-15 7.825-17
$2p - 4d$	1.591-02 1.004+00	1.673-04 1.889-04	9.135-10 -3.433-10	-1.037-14 2.692-16
$2p - 4f$	2.254-01 2.785+00	1.365-04 6.406-05	-7.926-10 -1.773-10	1.760-15 1.638-16
$2p - 5$	1.094+00 4.449+00	2.143-04 9.754-05	-1.655-09 -2.184-10	6.771-15 1.901-16
$2p - 6$	5.379-01 2.240+00	1.080-04 4.814-05	-8.544-10 -1.083-10	3.566-15 9.448-17
$2p - 7$	3.080-01 1.300+00	6.270-05 2.767-05	-5.024-10 -6.243-11	2.117-15 5.450-17
$2p - 8$	1.943-01 8.266-01	3.989-05 1.750-05	-3.220-10 -3.955-11	1.364-15 3.454-17
$2p - 9$	1.310-01 5.604-01	2.706-05 1.182-05	-2.194-10 -2.675-11	9.325-16 2.337-17
$2p - 10$	9.276-02 3.984-01	1.925-05 8.384-06	-1.565-10 -1.899-11	6.668-16 1.659-17
$2p - 11$	4.935-02 2.126-01	1.027-05 4.466-06	-8.372-11 -1.012-11	3.572-16 8.844-18
$2p - 12$	3.741-02 1.615-01	7.803-06 3.388-06	-6.371-11 -7.680-12	2.722-16 6.713-18
$2p - 13$	2.906-02 1.256-01	6.072-06 2.634-06	-4.964-11 -5.972-12	2.123-16 5.220-18
$2p - 14$	2.304-02 9.973-02	4.821-06 2.089-06	-3.945-11 -4.738-12	1.688-16 4.142-18
$2p - 15$	1.858-02 8.053-02	3.893-06 1.686-06	-3.188-11 -3.825-12	1.365-16 3.344-18
$3s - 4s$	-3.207-01 5.697-01	9.244-05 1.740-04	2.640-09 -3.941-10	-2.373-14 3.383-16
$3s - 4p$	-3.391-01 -9.335+00	1.439-04 5.521-04	6.033-09 -5.967-10	-3.777-14 3.066-16
$3s - 4d$	-7.739-01 5.641+00	3.623-04 4.317-04	5.026-09 -1.094-09	-5.334-14 9.844-16
$3s - 4f$	5.916-01 1.721+01	8.966-04 2.360-04	-1.047-08 -6.574-10	5.520-14 6.176-16

Table 13 (Continuation)

Transition	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>
$3s - 5$	2.928+01 3.970+01	6.550-04 1.720-04	-8.590-09 -3.724-10	4.996-14 3.239-16
$3s - 6$	5.342-01 6.269+00	3.320-04 1.223-04	-3.031-09 -2.925-10	1.350-14 2.617-16
$3s - 7$	2.760-01 3.203+00	1.686-04 6.023-05	-1.584-09 -1.451-10	7.202-15 1.301-16
$3s - 8$	1.633-01 1.888+00	9.909-05 3.482-05	-9.445-10 -8.421-11	4.340-15 7.561-17
$3s - 9$	1.055-01 1.219+00	6.385-05 2.221-05	-6.139-10 -5.384-11	2.838-15 4.839-17
$3s - 10$	7.256-02 8.377-01	4.383-05 1.515-05	-4.239-10 -3.678-11	1.967-15 3.307-17
$3s - 11$	5.223-02 6.030-01	3.153-05 1.085-05	-3.061-10 -2.636-11	1.425-15 2.371-17
$3s - 12$	3.895-02 4.497-01	2.351-05 8.059-06	-2.289-10 -1.960-11	1.067-15 1.764-17
$3s - 13$	2.988-02 3.451-01	1.803-05 6.166-06	-1.759-10 -1.501-11	8.214-16 1.350-17
$3s - 14$	2.346-02 2.709-01	1.415-05 4.831-06	-1.383-10 -1.176-11	6.466-16 1.059-17
$3s - 15$	1.877-02 2.169-01	1.133-05 3.860-06	-1.108-10 -9.403-12	5.185-16 8.463-18
$3p - 4s$	-6.866-04 2.290+00	2.012-04 1.391-04	-7.084-10 -2.365-10	1.046-15 1.857-16
$3p - 4p$	-8.174-01 1.220+01	7.898-04 6.924-04	3.420-09 -1.698-09	-5.299-14 1.512-15
$3p - 4d$	-2.328+00 -2.813+01	1.173-03 2.839-03	2.980-08 -4.071-09	-2.176-13 2.739-15
$3p - 4f$	2.395-01 7.244+01	3.736-03 1.596-03	-2.458-08 -4.378-09	6.950-14 4.085-15
$3p - 5$	9.375+01 1.316+02	2.382-03 6.255-04	-3.124-08 -1.354-09	1.817-13 1.178-15
$3p - 6$	1.729+00 2.029+01	1.075-03 3.957-04	-9.810-09 -9.468-10	4.370-14 8.471-16
$3p - 7$	8.934-01 1.037+01	5.457-04 1.950-04	-5.125-09 -4.696-10	2.331-14 4.212-16
$3p - 8$	5.286-01 6.112+00	3.207-04 1.127-04	-3.057-09 -2.725-10	1.405-14 2.447-16
$3p - 9$	3.416-01 3.945+00	2.066-04 7.189-05	-1.987-09 -1.734-10	9.187-15 1.566-16
$3p - 10$	2.348-01 2.711+00	1.419-04 4.903-05	-1.372-09 -1.190-10	6.368-15 1.070-16

Table 13 (Continuation)

Transition	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>
<i>3p</i> – 11	1.690-01	1.020-04	-9.908-10	4.611-15
	1.952+00	3.511-05	-8.533-11	7.675-17
<i>3p</i> – 12	1.261-01	7.608-05	-7.407-10	3.454-15
	1.456+00	2.608-05	-6.345-11	5.708-17
<i>3p</i> – 13	9.671-02	5.835-05	-5.694-10	2.659-15
	1.117+00	1.996-05	-4.857-11	4.371-17
<i>3p</i> – 14	7.593-02	4.580-05	-4.477-10	2.093-15
	8.769-01	1.563-05	-3.807-11	3.426-17
<i>3p</i> – 15	6.076-02	3.665-05	-3.587-10	1.678-15
	7.019-01	1.249-05	-3.043-11	2.739-17
<i>3d</i> – 4 <i>s</i>	4.602-01	3.451-04	-6.086-09	3.823-14
	6.804+00	1.948-05	-7.904-11	8.451-17
<i>3d</i> – 4 <i>p</i>	1.456+00	1.303-03	-2.048-08	1.240-13
	2.532+01	1.621-04	-4.722-10	4.641-16
<i>3d</i> – 4 <i>d</i>	1.424-01	2.943-03	-1.984-08	5.541-14
	5.947+01	1.183-03	-3.338-09	3.153-15
<i>3d</i> – 4 <i>f</i>	-1.121+01	8.600-03	8.986-08	-8.662-13
	2.948+01	1.147-02	-2.131-08	1.690-14
<i>3d</i> – 5	2.332+02	4.300-03	-5.639-08	3.279-13
	3.016+02	1.129-03	-2.445-09	2.126-15
<i>3d</i> – 6	3.481+00	2.163-03	-1.975-08	8.799-14
	4.085+01	7.967-04	-1.906-09	1.705-15
<i>3d</i> – 7	1.799+00	1.099-03	-1.032-08	4.693-14
	2.087+01	3.925-04	-9.455-10	8.479-16
<i>3d</i> – 8	1.064+00	6.457-04	-6.155-09	2.828-14
	1.231+01	2.269-04	-5.487-10	4.927-16
<i>3d</i> – 9	6.877-01	4.160-04	-4.000-09	1.850-14
	7.942+00	1.447-04	-3.508-10	3.153-16
<i>3d</i> – 10	4.728-01	2.856-04	-2.762-09	1.282-14
	5.458+00	9.872-05	-2.397-10	2.155-16
<i>3d</i> – 11	3.403-01	2.055-04	-1.995-09	9.283-15
	3.929+00	7.068-05	-1.718-10	1.545-16
<i>3d</i> – 12	2.538-01	1.532-04	-1.491-09	6.954-15
	2.931+00	5.252-05	-1.277-10	1.149-16
<i>3d</i> – 13	1.947-01	1.175-04	-1.146-09	5.353-15
	2.249+00	4.018-05	-9.779-11	8.800-17
<i>3d</i> – 14	1.529-01	9.222-05	-9.013-10	4.213-15
	1.766+00	3.148-05	-7.665-11	6.899-17
<i>3d</i> – 15	1.223-01	7.380-05	-7.222-10	3.379-15
	1.413+00	2.515-05	-6.127-11	5.515-17
<i>4s</i> – 5	2.555+02	1.523-02	-2.326-07	1.438-12
	3.560+02	5.331-03	-1.698-08	1.837-14



Table 13 (Continuation)

Transition	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>
4 <i>s</i> – 6	7.880+01 1.131+02	2.140-03 4.513-04	-3.123-08 -1.007-09	1.896-13 8.872-16
4 <i>s</i> – 7	7.059-01 1.757+01	9.385-04 2.978-04	-9.491-09 -7.355-10	4.473-14 6.671-16
4 <i>s</i> – 8	4.012-01 8.960+00	4.747-04 1.452-04	-4.937-09 -3.616-10	2.371-14 3.289-16
4 <i>s</i> – 9	2.497-01 5.301+00	2.796-04 8.379-05	-2.952-09 -2.096-10	1.432-14 1.909-16
4 <i>s</i> – 10	1.667-01 3.440+00	1.810-04 5.355-05	-1.928-09 -1.343-10	9.410-15 1.225-16
4 <i>s</i> – 11	1.174-01 2.379+00	1.249-04 3.665-05	-1.340-09 -9.214-11	6.562-15 8.407-17
4 <i>s</i> – 12	8.609-02 1.724+00	9.041-05 2.636-05	-9.735-10 -6.637-11	4.781-15 6.058-17
4 <i>s</i> – 13	6.518-02 1.294+00	6.781-05 1.968-05	-7.324-10 -4.961-11	3.604-15 4.530-17
4 <i>s</i> – 14	5.063-02 9.990-01	5.231-05 1.513-05	-5.664-10 -3.817-11	2.791-15 3.487-17
4 <i>s</i> – 15	4.018-02 7.890-01	4.130-05 1.191-05	-4.479-10 -3.007-11	2.210-15 2.747-17
4 <i>p</i> – 5	9.393+02 1.306+03	5.559-02 1.946-02	-8.491-07 -6.199-08	5.251-12 6.707-14
4 <i>p</i> – 6	2.445+02 3.645+02	7.474-03 1.576-03	-1.091-07 -3.518-09	6.621-13 3.099-15
4 <i>p</i> – 7	2.363+00 5.881+01	3.142-03 9.968-04	-3.177-08 -2.462-09	1.498-13 2.233-15
4 <i>p</i> – 8	1.343+00 3.000+01	1.589-03 4.862-04	-1.653-08 -1.211-09	7.939-14 1.101-15
4 <i>p</i> – 9	8.359-01 1.775+01	9.359-04 2.805-04	-9.882-09 -7.017-10	4.794-14 6.392-16
4 <i>p</i> – 10	5.582-01 1.152+01	6.058-04 1.793-04	-6.456-09 -4.497-10	3.150-14 4.101-16
4 <i>p</i> – 11	3.931-01 7.966+00	4.183-04 1.227-04	-4.484-09 -3.085-10	2.197-14 2.815-16
4 <i>p</i> – 12	2.882-01 5.771+00	3.027-04 8.825-05	-3.259-09 -2.222-10	1.601-14 2.028-16
4 <i>p</i> – 13	2.182-01 4.332+00	2.270-04 6.589-05	-2.452-09 -1.661-10	1.207-14 1.517-16
4 <i>p</i> – 14	1.695-01 3.344+00	1.751-04 5.066-05	-1.896-09 -1.278-10	9.345-15 1.167-16
4 <i>p</i> – 15	1.345-01 2.641+00	1.383-04 3.988-05	-1.499-09 -1.007-10	7.399-15 9.197-17

Table 13 (Continuation)

Transition	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>
$4d - 5$	1.469+03 2.317+03	1.284-01 4.497-02	-1.962-06 -1.432-07	1.213-11 1.550-13
$4d - 6$	4.677+02 7.064+02	1.487-02 3.136-03	-2.170-07 -7.000-09	1.317-12 6.166-15
$4d - 7$	4.527+00 1.127+02	6.019-03 1.910-03	-6.087-08 -4.716-09	2.869-13 4.278-15
$4d - 8$	2.573+00 5.746+01	3.044-03 9.314-04	-3.166-08 -2.319-09	1.521-13 2.109-15
$4d - 9$	1.601+00 3.399+01	1.793-03 5.374-04	-1.893-08 -1.344-09	9.183-14 1.224-15
$4d - 10$	1.069+00 2.206+01	1.160-03 3.434-04	-1.237-08 -8.615-10	6.034-14 7.856-16
$4d - 11$	7.529-01 1.526+01	8.012-04 2.351-04	-8.590-09 -5.909-10	4.208-14 5.392-16
$4d - 12$	5.521-01 1.106+01	5.798-04 1.691-04	-6.243-09 -4.256-10	3.066-14 3.885-16
$4d - 13$	4.180-01 8.299+00	4.349-04 1.262-04	-4.697-09 -3.181-10	2.311-14 2.905-16
$4d - 14$	3.247-01 6.406+00	3.355-04 9.705-05	-3.632-09 -2.448-10	1.790-14 2.236-16
$4d - 15$	2.577-01 5.060+00	2.648-04 7.640-05	-2.872-09 -1.928-10	1.417-14 1.762-16
$4f - 5$	1.475+03 3.225+03	2.653-01 9.290-02	-4.053-06 -2.959-07	2.506-11 3.201-13
$4f - 6$	1.003+03 1.323+03	1.995-02 4.207-03	-2.911-07 -9.389-09	1.767-12 8.270-15
$4f - 7$	7.765+00 1.932+02	1.032-02 3.275-03	-1.044-07 -8.090-09	4.920-13 7.338-15
$4f - 8$	4.413+00 9.856+01	5.222-03 1.598-03	-5.431-08 -3.977-09	2.609-13 3.618-15
$4f - 9$	2.747+00 5.831+01	3.075-03 9.217-04	-3.247-08 -2.306-09	1.575-13 2.100-15
$4f - 10$	1.834+00 3.784+01	1.991-03 5.890-04	-2.121-08 -1.478-09	1.035-13 1.347-15
$4f - 11$	1.291+00 2.617+01	1.374-03 4.032-04	-1.473-08 -1.014-09	7.218-14 9.248-16
$4f - 12$	9.470-01 1.896+01	9.945-04 2.900-04	-1.071-08 -7.300-10	5.260-14 6.664-16
$4f - 13$	7.169-01 1.423+01	7.459-04 2.165-04	-8.056-09 -5.457-10	3.965-14 4.983-16
$4f - 14$	5.570-01 1.099+01	5.755-04 1.665-04	-6.230-09 -4.199-10	3.071-14 3.835-16

Table 13 (Continuation)

Transition	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>
4 <i>f</i> – 15	4.420-01 8.678+00	4.543-04 1.310-04	-4.927-09 -3.308-10	2.431-14 3.022-16
5 – 6	-9.122+02 2.166+04	1.260+00 4.690-01	-1.070-05 -1.122-06	4.290-11 1.008-12
5 – 7	3.959+01 3.874+03	2.108-01 6.443-02	-2.162-06 -1.596-07	1.020-11 1.452-13
5 – 8	3.691+01 1.465+03	7.806-02 2.207-02	-8.485-07 -5.556-08	4.166-12 5.082-14
5 – 9	2.352+01 7.410+02	3.911-02 1.062-02	-4.365-07 -2.698-08	2.179-12 2.476-14
5 – 10	1.542+01 4.374+02	2.296-02 6.096-03	-2.601-07 -1.556-08	1.310-12 1.430-14
5 – 11	1.062+01 2.841+02	1.487-02 3.889-03	-1.699-07 -9.962-09	8.608-13 9.167-15
5 – 12	7.642+00 1.969+02	1.029-02 2.663-03	-1.183-07 -6.838-09	6.014-13 6.297-15
5 – 13	5.695+00 1.431+02	7.464-03 1.918-03	-8.621-08 -4.935-09	4.394-13 4.547-15
5 – 14	4.368+00 1.078+02	5.617-03 1.436-03	-6.508-08 -3.698-09	3.323-13 3.409-15
5 – 15	3.430+00 8.353+01	4.348-03 1.107-03	-5.051-08 -2.854-09	2.583-13 2.632-15
6 – 7	-3.431+03 7.146+04	4.116+00 1.379+00	-3.853-05 -3.346-06	1.679-10 3.023-12
6 – 8	4.397+01 1.187+04	6.434-01 1.794-01	-7.008-06 -4.501-07	3.431-11 4.118-13
6 – 9	8.927+01 4.380+03	2.325-01 5.990-02	-2.667-06 -1.527-07	1.350-11 1.405-13
6 – 10	6.153+01 2.192+03	1.152-01 2.846-02	-1.354-06 -7.324-08	6.957-12 6.759-14
6 – 11	4.165+01 1.288+03	6.729-02 1.621-02	-8.024-07 -4.197-08	4.156-12 3.881-14
6 – 12	2.923+01 8.351+02	4.349-02 1.031-02	-5.232-07 -2.678-08	2.724-12 2.480-14
6 – 13	2.130+01 5.790+02	3.008-02 7.050-03	-3.641-07 -1.837-08	1.902-12 1.702-14
6 – 14	1.603+01 4.213+02	2.185-02 5.079-03	-2.656-07 -1.326-08	1.391-12 1.229-14
6 – 15	1.239+01 3.179+02	1.647-02 3.804-03	-2.008-07 -9.944-09	1.054-12 9.226-15
7 – 8	-9.280+03 1.954+05	1.116+01 3.426+00	-1.122-04 -8.397-06	5.167-10 7.624-12

Table 13 (Continuation)

Transition	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>
7 - 9	6.658+01 3.057+04	1.651+00 4.266-01	-1.884-05 -1.080-06	9.487-11 9.917-13
7 - 10	2.172+02 1.103+04	5.833-01 1.392-01	-6.977-06 -3.582-07	3.615-11 3.309-13
7 - 11	1.535+02 5.458+03	2.858-01 6.530-02	-3.499-06 -1.696-07	1.838-11 1.572-13
7 - 12	1.049+02 3.189+03	1.660-01 3.693-02	-2.060-06 -9.653-08	1.090-11 8.966-14
7 - 13	7.412+01 2.062+03	1.070-01 2.338-02	-1.339-06 -6.136-08	7.118-12 5.707-14
7 - 14	5.428+01 1.429+03	7.389-02 1.595-02	-9.304-07 -4.200-08	4.963-12 3.910-14
7 - 15	4.103+01 1.039+03	5.366-02 1.148-02	-6.786-07 -3.029-08	3.629-12 2.282-14
8 - 9	-2.069+04 4.651+05	2.637+01 7.527+00	-2.802-04 -1.859-05	1.342-09 1.694-11
8 - 10	2.055+02 6.930+04	3.731+00 9.038-01	-4.420-05 -2.302-06	2.276-10 2.121-12
8 - 11	5.123+02 2.450+04	1.292+00 2.891-01	-1.599-05 -7.487-07	8.442-11 6.939-13
8 - 12	3.578+02 1.200+04	6.265-01 1.340-01	-7.922-06 -3.505-07	4.235-11 3.260-13
8 - 13	2.438+02 6.970+03	3.616-01 7.523-02	-4.633-06 -1.981-07	2.494-11 1.846-13
8 - 14	1.721+02 4.493+03	2.322-01 4.741-02	-3.000-06 -1.254-07	1.622-11 1.170-13
8 - 15	1.260+02 3.106+03	1.601-01 3.226-02	-2.081-06 -8.559-08	1.129-11 7.997-14
9 - 10	-4.032+04 9.956+05	5.614+01 1.506+01	-6.231-04 -3.741-05	3.073-09 3.418-11
9 - 11	6.989+02 1.425+05	7.655+00 1.754+00	-9.352-05 -4.489-06	4.903-10 4.146-12
9 - 12	1.141+03 4.949+04	2.605+00 5.510-01	-3.313-05 -1.435-06	1.777-10 1.333-12
9 - 13	7.755+02 2.401+04	1.250+00 2.526-01	-1.624-05 -6.645-07	8.808-11 6.196-13
9 - 14	5.234+02 1.386+04	7.175-01 1.408-01	-9.437-06 -3.729-07	5.153-11 3.485-13
9 - 15	3.677+02 8.904+03	4.590-01 8.835-02	-6.087-06 -2.305-07	3.338-11 2.200-13
10 - 11	-7.097+04 1.961+06	1.101+02 2.798+01	-1.266-03 -6.982-05	6.390-09 6.394-11

Table 13 (Continuation)

Transition	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>
10 – 12	2.018+03 2.715+05	1.455+01 3.175+00	-1.824-04 -8.158-06	9.708-10 7.551-12
10 – 13	2.383+03 9.279+04	4.875+00 9.821-01	-5.348-05 -2.567-06	3.449-10 2.390-12
10 – 14	1.569+03 4.460+04	2.319+00 4.458-01	-3.081-05 -1.178-06	1.691-10 1.100-12
10 – 15	1.046+03 2.561+04	1.323+00 2.468-01	-1.779-05 -6.566-07	9.830-11 6.150-13
11 – 12	-1.150+05 3.613+06	2.020+02 4.898+01	-2.392-03 -1.227-04	1.231-08 1.125-10
11 – 13	4.988+03 4.861+05	2.601+01 5.434+00	-3.334-04 -1.401-05	1.797-09 1.299-11
11 – 14	4.675+03 1.638+05	8.595+00 1.658+00	-1.142-04 -4.348-06	6.273-10 4.054-12
11 – 15	2.986+03 7.810+04	4.054+00 7.456-01	-5.491-05 -1.976-06	3.046-10 1.850-12
12 – 13	-1.737+05 6.300+06	3.511+02 8.163+01	-4.263-03 -2.051-04	2.227-08 1.884-10
12 – 14	1.094+04 8.271+05	4.419+01 8.881+00	-5.774-04 -2.296-05	3.146-09 2.131-11
12 – 15	8.673+03 2.753+05	1.442+01 2.676+00	-1.950-04 -7.037-06	1.082-09 6.571-12
13 – 14	-2.459+05 1.049+07	5.829+02 1.305+02	-7.233-03 -3.288-04	3.830-08 3.025-10
13 – 15	2.191+04 1.348+06	7.194+01 1.396+01	-9.561-04 -3.617-05	5.259-09 3.361-11
14 – 15	-3.273+05 1.680+07	9.312+02 2.016+02	-1.178-02 -5.089-04	6.306-08 4.687-10

Coefficients of polynomial fit to the effective collision strengths for HeII

Transition	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>
<i>1s</i> - <i>2s</i>	1.435-01	-1.156-03	7.442-05	-6.725-06
<i>1s</i> - <i>2p</i>	2.908-01	2.657-02	-1.736-03	7.498-05
<i>1s</i> - <i>3s</i>	5.042-02	6.663-03	-1.037-03	4.835-05
<i>1s</i> - <i>3p</i>	8.002-02	1.669-02	-1.448-03	5.509-05
<i>1s</i> - <i>3d</i>	6.212-02	-1.441-03	-4.799-05	5.412-06
<i>2s</i> - <i>3s</i>	4.700-01	1.759-01	-1.228-02	4.193-04
<i>2s</i> - <i>3p</i>	2.156	1.521-01	-7.095-03	3.125-04
<i>2s</i> - <i>3d</i>	1.998	3.513-01	-2.075-02	6.523-04
<i>2p</i> - <i>3s</i>	2.388	-1.361-01	7.334-03	-1.569-04
<i>2p</i> - <i>3p</i>	5.906	2.648-01	-2.352-02	9.556-04
<i>2p</i> - <i>3d</i>	11.35	2.584	-1.873-01	7.257-03

Table 14

Electron impact excitation rates for atomic hydrogen (Eq. 3.8)

$T_e, K$	q(1-2)	q(1-3)	q(1-4)	q(1-5)	q(1-6)	q(1-7)	q(1-8)
6000	1.03-16	8.20-19	2.09-20	1.45-20	5.86-21	2.98-21	1.74-21
8000	1.29-14	2.46-16	1.04-17	7.25-18	3.19-18	1.70-18	1.02-18
10000	2.33-13	7.37-15	4.40-16	3.00-16	1.38-16	7.60-17	4.66-17
12000	1.59-12	7.03-14	5.40-15	3.58-15	1.70-15	9.55-16	5.93-16
14000	6.29-12	3.49-13	3.26-14	2.10-14	1.02-14	5.81-15	3.64-15
16000	1.76-11	1.16-12	1.26-13	7.91-14	3.92-14	2.25-14	1.42-14
18000	3.90-11	2.93-12	3.63-13	2.22-13	1.12-13	6.46-14	4.10-14
20000	7.39-11	6.16-12	8.47-13	5.07-13	2.58-13	1.50-13	9.57-14
25000	2.33-10	2.35-11	3.93-12	2.25-12	1.17-12	6.89-13	4.42-13
30000	5.03-10	5.76-11	1.10-11	6.12-12	3.22-12	1.91-12	1.23-12
35000	8.72-10	1.10-10	2.31-11	1.25-11	6.66-12	3.98-12	2.58-12
40000	1.32-09	1.81-10	4.04-11	2.16-11	1.15-11	6.92-12	4.49-12
45000	1.83-09	2.67-10	6.25-11	3.30-11	1.77-11	1.07-11	6.95-12
50000	2.38-09	3.67-10	8.90-11	4.65-11	2.51-11	1.51-11	9.87-12

$T_e, K$	q(1-9)	q(1-10)	q(1-11)	q(1-12)	q(1-13)	q(1-14)	q(1-15)
6000	1.11-21	7.55-22	5.39-22	4.00-22	3.05-22	2.39-22	1.90-22
8000	6.67-19	4.61-19	3.33-19	2.49-19	1.92-19	1.51-19	1.21-19
10000	3.08-17	2.15-17	1.56-17	1.18-17	9.08-18	7.16-18	5.75-18
12000	3.95-16	2.78-16	2.03-16	1.53-16	1.18-16	9.36-17	7.53-17
14000	2.44-15	1.72-15	1.26-15	9.56-16	7.41-16	5.87-16	4.73-16
16000	9.58-15	6.78-15	4.99-15	3.78-15	2.93-15	2.32-15	1.87-15
18000	2.77-14	1.97-14	1.45-14	1.10-14	8.55-15	6.78-15	5.47-15
20000	6.50-14	4.62-14	3.41-14	2.59-14	2.02-14	1.60-14	1.29-14
25000	3.02-13	2.15-13	1.59-13	1.21-13	9.45-14	7.51-14	6.07-14
30000	8.44-13	6.04-13	4.48-13	3.41-13	2.66-13	2.12-13	1.71-13
35000	1.77-12	1.27-12	9.41-13	7.18-13	5.60-13	4.46-13	3.61-13
40000	3.09-12	2.22-12	1.65-12	1.26-12	9.83-13	7.83-13	6.34-13
45000	4.78-12	3.44-12	2.56-12	1.95-12	1.53-12	1.22-12	9.85-13
50000	6.81-12	4.90-12	3.64-12	2.78-12	2.18-12	1.74-12	1.41-12



Table 14 (Continuation)

$T_e, K$	q(2-3)	q(2-4)	q(2-5)	q(2-6)	q(2-7)	q(2-8)	q(2-9)
6000	1.65-08	8.17-10	3.44-10	1.24-10	5.89-11	3.29-11	2.04-11
8000	3.96-08	3.03-09	1.38-09	5.41-10	2.70-10	1.56-10	9.87-11
10000	6.74-08	6.79-09	3.22-09	1.32-09	6.80-10	4.00-10	2.57-10
12000	9.69-08	1.18-08	5.70-09	2.42-09	1.27-09	7.57-10	4.91-10
14000	1.26-07	1.76-08	8.63-09	3.75-09	2.00-09	1.20-09	7.83-10
16000	1.55-07	2.39-08	1.18-08	5.23-09	2.81-09	1.70-09	1.12-09
18000	1.83-07	3.05-08	1.51-08	6.80-09	3.68-09	2.24-09	1.47-09
20000	2.10-07	3.72-08	1.85-08	8.39-09	4.58-09	2.80-09	1.84-09
25000	2.72-07	5.38-08	2.67-08	1.23-08	6.81-09	4.19-09	2.78-09
30000	3.28-07	6.93-08	3.42-08	1.60-08	8.90-09	5.51-09	3.66-09
35000	3.79-07	8.35-08	4.09-08	1.93-08	1.08-08	6.70-09	4.47-09
40000	4.26-07	9.64-08	4.68-08	2.22-08	1.25-08	7.77-09	5.19-09
45000	4.69-07	1.08-07	5.20-08	2.48-08	1.40-08	8.71-09	5.83-09
50000	5.08-07	1.18-07	5.65-08	2.71-08	1.53-08	9.54-09	6.39-09

$T_e, K$	q(2-10)	q(2-11)	q(2-12)	q(2-13)	q(2-14)	q(2-15)
6000	1.36-11	1.22-11	8.98-12	6.79-12	5.28-12	4.18-12
8000	6.69-11	6.08-11	4.50-11	3.43-11	2.68-11	2.13-11
10000	1.76-10	1.61-10	1.20-10	9.16-11	7.18-11	5.73-11
12000	3.38-10	3.11-10	2.32-10	1.78-10	1.40-10	1.12-10
14000	5.41-10	4.99-10	3.74-10	2.87-10	2.26-10	1.81-10
16000	7.74-10	7.16-10	5.37-10	4.13-10	3.25-10	2.61-10
18000	1.03-09	9.50-10	7.13-10	5.50-10	4.33-10	3.48-10
20000	1.29-09	1.19-09	8.97-10	6.92-10	5.46-10	4.38-10
25000	1.94-09	1.81-09	1.36-09	1.05-09	8.31-10	6.68-10
30000	2.57-09	2.40-09	1.81-09	1.40-09	1.10-09	8.89-10
35000	3.14-09	2.93-09	2.21-09	1.71-09	1.36-09	1.09-09
40000	3.65-09	3.41-09	2.58-09	2.00-09	1.58-09	1.27-09
45000	4.11-09	3.84-09	2.90-09	2.25-09	1.78-09	1.43-09
50000	4.51-09	4.21-09	3.19-09	2.47-09	1.96-09	1.57-09

Table 14 (Continuation)

$T_e, K$	q(3-4)	q(3-5)	q(3-6)	q(3-7)	q(3-8)	q(3-9)
6000	5.18-07	1.03-06	5.09-08	2.14-08	1.11-08	6.55-09
8000	8.50-07	1.47-06	9.46-08	4.16-08	2.23-08	1.34-08
10000	1.17-06	1.79-06	1.40-07	6.31-08	3.44-08	2.10-08
12000	1.48-06	2.02-06	1.83-07	8.42-08	4.64-08	2.86-08
14000	1.77-06	2.19-06	2.23-07	1.04-07	5.79-08	3.59-08
16000	2.04-06	2.32-06	2.60-07	1.22-07	6.86-08	4.27-08
18000	2.30-06	2.41-06	2.94-07	1.39-07	7.84-08	4.90-08
20000	2.54-06	2.48-06	3.24-07	1.55-07	8.75-08	5.49-08
25000	3.09-06	2.59-06	3.90-07	1.88-07	1.07-07	6.74-08
30000	3.58-06	2.64-06	4.42-07	2.15-07	1.22-07	7.74-08
35000	4.01-06	2.65-06	4.83-07	2.36-07	1.35-07	8.54-08
40000	4.40-06	2.65-06	5.16-07	2.52-07	1.45-07	9.18-08
45000	4.75-06	2.63-06	5.43-07	2.66-07	1.53-07	9.70-08
50000	5.06-06	2.60-06	5.64-07	2.77-07	1.59-07	1.01-07

  

$T_e, K$	q(3-10)	q(3-11)	q(3-12)	q(3-13)	q(3-14)	q(3-15)
6000	4.23-09	2.90-09	2.09-09	1.56-09	1.20-09	9.43-10
8000	8.81-09	6.12-09	4.45-09	3.34-09	2.58-09	2.04-09
10000	1.39-08	9.74-09	7.11-09	5.36-09	4.16-09	3.29-09
12000	1.91-08	1.34-08	9.81-09	7.42-09	5.76-09	4.57-09
14000	2.40-08	1.69-08	1.24-08	9.42-09	7.32-09	5.82-09
16000	2.86-08	2.02-08	1.49-08	1.13-08	8.80-09	7.00-09
18000	3.30-08	2.33-08	1.72-08	1.31-08	1.02-08	8.10-09
20000	3.69-08	2.62-08	1.93-08	1.47-08	1.15-08	9.12-09
25000	4.55-08	3.24-08	2.39-08	1.82-08	1.42-08	1.13-08
30000	5.24-08	3.73-08	2.76-08	2.11-08	1.64-08	1.31-08
35000	5.79-08	4.13-08	3.06-08	2.33-08	1.82-08	1.45-08
40000	6.23-08	4.45-08	3.30-08	2.52-08	1.97-08	1.57-08
45000	6.59-08	4.70-08	3.49-08	2.66-08	2.08-08	1.66-08
50000	6.88-08	4.91-08	3.64-08	2.78-08	2.18-08	1.74-08

Table 14 (Continuation)

$T_e, K$	$\sum_j q(1-j)$	$\sum_j q(2-j)$	$\sum_j q(3-j)$
6000	1.03-16	1.79-08	1.65-06
8000	1.32-14	4.53-08	2.52-06
10000	2.41-13	8.07-08	3.26-06
12000	1.68-12	1.21-07	3.90-06
14000	6.72-12	1.62-07	4.46-06
16000	1.90-11	2.05-07	4.94-06
18000	4.25-11	2.47-07	5.37-06
20000	8.21-11	2.88-07	5.76-06
25000	2.66-10	3.86-07	6.58-06
30000	5.87-10	4.76-07	7.24-06
35000	1.04-09	5.57-07	7.79-06
40000	1.60-09	6.31-07	8.25-06
45000	2.24-09	6.98-07	8.65-06
50000	2.96-09	7.59-07	8.99-06

Table 15

Approximation parameters for the electron impact excitation rates  
for some ions (Eq. 3.13)

Atom	Transition	$b_1$	$d_1$	$b_2$	$d_1$
H	$1s - 2s$	3.0255-2	2.8721+0	1.5828-2	-6.8354-3
	$1s - 2p$	-7.2121-1	7.9039-1	-2.8375-1	3.7837-1
He	$1s^2 - 1s2s^1S$	-3.9862-1	1.9305+0	-5.3181-1	1.0520+0
	$1s^2 - 1s2p^1P$	-8.7050-1	1.3427+0	-7.7148-1	1.3553+0
Li	$2s - 2p$	-1.8357+0	6.7641+0	-1.4303+0	-1.0308+0
	$2s - 3s$	7.6061-1	-2.9960-1	-1.4644+0	3.7946-1
	$2s - 3p$	-2.3123+0	1.2005+1	-1.6955+0	1.1404+1
	$2s - 3d$	-1.7336+0	2.6599+0	-1.5825+0	3.0934+0
Be	$2s^2 - 2s2p^1P$	-5.4701+0	4.1354+0	-1.9273+0	-3.7323-2
	$2s^2 - 2s3s^1S$	-1.5089+0	4.1170+0	-1.6947+0	-1.0008-1
	$2s^2 - 2s3p^1P$	-6.1290+0	2.8693+1	-5.9038+0	3.0727+1
	$2s^2 - 2s3d^1D$	-2.4614+0	7.2745+0	-2.0230+0	8.4731+0
B	$2p - 2p^2^2D$	-2.5357+0	1.6273+1	2.2823-1	-1.2860+1
	$2p - 2p^2^2S$	1.2389+0	-1.6709+0	2.2454+0	-2.5053+1
	$2p - 2p^2^2P$	-5.5294+0	3.8336+1	-2.1885+0	-2.2321+0
	$2p - 3s^2S$	-5.2852+0	6.2157+0	-7.1461+0	1.7524+1
	$2p - 3d^2D$	-2.6613+0	6.1030+0	-2.6047+0	6.1124+0
Na	$3s - 3p$	-6.2955+0	1.1678+1	-4.3993+0	-4.0964+1
Mg	$3s^2 - 3s3p^1P$	-1.0469+1	7.5316+1	-7.3671+0	-1.1696+1

Atom	Transition	$c_0$	$c_1$	$c_2$	$c_3$	$c_4$
H	$1s - 2s$	0	-2.8348-1	1.4644-1	0	8.8632-1
	$1s - 2p$	-3.1169+0	1.4595+0	1.1221+0	4.3571+0	3.4015+0
He	$1s^2 - 1s2s^1S$	0	-4.6688-1	7.9729-2	0	8.7561-1
	$1s^2 - 1s2p^1P$	-1.2663+1	1.3627+0	1.1779-1	4.1292+0	1.2640+1
Li	$2s - 2p$	1.2644+2	2.2678+2	-7.7611+1	9.1550+1	-1.2483+1
	$2s - 3s$	0	-2.6169+0	4.7124-1	0	1.0335+1
	$2s - 3p$	-3.5391+1	2.6411+1	-5.9858+0	2.0986+1	2.2133+1
	$2s - 3d$	0	-3.1967+1	1.7385+1	0	3.1034+1
Be	$2s^2 - 2s2p^1P$	4.8738+1	1.1374+2	-2.9936+1	6.4360+1	2.3304+1
	$2s^2 - 2s3s^1S$	0	-2.2488+0	-2.8697-1	0	1.0413+1
	$2s^2 - 2s3p^1P$	-1.7122+1	1.1138+1	-2.2600+0	1.0231+1	1.0797+1
	$2s^2 - 2s3d^1D$	0	-3.1033+1	1.2496+1	0	2.9371+1

Table 15 (Continuation)

Atom	Transition	$c_0$	$c_1$	$c_2$	$c_3$	$c_4$
B	$2p - 2p^2\ ^2D$	2.3051+2	3.0526+2	-1.1423+2	1.4200+2	-7.9871+1
	$2p - 2p^2\ ^2S$	1.1548+2	1.7294+2	-7.4270+1	6.9007+1	-3.7716+1
	$2p - 2p^2\ ^2P$	2.4309+2	3.5044+2	-1.0487+2	1.9704+2	-5.3362+1
	$2p - 3s\ ^2S$	-1.5911+0	5.1577+0	-8.1767-1	2.9391+0	-1.1354+0
	$2p - 3d\ ^2D$	-1.9081+3	1.2813+2	-1.4259+1	1.2072+2	1.8988+3
Na	$3s - 3p$	1.0320+3	1.1301+3	-3.2897+2	5.0125+2	-3.8105+2
Mg	$3s^2 - 3s3p\ ^1P$	6.4280+2	6.5293+2	-1.0841+2	3.5073+2	-2.2096+2
Atom	Transition	$a_0$	$a_1$	$a_2$	$a_3$	$a_4$
H	$1s - 2s$	-2.4146-2	1.6733-2	1.0200+1	1.2581-4	1.1876-4
	$1s - 2p$	2.2668-2	-2.3461-2	1.0210+1	-9.7361-4	1.8101-4
He	$1s^2 - 1s2s\ ^1S$	4.1136-1	-1.0370+1	1.0155+1	2.3318-3	6.8920-5
	$1s^2 - 1s2p\ ^1P$	-1.6465+0	-8.9437+0	1.0053+1	7.3500-3	2.5688-5
Li	$2s - 2p$	-4.6636+0	2.2833+0	-3.9025-2	1.7520-3	0
	$2s - 3s$	2.8825+0	-5.4725+0	1.8648+0	1.6849-3	1.8420-6
	$2s - 3p$	2.3189+0	-5.2566+0	1.9255+0	-2.5229-3	9.5942-5
	$2s - 3d$	1.6400+0	-5.0109+0	1.9148+0	-1.5113-3	7.5428-5
Be	$2s^2 - 2s2p\ ^1P$	-1.0050+1	4.1061+0	-6.7408-2	2.4015-3	0
	$2s^2 - 2s3s\ ^1S$	4.6753+0	-6.9992+0	1.8838+0	5.8812-4	9.7093-6
	$2s^2 - 2s3p\ ^1P$	3.4151+0	-6.5534+0	1.8861+0	3.8007-4	2.5128-5
	$2s^2 - 2s3d\ ^1D$	4.5549-1	-5.7056+0	1.8864+0	5.9589-4	2.1710-5
B	$2p - 2p^2\ ^2D$	-1.1341+1	3.7007+0	-5.6339-2	2.0624-3	0
	$2p - 2p^2\ ^2S$	-1.3042+1	4.2204+0	-9.7416-3	3.4929-4	0
	$2p - 2p^2\ ^2P$	-1.4969+1	5.2729+0	-1.0270-1	3.4006-3	0
	$2p - 3s\ ^2S$	1.7830+1	-1.2243+1	1.9563+0	-1.7541-3	1.8977-5
	$2p - 3d\ ^2D$	7.1403+0	-9.5604+0	1.8991+0	-6.6362-4	3.0004-5
Na	$3s - 3p$	-2.6149+1	3.0072+0	-5.0588-2	1.0321-3	0
Mg	$3s^2 - 3s3p\ ^1P$	-3.5986+1	4.0890+0	-7.5769-2	1.3900-3	0

Table 16

Energies and designations for the ground and metastable levels of the selected atoms and ions (in  $\text{cm}^{-1}$ )

**Be sequence**

No.	Conf.	Term	$J$	CIII	NIV	OV	NeVI
1	$2s^2$	$^1S$	0	0.0	0.0	0.0	0.0
2	$2s2p$	$^3P^o$	0	52367.1	67209.2	81942.5	111264.9
3			1	52390.8	67272.3	82078.6	111717
4			2	52447.1	67416.3	82385.3	112711.5
5		$^1P^o$	1	102352.0	130693.9	158797.7	214951.6

**B sequence**

No.	Conf.	Term	$J$	CII	NIII	OIV	NeV
1	$2s^2 2p$	$^2P^o$	1/2	0.0	0.0	0.0	0.0
2	$2s^2 2p$		3/2	63.42	174.4	386.3	1306.6
3	$2s 2p^2$	$^4P$	1/2	43003.3	57187.1	71440.0	
4	$2s 2p^2$		3/2	42025.3	57246.8	71571.4	
5	$2s 2p^2$		5/2	43053.6	57327.9	71755.9	

**C sequence**

No.	Conf.	Term	$J$	CI	NII	OIII	NeIV
1	$2p^2$	$^3P$	0	0.0	0.0	0.0	0.0
2	$2p^2$		1	16.4	48.7	113.2	412.4
3	$2p^2$		2	43.4	130.8	306.2	1110.1
4	$2p^2$	$^1D$	2	10192.6	15316.2	20273.3	30291.5
5	$2p^2$	$^1S$	0	21648.0	32688.8	43185.7	63913.6
6	$2p^3$	$^5S^o$	2	33735.2	46784.6	60325.0	88363.1

**N sequence**

No.	Conf.	Term	$J$	NI	OII	NeIV	NaV
1	$2p^3$	$^4S^o$	3/2	0.0	0.0	0.0	0.0
2	$2p^3$	$^2D^o$	5/2	19224.5	26810.7	41234.6	48313.5
3	$2p^3$		3/2	19233.2	26830.2	41279.5	48359.3
4	$2p^3$	$^2P^o$	1/2	28838.9	40468.6(5)	62434.6	73201.9
5	$2p^3$	$^2P^o$	3/2	28839.3	40467.5(4)	62441.3	73236.4



Table 17

Transition probabilities and effective collision strengths  $\gamma_{ij}$  of selected atoms and ions for transitions between low excited lines

<b>Be sequence</b>						
Ion	Transition	$A_{ki}, s^{-1}$	$T_e, K$			
			5000	10000	15000	20000
CIII	1-2	0	1.12	1.01	0.990	0.996
	1-3	95.9	1.12	1.01	0.990	0.996
	1-4	5.19-3	1.12	1.01	0.990	0.996
	1-5	1.79+9	3.85	4.34	4.56	4.69
	2-3	2.39-7	0.848	0.911	0.975	1.03
	2-4	0	0.579	0.677	0.776	0.867
	3-4	2.41-6	2.36	2.66	2.97	3.23
NIV	1-2	0	0.904	0.852	0.817	0.798
	1-3	5.77+2	0.904	0.852	0.817	0.798
	1-4	1.15-2	0.904	0.852	0.817	0.798
	1-5	2.38+9	3.20	3.46	3.58	3.65
	2-3	4.53-6				
	3-4	4.03-5				
OV	1-2	0	0.733	0.721	0.674	0.639
	1-3	2.25+3	0.733	0.721	0.674	0.639
	1-4	2.16-2	0.733	0.721	0.674	0.639
	1-5	2.92+9	2.66	2.76	2.82	2.85
	2-3	4.54-5				
	3-4	3.89-4				
NeVII	1-2	0	0.129	0.172	0.205	0.228
	1-3	1.98+4	0.129	0.172	0.205	0.228
	1-4	5.78-2	0.129	0.172	0.205	0.228
	1-5	4.08+9	1.39	1.56	1.63	1.66
	2-3	1.69-3				
	3-4	1.32-2				

Table 17 (Continuation)

		<b>B sequence</b>				
			$T_e, K$			
Ion	Transition	$A_{ki}, s^{-1}$	5000	10000	15000	20000
CII	2-1	2.29-6		1.25		
	3-1	5.53+1	3.25	3.17	3.09	2.97
	3-2	6.55+1	3.25	3.17	3.09	2.97
	4-1	1.71	3.25	3.17	3.09	2.97
	4-2	5.24				
	4-3	2.39-7				
	5-2	4.32+1				
	5-3	3.49-14				
	5-4	3.67-7				

**O sequence**

Ion	Trans.	$A_{ki}, s^{-1}$	$T_e, K$					
			500	1000	5000	10000	15000	20000
OI	3-1	7.32-2	0.00065	0.00184	0.0153	0.0324		0.0607
	3-2	1.74-5	0.0008	0.0018	0.0112	0.0265		0.0693
	4-1	2.88-4	0.00065	0.00184	0.0153	0.0324		0.0607
	4-2		0.0006	0.0022	0.0148	0.0292		0.0536
	4-3	8.92-5	0.0027	0.0076	0.0474	0.0987		0.207
	5-1	1.22	0.0221	0.0310	0.0732	0.105		0.148
	5-2	7.23-7	0.0058	0.0151	0.124	0.266		0.501
	5-3	2.11-3	0.0058	0.0151	0.124	0.266		0.501
	5-4	6.34-3	0.0058	0.0151	0.124	0.266		0.501
	NeIII	3-1	2.00			0.152	0.151	0.152
3-2		1.15-3			0.185			
4-1		3.94-3			0.152	0.151	0.152	0.157
4-2		2.18-8			0.131			
4-3		5.97-3			0.527			
5-1		2.71			0.220	0.236	0.262	0.284
5-2		8.51-6			1.35	1.34	1.33	1.32
5-3		5.42-2			1.35	1.34	1.33	1.32
5-4		1.71-1			1.35	1.34	1.33	1.32

Table 17 (Continuation)

Mg sequence						
Ion	Transition	$A_{ki}, s^{-1}$	$T_e, K$			
			5000	10000	15000	20000
MgI	1-3	1.80+2				
	1-4	4.13-4				
	1-5	4.93+8				
	2-3	1.45-7				
	2-4	4.08-12				
	3-4	9.10-7				
SiIII	1-2	0	6.90	5.43	4.80	4.41
	1-3	1.26+4	6.90	5.43	4.80	4.41
	1-4	1.20-2	6.90	5.43	4.80	4.41
	1-5	2.60+9	5.48	5.82	6.21	6.54
	2-3	3.82-5				
	2-4	3.20-9				
	3-4	2.42-4				
SV	1-2	0	0.911	0.910	0.914	0.905
	1-3	1.26+5	0.911	0.910	0.914	0.905
	1-4	6.59-2	0.911	0.910	0.914	0.905
	1-5	5.13+9	7.30	7.30	7.29	7.27
	2-3	9.07-4	0.272			
	2-4	1.63-7	0.400			
	3-4	5.96-3	1.24			

Table 18

Collision excitation rates (in  $\text{cm}^3 \text{s}^{-1}$ )  
of the CI fine structure levels by the  
proton impact (Roueff and Le Bourlot (1990))

T, K	$k_{0 \rightarrow 1}$	$k_{0 \rightarrow 1}$	$k_{1 \rightarrow 2}$
100	1.8-9	8.1-10	2.6-9
200	2.7-9	2.0-9	5.4-9
300	3.3-9	3.5-9	8.0-9
500	4.1-9	6.4-9	1.2-8
700	4.6-9	9.1-9	1.5-8
1000	5.2-9	1.2-8	1.7-8
2000	6.1-9	1.9-8	2.1-8
3000	6.6-9	2.3-8	2.3-8
5000	7.2-9	2.6-8	2.4-8
7000	7.6-9	2.7-8	2.5-8
10000	7.9-9	2.8-8	2.5-8
20000	8.5-9	3.0-8	2.6-8

Table 19

Parameters  $\alpha_i$  and  $T_i$  for  
total of dielectronic recombination rates (Eq. 3.23)

Sequence	Ion	$t$	$T_i/Ry, K$	$\alpha_i$
He	CV	1	20.9	2.98-10
		2	29.8	6.78-10
	NVI	1	39.2	1.05-9
		2	51.8	3.11-10
	NeIX	1	63.9	1.56-9
		2	74.4	6.30-10
	MgXI	1	92.9	2.42-9
		2	101.	1.04-9
	SiXIII	1	127.	3.13-9
		2	132.	1.56-9
	SXV	1	167.	4.07-9
		2	167.	1.56-9
	ArXVII	1	212.	2.04-9
		2	212.	4.58-9
CaXIX	1	206.	2.50-9	
	2	263.	5.07-9	
FeXXV	1	339.	4.17-9	
	2	441.	7.21-9	
NiXXVII	1	404.	4.44-9	
	2	522.	7.54-9	
Li	CIV	1	0.0262	5.21-13
		2	0.351	3.16-13
		3	0.371	5.44-13
		4	0.579	5.47-11
	NV	1	0.0957	1.09-12
		2	0.295	6.90-13
		3	0.449	1.18-12
		4	0.720	7.74-11
	OVI	1	0.187	1.83-12
		2	0.368	1.22-12
		3	0.534	2.03-12
		4	0.860	1.00-10
		5	5.07	5.00-11
	NeVIII	1	0.179	4.76-12
		2	0.412	3.14-12
		3	0.623	4.70-12
		4	0.859	8.44-12
		5	1.15	0.47-10
		6	7.13	2.73-11
		7	9.09	1.74-10

Table 19 (Continuation)

Sequence	Ion	$t$	$T_i/Ry, K$	$\alpha_i$
Li	MgX	1	0.217	9.40-12
		2	0.480	6.36-12
		3	0.738	1.22-12
		4	0.999	1.16-11
		5	1.43	2.11-10
		6	5.81	3.95-11
		7	10.9	5.72-11
		8	13.8	5.07-10
	SiXII	1	0.306	1.58-11
		2	0.579	1.10-11
		3	0.871	1.60-11
		4	1.17	1.86-11
		5	1.73	2.22-10
		6	7.70	5.83-11
		7	14.5	8.82-10
		8	19.4	1.07-9
	SXIV	1	0.0255	3.02-11
		2	0.432	2.06-11
		3	0.813	2.90-11
		4	1.23	3.33-11
		5	2.01	4.33-10
		6	9.80	11.37-10
		7	19.1	15.7-10
		8	25.9	1.72-9
	ArXVI	1	0.204	4.06-11
		2	0.584	3.88-11
		3	0.997	3.84-11
		4	1.41	3.83-11
		5	2.33	3.70-10
		6	11.8	3.32-10
		7	24.2	4.16-10
		8	33.3	2.74-9
	CaXVIII	1	0.429	5.34-11
		2	0.801	5.81-11
		3	1.22	5.47-11
		4	1.77	5.59-11
		5	2.67	4.55-10
		6	15.1	3.68-10
		7	34.1	5.11-9
		8	43.6	3.01-9
	FeXXIV	1	0.675	1.36-10
		2	1.20	1.80-11
		3	1.80	1.40-10
		4	2.68	1.24-10
		5	4.00	1.47-10
		6	15.0	6.15-9
		7	22.6	5.55-9
		8	72.8	5.58-9
	NiXXVI	1	0.768	1.87-10
		2	1.39	1.35-10
		3	2.10	1.93-10
		4	2.94	2.29-10
		5	4.33	3.39-10
		6	14.8	7.47-9
		7	28.7	14.2-9
		8	61.3	2.00-9
		9	84.9	0.08-9

Table 19 (Continuation)

Sequence	Ion	$t$	$T_i/Ry, K$	$\alpha_i$		
	Be	CIII	1	0.0326	3.70-13	
			2	0.227	1.25-13	
			3	0.334	9.12-14	
			4	0.478	4.08-13	
			5	0.738	1.41-12	
		6	0.925	1.09-10		
			NIV	1	0.0505	8.46-13
				2	0.218	1.40-12
				3	0.440	6.39-13
				4	0.745	2.07-12
5	1.17	1.56-10				
		6	3.39	1.83-11		
			OV	1	0.111	1.41-12
				2	0.307	7.90-13
				3	0.479	3.85-12
				4	0.916	4.22-12
5	1.42	2.83-10				
		6	4.79	5.97-11		
			NeVII	1	0.207	2.67-12
				2	0.532	1.27-11
				3	1.10	9.88-12
				4	1.90	4.76-10
5	3.22	2.24-10				
	MgIX	1	0.292	5.59-12		
		2	0.502	3.89-12		
		3	0.742	2.38-11		
		4	1.13	2.08-11		
		5	1.68	6.96-10		
		6	3.0	5.98-10		
			SiXI	1	0.228	2.96-11
				2	0.53	1.13-12
				3	0.85	3.60-11
				4	1.16	3.23-11
5	1.91	4.89-11				
		6	3.4	8.45-10		
			SXIII	1	0.0642	1.80-11
				2	0.19	5.30-11
				3	0.30	1.43-11
				4	0.49	4.00-11
5	0.73	5.09-11				
		6	1.11	7.11-11		
			7	1.44	1.04-9	
				8	1.9	4.65-9
				9	2.48	2.25-9
				ArXV	1	0.130
2	0.406	1.55-11				
3	0.80	8.71-11				
4	1.19	7.73-11				
5	1.6	1.01-9				
		6	2.4	1.33-9		
			7	3.2	1.49-9	
			8	4.0	3.40-9	
			9	5.0		
			10	6.0		



Table 19 (Continuation)

Sequence	Ion	$t$	$T_i/Ry, K$	$\alpha_i$
Be	CaXVII	1	0.271	2.28-11
		2	0.708	1.18-10
		3	0.965	2.46-11
		4	1.07	8.09-11
		5	1.37	1.10-10
		6	1.49	1.33-10
		7	1.49	1.54-9
		8	1.3	1.97-10
		9	1.1	1.15-9
		10	40.4	5.47-9
	FeXXIII	1	0.101	3.21-11
		2	0.708	3.87-11
		3	0.965	2.89-10
		4	1.12	1.78-10
		5	1.20	2.50-10
		6	1.40	2.58-10
		7	1.50	2.11-9
		8	1.3	7.29-10
		9	1.88	2.96-9
		10	70.8	1.17-8
	NiXXV	1	0.434	2.83-11
		2	0.615	3.49-10
		3	1.07	4.08-11
		4	2.00	2.43-10
		5	2.30	3.52-10
		6	4.71	3.31-10
		7	1.9	3.39-9
		8	1.0	9.90-10
		9	60.1	3.67-9
		10	82.6	1.34-8
Ne	MgIII	1	2.79	5.02-13
		2	3.88	4.17-11
	SiV	1	6.00	2.40-11
		3	9.04	8.68-11
	SVII	1	8.80	1.39-10
		3	14.5	6.59-11
	ArIX	1	11.7	3.82-10
		3	19.8	1.03-9
	CaXI	1	16.7	1.19-10
		3	27.7	1.78-10
	FeXVII	1	29.0	2.55-9
		3	54.8	6.37-10
	NiXIX	1	33.7	1.21-9
		3	62.8	3.92-9
				2.83-9
			5.05-9	
			1.67-8	
			3.79-9	
			6.67-9	
			1.14-8	

Table 20.

Parameters for dielectronic recombination rates (Nussbaumer &amp; Storey 1984, 1986, 1987)

Term	$E_0$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$
CI								
$^1S$	21618	0.0000	0.0000	0.0000	0.0000	0.0000	0.10	0.000
$^1D$	10163	-0.0202	0.3799	0.0890	-0.0057	0.9237	0.10	0.176
$^3P$	0	0.0238	-0.0222	0.1722	-0.0154	2.7590	0.10	0.010
CII								
$^2P^0$	0	1.9661	3.8179	5.0243	0.1934	0.6013	0.10	6.030
CIII								
$^3P^0$	52419	1.8790	5.0085	4.5530	-0.1453	0.4090	0.10	7.504
$^1S$	0	0.8361	5.2192	2.7046	-0.0856	0.4436	0.10	5.566
NI								
$^2P^0$	28839	0.0000	0.1264	0.0273	-0.0031	0.4570	0.10	0.095
$^2D^0$	19228	0.0017	0.5661	0.1008	-0.0121	0.4443	0.10	0.421
$^4S^0$	0	0.0102	-0.0032	0.0754	-0.0068	3.1555	0.15	0.008
NII								
$^1S$	32600	0.0090	-0.0111	0.0232	-0.0009	3.3623	0.15	0.001
$^1D$	15227	0.1851	0.3804	0.6203	-0.0321	3.2769	0.10	0.044
$^3P$	0	0.0324	-0.6695	4.0805	-0.0509	0.5569	0.10	1.944
NIII								
$^2P^0$	0	3.6446	16.6017	30.2077	-1.2409	0.8275	0.10	21.513
NIV								
$^3P^0$	67345	0.3327	-2.1374	16.0006	-1.3683	0.2665	0.10	9.827
$^1S$	0	0.1065	-1.9371	10.4904	-0.9499	0.3468	0.10	5.450
OI								
$^5S^0$	73690	0.9887	-2.1047	3.6416	-0.2442	12.4049	0.40	0.000
$^3P$	0	0.0051	0.0012	0.1377	-0.0135	0.6061	0.10	0.071
OII								
$^2P^0$	40467	0.0000	0.2105	0.2768	-0.0238	0.3353	0.10	0.331
$^2D^0$	26817	-0.0002	1.0132	0.3488	-0.0199	0.3186	0.10	0.976
$^4S^0$	0	0.0629	-0.1823	0.3497	0.0085	1.8398	0.10	0.038
OIII								
$^1S$	42975	-0.0002	0.3726	0.3460	-0.0219	2.1618	0.15	0.080
$^1D$	20063	-0.0049	1.6231	2.6810	-0.1466	1.5497	0.10	0.882
$^3P$	0	0.2789	-4.8663	23.1182	-1.9408	0.5530	0.10	9.543

Table 20 (Continuation)

Term	$E_0$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$
$^2P^0$	OIV 0	5.9556	-10.8824	60.9389	-1.8906	0.2173	0.10	43.551
$^3P^0$	OV 82234	0.3075	-4.6445	30.2563	-3.0843	1.8174	0.10	3.709
$^1S$	0	0.2155	-3.0795	19.7360	-1.9183	2.0666	0.10	1.893
$^3P^0$	MgI 21885	0.5116	-2.8906	7.4450	-0.7234	2.4137	0.10	0.389
$^1S$	0	0.1028	-0.3270	1.3742	-0.0742	1.2735	0.10	0.301
Total	0	1.2044	-4.6836	7.6620	-0.5930	1.6260	0.15	0.706
$^4P$	Al I 29022	0.1290	0.1380	1.3088	-0.1254	2.0075	0.10	0.195
$^2P^0$	0	-0.0001	1.0652	1.5718	-0.1149	0.6513	0.10	1.315
Total	0	0.0219	-0.4528	2.5427	-0.1678	0.2276	0.10	1.548
$^3P^0$	Al II 37517	1.7223	-4.5922	7.2682	0.1478	1.1321	0.10	1.465
$^1S$	0	0.3813	-1.4668	3.8543	-0.1085	0.3581	0.10	1.860
Total	0	0.7086	-3.1083	7.0422	0.5998	0.4194	0.10	3.447
$^3P$	Si I 0	-0.0219	0.4364	0.0684	-0.0032	0.1342	0.10	0.419
Total	0	-0.0219	0.4364	0.0684	-0.0032	0.1342	0.10	0.419
$^4F^0$	Si II 114224	0.2692	-0.7274	0.8477	0.0543	0.4070	0.15	0.223
$^4P$	42811	0.2899	-0.8854	1.7321	-0.1101	0.3248	0.10	0.742
$^2P^0$	0	3.0004	-11.8047	15.8005	-0.7492	0.7858	0.20	2.847
Total	0	3.2163	-12.0571	16.2118	-0.5886	0.5613	0.15	3.869
$^4P$	Ne II 219181	0.3073	-0.5251	1.7029	-0.0739	13.3271	0.45	0.000
$^2P^0$	0	0.0146	-0.1906	0.9996	-0.0970	0.4741	0.10	0.452
Total	0	0.0129	-0.1779	0.9353	-0.0682	0.4516	0.10	0.447

Table 20 (Continuation)

Term	$E_0$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$
NeIII								
$^5S^0$	313828	0.0004	2.9380	1.5448	-0.0820	3.0010	0.10	0.219
$^1S$	55427	0.5209	2.0127	1.0069	-0.0243	0.2447	0.10	2.753
$^1D$	25521	1.2277	5.5667	7.0485	-0.4427	0.2799	0.10	10.129
$^3P$	0	1.8736	7.6536	7.9371	-0.0495	0.2062	0.10	14.170
Total	0	3.6781	14.1481	17.1175	-0.5017	0.2313	0.10	27.330
NeIV								
$^2P^0$	62499	0.0374	-0.1777	2.9749	-0.2530	0.1819	0.10	2.152
$^2D^0$	41313	0.0523	-1.1191	7.9365	-0.7140	-0.0331	0.10	6.363
$^4S^0$	0	1.0446	4.6520	7.0880	0.1502	0.2842	0.10	9.735
Total	0	-0.0254	5.5365	17.0727	-0.7225	0.1702	0.10	18.440
NeV								
$^5S^0$	97713	0.7469	-3.2024	12.1163	-1.0379	1.8482	0.10	1.358
$^1S$	63900	0.0000	1.2354	0.3603	0.0245	0.7655	0.15	0.754
$^1D$	30294	-0.0283	21.5485	7.0314	-0.2801	0.4342	0.10	18.314
$^3P$	0	0.0435	25.1260	24.6502	-0.4953	0.1664	0.10	41.763
Total	0	-0.0141	33.8479	43.1608	-1.6072	0.1942	0.10	62.081
NeVI								
$^4P$	105390	23.8234	135.1852	85.8070	-1.2212	0.1231	0.10	215.380
$^2P^0$	0	1.1880	121.9472	56.3464	12.1953	0.2288	0.10	152.477
Total	0	19.9280	235.0536	152.5096	9.1413	0.1282	0.10	366.502
NeVII								
$^3P^0$	112196	4.2564	145.0547	59.8074	-5.1910	2.5046	0.20	16.663
$^1S$	0	0.0610	39.1376	37.6243	-3.7043	2.4254	0.15	6.467
Total	0	5.4751	203.9751	86.9016	-7.4568	2.5145	0.20	23.373

Table 21a

Charge transfer rates (in  $\text{cm}^3/\text{s}$ ) for collisions with H ( $T_e$  in  $10^3$  K)  
 $X^{i+1} + H^0 \leftrightarrow X^i + H^+ + \Delta E$

$X^{i+1}$	$\vec{k}(X^{i+1}, H^0)$	$T_e$	Meth	Ref	$\overleftarrow{k}(X^i, H^+)$	$T_e$	Meth	Ref	$\Delta E, \text{eV}$
H <sup>+</sup>	5.0-10	0.1		W78					0
He <sup>+</sup>	8.0-16	0.1		W78					+11.0
He <sup>2+</sup>	1.9-15			JD71					
	1.6-13	0.25-64		AH57					+40.8
	1.0-13			AD65					
Li <sup>2+</sup>	3.0-9	10		W78					+62.0
C <sup>+</sup>	1.4-17	10	DW	B80	2.8-16	10		B80	-2.33
					1.4-11	10		S75	
C <sup>2+</sup>	1.0-14			MV76					+10.8
	1.3-11			S75a					
	1.0-12	10	QM	BD80					
	1.0-12	5	QM	BH80					
	1.0-12	10	QM	BH80					
	1.35-12	20	QM	BH80					
	3.53-12	30	QM	BH80					
	1.49-11	50	QM	BH80					
C <sup>3+</sup>	2.0-9		**	PA78					+34.3
	1.0-9			B76					
	3.6-9	10	QM	BD80					
	2.9-9	10	LZ	BD80					
	3.09-9	5	QM	BH80					
	3.58-9	10	QM	BH80					
	4.22-9	20	QM	BH80					
	4.78-9	30	QM	BH80					
	5.46-9	50	QM	BH80					
	C <sup>4+</sup>	2.8-11	1.0	LZ	BD80				
1.2-10		3.16	LZ	BD80					
7.6-10		10	LZ	BD80					
3.8-9		31.6	LZ	BD80					
N <sup>+</sup>	5.0-10	10		SW71	4.0-10	10		SW71	+0.95
	1.0-12	10		M73	5.3-10	10		FS71	
	1.0-12	10	61 DW	BD79					
	3.7-10	10		FS71					
N <sup>2+</sup>	3.96-9			S75					+16.0
	2.0-9		**	PA78					

Table 21a (Continuation)

$X^{i+1}$	$\vec{k}(X^{i+1}, H^0)$	$T_e$	Meth	Ref	$\overleftarrow{k}(X^i, H^+)$	$T_e$	Meth	Ref	$\Delta E, eV$
N <sup>2+</sup>	8.6-10	10	QM	BD80					+16.0
	5.2-10	10	LZ	BD80					
	7.8-10	5	QM	BH80					
	8.6-10	10	QM	BH80					
	9.7-10	20	QM	BH80					
	1.05-9	30	QM	BH80					
	1.11-9	50	QM	BH80					
	1.11-9	50	QM	BH80					
N <sup>3+</sup>	1.11-9	3		MV79					+33.9
	3.56-9	10		MV79					
	7.90-9	30		MV79					
	3.0-9		**	PA78					
	2.9-9	10	QM	BD80					
	2.7-9	10	LZ	BD80					
	4.4-10	2.0		CW77					
	9.7-10	3.5		CW77					
	1.5-9	5.0		CW77					
	2.3-9	7.5		CW77					
	3.1-9	10.0		CW77					
	3.8-9	12.5		CW77					
	4.4-9	15.0		CW77					
	5.6-9	20.0		CW77					
	1.54-9	5	QM	BH80					
	2.93-9	10	QM	BH80					
	5.14-9	20	QM	BH80					
	7.10-9	30	QM	BH80					
	9.47-9	50	QM	BH80					
	N <sup>4+</sup>	6.4-11	1.0	LZ	BD80				
2.7-11		3.16	LZ	BD80					
1.6-10		10.0	LZ	BD80					
8.7-10		31.6	LZ	BD80					
O <sup>+</sup>	1.04-9	10		FS71	9.1-10	10		FS71	+0.02
	6.8-10	0.3		FF72	3.8-10	0.3		FF72	
	8.0-10	1.2		R63					
	3.8-10	1.2		HP63					
O <sup>2+</sup>	3.96-9	10		S75					+21.5
	1.6-9		<del>62</del>	PA78					
	5.9-10		LZ	BB79					
	7.7-10	10	QM	BG77					
	7.7-10	10	LZ	BD80					

Table 21a (Continuation)

$X^{i+1}$	$\vec{k}^{\rightarrow}(X^{i+1}, H^0)$	$T_e$	Meth	Ref	$\vec{k}^{\leftarrow}(X^i, H^+)$	$T_e$	Meth	Ref	$\Delta E, eV$
$O^{2+}$	6.0-10	5	QM	BH80					+21.5
	7.7-10	10	QM	BH80					
	1.03-9	20	QM	BH80					
	1.26-9	30	QM	BH80					
	1.62-9	50	QM	BH80					
$O^{3+}$	8.6-9	10	QM	BD80					+41.3
	2.1-9	10	LZ	BD80					
	6.34-9	5	QM	BH80					
	8.63-9	10	QM	BH80					
	1.18-8	20	QM	BH80					
	1.45-8	30	QM	BH80					
$O^{4+}$	1.76-8	50	QM	BH80					+63.8
	1.4-10	1.0	LZ	BD80					
	1.9-10	3.16	LZ	BD80					
	2.6-10	10.0	LZ	BD80					
	5.2-10	31.6	LZ	BD80					
$Ne^{2+}$	2.0-9	10		S75					+27.4
	3.0-10		**	PA78					
	3.0-11		LZ	BB79					
	1.0-20			BG77					
	9.0-21	5	QM	BH80					
$Ne^{3+}$	1.0-20	10-50	QM	BH80					+49.9
	5.7-9	10	QM	BD80					
	3.8-9	10	LZ	BD80					
	4.0-9	5	QM	BH80					
	5.68-9	10	QM	BH80					
	8.28-9	20	QM	BH80					
	1.05-8	30	QM	BH80					
1.30-8	50	QM	BH80						
$Ne^{4+}$	5.9-9	1.0	LZ	BD80					+83.5
	5.9-9	3.16	LZ	BD80					
	6.9-9	10	LZ	BD80					
	1.2-8	31.6	LZ	BD80					
$Mg^{2+}$	1.0-14			W78	7.4-14	10	LZ	BD80	+1.44
	8.7-14	1.0	LZ	BD80	7.6-14	31.6-316	LZ	BD80	
	8.6-14	3.16	LZ <sup>3</sup>	BD80					
	8.6-14	10	LZ	BD80					
	8.6-14	31.6	LZ	BD80					

Table 21a (Continuation)

$X^{i+1}$	$\vec{k}(X^{i+1}, H^0)$	$T_e$	Meth	Ref	$\overleftarrow{k}(X^i, H^+)$	$T_e$	Meth	Ref	$\Delta E, eV$
$Mg^{3+}$	7.0-21			BM54					+66.5
	4.4-9	1.0	LZ	BD80					
	4.4-9	3.16	LZ	BD80					
	6.5-9	10	LZ	BD80					
$Mg^{4+}$	1.2-8	31.6	LZ	BD80					
	5.9-9	1.0	LZ	BD80					+95.7
	5.9-9	3.16	LZ	BD80					
	6.5-9	10	LZ	BD80					
$Si^{2+}$	1.2-8	31.6	LZ	BD80					
	5.0-9	10		MV76					+2.74
	5.0-9	10		W78					
	1.98-9	0.01	QM	GM82					
	1.80-9	0.02	QM	GM82					
	1.75-9	0.05	QM	GM82					
	1.72-9	0.1	QM	GM82					
	1.74-9	0.2	QM	GM82					
	2.01-9	0.5	QM	GM82					
	2.50-9	1	QM	GM82					
	3.20-9	2	QM	GM82					
	4.34-9	5	QM	GM82	3.0-12	5	QM	GM82	
	5.28-9	10	QM	GM82	7.3-11	10	QM	GM82	
	6.26-9	20	QM	GM82	4.26-10	20	QM	GM82	
	6.87-9	30	QM	GM82	4.94-10	30	QM	GM82	
	7.70-9	50	QM	GM82	1.36-9	50	QM	GM82	
	9.10-9	100	QM	GM82	2.21-9	100	QM	GM82	
	1.12-8	200	QM	GM82	3.18-9	200	QM	GM82	
	1.60-8	500	QM	GM82	4.99-9	500	QM	GM82	
	2.18-8	1000	QM	GM82	7.03-9	1000	QM	GM82	
$Si^{3+}$	4.0-10	1.0	LZ	BD80					+19.9
	3.9-10	3.16	LZ	BD80					
	4.1-10	10	LZ	BD80					
	4.3-10	31.6	LZ	BD80					
$Si^{4+}$	2.4-9	1.0	LZ	BD80					+31.5
	2.2-9	3.16	LZ	BD80					
	2.3-9	10	LZ	BD80					
	2.7-9	31.6 <sup>4</sup>	LZ	BD80					
$S^+(^4S)$	3.0-15	10	DW	B80					-3.24
$S^+(^2P)$					1.0-9	10		DB78	+0.20



Table 21a (Continuation)

$X^{i+1}$	$\vec{k}(X^{i+1}, H^0)$	$T_e$	Meth	Ref	$\overleftarrow{k}(X^i, H^+)$	$T_e$	Meth	Ref	$\Delta E, eV$
$S^{2+}$	0			PA78					+9.74
	1.0-14*	1-31.6	LZ	BD80					
$S^{3+}$	1.5-9		**	PA78					+21.2
	3.9-9	1.0	LZ	BD80					
	2.7-9	3.16	LZ	BD80					
	2.3-9	10	LZ	BD80					
	2.4-9	31.6	LZ	BD80					
$S^{4+}$	1.2-8	1.0	LZ	BD80					+33.7
	8.0-9	3.16	LZ	BD80					
	6.5-9	10	LZ	BD80					
	7.5-9	31.6	LZ	BD80					
$Ar^{2+}$	1.0-14*	1-31.6	LZ	BD80					+14.0
$Ar^{3+}$	2.1-9	1.0	LZ	BD80					+27.3
	3.0-9	3.16	LZ	BD80					
	4.4-9	10	LZ	BD80					
	6.2-9	31.6	LZ	BD80					
$Ar^{4+}$	5.8-9	1.0	LZ	BD80					+46.2
	5.8-9	3.16	LZ	BD80					
	6.5-9	10	LZ	BD80					
	1.7-9	31.6	LZ	BD80					
$Fe^+$					7.0-9	0.3		W78	-5.7

Table 21b Charge transfer rates (in  $\text{cm}^3/\text{s}$ ) for collisions with He ( $T_e$  in  $10^3$  K)

$X^{i+1}$	$\vec{k}(X^{i+1}, \text{He}^0)$	$T_e$	Meth	Ref	$\overleftarrow{k}(X^i, \text{He}^+)$	$T_e$	Meth	Ref	$\Delta E, \text{eV}$
$\text{Li}^{2+}$	3.0-9	10		D54					+51.1
	2.0-17	10		D54					
$\text{Li}^{3+}$	5.0-10	10		W78					+97.9
$\text{Be}^{3+}$	1.0-9	10		W78					+129.3
$\text{C}^{2+}$	8.13-15	0.2		B72	3.1-15	10	QM	BD80	-0.21
	4.26-13	0.3		B72	1.0-15	10	LZ	BD80	
	1.02-11	0.5		B72					
	3.31-11	0.7		B72					
	1.12-10	1.0		B72					
	3.63-10	2.0		B72					
	5.62-10	3.0		B72					
	7.41-10	5.0		B72					
	1.00-9	10.0		B72					
	$\text{C}^{2+}(^3P^0)$	1.4-12	5	QM	BH80	5.0-16	5		
6.1-12		10	QM	BH80	3.1-15	10		BH80	
2.2-11		20	QM	BH80	4.2-13	20		BH80	
4.8-11		30	QM	BH80	3.2-12	30		BH80	
1.1-10		50	QM	BH80	1.8-11	50		BH80	
$\text{C}^{3+}$	4.7-13	1.0	LZ	BD80					+23.3
	4.6-12	3.16	LZ	BD80					
	5.1-11	10.0	LZ	BD80					
	3.5-10	31.6	LZ	BD80					
$\text{C}^{4+}$	1.0-14*	1.0-31.6	LZ	BD80					+39.9
$\text{N}^{2+}$	3.0-10	1.0	LZ	BD80	4.1-12	10	LZ	BD80	+5.03
	3.1-10	3.16	LZ	BD80	4.7-11	31.6	LZ	BD80	
	3.3-10	10.0	LZ	BD80	2.5-10	100	LZ	BD80	
	4.6-10	31.6	LZ	BD80	8.5-10	316	LZ	BD80	
$\text{N}^{3+}$	1.8-10	1.0	LZ	BD80					+22.9
	1.9-10	3.16	LZ	BD80					
	1.1-10	10.0	LZ	BD80					
	1.9-10	31.6	LZ	BD80					
	4.4-10	2.0		CW77					
	9.7-10	3.5		CW77					
	1.5-9	5.0		CW77					
2.3-9	7.5		CW77						

Table 21b (Continuation)

$X^{i+1}$	$\vec{k}(X^{i+1}, \text{He}^0)$	$T_e$	Meth	Ref	$\overleftarrow{k}(X^i, \text{He}^+)$	$T_e$	Meth	Ref	$\Delta E, \text{eV}$
$\text{N}^{3+}$	3.1-9	10.0		CW77					
	3.8-9	12.5		CW77					
	4.4-9	15.0		CW77					
	5.6-9	20.0		CW77					
$\text{N}^{4+}$	4.6-9	1.0	LZ	BD80					+52.9
	2.8-9	3.16	LZ	BD80					
	2.0-9	10.0	LZ	BD80					
	1.7-9	31.6	LZ	BD80					
$\text{O}^{2+}$	2.0-10			BG77					+10.5
	2.0-10	10	QM	BD80					
	3.2-10	10	LZ	BD80					
	1.0-10	5	QM	BH80					
	2.0-10	10	QM	BH80					
	3.9-10	20	QM	BH80					
	5.9-10	30	QM	BH80					
	8.9-10	50	QM	BH80					
$\text{O}^{3+}$	1.7-9	1.0	LZ	BD80					+30.3
	1.2-9	3.16	LZ	BD80					
	1.0-9	10.0	LZ	BD80					
	1.0-9	31.6	LZ	BD80					
$\text{O}^{4+}$	1.4-9	1.0	LZ	BD80					+52.8
	8.7-10	3.16	LZ	BD80					
	6.5-10	10.0	LZ	BD80					
	6.4-10	31.6	LZ	BD80					
$\text{Ne}^{2+}$	1.0-14			D80					+16.4
	5.0-15	0.3	exp	JB78					
	1.0-14*	1.0-31.6	LZ	BD80					
$\text{Ne}^{3+}$	1.0-14*	1.0-31.6	LZ	BD80					+38.9
$\text{Ne}^{4+}$	1.7-9	1.0	LZ	BD80					+72.5
	1.7-9	3.16	LZ	BD80					
	1.7-9	10.0	LZ	BD80					
	3.1-9	31.6	LZ	BD80					
$\text{Mg}^{3+}$	7.0-21	10.0		W78					+55.6
	1.2-9	1.0	LZ	BD80					
	8.6-10	3.16	LZ	BD80					
	7.4-10	10.0	LZ	BD80					
	7.7-10	31.6	LZ	BD80					
$\text{Mg}^{4+}$	1.8-9	1.0	LZ	BD80					+84.7
	1.8-9	3.16	LZ	BD80					

Table 21b (Continuation)

$X^{i+1}$	$\vec{k}(X^{i+1}, \text{He}^0)$	$T_e$	Meth	Ref	$\overleftarrow{k}(X^i, \text{He}^+)$	$T_e$	Meth	Ref	$\Delta E, \text{eV}$
$\text{Mg}^{4+}$	2.2-9	10.0	LZ	BD80					
	3.2-9	31.6	LZ	BD80					
$\text{Al}^{3+}$	6.0-15			W78					+3.86
$\text{Si}^{2+}$					1.5-10	10.0	LZ	BD80	-8.24
					2.0-10	31.6	LZ	BD80	
					2.7-10	100	LZ	BD80	
					3.4-10	316	LZ	BD80	
$\text{Si}^{3+}$	1.7-10	1.0	LZ	BD80	3.0-10			B80	+8.88
	3.9-10	3.16	LZ	BD80	9.9-10	10	LZ	BD80	
	9.6-10	10.0	LZ	BD80	2.0-9	31.6	LZ	BD80	
	2.0-10	31.6	LZ	BD80	3.4-9	100	LZ	BD80	
$\text{Si}^{4+}$	1.4-9	0.001		OM85	5.0-15	50		OM85	+20.6 ( $^2S$ )
	7.0-10	0.01		OM85	6.0-13	100		OM85	+11.7 ( $^2P$ )
	4.0-10	0.1		OM85	2.5-10	500		OM85	
	5.0-10	1.0		OM85	1.0-9	1000		OM85	
	9.0-10	3.2		OM85					
	1.6-9	10.0		OM85					
	2.7-9	31.6		OM85					
	4.0-9	100		OM85					
	$\text{S}^{2+}$					2.5-11	10.0	LZ	BD80
					9.8-11	31.6	LZ	BD80	
					2.7-10	100	LZ	BD80	
					5.5-10	316	LZ	BD80	
$\text{S}^{3+}$	3.3-10	1.0	LZ	BD80	1.3-11	10.0	LZ	BD80	+10.4
	5.2-10	3.16	LZ	BD80	8.4-11	31.6	LZ	BD80	
	1.1-9	10.0	LZ	BD80	3.3-10	100	LZ	BD80	
	2.3-9	31.6	LZ	BD80	8.8-10	316	LZ	BD80	
$\text{S}^{4+}$	1.1-12	1.0	LZ	BD80					+22.7
	8.7-13	3.16	LZ	BD80					
	7.6-13	10.0	LZ	BD80					
	1.1-12	31.6	LZ	BD80					
$\text{Ar}^{2+}$	7.0-11	0.3	exp	JB78	1.1-10*	10-316	LZ	BD80	+3.04
	1.3-10*	1-31.6	LZ	BD80					

Table 21b (Continuation)

$X^{i+1}$	$\vec{k}(X^{i+1}, \text{He}^0)$	$T_e$	Meth	Ref	$\overleftarrow{k}(X^i, \text{He}^+)$	$T_e$	Meth	Ref	$\Delta E, \text{eV}$
Ar <sup>3+</sup>	1.0-14*	1-31.6	LZ	BD80					+16.3
Ar <sup>4+</sup>	2.2-9	1.0	LZ	BD80					+35.2
	1.4-9	3.16	LZ	BD80					
	9.8-10	10.0	LZ	BD80					
	8.3-10	31.6	LZ	BD80					

Comments: \* - there is a dependence on  $T_e$

\*\* - empirical values obtained from the best fit of the observed NGC 7027 spectra

DW - distorted wave approximation

LZ - Landau-Zener approximation

QM - ab initio quantum mechanical calculation

exp - experimental data

AH57 - Arthurs & Hyslop (1957)

FS71 - Field & Steigman (1971)

AD65 - Allison & Dalgarno (1965)

GM82 - Gargaud et al. (1982)

B72 - Brown (1972)

HP63 - Hanson et al. (1963)

B76 - Blint et al. (1976)

JB78 - Johnson & Biondi (1978)

B80 - Butler & Dalgarno (1980)

JD71 - Jura & Dalgarno (1971)

BB79 - Butler et al. (1979)

M73 - Melius (1973)

BD79 - Butler & Dalgarno (1979)

MV76 - McCarrol & Valiron (1976)

BD80 - Butler & Dalgarno (1980a)

MV79 - McCarrol & Valiron (1979)

BG77 - Butler et al. (1977)

OM85 - Opradolse et al. (1985)

BH80 - Butler et al. (1980)

PA78 - Pequignot et al. (1978)

BM54 - Bates & Moiseiwisch (1954)

R63 - Rapp (1963)

CW77 - Christensen et al. (1977)

S75 - Steigman (1975)

D54 - Dalgarno (1954)

S75a - Steigman (1975a)

D80 - Dalgarno et al. (1980)

SW71 - Steigman et al. (1971)

DB78 - Dalgarno & Butler (1978)

W78 - Watson (1978)

FF72 - Fehsenfeld & Ferguson (1972)

Table 22

Parameters for recombination and ionization  
charge transfer with H and He (Arnaud & Rothenflug (1985))

Ion	Interval of $T_e, 10^4\text{K}$	$A, 10^{-9} \text{ cm}^3/\text{s}$	$B$	$C$	$D$
Recombination with $\text{H}^0$					
$\text{He}^{1+}$	1	1.9-06	0.0	0.0	0.0
$\text{He}^{2+}$	1	1.6-04	0.0	0.0	0.0
$\text{C}^{1+}$	1	1.4-08	0.0	0.0	0.0
$\text{C}^{2+}$	0.5-5	1.6-04	2.8	350.0	-4.2
$\text{C}^{3+}$	0.5-5	3.65	0.25	0.0	0.0
$\text{C}^{4+}$	0.1-1	0.76	1.4	0.0	0.0
$\text{N}^{1+}$	0.01-10	1.0-03	-0.27	-0.9	-8.8
$\text{N}^{2+}$	0.5-5	0.86	0.15	0.0	0.0
$\text{N}^{3+}$	0.5-5	2.93	0.85	0.0	0.0
$\text{N}^{4+}$	0.1-3	0.15	1.5	440.0	-35.6
$\text{O}^{1+}$	0.01-3	1.0	0.0	-0.66	-9.3
$\text{O}^{2+}$	0.5-5	0.8	0.43	0.0	0.0
$\text{O}^{3+}$	0.5-5	0.85	0.44	0.0	0.0
$\text{O}^{4+}$	0.1-3	0.31	0.44	0.0	0.0
$\text{Ne}^{2+}$	1	<1.0-05	0.0	0.0	0.0
$\text{Ne}^{3+}$	0.5-5	5.7	0.51	0.0	0.0
$\text{Ne}^{4+}$	0.1-3	6.6	0.52	3.3	-5.3
$\text{Mg}^{2+}$	0.1-3	9.0-05	0.0	0.0	0.0
$\text{Mg}^{3+}$	0.1-3	6.6	0.52	2.7	-8.0
$\text{Mg}^{4+}$	0.1-3	6.6	0.52	3.3	-5.3
$\text{Si}^{2+}$	0.03-10	5.0	0.28	0.0	0.0
$\text{Si}^{3+}$	0.1-3	0.41	0.0	0.0	0.0
$\text{Si}^{4+}$	0.1-3	2.4	0.0	0.0	0.0
$\text{S}^{1+}$	1	<3.0-06	0.0	0.0	0.0
$\text{S}^{2+}$	0.1-3	1.0-05	0.0	0.0	0.0
$\text{S}^{3+}$	0.1-3	2.3	0.0	1.25	-5.8
$\text{S}^{4+}$	0.1-3	7.0	0.0	1.25	-5.8
$\text{Ar}^{2+}$	0.1-3	1.0-05	0.0	0.0	0.0
$\text{Ar}^{3+}$	0.1-3	4.4	0.3	0.0	0.0
$\text{Ar}^{4+}$	0.1-3	6.5	0.83	9.4	0.0
Recombination with $\text{He}^0$					
$\text{C}^{2+}$	1	<0.1	0.0	0.0	0.0
$\text{C}^{3+}$	0.1-3	4.6-02	2.0	0.0	0.0
$\text{C}^{4+}$	0.1-3	1.0-05	0.0	0.0	0.0

Table 22 (Continuation)

Ion	Interval of $T_e, 10^4\text{K}$	$A, 10^{-9} \text{ cm}^3/\text{s}$	$B$	$C$	$D$
$\text{N}^{2+}$	0.1-3	0.33	0.29	1.3	-4.5
$\text{N}^{3+}$	0.1-3	0.15	0.0	0.0	0.0
$\text{N}^{4+}$	0.1-3	1.7	0.0	2.5	-3.7
$\text{O}^{2+}$	0.5-5	0.2	0.95	0.0	0.0
$\text{O}^{3+}$	0.1-3	1.0	0.0	1.25	-5.8
$\text{O}^{4+}$	0.1-3	0.64	0.0	2.0	-5.5
$\text{Ne}^{2+}$	0.1-3	1.0-05	0.0	0.0	0.0
$\text{Ne}^{3+}$	0.1-3	1.0-05	0.51	0.0	0.0
$\text{Ne}^{4+}$	0.1-3	1.7	0.52	3.3	-5.3
$\text{Mg}^{3+}$	0.1-3	0.75	0.0	1.25	-5.8
$\text{Mg}^{4+}$	0.1-3	2.2	0.33	0.88	-1.85
$\text{Si}^{3+}$	0.1-3	0.95	0.75	0.0	0.0
$\text{Si}^{4+}$	0.1-3	1.2	0.0	0.0	0.0
$\text{S}^{3+}$	0.1-3	1.1	0.56	0.0	0.0
$\text{S}^{4+}$	0.1-3	7.6-04	0.32	3.4	-5.25
$\text{Ar}^{2+}$	0.1-3	0.13	0.0	0.0	0.0
$\text{Ar}^{3+}$	0.1-3	1.0-05	0.0	0.0	0.0
$\text{Ar}^{4+}$	0.1-3	1.0	-0.3	0.0	0.0

  

Ion	Interval of $T_e, 10^4\text{K}$	$A, 10^{-9} \text{ cm}^3/\text{s}$	$B$	$C$	$\Delta E$
Ionization with $\text{H}^+$					
$\text{O}^0$	0.01-10	0.91	0.0	10	0.0196
$\text{Mg}^{1+}$	1-30	7.6-05	0.0	0.0	1.44
$\text{Si}^0$	1	1.0-02	0.0	0.0	0.03
$\text{Si}^{1+}$	0.50-10	1.7	0.32	0.0	2.74
$\text{S}^0$	1	1.0	0.0	0.0	0.0
Ionization with $\text{He}^+$					
$\text{C}^{1+}$	0.50- 5	5.0-03	2.0	0.07	6.29
$\text{N}^{1+}$	1-30	3.7-03	2.1	0.063	1.44
$\text{Si}^{1+}$	1-30	0.15	0.24	0.0	6.91
$\text{Si}^{2+}$	1-30	0.15	0.44	0.0	8.88
$\text{S}^{1+}$	1-30	2.8-02	1.2	0.036	9.2
$\text{S}^{2+}$	1-30	1.4-02	1.6	0.046	10.5
$\text{Ar}^{1+}$	1-30	0.11	0.0	0.0	3.04

Table 23

Parameters for charge transfer  
with  $H^0$  and  $He^+$  (Suchkov & Shchekinov (1983))\*

Element	Ion							
	$X^+$		$X^{2+}$		$X^{3+}$		$X^{4+}$	
	$k_0$	$\alpha$	$k_0$	$\alpha$	$k_0$	$\alpha$	$k_0$	$\alpha$
a) $X^{i+1} + H^0 \rightarrow X^i + H^+$								
C	3.87-19	1.64	1.90-19	1.68	3.20-10	0.26	1.93-15	1.4
N	1.00-12	1.4	2.10-10	0.153	3.56-12	0.73	2.08-16	1.73
O	6.80-10	0	1.09-11	0.46	1.47-10	0.44	1.07-12	0.6
Ne	0	0	0	0	4.90-11	0.52	5.51-11	0.52
Mg	0	0	4.80-11	0.53	4.80-11	0.53	6.60-09	0
Si	0	0	5.00-09	0	2.80-10	0.041	6.40-10	0.14
S	0	0	1.00-14	0	1.64-09	0.037	2.07-09	0.124
b) $X^{i+1} + He^0 \rightarrow X^i + He^+$								
C	0	0	0	0	1.03-17	1.67	1.00-14	0
N	0	0.9	2.30-11	0.29	1.39-12	0.48	7.35-09	-0.14
O	0	0	0	0	1.00-09	0	7.40-10	-0.013
Ne	0	0	1.00-14	0	1.00-14	0	1.39-11	0
Mg	0	0	0	0	5.40-10	0.035	1.10-10	0.33
Si	0	0	0	0	2.70-12	0.64	6.30-10	0.07
S	0	0	0	0	3.00-12	0.64	3.94-14	0.32
c) $X^i + He^+ \rightarrow X^{i+1} + He^0$								
	$k_1$	$\alpha$	$\Delta E, eV$					
NII	3.00	1.79	5.03					
MgII**	6.65-14	0.02	1.44					
SiII	1.43-11	0.26	6.91					
SiIII	7.10-17	1.54	6.88					
SII	1.80-15	1.03	9.17					
SIII	3.13-17	1.40	10.47					

Comments: \* -  $k(T) = k_0 T^\alpha$  for the reactions with  $H^0$  and  $He^0$  and  $k(T) = k_1 T^\alpha \exp(-\Delta E/kT)$  for the reaction with  $He^+$

\*\* -  $Mg^+ + H^+ \rightarrow Mg^{2+} + H$



Table 24

Recombination charge transfer rates in units  $10^{-9}\text{cm}^3\text{s}^{-1}$  between atoms and ions of heavy elements (Pequignot & Aldrovandi (1986))

Ion	Li	Na	Mg	Al	Si	P	S
C <sup>+</sup>	0.0	0.0	0.0 0.93	0.3 0.63	1.0 0.43	0.1 0.77	0.0 0.90
Li <sup>+</sup>		3.0 0.25					
Na <sup>+</sup>							
Mg <sup>+</sup>	0.0	0.0		0.0			
Al <sup>+</sup>	0.3 0.59	0.0 0.85					
Si <sup>+</sup>	0.0 0.85	0.0 1.1	1.0 0.48	3.0 0.25			
P <sup>+</sup>	0.0	0.0	0.3 0.52	0.0 -0.14	1.0 0.01		3.0 0.13
S <sup>+</sup>	0.0	0.0	0.0 -0.04	0.0	0.0 1.06		
Cl <sup>+</sup>	0.0	0.0	0.1 0.78	0.0	0.0	0.0	0.1 0.65
Ca <sup>+</sup>	0.1 0.72	0.0 0.97		3.0 0.13			
Ti <sup>+</sup>	3.0	3.0		1.0 0.02, 0.78			
Mn <sup>+</sup>	0.0 -0.06	3.0 0.19		0.0			
Fe <sup>+</sup>	3.0	3.0	3.0	1.0 0.36			
Ni <sup>+</sup>	3.0	3.0		0.0 -0.03			
Ca <sup>++</sup>	1.0	1.0	1.0	1.0	1.0	0.0	0.0
H <sup>+</sup>	0.0	0.0	0.0	3.0 0.19	0.0 -0.03	1.0 0.44	3.0 0.20

Table 24 (Continuation)

Ion	Cl	K	Ca	Ti	Mn	Fe	Ni
C <sup>+</sup>		0.0	0.0	3.0	3.0	3.0	3.0
Li <sup>+</sup>		0.0					
Na <sup>+</sup>		0.1 0.80					
Mg <sup>+</sup>		0.3 0.59	0.0 -0.15	1.0 0.78,0.02	3.0 0.21		1.0 0.01
Al <sup>+</sup>		0.0					
Si <sup>+</sup>		0.0	3.0 0.13	3.0	0.1 -0.06,0.7	3.0	3.0 0.33
P <sup>+</sup>		0.0	1.0 0.36	3.0	1.0 0.47	3.0	3.0
S <sup>+</sup>		0.0	0.0 -0.04,1.1	3.0	3.0 0.18	3.0	3.0
Cl <sup>+</sup>		0.0	3.0 0.28	3.0	3.0	3.0	3.0
Ca <sup>+</sup>		0.0					
Ti <sup>+</sup>		3.0	0.1 0.66				
Mn <sup>+</sup>		3.0	0.0	1.0 0.01,0.47			
Fe <sup>+</sup>		3.0	3.0	3.0	3.0 0.32		3.0
Ni <sup>+</sup>		3.0	0.0 1.1	1.0 0.01,0.4	3.0 0.20		
Ca <sup>++</sup>		1.0	1.0	1.0	1.0	1.0	1.0
H <sup>+</sup>	1.0 0.47	0.0	0.0 -0.02,1.0	3.0	3.0	3.0	3.0

Comment: for each ion the value of charge transfer rates is presented in the upper line and the value of  $\Delta E$  (in  $\text{cm}^{-1}$ ) – in the lower line.

Table 25

The list of lines observed in the spectra of gaseous nebulae

$\lambda, \text{\AA}$	Ion	Transition	$A, s^{-1}$	Ex. M.	Ref
919.78	ArII	$3p^5 \ ^2P_{3/2} - 3p^6 \ ^2S_{1/2}$	1.398+8	C	M91
932.05	ArII	$3p^5 \ ^2P_{1/2} - 3p^6 \ ^2S_{1/2}$	6.719+7	C	M91
933.38	SVI	$3s \ ^2S_{1/2} - 3p \ ^2P_{3/2}$	1.690+9	C	M91
972.11	HeII	2-8	3.550+6	R	R80
972.54	HI-L $\gamma$	$1s \ ^2S_{1/2} - 4p \ ^2P_{3/2}$	6.818+7	R	M91
977.03	CIII	$2s^2 \ ^1S_0 - 2p \ ^1P_1$	1.775+9	C, Au	M91
989.79	NIII	$2p \ ^2P_{1/2} - 2p^2 \ ^2D_{3/2}$	3.630+8	C	M91
991.51	NIII	$2p \ ^2P_{3/2} - 2p^2 \ ^2D_{5/2}$	4.332+8	C	M91
992.36	HeII	2-7	7.030+6	R	R80
998.43	ArVI	$3p \ ^2P_{1/2} - 3p^2 \ ^4P_{3/2}$		C	
1000.16	ArVI	$3p \ ^2P_{1/2} - 3p^2 \ ^4P_{1/2}$		C	
1012.67	ArVI	$3p \ ^2P_{3/2} - 3p^2 \ ^4P_{3/2}$		C	
1020	NeVI	$2p \ ^2P_{3/2} - 2p^2 \ ^4P_{1/2}$		C	
1022.6	ArVI	$3p \ ^2P_{3/2} - 3p^2 \ ^4P_{1/2}$		C	
1025.27	HeII	2-6	1.560+7	R	R80
1025.72	HI-L $\beta$	$1s \ ^2S_{1/2} - 3p \ ^2P_{1/2}$	1.672+8	R	M91
1031.91	OVI	$2s \ ^2S_{1/2} - 2p \ ^2P_{3/2}$	4.163+8	C, Au	M91
1037.02	CII	$2p \ ^2P_{3/2} - 2p^2 \ ^2S_{1/2}$	1.526+9	C	M91
1037.61	OVI	$2s \ ^2S_{1/2} - 2p \ ^2P_{1/2}$	4.095+8	C, Au	M91
1072.99	SIV	$3p \ ^2P_{3/2} - 3p^2 \ ^2D_{5/2}$	1.377+8	C	M91
1084.58	NII	$2p^2 \ ^3P_1 - 2p^3 \ ^3D_2$	2.629+8	C	M91
1084.94	HeII	2-5	4.050+7	R	R80
1085.70	NII	$2p^2 \ ^3P_2 - 2p^3 \ ^3D_3$	3.494+8	C	M91
1175.71	CIII	$2p \ ^3P_2 - 2p^2 \ ^3P_2$		C, D	
1176.37	CIII	$2p \ ^3P_2 - 2p^2 \ ^3P_1$		C, D, Au	
1194.50	SiIII	$3p \ ^2P_{3/2} - 3p^2 \ ^2P_{3/2}$	2.914+9	C	M91
1198.6	SV	$3s^2 \ ^1S_0 - 3p \ ^3P_1$	1.640+5	C	M91
1201.97	SIII	$3p^2 \ ^3P_2 - 3p^3 \ ^3D_3$	6.098+7	C	M91
1206.51	SiIII	$3s^2 \ ^1S_0 - 3p \ ^1P_1$	2.550+9	C	M91
1215.09	HeII	2-4	1.350+8	R	R80
1215.17	HeII	2-4	1.350+8	R	R80
1215.67	HI-L $\alpha$	$1s \ ^2S_{1/2} - 2p \ ^2P_{3/2}$	6.265+8	R	M91
1218.34	OVI	$2s^2 \ ^1S_0 - 2p \ ^3P_1$	2.210+3	C, Au	M91
1238.82	NV	$2s \ ^2S_{1/2} - 2p \ ^2P_{3/2}$	3.411+8	C, Au	M91
1242.80	NV	$2s \ ^2S_{1/2} - 2p \ ^2P_{1/2}$	3.378+8	C, Au	M91
1247.38	CIII	$2p \ ^1P_1 - 2p^2 \ ^1S_0$	1.860+9	C, D	R80
1256.52	CIII	$3s \ ^3S_1 - 4p \ ^3P_2$	1.040+8	C, D	NS84
1259.52	SII	$3p^3 \ ^4S_{3/2} - 3p^4 \ ^4P_{5/2}$	4.553+7	C	M91

Table 25 (Continuation)

$\lambda, \text{\AA}$	Ion	Transition	$A, \text{s}^{-1}$	Ex.M.	Ref
1264.74	SiIII	$3p^2 P_{3/2} - 3d^2 D_{5/2}$	2.512+9	C	M91
1302.17	OI	$2p^4 {}^3P_2 - 3s^3 S_1$	3.204+8	C	M91
1304.37	SiIII	$3p^2 P_{1/2} - 3p^2 {}^2S_{1/2}$	5.776+8	C	M91
1304.86	OI	$2p^4 {}^3P_1 - 3s^3 S_1$	1.911+8	C	M91
1306.03	OI	$2p^4 {}^3P_0 - 3s^3 S_1$	6.352+7	C	M91
1309.28	SiIII	$3p^2 P_{3/2} - 3p^2 {}^2S_{1/2}$	1.142+9	C	M91
1335.71	CII	$2p^2 P_{3/2} - 2p^2 D_{5/2}$	2.864+8	C,D	M91
1343.51	OIV	$2p^2 {}^2P_{3/2} - 2p^3 D_{5/2}$	2.640+8	C	R80
1371.29	OV	$2p^1 P_1 - 2p^2 D_2$	3.480+8	C,D	Kh81
1393.78	SiIV	$3s^2 S_{1/2} - 3p^2 P_{3/2}$	8.825+8	C	M91
1397.20	OIV]	$2p^2 P_{1/2} - 2p^2 {}^4P_{3/2}$	5.815+1	C	M91
1399.77	OIV]	$2p^2 P_{1/2} - 2p^2 {}^4P_{1/2}$	2.075+3	C	M91
1401.16	OIV]	$2p^2 P_{3/2} - 2p^2 {}^4P_{5/2}$	1.466+3	C	M91
1402.77	SiIV	$3s^2 S_{1/2} - 3p^2 P_{1/2}$	8.656+8	C	M91
1404.81	OIV]	$2p^2 P_{3/2} - 2p^2 {}^4P_{3/2}$	4.414+2	C	M91
1407.39	OIV]	$2p^2 P_{3/2} - 2p^2 {}^4P_{1/2}$	2.120+3	C	M91
1483.3	NIV]	$2s^2 {}^1S_0 - 2p^3 P_2$	1.150-2	C	M83
1486.50	NIV]	$2s^2 {}^1S_0 - 2p^3 P_1$	5.773+2	C	M91
1503.7	[NaIV]	$2p^4 {}^3P_2 - 2p^4 {}^1S_0$	1.050-2	C	M83
1529.1	[NaIV]	$2p^4 {}^3P_1 - 2p^4 {}^1S_0$	0.710+1	C	M83
1548.20	CIV	$2s^2 S_{1/2} - 2p^2 P_{3/2}$	2.654+8	C	M91
1550.77	CIV	$2s^2 S_{1/2} - 2p^2 P_{1/2}$	2.641+8	C	M91
1574.9	[NeV]	$2p^2 {}^3P_1 - 2p^2 {}^1S_0$	0.421+1	C	M83
1592.7	[NeV]	$2p^2 {}^3P_2 - 2p^2 {}^1S_0$	6.690-3	C	M83
1608.8	[NeIV]	$2p^3 {}^4S_{3/2} - 2p^3 {}^2P_{3/2}$	0.127+1	C	M83
1609.0	[NeIV]	$2p^3 {}^4S_{3/2} - 2p^3 {}^2P_{1/2}$	5.210-1	C	M83
1620.05	CIII	$3p^3 P_1 - 4d^3 D_2$	8.520+8	R,D	NS84
1640.33	HeII	$2-3$	7.060+8	R	R80
1640.47	HeII	$2-3$	7.060+8	R	R80
1640.49	HeII	$2-3$	7.060+8	R	R80
1641.3	OI]	$2p^4 {}^1D_2 - 3s^3 S_1$		C	
1661.17	OIII]	$2p^2 {}^3P_1 - 2p^3 {}^5S_2$	2.369+2	C,Au	M91
1666.52	OIII]	$2p^2 {}^3P_2 - 2p^3 {}^5S_2$	5.845+2	C,Au	M91
1711.30	SiII	$3p^2 {}^2D_{5/2} - 5f^2 F_{7/2}$		R	
1718.55	NIV	$2p^1 P_1 - 2p^2 D_2$	2.540+8	C,D	Kh81
1746.82	NIII]	$2p^2 P_{1/2} - 2p^2 {}^4P_{3/2}$	8.950+0	C	M91
1748.61	NIII]	$2p^2 P_{1/2} - 2p^2 {}^4P_{1/2}$	3.390+2	C	M91
1749.67	NIII]	$2p^2 P_{3/2} - 2p^2 {}^4P_{5/2}$	2.510+2	C	M91
1751.22	NIII]	$2p^2 P_{3/2} - 2p^2 {}^4P_{3/2}$	5.900+1	C	M91
1753.99	NIII]	$2p^2 P_{3/2} - 2p^2 {}^4P_{1/2}$	3.640+2	C	M91

Table 25 (Continuation)

$\lambda, \text{\AA}$	Ion	Transition	$A, \text{s}^{-1}$	Ex.M.	Ref
1760.40	CII	$2p^2\ ^2D_{5/2} - 3p\ ^2P_{3/2}$	3.500+7	R	B85
1793.8	[NeIII]	$2p^4\ ^3P_2 - 2p^4\ ^1S_0$	3.940-3	C	M83
1808.01	SiII	$3p\ ^2P_{1/2} - 3p^2\ ^2D_{3/2}$	5.639+6	C	M91
1814.7	[NeIII]	$2p^4\ ^3P_1 - 2p^4\ ^1S_0$	2.000+0	C	M83
1816.93	SiII	$3p\ ^2P_{3/2} - 3p^2\ ^2D_{5/2}$	6.668+6	C	M91
1817.45	SiII	$3p\ ^2P_{3/2} - 3p^2\ ^2D_{3/2}$	1.110+6	C	M91
1854.72	AlIII	$3s\ ^2S_{1/2} - 3p\ ^2P_{3/2}$	5.432+8	C	M91
1862.79	AlIII	$3s\ ^2S_{1/2} - 3p\ ^2P_{1/2}$	5.361+8	C	M91
1867.4	[FIV]	$2p^2\ ^3P_0 - 2p^2\ ^1S_0$		C	
1875.5	[FIV]	$2p^2\ ^3P_1 - 2p^2\ ^1S_0$	1.100+0	C	G68
1883	SiIII]	$3s^2\ ^1S_0 - 3p\ ^3P_2$	1.200-2	C	M83
1889.3	[FIV]	$2p^2\ ^3P_2 - 2p^2\ ^1S_0$	2.300-3	C	G68
1892.03	SiIII]	$3s^2\ ^1S_0 - 3p\ ^3P_1$	1.670+4	C	M91
1906.68	CIII]	$2s^2\ ^1S_0 - 2p\ ^3P_2$	5.190-3	C, Au, Ph	M83
1908.73	CIII]	$2s^2\ ^1S_0 - 2p\ ^3P_1$	7.520+1	C, Au, Ph	M91
1922.93	CIII	$3p\ ^3D_3 - 4f\ ^3F_4$	7.720+8	R, D	NS84
1939.6	[FIII]	$2p^3\ ^4S_{3/2} - 2p^3\ ^4P_{3/2}$	0.260+0	C	G68
1939.6	[FIII]	$2p^3\ ^4S_{3/2} - 2p^3\ ^4P_{1/2}$	0.100+0	C	G68
2009.57	CIII	$3p\ ^3P_1 - 4s\ ^3S_1$	6.860+8	R	NS84
2010.09	CIII	$3p\ ^3P_2 - 4s\ ^3S_1$	6.860+8	R	NS84
2112.0	[CaVII]	$3p^2\ ^3P_1 - 3p^2\ ^1S_0$	3.400+1	C	G68
2139.01	NII]	$2p^2\ ^3P_1 - 2p^3\ ^5S_2$	5.700+1	C	M91
2225.61	[FII]	$2p^4\ ^3P_2 - 2p^4\ ^1S_0$	1.600-3	C	G68
2226.0	[CaVII]	$3p^2\ ^3P_2 - 3p^2\ ^1S_0$	0.250+0	C	G68
2242.61	[FII]	$2p^4\ ^3P_1 - 2p^4\ ^1S_0$	0.490+0	C	G68
2252.69	HeII-P $_{\zeta}$	$3-10$	8.250+5	R	R80
2280.0	[CaV]	$3p^4\ ^3P_2 - 3p^4\ ^1S_0$	0.145+0	C	M83
2296.87	CIII	$2p\ ^1P_1 - 2p^2\ ^1D_2$	1.490+8	C, D	Kh81
2306.19	HeII-P $_{\epsilon}$	$3-9$	1.430+6	R	R80
2321.08	[OIII]	$2p^2\ ^3P_1 - 2p^2\ ^1S_0$	0.223+0	C	M83
2325.40	CII]	$2p\ ^2P_{3/2} - 2p^2\ ^4P_{5/2}$	4.320+1	C	M91
2328.12	CII]	$2p\ ^2P_{3/2} - 2p^2\ ^4P_{1/2}$	6.550+1	C	M91
2331.55	[OIII]	$2p^2\ ^3P_2 - 2p^2\ ^1S_0$	7.850-4	C	M83
2334.40	SiIII]	$3p\ ^2P_{1/2} - 3p^2\ ^4P_{1/2}$	4.550+3	C	M91
2334.61	SiIII]	$3p\ ^2P_{3/2} - 3p^2\ ^4P_{5/2}$	2.400+3	C	M91
2350.17	SiIII]	$3p\ ^2P_{3/2} - 3p^2\ ^4P_{1/2}$	3.000+3	C	M91
2366.8	[KVI]	$3p^2\ ^3P_1 - 3p^2\ ^1S_0$	1.600+1	C	G68
2385.40	HeII-P $_{\delta}$	$3-8$	2.640+6	R	R80
2399.2	FeII	$4s^6\ ^5D_{5/2} - z^6\ ^5F_{5/2}$	1.366+8	C	M91
2412.4	[CaV]	$3p^4\ ^3P_1 - 3p^4\ ^1S_0$	2.310+1	C	M83
2416.5	[MgV]	$2p^4\ ^1D_2 - 2p^4\ ^1S_0$	4.230+0	C	M83

Table 25 (Continuation)

$\lambda, \text{\AA}$	Ion	Transition	$A, s^{-1}$	Ex.M.	Ref
2421.8	[NeIV]	$2p^3\ ^4S_{3/2} - 2p^3\ ^2D_{3/2}$	5.540-3	C, Au	M83
2436.2	FeII	$a^4G_{11/2} - y^4H_{11/2}$		C	
2438.6	[NeIV]	$2p^3\ ^4S_{3/2} - 2p^3\ ^2D_{5/2}$	4.840-4	C	M83
2441.6	[MgVII]	$2p^2\ ^1D_2 - 2p^2\ ^3P_0$	1.600-4	C	KL80
2444.5	FeII	$b^4P_{5/2} - y^4D_{7/2}$		C	
2458.8	FeII	$a^4G_{9/2} - y^4H_{11/2}$		C	
2465.2	FeII	$b^4P_{1/2} - y^4D_{3/2}$		C	
2470.32	[OIII]	$2p^3\ ^4S_{3/2} - 2p^3\ ^2P_{1/2}$	0.232-1	C	M83
2470.41	[OIII]	$2p^3\ ^4S_{3/2} - 2p^3\ ^2P_{3/2}$	0.564-1	C	M83
2471.7	[KVI]	$3p^2\ ^3P_2 - 3p^2\ ^1S_0$	0.140+0	C	G68
2479.2	FeII	$c^2D_{5/2} - w^2D_{3/2}$		C	
2481.0	FeII	$b^2H_{11/2} - y^4H_{11/2}$		C	
2482.3	FeII	$c^2D_{3/2} - w^2D_{3/2}$		C	
2484.2	FeII	$b^2H_{11/2} - y^4H_{13/2}$		C	
2492.3	FeII	$b^2H_{9/2} - y^4H_{11/2}$		C	
2494.5	[KV]	$3p^3\ ^4S_{3/2} - 3p^3\ ^2P_{3/2}$	5.190+0	C	M83
2506.4	FeII	$c^4F_{9/2} - z^4G_{9/2}$		C	
2506.8	FeII	$c^4F_{7/2} - y^6F_{9/2}$		C	
2508.3	FeII	$c^4F_{7/2} - w^4G_{9/2}$		C	
2511.20	HeII-P $_{\gamma}$	3-7	5.370+6	R	R80
2512.0	[MgVII]	$2p^2\ ^3P_1 - 2p^2\ ^1D_2$	1.050+0	C	KL80
2514.5	[KV]	$3p^3\ ^4S_{3/2} - 3p^3\ ^2P_{1/2}$	2.140+0	C	M83
2519.4	FeII	$b^2P_{1/2} - x^4P_{3/2}$		C	
2548.2	FeII	$b^4F_{5/2} - y^6P_{7/2}$		C	
2562.5	FeII	$a^4D_{7/2} - x^4P_{5/2}$		C	
2582.6	FeII	$a^4D_{3/2} - x^4P_{3/2}$		C	
2585.9	FeII	$a^6D_{9/2} - x^6D_{7/2}$	8.046+7	C	M91
2591.5	FeII	$a^4D_{5/2} - x^4P_{5/2}$		C	
2593.5	[KIV]	$3p^4\ ^3P_2 - 3p^4\ ^1S_0$	0.817-1	C	M83
2593.60	NeIII	$3s\ ^5S_2 - 3p\ ^5P_2$		R	
2595.68	NeIII	$3s\ ^5S_2 - 3p\ ^5P_1$		R	
2598.4	FeII	$a^6D_{7/2} - z^6D_{5/2}$	1.307+8	C	M91
2599.4	FeII	$a^6D_{9/2} - a^6D_{7/2}$		C	
2604.0	FeII	$c^2F_{7/2} - v^2G_{7/2}$		C	
2605.0	FeII	$c^2F_{5/2} - v^2G_{7/2}$		C	
2606.5	FeII	$b^2D_{5/2} - x^2D_{5/2}$		C	
2607.1	FeII	$a^6D_{5/2} - z^6D_{3/2}$	1.658+8	C	M91
2611.9	FeII	$a^6D_{7/2} - z^6D_{7/2}$	1.089+8	C	M91

Table 25 (Continuation)

$\lambda, \text{\AA}$	Ion	Transition	$A, \text{s}^{-1}$	Ex.M.	Ref
2613.8	FeII	$a^6 D_{3/2} - z^6 D_{1/2}$	1.988+8	C	M91
2617.6	FeII	$a^6 D_{5/2} - z^6 D_{5/2}$	4.364+7	C	M91
2620.4	FeII	$a^6 D_{3/2} - z^6 D_{3/2}$	3.590+6	C	M91
2625.6	FeII	$a^6 D_{7/2} - z^6 D_{9/2}$	3.353+7	C	M91
2628.3	FeII	$a^6 D_{1/2} - z^6 D_{3/2}$	8.560+7	C	M91
2631.0	FeII	$a^6 D_{3/2} - z^6 D_{5/2}$	7.682+7	C	M91
2631.3	FeII	$a^6 D_{5/2} - z^6 D_{7/2}$	6.032+7	C	M91
2663.27	HeI	$2s^3 S_1 - 11p^3 P_{0-2}$	3.190+5	R	T87
2669.16	AlIII	$3s^2 1 S_0 - 3p^3 P_1$	3.330+3	C	M91
2690.82	[ArV]	$3p^2 3 P_1 - 3p^2 1 S_0$	6.550+0	C	KL80
2696.12	HeI	$2s^3 S_1 - 9p^3 P_{0-2}$	5.790+5	R	T87
2709.4	FeII	$a^4 D_{5/2} - z^4 F_{3/2}$		C	
2711.2	[KIV]	$3p^4 3 P_1 - 3p^4 1 S_0$	1.000+1	C	M83
2711.8	FeII	$a^4 G_{11/2} - z^2 I_{13/2}$		C	
2712.4	FeII	$a^4 G_{9/2} - z^2 I_{11/2}$		C	
2714.4	FeII	$a^4 D_{7/2} - z^4 D_{5/2}$		C	
2716.7	FeII	$a^4 D_{7/2} - z^4 F_{7/2}$		C	
2723.19	HeI	$2s^3 S_1 - 8p^3 P_{0-2}$	8.170+5	R	T87
2724.9	FeII	$a^4 D_{5/2} - z^4 F_{5/2}$		C	
2727.5	FeII	$a^4 D_{5/2} - z^4 D_{3/2}$		C	
2730.7	FeII	$a^4 D_{3/2} - z^4 F_{3/2}$		C	
2732.4	FeII	$a^4 F_{9/2} - z^6 D_{9/2}$		C	
2733.30	HeII- $P_\beta$	$3-6$	1.250+7	R	R80
2739.5	FeII	$a^4 D_{7/2} - z^4 D_{7/2}$		C	
2741.7	FeII	$z^2 F_{5/2} - e^2 F_{5/2}$		C	
2743.2	FeII	$a^4 D_{1/2} - z^4 F_{3/2}$		C	
2746.5	FeII	$a^4 D_{3/2} - z^4 F_{5/2}$		C	
2747.0	FeII	$a^4 D_{5/2} - z^4 D_{5/2}$		C	
2749.2	FeII	$a^4 D_{3/2} - z^4 D_{3/2}$		C	
2749.3	FeII	$a^4 D_{5/2} - z^4 F_{7/2}$		C	
2749.5	FeII	$a^4 D_{1/2} - z^4 D_{1/2}$		C	
2754.9	FeII	$z^6 F_{7/2} - e^6 D_{5/2}$		C	
2755.1	FeII	$z^6 F_{7/2} - e^6 D_{3/2}$		C	
2755.7	FeII	$a^4 D_{7/2} - z^4 F_{9/2}$		C	
2763.80	HeI	$2s^3 S_1 - 7p^3 P_{0-2}$	1.200+6	R	T87
2767.5	FeII	$b^2 H_{11/2} - z^2 I_{13/2}$		C	
2767.5	FeII	$z^6 F_{9/2} - e^6 D_{7/2}$		C	
2768.9	FeII	$a^4 D_{3/2} - z^4 D_{5/2}$		C	

Table 25 (Continuation)

$\lambda, \text{\AA}$	Ion	Transition	$A, \text{s}^{-1}$	Ex.M.	Ref
2771.2	FeII	$b^2G_{9/2} - y^4H_{11/2}$		C	
2776.9	FeII	$z^6F_{7/2} - e^6D_{7/2}$		C	
2783.2	[MgV]	$2p^4\ ^3P_2 - 2p^4\ ^1D_2$	1.850+0	C	M83
2785.2	FeII	$z^6F_{11/2} - e^6D_{9/2}$		C	
2785.76	[ArV]	$3p^2\ ^3P_2 - 3p^2\ ^1S_0$	0.569-1	C	KL80
2790.6	FeII	$b^2G_{7/2} - y^4H_{9/2}$		C	
2790.78	MgII	$3p\ ^2P_{1/2} - 3d\ ^2D_{3/2}$		C,R	
2795.53	MgII	$3s\ ^2S_{1/2} - 3p\ ^2P_{3/2}$	2.612+8	C	M91
2797.99	MgII	$3p\ ^2P_{3/2} - 3d\ ^2D_{5/2}$		C,R	
2802.70	MgII	$3s\ ^2S_{1/2} - 3p\ ^2P_{1/2}$	2.592+8	C	M91
2803.3	[NaIV]	$2p^4\ ^1D_2 - 2p^4\ ^1S_0$	3.460+0	C	M83
2818.68	OIII	$3p\ ^3D_2 - 3d\ ^3P_2$	6.980+5	B,R	E84
2829.08	HeI	$2s\ ^3S_1 - 6p\ ^3P_{0-2}$	1.860+6	R	T87
2836.34	OIII	$3p\ ^3D_3 - 3d\ ^3P_2$	8.710+6	B,R	E84
2839.5	FeII	$z^4F_{9/2} - e^4D_{7/2}$		C	
2845.5	FeII	$z^4D_{3/2} - e^4D_{3/2}$		C	
2848.1	FeII	$z^4D_{5/2} - e^4D_{5/2}$		C	
2848.3	FeII	$z^4F_{5/2} - e^4D_{3/2}$		C	
2851.7	FeII	$z^4F_{3/2} - e^4D_{1/2}$		C	
2853.68	[ArIV]	$3p^3\ ^4S_{3/2} - 3p^3\ ^2P_{3/2}$	2.110+0	C	M83
2856.4	FeII	$z^6P_{5/2} - e^6D_{7/2}$		C	
2856.9	FeII	$z^4D_{7/2} - e^4D_{7/2}$		C	
2865.5	FeII	$z^4F_{3/2} - e^4D_{3/2}$		C	
2868.18	[ArIV]	$3p^3\ ^4S_{3/2} - 3p^3\ ^2P_{1/2}$	0.862+0	C	M83
2886.2	FeII	$b^2H_{11/2} - z^4G_{9/2}$		C	
2888.1	FeII	$b^2P_{3/2} - y^4P_{5/2}$		C	
2916.2	FeII	$a^4D_{7/2} - z^6F_{7/2}$		C	
2922.0	FeII	$b^4D_{7/2} - x^4G_{9/2}$		C	
2926.6	FeII	$a^4D_{7/2} - z^6F_{9/2}$		C	
2928.7	[MgV]	$2p^4\ ^3P_1 - 2p^4\ ^1D_2$	0.541+0	C	M83
2930.0	[FIII]	$2p^3\ ^4S_{3/2} - 2p^3\ ^2D_{3/2}$	1.300-3	C	G68
2933.1	[FIII]	$2p^3\ ^4S_{3/2} - 2p^3\ ^2D_{5/2}$	1.300-4	C	G68
2944.1	FeII	$a^4P_{3/2} - z^4P_{1/2}$		C	
2945.11	HeI	$2s\ ^3S_1 - 5p\ ^3P_{0-2}$	3.080+6	R	T87
2945.3	FeII	$a^4D_{5/2} - z^6F_{5/2}$		C	
2953.8	FeII	$a^4D_{5/2} - z^6F_{7/2}$		C	
2958.36	[OI]	$2p^4\ ^3P_2 - 2p^4\ ^1S_0$	2.880-4	C	M83
2964.6	FeII	$a^4P_{1/2} - z^4P_{1/2}$		C	



Table 25 (Continuation)

$\lambda, \text{\AA}$	Ion	Transition	$A, \text{s}^{-1}$	Ex.M.	Ref
2965.0	FeII	$a^4P_{3/2} - z^4P_{3/2}$		C	
2970.5	FeII	$a^4D_{3/2} - z^6F_{5/2}$		C	
2972.29	[OI]	$2p^4\ ^3P_1 - 2p^4\ ^1S_0$	0.732-1	C	M83
2972.56	NIII	$3p'^2\ P_{1/2} - 3d'^2\ P_{1/2}$	6.310+7	R,D	NS84
2973.4	[NeV]	$2p^2\ ^1D_2 - 2p^2\ ^1S_0$	2.850+0	C	M83
2978.83	NIII	$3p'^2\ P_{1/2} - 3d'^2\ P_{3/2}$	3.600+7	R,D	NS84
2979.1	FeII	$b^2F_{7/2} - z^2H_{9/2}$		C	
2979.3	FeII	$a^4D_{1/2} - z^6F_{3/2}$		C	
2984.8	FeII	$a^4P_{5/2} - z^4P_{5/2}$		C	
3002.7	FeII	$a^4P_{3/2} - z^4P_{5/2}$		C	
3005.22	[ArIII]	$3p^4\ ^3P_2 - 3p^4\ ^1S_0$	0.417-1	C	M83
3023.45	OIII	$3s\ ^3P_1 - 3p\ ^3P_2$	5.100+7	B,R	E84
3024.57	OIII	$3s\ ^3P_0 - 3p\ ^3P_1$	6.560+7	B,R	E84
3047.13	OIII	$3s\ ^3P_2 - 3p\ ^3P_2$	1.610+8	B,R	E84
3059.30	OIII	$3s\ ^3P_2 - 3p\ ^3P_1$	9.650+7	B,R	E84
3062.83	[NII]	$2p^2\ ^3P_1 - 2p^2\ ^1S_0$	0.338-1	C	M83
3070.55	[NII]	$2p^2\ ^3P_2 - 2p^2\ ^1S_0$	1.510-4	C	M83
3109.16	[ArIII]	$3p^4\ ^3P_1 - 3p^4\ ^1S_0$	3.910+0	C	M83
3118.61	[ClIV]	$3p^2\ ^3P_1 - 3p^2\ ^1S_0$	2.470+0	C	KL80
3121.71	OIII	$3p\ ^3S_1 - 3d\ ^3P_1$	1.240+8	B,R	E84
3132.86	OIII	$3p\ ^3S_1 - 3d\ ^3P_2$	1.360+8	B,R	E84
3183.1	FeII	$a^4P_{3/2} - z^4P_{5/2}$		C	
3187.74	HeI	$2s\ ^3S_1 - 4p\ ^3P_{0-2}$	5.420+6	R	T87
3196.1	FeII	$a^4P_{5/2} - z^4F_{7/2}$		C	
3203.10	HeII-P $_{\alpha}$	3-5	3.520+7	R	R80
3203.60	[ClIV]	$3p^2\ ^3P_2 - 3p^2\ ^1S_0$	0.262-1	C	KL80
3241.67	[NaIV]	$2p^4\ ^3P_2 - 2p^4\ ^1D_2$	0.610+0	C	M83
3260.98	OIII	$3p\ ^3D_2 - 3d\ ^3F_3$	2.040+8	R,D	E84
3265.43	OIII	$3p\ ^3D_3 - 3d\ ^3F_4$	2.240+8	R,D	E84
3299.36	OIII	$3s\ ^3P_0 - 3p\ ^3S_1$	2.090+7	B,R	E84
3300.0	[NeV]	$2p^2\ ^3P_0 - 2p^2\ ^1D_2$	2.370-5	C	M83
3306.63	NIII	$4p^2\ P_{3/2} - 5d^2\ D_{5/2}$	7.980+7	R	NS84
3312.30	OIII	$3s\ ^3P_1 - 3p\ ^3S_1$	5.780+7	B,R,D,Ch	E84
3319.00	[FeIII]	$a\ ^5D_2 - a\ ^3D_3$		C	
3334.84	[FeIII]	$a\ ^5D_2 - a\ ^3D_2$		C	
3334.84	NeII	$3s^4\ P_{5/2} - 3p^4\ D_{7/2}$		R	
3340.74	OIII	$3s\ ^3P_2 - 3p\ ^3S_1$	7.970+7	B,R,D,Ch	E84
3340.81	[FeIII]	$a\ ^5D_1 - a\ ^3D_3$		C	
3342.55	[NeIII]	$2p^4\ ^1D_2 - 2p^4\ ^1S_0$	2.710+0	C	M83
3342.85	[ClIII]	$3p^3\ ^4S_{3/2} - 3p^3\ ^2P_{3/2}$	0.754+0	C	M83
3345.86	[NeV]	$2p^2\ ^3P_1 - 2p^2\ ^1D_2$	0.131+0	C	M83

Table 25 (Continuation)

$\lambda, \text{\AA}$	Ion	Transition	$A, \text{s}^{-1}$	Ex. M.	Ref
3349.12	OIV	$3s^2 P_{3/2} - 3p^2 D_{5/2}$	1.330+8	R	NS84
3350.68	OIII	$3s^1 5P_2 - 3p^1 5P_1$		R, D	
3350.99	OIII	$3s^1 5P_3 - 3p^1 5P_3$		R, D	
3353.21	[ClIII]	$3p^3 4S_{3/2} - 3p^3 2P_{1/2}$	0.305+0	C	M83
3355.05	NeII	$3s^4 P_{3/2} - 3p^4 D_{5/2}$	1.300+8	R	R80
3355.05	[FeIII]	$a^5 D_1 - a^3 D_1$		C	
3362.20	[NaIV]	$2p^4 3P_1 - 2p^4 1D_2$	0.186+0	C	M83
3381.24	OIV	$3s^4 P_{3/2} - 3p^4 P_{5/2}$		R	
3382.69:	OIII	$3p^1 5P_2 - 3d^1 5D_3$		R, D	
3385.50	OIV	$3s^4 P_{5/2} - 3p^4 D_{7/2}$		R	
3396.67	OIV	$3s^4 P_{3/2} - 3p^4 D_{3/2}$		R	
3403.54	OIV	$3p^2 P_{1/2} - 3d^2 D_{3/2}$	8.060+7	R	NS84
3404.82	NeII	$3p^2 D_{3/2} - 3d^2 D_{5/2}$	1.900+8	R	R80
3405.74	OIII	$3p^3 P_0 - 3d^3 P_1$	2.070+7	B, R	E84
3407.38	OII	$3p^2 D_{5/2} - 4s^2 D_{5/2}$	4.080+7	R	NS84
3407.38	OII	$3p^2 D_{5/2} - 4s^2 D_{3/2}$	4.080+7	R	NS84
3407.96	OIII	$3p^3 P_1 - 3d^3 P_0$	8.200+7	R	E84
3409.60	OIV	$3s^4 P_{5/2} - 3p^4 D_{5/2}$		R	
3411.69	OIV	$3p^2 P_{3/2} - 3d^2 D_{5/2}$	1.030+8	R	NS84
3415.18	OIII	$3p^3 P_1 - 3d^3 P_1$	2.560+7	B, R	E84
3416.2	[NaIV]	$2p^4 3P_0 - 2p^4 1D_2$	2.240-5	C	M83
3425.97	[NeV]	$2p^2 3P_2 - 2p^2 1D_2$	0.365+0	C	M83
3428.67	OIII	$3p^3 P_1 - 3d^3 P_2$	9.840+6	B, R	E84
3430.60	OIII	$3p^3 P_2 - 3d^3 P_1$	3.120+7	B, R	E84
3433.9	OVI	$6fgFG - 7ghGH$	5.910+8	R	Kh93
3444.10	OIII	$3p^3 P_2 - 3d^3 P_2$	5.820+7	B, R	E84
3447.59	HeI	$2s^1 S_0 - 6p^1 P_1$	2.230+6	R	T87
3450.40	OIII	$3p^1 5D_1 - 3d^1 5F_1$		R, D	
3455.20	OIII	$3p^1 5D_2 - 3d^1 5F_2$		R, D	
3466.50	[NI]	$2p^3 4S_{3/2} - 2p^3 2P_{3/2}$	6.580-3	C	M83
3466.54	[NI]	$2p^3 4S_{3/2} - 2p^3 2P_{1/2}$	2.710-3	C	M83
3471.81	HeI	$2p^3 P - 16d^3 D$	3.140+5	R	T87
3478.71	NIV	$3s^3 S_1 - 3p^3 P_2$	1.100+8	R, D	R80
3478.96	HeI	$2p^3 P - 15d^3 D$	3.820+5	R	T87
3485.5	[MgVI]	$2p^3 2D_{5/2} - 2p^3 2P_{3/2}$	2.400+0	C	G68
3487.72	HeI	$2p^3 P - 14d^3 D$	4.710+5	R	T87
3488.1	[MgVI]	$2p^3 2D_{3/2} - 2p^3 2P_{3/2}$	3.800+0	C	G68
3498.64	HeI	$2p^3 P - 13d^3 D$	5.900+5	R	T87
3500.4	[MgVI]	$2p^3 2D_{5/2} - 2p^3 2P_{1/2}$	0.150+0	C	G68
3503.0	[MgVI]	$2p^3 2D_{3/2} - 2p^3 2P_{1/2}$	2.500+0	C	G68

Table 25 (Continuation)

$\lambda, \text{\AA}$	Ion	Transition	$A, \text{s}^{-1}$	Ex.M.	Ref
3512.51	HeI	$2p^3P - 12d^3D$	7.520+5	R	T87
3530.49	HeI	$2p^3P - 11d^3D$	9.810+5	R	T87
3532.2	[FIV]	$2p^2^1D_2 - 2p^2^1S_0$	2.100+0	C	G68
3554.34	NeII	$3p^2D_{5/2} - 3d^4D_{7/2}$		R	
3554.41	HeI	$2p^3P - 10d^3D$	1.310+6	R	T87
3568.53	NeII	$3s^2D_{5/2} - 3p^2F_{7/2}$	1.400+8	R	R80
3583.0	[ClIII]	$3p^4^3P_2 - 3p^4^1S_0$	0.197-1	C	M83
3586.0	[FeVII]	$3d^2(a^3F_3 - a^1G_4)$		C	
3587.27	HeI	$2p^3P - 9d^3D$	1.810+6	R	T87
3609.62	CIII	$4p^3P_2 - 5d^3D_3$	9.090+7	R	NS84
3613.64	HeI	$2s^1S_0 - 5p^1P_1$	3.740+6	R	T87
3634.23	HeI	$2p^3P_{1,2} - 8d^3D_{1-3}$	2.320+6	R	T87
3634.37	HeI	$2p^3P_0 - 8d^3D_1$	1.450+8	R	T87
3657.68	H <sub>35</sub>	2-35	1.320+2	R	Kh93
3658.56	H <sub>34</sub>	2-34	1.520+2	R	Kh93
3659.46	H <sub>33</sub>	2-33	1.770+2	R	Kh93
3660.34	H <sub>32</sub>	2-32	2.060+2	R	Kh93
3661.28	H <sub>31</sub>	2-31	2.420+2	R	Kh93
3662.25	H <sub>30</sub>	2-30	2.850+2	R	Kh93
3662.50	[FeVI]	$3d^3(a^4F_{7/2} - a^2D_{5/2})$		C	
3663.35	H <sub>29</sub>	2-29	3.380+2	R	Kh93
3664.67	H <sub>28</sub>	2-28	4.020+2	R	Kh93
3666.15	H <sub>27</sub>	2-27	4.830+2	R	Kh93
3667.66	H <sub>26</sub>	2-26	5.830+2	R	Kh93
3669.46	H <sub>25</sub>	2-25	7.100+2	R	Kh93
3671.48	H <sub>24</sub>	2-24	8.710+2	R	Kh93
3673.76	H <sub>23</sub>	2-23	1.080+3	R	Kh93
3675.0	[ClIII]	$3p^4^3P_1 - 3p^4^1S_0$	1.310+0	C	M83
3676.36	H <sub>22</sub>	2-22	1.350+3	R	Kh93
3679.35	H <sub>21</sub>	2-21	1.700+3	R	Kh93
3682.81	H <sub>20</sub>	2-20	2.170+3	R	Kh93
3686.83	H <sub>19</sub>	2-19	2.810+3	R	Kh93
3688.0:	[CaVII]	$3p^2^1D_2 - 3p^2^1S_0$	4.300+0	C	G68
3690.07	HeII	4-36	9.660+2	R	Kh93
3691.55	H <sub>18</sub>	2-18	3.690+3	R	Kh93
3694.21	NeII	$3s^4P_{5/2} - 3p^4P_{5/2}$	1.000+8	R	R80
3697.15	H <sub>17</sub>	2-17	4.910+3	R	Kh93
3698.07	NeII	$3d^4P_{3/2} - 5p^4D_{1/2}$		R	
3698.72	HeII	4-33	1.500+3	R	Kh93
3701.77	NeII	$3p^2P_{3/2} - 3d^4P_{5/2}$	2.700+7	R	R80
3703.85	H <sub>16</sub>	2-16	6.660+3	R	Kh93
3705.00	HeI	$2p^3P_{1,2} - 7d^3D_{1-3}$	3.520+6	R	T87
3705.15	HeI	$2p^3P_0 - 7d^3D_1$	2.200+6	R	T87
3707.24	OIII	$3p^3P_1 - 3d^3D_2$	7.740+7	R	E84
3709.52	OIII	$3s^i^5P_1 - 3p^i^5D_0$		R,D	

Table 25 (Continuation)

$\lambda, \text{\AA}$	Ion	Transition	$A, s^{-1}$	Ex.M.	Ref
3709.52	NeII	$3s^4P_{3/2} - 3p^4P_{1/2}$	1.100+8	R	R80
3711.97	H <sub>22</sub>	2-15	9.210+3	R	Kh93
3715.08	OIII	$3p^3P_2 - 3d^3D_3$	9.810+7	B,R	E84
3715.15	HeII	4-29	2.870+3	R	R80
3715.46	NeII	$4p^2D_{5/2} - 7s^2P_{3/2}$		R	
3720.72	NeII	$3d^2F_{5/2} - 5p^2D_{5/2}$		R	
3721.88	[SIII]	$3p^2^3P_1 - 3p^2^1S_0$	0.796+0	C	KL80
3721.94	H <sub>14</sub>	2-14	1.300+4	R	Gr90
3726.19	[OII]	$2p^3^4S_{3/2} - 2p^3^2D_{3/2}$	1.650-4	C,Ph	M83
3729.11	[OII]	$2p^3^4S_{3/2} - 2p^3^2D_{5/2}$	3.820-5	C,Ph	M83
3731.60	OIII	$3p^3P_2 - 3d^3D_1$	2.150+6	B,R	E84
3732.34	NeII	$3p^2P_{3/2} - 3d^4F_{3/2}$		R	
3732.82	HeII	4-26	4.980+3	R	R80
3732.86	HeI	$2p^3P_{1,2} - 7s^3S_1$	1.290+6	R	T87
3733.01	HeI	$2p^3P_0 - 7s^3S_1$	1.610+5	R	T87
3734.37	H <sub>13</sub>	$2p^2P - 13d^2D$	1.880+4	R	Gr90
3736.85	OIV	$3p'^4D_{7/2} - 3d'^4F_{9/2}$		R,D	
3740.22	HeII	4-25	6.060+3	R	R80
3740.30	[FeVI]	$3d^4F_{9/2} - 3d^2H_{9/2}$		C	
3745.91	NIII	$3s'^4P_{1/2} - 3p'^4S_{3/2}$		R,D	
3747.86	NeII	$3d^2P_{1/2} - 5p^2S_{1/2}$		R	
3748.60	HeII	4-24	7.450+3	R	R80
3750.15	H <sub>12</sub>	$2p^2P - 12d^2D$	2.820+4	R	Gr90
3754.67	OIII	$3s^3P_1 - 3p^3D_2$	8.270+7	B,R,Ch	E84
3757.21	OIII	$3s^3P_0 - 3p^3D_1$	6.120+7	B,R,Ch	E84
3758.14	HeII	4-23	9.240+3	R	R80
3759.0	[FeVII]	$3d^2(a^3F_4 - a^1G_4)$		C	
3759.87	OIII	$3s^3P_2 - 3p^3D_3$	1.080+8	B,R,Ch	E84
3768.07	HeII	4-22	1.160+4	R	R80
3768.78	HeI	$2p^1P_1 - 13d^1D_2$	4.320+5	R	T87
3770.63	H <sub>11</sub>	$2p^2P - 11d^2D$	4.370+4	R	Gr90
3773.98	[FeVI]	$3d^4F_{3/2} - 3d^2P_{1/2}$		C	
3774.00	OIII	$3s^3P_1 - 3p^3D_1$	4.290+7	B,R,Ch	E84
3777.07	[FeV]	$3d^5D_0 - 3d^3P_2$		C	
3777.07	NeII	$3s^4P_{1/2} - 3p^4P_{3/2}$		R	
3781.62	FII	$3s'^3D_2 - 3p'^1F_3$		R,D	
3781.68	HeII	4-21	1.460+4	R	R80
3783.47	[FeV]	$3d^5D_2 - 3d^3F_3$		C	
3784.86	HeI	$2d^1P_1 - 12d^1D_2$	5.550+5	R	T87
3791.26	OIII	$3s^3P_2 - 3p^3D_2$	2.490+7	B,R,Ch	E84
3795.23	[FeV]	$3d^5D_2 - 3d^3F_2$		C	
3796.3	SiIII	$4p^3P_1 - 4d^3D_2$		R	
3796.33	HeII	4-20	1.880+4	R	R80

Table 22 (Continuation)

$\lambda, \text{\AA}$	Ion	Transition	$A, s^{-1}$	Ex. M.	Ref
3796.7	[SIII]	$3p^2\ ^3P_2 - 3p^2\ ^1S_0$	0.105-1	C	KL80
3797.90	H <sub>10</sub>	$2p\ ^2P - 10d\ ^2D$	7.080+4	R	Gr90
3805.74	HeI	$2p\ ^1P_1 - 11d\ ^1D_2$	7.240+5	R	T87
3810.80	OIII	$3s\ ^3P_2 - 3p\ ^3D_1$		B, R, Ch	
3813.49	HeII	$4-19$	2.440+4	R	R80
3814.56	FII	$3p'\ ^3P_1 - 3d'\ ^3S_1$		R, D	
3819.61	HeI	$2p\ ^3P_{1,2} - 6d\ ^3D_{1-3}$	5.720+6	R	T87
3819.76	HeI	$2p\ ^3P_0 - 6d\ ^3D_1$	3.580+6	R	T87
3829.75	NeII	$3p\ ^2P_{3/2} - 3d\ ^2D_{5/2}$	8.400+7	R	R80
3829.79	NII	$3p\ ^3P_1 - 4s\ ^3P_2$	1.500+7	R	R80
3833.55	HeI	$2p\ ^1P_1 - 10d\ ^1D_2$	9.720+5	R	T87
3833.78	HeII	$2-10$	2.850+5	R	Kh93
3833.80	HeII	$4-18$	3.210+4	R	R80
3835.38	H <sub>9</sub>	$2p\ ^2P - 9d\ ^2D$	1.210+5	R	Gr90
3839.27	[FeV]	$3d^4(a^5D_3 - a^3F_3)$		C	
3842.82:	OII	$3p\ ^4D_{1/2} - 3d\ ^4D_{3/2}$	1.460+7	R	NS84
3851.20	[FeV]	$3d^5D_3 - 3d^3F_2$		C	
3853.66	SiII	$3p^2\ ^2D_{3/2} - 4p\ ^2P_{3/2}$		R	
3856.02	SiII	$3p^2\ ^2D_{5/2} - 4p\ ^2P_{3/2}$		R	
3857.81	NeII	$3p'\ ^2P_{1/2} - 4d\ ^2D_{3/2}$		R, D	
3858.07	HeII	$4-17$	4.300+4	R	R80
3862.59	SiII	$3p^2\ ^2D_{3/2} - 4p\ ^2P_{1/2}$		R	
3867.48	HeI	$2p\ ^3P_{2,1} - 6s\ ^3S_1$	2.120+6	R	T87
3867.63	HeI	$2p\ ^3P_0 - 6s\ ^3S_1$	2.640+5	R	T87
3868.76	[NeIII]	$2p^4\ ^3P_2 - 2p^4\ ^1D_2$	0.171+0	C	M83
3871.79	HeI	$2p\ ^1P_1 - 9d\ ^1D_2$	1.350+6	R	T87
3875.50	OII]	$3p^4D_{7/2} - 3d^2F_{5/2}$		R	
3883.82	CIII	$4d\ ^3D_1 - 5f\ ^3F_2$	9.030+7	R, D	NS84
3885.94	CIII	$4d^3D_2 - 5f\ ^3F_3$	9.560+7	R	NS84
3887.44	HeII	$4-16$	5.860+4	R	R80
3887.57:	NI	$3s\ ^2P_{1/2} - 5p\ ^2D_{3/2}$	6.410+6	R	NS84
3888.65	HeI	$2s\ ^3S_1 - 3p\ ^3P_{0-2}$	9.120+6	R	T87
3889.05	H <sub>8</sub>	$2-8$	2.210+5	R	S77
3891.28	[FeV]	$^5D_4 - ^3F_4$		C	
3895.22	[FeV]	$^5D_3 - ^3P_2$		C	
3918.98	CII	$3p^2P_{1/2} - 4s^2S_{1/2}$	1.810+8	R, NF	B85
3920.69	CII	$3p^2P_{3/2} - 4s^2S_{1/2}$	1.810+8	R, NF	B85
3923.48	HeII	$4-15$	8.160+4	R	R80
3924.47	SiIII	$4f\ ^1F_3 - 5g\ ^1G_4$		R	
3926.53	HeI	$2p\ ^1P_1 - 8d\ ^1D_2$	1.950+6	R	T87
3954.37:	OII	$3s\ ^2P_{1/2} - 3p\ ^2P_{1/2}$	4.320+7	R	NS84
3956.74:	OIV	$3s'\ ^4P_{3/2} - 3d'\ ^4P_{3/2}$		R, D	

Table 25 (Continuation)

$\lambda, \text{\AA}$	Ion	Transition	$A, \text{s}^{-1}$	Ex.M.	Ref
3960.7	[FIV]	$2p^2\ ^3P_0 - 2p^2\ ^1D_2$	6.400-6	C	G68
3961.59	OIII	$3p\ ^1D_2 - 3d\ ^1F_3$	1.500+8	R	E84
3964.73	HeI	$2s\ ^1S_0 - 4p\ ^1P_1$	6.830+6	R	T87
3967.47	[NeIII]	$2p^4\ ^3P_1 - 2p^4\ ^1D_2$	0.542-1	C	M83
3968.43	HeII	$4-14$	1.160+5	R	R80
3970.07	H <sub>7</sub>	$2p\ ^2P - 7d\ ^2D$	4.390+5	R	S77
3996.3	[CaV]	$3p^4\ ^1D_2 - 3p^4\ ^1S_0$	3.730+0	C	M83
3997.4	[FIV]	$2p^2\ ^3P_1 - 2p^2\ ^1D_2$	0.340-1	C	G68
4003.58	NIII	$4d\ ^2D_{5/2} - 5f\ ^2F_{7/2}$	1.820+8	R,D	NS84
4007.91	[FeIII]	$a^5D_4 - a^3G_4$		C	
4009.27	HeI	$2p\ ^1P_1 - 7d\ ^1D_2$	2.980+6	R	T87
4011.60	[NaV]	$2p^3\ ^2D_{5/2} - 2p^3\ ^2P_{3/2}$		C	
4012.7	[NeIII]	$2p^4\ ^3P_0 - 2p^4\ ^1D_2$	8.510-6	C	M83
4025.60	HeII	$4-13$	1.710+5	R	R80
4026.13	HeI	$2p\ ^3P_{1,2} - 5d\ ^3D_{1-3}$	1.030+7	R	T87
4026.36	HeI	$2p^3\ ^3P_0 - 5d^3\ ^3D_1$	6.440+6	R	T87
4033.18:	OII	$3d\ ^4F_{3/2} - 4f\ ^4F_{3/2}$	2.300+7	R	NS84
4035.09	OII	$3d\ ^4F_{5/2} - 4f\ ^2F_{5/2}$		R	
4046.5	[FeIII]	$3d^6(a^5D_3 - a^3G_3)$		C	
4047.80	OII	$3d\ ^4F_{7/2} - 4f\ ^4F_{7/2}$	2.200+7	R	NS84
4056.06	CIII	$4d\ ^1D_2 - 5f\ ^1F_3$	2.520+8	R,D	Kh81
4057.76	NIV	$3p\ ^1P_1 - 3d\ ^1D_2$	7.080+7	R	Kh81
4060.2	[FIV]	$2p^2\ ^3P_2 - 2p^2\ ^1D_2$	0.098+0	C	G68
4068.7	[SII]	$3p^3\ ^4S_{3/2} - 3p^3\ ^2P_{3/2}$	0.225+0	C	M83
4068.91	CIII	$4f\ ^3F_3 - 5g\ ^3G_4$	3.070+8	R,D	NS84
4069.64	OII	$3p^4\ ^1D_{1/2} - 3d^4\ ^1F_{3/2}$	1.420+8	R	NS84
4069.90	OII	$3p^4\ ^3D_{3/2} - 3d^4\ ^3F_{3/2}$	1.520+8	R	NS84
4070.26	CIII	$4f\ ^3F_4 - 5g\ ^3G_5$	3.270+8	R	NS84
4071.3	[FeV]	$^5D_2 - ^3P_1$		C	
4072.16	OII	$3p\ ^4D_{5/2} - 3d\ ^4F_{7/2}$	1.740+8	R	NS84
4073.90	OIII	$3s'\ ^3P_1 - 3p'\ ^3D_2$	3.110+7	R,D	NS84
4076.20	[SII]	$3p^3\ ^4S_{3/2} - 3p^3\ ^2P_{1/2}$	0.906-1	C	M83
4077.78	CII	$3d'\ ^4D_{7/2} - 4f'\ ^2F_{7/2}$		R	
4078.86	OII	$3p^4\ ^3D_{3/2} - 3d^4\ ^3F_{3/2}$	5.680+7	R	NS84
4081.10	OIII	$3s'\ ^3P_2 - 3p'\ ^3D_3$	4.140+7	R	NS84
4085.12	OII	$3p^4\ ^1D_{5/2} - 3d^4\ ^1F_{5/2}$	4.950+7	R	NS84
4087.16	OII	$3d\ ^4F_{3/2} - 4f\ ^4G_{5/2}$	2.240+8	R	R80
4089.29	OII	$3d\ ^4F_{9/2} - 4f\ ^4G_{11/2}$	2.620+8	R	R80
4092.80	OII	$3p\ ^4D_{7/2} - 3d\ ^4F_{7/2}$	2.900+7	R	NS84
4097.0:	[KVI]	$3p^2\ ^1D_2 - 3p^2\ ^1S_0$	4.100+0	C	G68
4097.33	NIII	$3s\ ^2S_{1/2} - 3p\ ^2P_{3/2}$	1.190+8	R	B85

Table 25 (Continuation)

$\lambda, \text{\AA}$	Ion	Transition	$A, \text{s}^{-1}$	Ex. M.	Ref
4100.04	HeII	4-12	2.590+5	R	R80
4101.74	H $\delta$	$2p^2P - 6d^2D$	9.730+5	R	S77
4102.94	SiI]	$3p^2^1S_0 - 4s^3P_1$		C	
4103.43	NIII	$3s^2S_{1/2} - 3p^2P_{1/2}$	1.190+8	R	B85
4107.07:	OII	$3d^4F_{5/2} - 4f^4D_{7/2}$	3.790+3	R	NS84
4115.83	SiIV	$4s^2S_{1/2} - 4p^2P_{1/2}$		R	
4119.22	OII	$3p^4P_{5/2} - 3d^4D_{7/2}$	1.480+8	R	R80
4120.82	HeI	$2p^3P_{1,2} - 5s^3S_1$	3.860+6	R	T87
4120.55:	OII	$3p^4P_{5/2} - 3d^4D_{3/2}$	7.600+6	R	NS84
4120.99	HeI	$2p^3P_{2-0} - 5s^3S_1$	4.820+5	R	T87
4121.84	CIII	$4p^1P_1 - 5d^1D_2$	1.090+8	R	NS84
4122.46	[KV]	$3p^3^4S_{3/2} - 3p^3^2D_{5/2}$	4.590-3	C	M83
4128.75	[FeIII]	$3d^6(a^5D_1 - a^3G_3)$		C	
4143.76	HeI	$2p^1P_1 - 6d^1D_2$	4.910+6	R	T87
4146.06:	OII	$3p^6P_{7/2} - 3d^6D_{7/2}$		R	
4152.51	CIII	$3p^3D_1 - 5f^3F_2$	1.090+8	R,D	Kh81
4156.45	OII	$3p^4P_{5/2} - 3d^4P_{3/2}$	4.350+7	R	NS84
4156.49	CIII	$3p^3D_2 - 5f^3F_3$	1.150+8	R,D	Kh81
4157.5	[FII]	$2p^4^1D_2 - 2p^4^1S_0$	2.100+0	C	G68
4162.86	CIII	$3p^3D_3 - 5f^3F_4$	1.300+8	R,D	Kh81
4163.05	[KV]	$3p^3^4S_{3/2} - 3p^3^2D_{3/2}$		C	
4163.30	[KV]	$3p^3^4S_{3/2} - 3p^3^2D_{3/2}$	0.884-1	C	M83
4168.97	HeI	$2p^1P_1 - 6s^1S_0$	1.100+6	R	T87
4180.59	[FeV]	$^5D_1 - ^3P_0$		C	
4185.46	OII	$3p^4F_{5/2} - 3d^4G_{7/2}$		R	
4186.90	CIII	$4f^1F_3 - 5g^1G_4$	4.310+8	R,D	Kh81
4189.79	OII	$3p^4F_{7/2} - 3d^4G_{9/2}$	1.980+8	R,D	NS84
4195.76	NIII	$3s'^2P_{1/2} - 3p'^2D_{3/2}$		R,D	
4199.83	HeII	4-11	4.090+5	R	R80
4227.19	[FeV]	$a^5D_4 - a^3H_4$		C	
4229.27	[FeV]	$a^5D_2 - a^3P_0$		C	
4244.0	[FeII]	$a^4F_{9/2} - a^4G_{11/2}$		C	
4247.31	CIII	$3p^1P_1 - 5p^1P_1$	1.060+7	R	NS84
4253.74	OII	$3d^4G_{9/2} - 4f^4H_{9,11/2}$		R,D	
4253.98	OII	$3d^4G_{7/2} - 4f^4H_{9/2}$		R,D	
4267.00	CII	$3d^2D_{3/2} - 4f^2F_{5/2}$	2.220+8	R	B85
4267.26	CII	$3d^2D_{5/2} - 4f^2F_{7/2}$	2.380+8	R	B85
4275.52	OII	$3d^4D_{7/2} - 4f^4F_{9/2}$		R	
4276.71	OII	$3d^4P_{3/2} - 4f^4D_{1/2}$		R	
4276.71	OII	$3d^4D_{5/2} - 4f^4F_{7/2}$	1.820+8	R	R80

Table 25 (Continuation)

$\lambda, \text{\AA}$	Ion	Transition	$A, \text{s}^{-1}$	Ex.M.	Ref
4276.71	OII]	$3d^4D_{5/2} - 4f^2F_{5/2}$		R	
4287.0	[FeII]	$a^6D_{9/2} - a^6S_{5/2}$		C	
4295.24	OII	$3d^4P_{3/2} - 4f^4D_{5/2}$		R	
4303.83	OII	$3d^4P_{5/2} - 4f^4D_{7/2}$		R	
4325.56	CIII	$3s'^1P_1 - 3p'^1D_2$	8.070+7	R,D	NS84
4338.67	HeII	$4-10$	6.760+5	R	R80
4340.47	H $_{\gamma}$	$2p^2P - 5d^2D$	2.530+6	R	S77
4349.43	OII	$3s^4P_{5/2} - 3p^4P_{5/2}$	7.400+7	R	R80
4359.0	[FeII]	$a^6D_{7/2} - a^6S_{5/2}$		C	
4363.21	[OIII]	$2p^2^1D_2 - 2p^2^1S_0$	1.780+0	C	M83
4366.84	OII	$3s^4P_{5/2} - 3p^4P_{3/2}$		R	
4368.25	OI	$3s^3S_1 - 4p^3P_{2-0}$		R	
4379.11	NIII	$4f^2F - 5g^2G$	3.560+8	R	NS84
4387.93	HeI	$2p^1P_1 - 5d^1D_2$	9.100+6	R	T87
4414.91	OII	$3s^2P_{3/2} - 3p^2D_{5/2}$	1.150+8	R	R80
4416.98	OII	$3s^2P_{1/2} - 3p^2D_{3/2}$	9.500+7	R	R80
4437.55	HeI	$2p^1P_1 - 5s^1S_0$	3.210+6	R	T87
4447.99	OII	$3p^2F_{7/2} - 3d^2F_{7/2}$		R	
4452.73	OII	$3s^2P_{3/2} - 3p^2D_{3/2}$		R	
4471.48	HeI	$2p^3P_{1,2} - 4d^3D_{1-3}$	2.190+7	R	T87
4471.68	HeI	$2p^3P_0 - 4d^3D_1$	1.370+7	R	T87
4481.13	MgII	$3d^2D_{5/2} - 4f^2F_{7/2}$		R	
4491.25	OII	$3d^2P_{3/2} - 4f^2D_{5/2}$	1.100+8	R	NS84
4506.9	[SI]	$3p^4^3P_2 - 3p^4^1S_0$	8.230-3	C	M83
4510.94	[KIV]	$3p^4^1D_2 - 3p^4^1S_0$	3.180+0	C	M83
4514.86	NIII	$3s'^4P_{5/2} - 3p'^4D_{7/2}$		R,D	
4516.77	CIII	$4p^3P_2 - 5s^3S_1$	1.660+8	R	NS84
4518.15	NIII	$3s'^4P_{1/2} - 3p'^4D_{1/2}$		R,D	
4523.58	NIII	$3s'^4P_{3/2} - 3p'^4D_{3/2}$		R,D	
4534.58	NIII	$3s'^4P_{5/2} - 3p'^4D_{5/2}$		R,D	
4541.59	HeII	$4-9$	1.210+6	R	R80
4544.85	NIII	$4p^2P_{3/2} - 5s^2S_{1/2}$	8.290+7	R	NS84
4552.00	SiIII	$4s^3S_1 - 4p^3P_2$		R	
4562.60	MgI]	$3s^2^1S_0 - 3p^3P_2$	4.130-4	C	M83
4568.50	OIV	$5f^2F - 6d^2D$		R	
4571.10	MgI]	$3s^2^1S_0 - 3p^3P_1$	1.800+2	C	M83
4571.0:	[CaVII]	$3p^2^3P_0 - 3p^2^1D_2$	2.100-4	C	G68
4589.0	[SI]	$3p^4^3P_1 - 3p^4^1S_0$	0.350+0	C	M83
4590.97	OII	$3s'^2D_{5/2} - 3p'^2F_{7/2}$	8.510+7	R	NS84
4596.17	OII	$3s'^2D_{3/2} - 3p'^2F_{5/2}$	7.940+7	R	NS84



Table 25 (Continuation)

$\lambda, \text{\AA}$	Ion	Transition	$A, \text{s}^{-1}$	Ex. M.	Ref
4603.73	NV	$3s^2S_{1/2} - 3p^2P_{3/2}$	4.120+7	R	R80
4606.6	[FeIII]	$a^5D_4 - a^3F_3$		C	
4618.40	CII	$3d'^2F_{5/2} - 4f'^2G_{7/2}$	2.550+8	R	NS84
4619.98	NV	$3s^2S_{1/2} - 3p^2P_{1/2}$	4.080+7	R	R80
4620.10	CII	$3d'^2F - 4f'^2G$		R	
4621.39:	NII	$3s^3P_1 - 3p^3P_0$	9.000+7	R	R80
4621.57	[CI]	$2p^2^3P_1 - 2p^2^1S_0$	2.710-3	C	M83
4624.93	[ArV]	$3p^2^1D_2 - 3p^2^1S_0$	3.290+0	C	KL80
4627.35	[CI]	$2p^2^3P_2 - 2p^2^1S_0$	2.000-5	C	M83
4631.89	OIV	$5g^2G - 6h^2H$		R	
4634.14	NIII	$3p^2P_{1/2} - 3d^2D_{3/2}$	5.660+7	R,D	B85
4640.64	NIII	$3p^2P_{3/2} - 3d^2D_{5/2}$	6.790+7	R,D	B85
4641.85	NIII	$3p^2P_{3/2} - 3d^2D_{3/2}$	1.130+7	R,D	B85
4647.42	CIII	$3s^3S_1 - 3p^3P_2$	7.180+7	R,D	NS84
4649.14	OII	$3s^4P_{5/2} - 3p^4D_{7/2}$	8.570+7	R	NS84
4650.25	CIII	$3s^3S_1 - 3p^3P_1$	7.180+7	R,D	NS84
4651.47	CIII	$3s^3S_1 - 3p^3P_0$	7.180+7	R,D	NS84
4658.0	[FeIII]	$a^5D - a^3F$		C	
4658.30	CIV	$5g^2G - 6h^2H$		R	
4661.63	OII	$3s^4P_{3/2} - 3p^4D_{3/2}$	5.200+7	R	R80
4663.64	CIII	$3s'^3P_1 - 3p'^3P_0$		R,D	
4665.61	CIV	$5f^2F - 6d^2D$		R	
4665.86	CIII	$3s'^3P_2 - 3p'^3P_2$		R,D	
4669.20	[PII]	$3p^2^3P_1 - 3p^2^1S_0$		C	
4673.75	OII	$3s^4P_{3/2} - 3p^4D_{1/2}$		R	
4676.23	OII	$3s^4P_{5/2} - 3p^4D_{5/2}$		R	
4678.14	NII	$3d^1P_1 - 4f^1D_2$		R	
4685.71	HeII	$3-4$	1.430+8	R	R80
4701.3	[FeIII]	$a^5D_3 - a^3F_3$		C	
4711.15	[ArIV]	$3p^3^4S_{3/2} - 3p^3^2D_{5/2}$	1.770-3	C	M83
4713.14	HeI	$2p^3P_{1,2} - 4s^3S_1$	8.270+6	R	T87
4713.38	HeI	$2p^3P_0 - 4s^3S_1$	1.030+6	R	T87
4714.3	[NeIV]	$2p^3^2D_{5/2} - 2p^3^2P_{3/2}$	0.400+0	C,Au	M83
4715.7	[NeIV]	$2p^3^2D_{5/2} - 2p^3^2P_{1/2}$	0.115+0	C,Au	M83
4724.3	[NeIV]	$2p^3^2D_{3/2} - 2p^3^2P_{3/2}$	0.437+0	C,Au	M83
4725.7	[NeIV]	$2p^3^2D_{3/2} - 2p^3^2P_{1/2}$	0.393+0	C,Au	M83
4733.0	[FeIII]	$a^5D_2 - a^3F_2$		C	
4736.6	[PII]	$3p^2^3P_2 - 3p^2^1S_0$		C	
4740.18	[ArIV]	$3p^3^4S_{3/2} - 3p^3^2D_{3/2}$	0.223-1	C	M83
4754.90	[FeIII]	$^5D_3 - ^3F_4$		C	

Table 25 (Continuation)

$\lambda, \text{\AA}$	Ion	Transition	$A, \text{s}^{-1}$	Ex.M.	Ref
4789.45	[FII]	$2p^4\ ^3P_2 - 2p^4\ ^1D_2$	0.038+0	C	G68
4859.32	HeII	$4-8$	2.280+6	R	R80
4861.29	H $\beta$	$2p\ ^2P - 4d\ ^2D$	8.420+6	R	S77
4868.99	[FII]	$2p^4\ ^3P_1 - 2p^4\ ^1D_2$	0.012+0	C	G68
4893.42	[FeVII]	$^3F_2 - ^3P_1$		C	
4904.80	NIII	$4d\ ^2D_{5/2} - 5p\ ^2P_{3/2}$		R	
4904.56	[FII]	$2p^4\ ^3P_0 - 2p^4\ ^1D_2$	4.100-6	C	G68
4906.60	OII	$3p^4\ S_{3/2} - 3d^4\ P_{3/2}$		R	
4921.93	HeI	$2p\ ^1P_1 - 4d\ ^1D_2$	1.990+7	R	T87
4930.27	OV	$6h\ ^{3,1}H - 7i\ ^{3,1}I$		R	
4931.78	[OIII]	$2p^2\ ^3P_0 - 2p^2\ ^1D_2$	2.740-6	C	M83
4938.6	[CaVII]	$3p^2\ ^3P_1 - 3p^2\ ^1D_2$	1.200+0	C	G68
4944.6	[FeVII]	$^3F_3 - ^3P_2$		C	
4959.52	[OIII]	$2p^2\ ^3P_1 - 2p^2\ ^1D_2$	6.740-3	C, Au	M83
4972.47	[FeVI]	$^4F_{5/2} - ^2G_{7/2}$		C	
4988.8	[FeVII]	$a^3F_2 - a^3P_0$		C	
5007.57	[OIII]	$2p^2\ ^3P_2 - 2p^2\ ^1D_2$	0.196-1	C, Au	M83
5015.67	HeI	$2s\ ^1S_0 - 3p\ ^1P_1$	1.310+7	R	T87
5032.07	CII	$2p^3\ ^2P_{3/2} - 3p'\ ^2D_{5/2}$		R, D	
5041.0	[FeIV]	$3d^5\ ^4G - 3d^5\ ^4F$		C	
5041.03	SiII	$4p\ ^2P_{1/2} - 4d\ ^2D_{3/2}$	9.800+7	R	R80
5047.74	HeI	$2p\ ^1P_1 - 4s\ ^1S_0$	6.670+6	R	T87
5055.98	SiII	$4p\ ^2P_{3/2} - 4d\ ^2D_{5/2}$	1.200+8	R	R80
5114.07	OV	$3s\ ^1S_0 - 3p\ ^1P_1$	1.700+7	R	R80
5145.75	[FeVI]	$^4F_{7/2} - ^2G_{7/2}$		C	
5151.0	[FeIII]	$a^5D_4 - a^3P_2$		C	
5158.9	[FeVII]	$^3F_3 - ^3P_1$		C	
5176.04	[FeVI]	$^4F_{9/2} - ^2G_{9/2}$		C	
5191.8	[ArIII]	$3p^4\ ^1D_2 - 3p^4\ ^1S_0$	2.590+0	C	M83
5197.90	[NI]	$2p^3\ ^4S_{3/2} - 2p^3\ ^2D_{3/2}$	2.020-5	C	M83
5200.26	[NI]	$2p^3\ ^4S_{3/2} - 2p^3\ ^2D_{5/2}$	7.270-6	C	M83
5269.2	[KVI]	$3p^2\ ^3P_0 - 3p^2\ ^1D_2$	1.100-4	C	G68
5270.3	[FeIII]	$a^5D_3 - a^3P_2$		C	
5277.8	[FeVII]	$^3F_4 - ^3P_2$		C	
5309.2	[CaV]	$3p^4\ ^3D_2 - 3p^4\ ^1D_2$	1.900+0	C	M83
5323.3	[ClIV]	$3p^2\ ^1D_2 - 3p^2\ ^1S_0$	2.800+0	C	KL80
5335.18	[FeVI]	$^4F_{3/2} - ^4P_{1/2}$		C	
5411.52	HeII	$4-7$	4.860+6	R	R80
5424.22	[FeVI]	$^4F_{5/2} - ^4P_{3/2}$		C	
5426.64	[FeVI]	$^4F_{7/2} - ^4P_{5/2}$		C	
5484.84	[FeVI]	$^4F_{5/2} - ^4P_{1/2}$		C	

Table 25 (Continuation)

$\lambda, \text{\AA}$	Ion	Transition	$A, \text{s}^{-1}$	Ex.M.	Ref
5517.72	[ClIII]	$3p^3\ ^4S_{3/2} - 3p^3\ ^2D_{5/2}$	7.040-4	C	M83
5537.89	[ClIII]	$3p^3\ ^4S_{3/2} - 3p^3\ ^2D_{3/2}$	4.830-3	C	M83
5577.34	[OI]	$2p^4\ ^1D_2 - 2p^4\ ^1S_0$	1.220+0	C	M83
5592.37	OIII	$3s\ ^1P_1 - 3p\ ^1P_1$	4.120+7	C, Ch	E84
5603.2	[KVI]	$3p^2\ ^3P_1 - 3p^2\ ^1D_2$	0.530+0	C	G68
5614.7	[CaVII]	$3p^2\ ^3P_2 - 3p^2\ ^1D_2$	2.500+0	C	G68
5631.07	[FeVI]	$^4F_{7/2} - ^4P_{3/2}$		C	
5666.63	NII	$3s\ ^3P_1 - 3p\ ^3D_2$	4.230+7	R	R80
5676.95	[FeVI]	$^4F_{9/2} - ^4P_{5/2}$		C	
5679.56	NII	$3s\ ^3P_2 - 3p\ ^3D_3$	5.600+7	R	R80
5695.92	CIII	$3p\ ^1P_1 - 3d\ ^1D_2$	4.980+7	R	Kh81
5696.4	[FeI]	$4s^2\ ^5D_4 - 4s\ ^5P_3$		C	
5721.1	[FeVII]	$^3F_2 - ^1D_2$		C	
5721.2	[FIII]	$2p^3\ ^2D_{5/2} - 2p^3\ ^2P_{1/2}$	0.088+0	C	G68
5733.0	[FIII]	$2p^3\ ^2D_{3/2} - 2p^3\ ^2P_{1/2}$	0.160+0	C	G68
5733.0	[FIII]	$2p^3\ ^2D_{3/2} - 2p^3\ ^2P_{3/2}$	0.114+0	C	G68
5754.59	[NII]	$2p^2\ ^1D_2 - 2p^2\ ^1S_0$	1.120+0	C	M83
5776.4	[MnVI]	$3d^2\ ^3F_3 - 3d^2\ ^3P_1$		C	
5784.94	HeII	5-40	4.630+2	R	R80
5789.72	HeII	5-39	5.260+2	R	R80
5794.88	HeII	5-38	6.000+2	R	R80
5800.48	HeII	5-37	6.860+2	R	R80
5801.33	CIV	$3s^2\ ^1S_{1/2} - 3p^2\ ^3P_{3/2}$	3.190+7	NF, R, Ch	R80
5806.56	HeII	5-36	7.870+2	R	R80
5811.98	CIV	$3s^2\ ^1S_{1/2} - 3p^2\ ^1P_{1/2}$	3.160+7	NF, R, Ch	R80
5813.19	HeII	5-35	9.080+2	R	R80
5820.43	HeII	5-34	1.050+3	R	R80
5828.36	HeII	5-33	1.220+3	R	R80
5837.06	HeII	5-32	1.430+3	R	R80
5846.65	HeII	5-31	1.670+3	R	R80
5857.26	HeII	5-30	1.980+3	R	R80
5863.0	[MnV]	$3d^3\ ^4F_{7/2} - 3d^3\ ^2G_{7/2}$		C	
5867.82	SiII	$4s^4\ ^5P_{5/2} - 4p^4\ ^5P_{5/2}$		R	
5869.02	HeII	5-29	2.350+3	R	R80
5875.62	HeI	$2p\ ^3P_{1,2} - 3d\ ^3D_{1-3}$	6.280+7	R	T87
5875.97	HeI	$2p\ ^3P_0 - 3d\ ^3D_1$	3.930+7	R	T87
5882.12	HeII	5-28	2.800+3	R	R80
5889.77	CII	$3d\ ^2D_{5/2} - 4p\ ^2P_{3/2}$		R	
5891.0	[MnV]	$3d^3\ ^4F_{9/2} - 3d^3\ ^2G_{9/2}$		C	
5894.0	[MnVI]	$3d^2\ ^3F - 3d^2\ ^3P$		C	
5896.78	HeII	5-27	3.370+3	R	R80
5913.24	HeII	5-26	4.080+3	R	R80
5931.83	HeII	5-25	4.980+3	R	R80
5952.93	HeII	5-24	6.130+3	R	R80

Table 25 (Continuation)

$\lambda, \text{\AA}$	Ion	Transition	$A, \text{s}^{-1}$	Ex.M.	Ref
5977.02	HeII	5-23	7.610+3	R	R80
6004.72	HeII	5-22	9.550+3	R	R80
6036.78	HeII	5-21	1.210+4	R	R80
6074.19	HeII	5-20	1.550+4	R	R80
6086.9	[CaV]	$3p^4\ ^3P_1 - 3p^4\ ^1D_2$	0.426+0	C	M83
6086.9	[FeVII]	$^3F_3 - ^1D_2$		C	
6101.8	[KIV]	$3p^4\ ^3P_2 - 3p^4\ ^1D_2$	0.814+0	C	M83
6118.26	HeII	5-19	2.020+4	R	R80
6133.42	[ArV]	$3p^2\ ^3P_0 - 3p^2\ ^1D_2$	3.500-5	C	KL80
6152.9	[ClIII]	$3p^4\ ^1D_2 - 3p^4\ ^1S_0$	2.060+0	C	M83
6166.2	[MnV]	$3d^3\ ^4F_{7/2} - 3d^3\ ^4P_{5/2}$		C	
6170.69	HeII	5-18	2.670+4	R	R80
6218.6	[MnV]	$3d^3\ ^4F_{5/2} - 3d^3\ ^4P_{3/2}$		C	
6221.0	[MnV]	$3d^3\ ^4F_{5/2} - 3d^3\ ^4P_{1/2}$		C	
6223.0:	[KV]	$3p^3\ ^2D_{3/2} - 3p^3\ ^2P_{3/2}$	1.860+0	C	M83
6228.4	[KVI]	$3p^2\ ^3P_2 - 3p^2\ ^1D_2$	1.100+0	C	G68
6233.82	HeII	5-17	3.590+4	R	R80
6300.30	[OI]	$2p^4\ ^3P_2 - 2p^4\ ^1D_2$	6.340-3	C	M83
6310.85	HeII	5-16	4.920+4	R	R80
6312.1	[SIII]	$3p^2\ ^1D_2 - 3p^2\ ^1S_0$	2.220+0	C,Ch	KL80
6317.0:	[KV]	$3p^3\ ^2D_{5/2} - 3p^3\ ^2P_{3/2}$	1.210+0	C	M83
6347.10	SiII	$4s\ ^2S_{1/2} - 4p\ ^2P_{3/2}$	7.000+7	R,D	R80
6349.0:	[KV]	$3p^3\ ^2D_{3/2} - 3p^3\ ^2P_{1/2}$	1.250+0	C	M83
6363.77	[OI]	$2p^4\ ^3P_1 - 2p^4\ ^1D_2$	2.110-3	C	M83
6371.36	SiII	$4s\ ^2S_{1/2} - 4p\ ^2P_{1/2}$	6.900+7	R,D	R80
6391.74	[OI]	$2p^4\ ^3P_0 - 2p^4\ ^1D_2$	7.230-7	C	M83
6393.62	[MnV]	$3d^3\ ^4F_{9/2} - 3d^3\ ^4P_{5/2}$		C	
6406.38	HeII	5-15	6.880+4	R	R80
6428.2	[CaV]	$3p^4\ ^3P_0 - 3p^4\ ^1D_2$	8.420-5	C	M83
6434.72	[ArV]	$3p^2\ ^3P_1 - 3p^2\ ^1D_2$	0.204+0	C	KL80
6447.0:	[KV]	$3p^3\ ^2D_{5/2} - 3p^3\ ^2P_{1/2}$	0.141+0	C	M83
6518.3	[MnVI]	$3d^2\ ^3F - 3d^2\ ^1D$		C	
6527.10	HeII	5-14	9.880+4	R	R80
6527.23	[NII]	$2p^2\ ^3P_0 - 2p^2\ ^1D_2$	5.350-7	C	M83
6548.05	[NII]	$2p^2\ ^3P_1 - 2p^2\ ^1D_2$	1.010-3	C	M83
6560.10	HeII	4-6	1.230+7	R	R80
6562.85	H $_{\alpha}$	$2p\ ^2P - 3d\ ^2D$	4.410+7	R	S77
6583.45	[NII]	$2p^2\ ^3P_2 - 2p^2\ ^1D_2$	2.990-3	C	M83
6598.76	[FeVII]	$3d^2\ (^3F_4 - ^1D_2)$		C	
6678.15	HeI	$2p\ ^1P_1 - 3d\ ^1D_2$	6.370+7	R	T87
6683.90	HeII	5-13	1.460+5	R	R80
6716.4	[SII]	$3p^3\ ^4S_{3/2} - 3p^3\ ^2D_{5/2}$	2.600-4	C	M83
6730.8	[SII]	$3p^3\ ^4S_{3/2} - 3p^3\ ^2D_{3/2}$	8.820-4	C	M83
6795.8	[KIV]	$3p^4\ ^3P_1 - 3p^4\ ^1D_2$	0.198+0	C	M83

Table 25 (Continuation)

$\lambda, \text{\AA}$	Ion	Transition	$A, \text{s}^{-1}$	Ex.M.	Ref
6890.90	HeII	5-12	2.240+5	R	R80
7005.58	[ArV]	$3p^2\ ^3P_2 - 3p^2\ ^1D_2$	0.476+0	C	KL80
7065.19	HeI	$2p^3\ P_{1,2} - 3s^3\ S_1$	2.430+7	R	T87
7065.71	HeI	$2p^3\ P_0 - 3s^3\ S_1$	3.030+6	R	T87
7110.4	[KIV]	$3p^4\ ^3P_0 - 3p^4\ ^1D_2$	4.540-5	C	M83
7136.15	[ArIII]	$3p^4\ ^3P_2 - 3p^4\ ^1D_2$	0.314+0	C	M83
7170.70	[ArIV]	$3p^3\ ^2D_{3/2} - 3p^3\ ^2P_{3/2}$	0.789+0	C	M83
7177.52	HeII	5-11	3.590+5	R	R80
7231.32	CII	$3p^2\ P_{1/2} - 3d^2\ D_{3/2}$	3.600+7	R	R80
7236.42	CII	$3p^2\ P_{3/2} - 3d^2\ D_{5/2}$	4.400+7	R	R80
7238.14	[ArIV]	$3p^3\ ^2D_{5/2} - 3p^3\ ^2P_{3/2}$	0.598+0	C	M83
7261.43	[ClIV]	$3p^2\ ^3P_0 - 3p^2\ ^1D_2$	1.560-5	C	KL80
7262.96	[ArIV]	$3p^3\ ^2D_{3/2} - 3p^3\ ^2P_{1/2}$	0.603+0	C	M83
7281.35	HeI	$2p^1\ P_1 - 3s^1\ S_0$	1.810+7	R	T87
7318.63	[OII]	$2p^3\ ^2D_{5/2} - 2p^3\ ^2P_{1/2}$	0.615-1	C	M83
7319.43	[OII]	$2p^3\ ^2D_{5/2} - 2p^3\ ^2P_{3/2}$	0.117+0	C	M83
7329.90	[OII]	$2p^3\ ^2D_{3/2} - 2p^3\ ^2P_{1/2}$	0.102+0	C	M83
7330.70	[OII]	$2p^3\ ^2D_{3/2} - 2p^3\ ^2P_{3/2}$	0.614-1	C	M83
7332.15	[ArIV]	$3p^3\ ^2D_{5/2} - 3p^3\ ^2P_{1/2}$	0.119+0	C	M83
7530.83	[ClIV]	$3p^2\ ^3P_1 - 3p^2\ ^1D_2$	0.723-1	C	KL80
7592.75	HeII	5-10	6.080+5	R	R80
7724.7	[SI]	$3p^4\ ^1D_2 - 3p^4\ ^1S_0$	1.530+0	C	M83
7751.43	[ArIII]	$3p^4\ ^3P_1 - 3p^4\ ^1D_2$	0.823-1	C	M83
7876.00	[PII]	$3p^2\ ^1D_2 - 3p^2\ ^1S_0$		C	
8036.76	[ArIII]	$3p^4\ ^3P_0 - 3p^4\ ^1D_2$	2.210-5	C	M83
8046.27	[ClIV]	$3p^2\ ^3P_2 - 3p^2\ ^1D_2$	0.179+0	C	KL80
8196.48	CIII	$5g^1\ ^3G - 6h^1\ ^3H$	1.380+8	R	Kh81
8236.78	HeII	5-9	1.100+6	R	R80
8347.6	[FeI]	$4s^2\ ^5D_4 - 4s^3\ F_4$		C	
8433.94	[ClIII]	$3p^3\ ^2D_{3/2} - 3p^3\ ^2P_{3/2}$	0.323+0	C	M83
8481.16	[ClIII]	$3p^3\ ^2D_{5/2} - 3p^3\ ^2P_{3/2}$	0.316+0	C	M83
8500.20	[ClIII]	$3p^3\ ^2D_{3/2} - 3p^3\ ^2P_{1/2}$	0.303+0	C	M83
8502.48	HI(P <sub>16</sub> )	$3d^2\ D - 16f^2\ F$	4.650+3	R	Gr90
8545.38	HI(P <sub>22</sub> )	$3d^2\ D - 15f^2\ F$	6.450+3	R	Gr90
8548.17	[ClIII]	$3p^3\ ^2D_{5/2} - 3p^3\ ^2P_{1/2}$	0.100+0	C	M83
8579.5	[ClII]	$3p^4\ ^3P_2 - 3p^4\ ^1D_2$	0.104+0	C	M83
8598.39	HI(P <sub>14</sub> )	$3d^2\ D - 14f^2\ F$	9.160+3	R	Gr90
8663.65	CIII	$5f^3\ F_3 - 6g^3\ G_4$		R	
8665.02	HI(P <sub>13</sub> )	$3d^2\ D - 13f^2\ F$	1.340+4	R	Gr90
8727.13	[CI]	$2p^2\ ^1D_2 - 2p^2\ ^1S_0$	0.528+0	C	M83
8750.47	HI(P <sub>12</sub> )	$3d^2\ D - 12f^2\ F$	2.010+4	R	Gr90

Table 25 (Continuation)

$\lambda, \text{\AA}$	Ion	Transition	$A, s^{-1}$	Ex. M.	Ref
8831.5	[SIII]	$3p^2\ ^3P_0 - 3p^2\ ^1D_2$	5.820-6	C	M83
8862.78	HI(P <sub>11</sub> )	$3d\ ^2D - 11f\ ^2F$	3.140+4	R	Gr90
9014.91	HI(P <sub>10</sub> )	$3d\ ^2D - 10f\ ^2F$	5.130+4	R	Gr90
9069.4	[SIII]	$3p^2\ ^3P_1 - 3p^2\ ^1D_2$	0.221-1	C, Ch	KL80
9125.8	[ClIII]	$3p^4\ ^3P_1 - 3p^4\ ^1D_2$	0.292-1	C	M83
9229.02	HI(P <sub>9</sub> )	$3d\ ^2D - 9f\ ^2F$	8.850+4	R	Gr90
9344.94	HeII	$5-8$	2.210+6	R	R80
9381.8	[ClIII]	$3p^4\ ^3P_0 - 3p^4\ ^1D_2$	9.820-6	C	M83
9412.0	NIII	$4s\ ^2S_{1/2} - 4p\ ^2P_{3/2}$		R	
9532.1	[SIII]	$3p^2\ ^3P_2 - 3p^2\ ^1D_2$	0.576-1	C	KL80
9545.97	HI(P <sub>8</sub> )	$3d\ ^2D - 8f\ ^2F$	1.640+5	R	Gr90
9715.11	CIII	$3p\ ^3P - 3d\ ^3D$		R	
9808.32	[CI]	$2p^2\ ^3P_0 - 2p^2\ ^1D_2$	7.770-8	C	M83
9824.13	[CI]	$2p^2\ ^3P_1 - 2p^2\ ^1D_2$	8.210-5	C	M83
9850.26	[CI]	$2p^2\ ^3P_2 - 2p^2\ ^1D_2$	2.440-4	C	M83
10049.37	HI-P <sub><math>\delta</math></sub>	$3d^2D - 7f^2F$	3.360+5	R	S77
10123.61	HeII	$4-5$	4.320+7	R	R80
10287.1	[SII]	$3p^3\ ^2D_{3/2} - 3p^3\ ^2P_{3/2}$	0.133+0	C	M83
10320.6	[SII]	$3p^3\ ^2D_{5/2} - 3p^3\ ^2P_{3/2}$	0.179+0	C	M83
10338.8	[SII]	$3p^3\ ^2D_{3/2} - 3p^3\ ^2P_{1/2}$	0.163+0	C	M83
10371.27	SiI	$4s\ ^3P_1 - 4p\ ^3S_1$		R	
10372.6	[SII]	$3p^3\ ^2D_{5/2} - 3p^3\ ^2P_{1/2}$	0.779-1	C	M83
10397.74	[NI]	$2p^3\ ^2D_{5/2} - 2p^3\ ^2P_{3/2}$	0.614-1	C	M83
10398.16	[NI]	$2p^3\ ^2D_{5/2} - 2p^3\ ^2P_{1/2}$	0.345-1	C	M83
10407.17	[NI]	$2p^3\ ^2D_{3/2} - 2p^3\ ^2P_{3/2}$	0.276-1	C	M83
10407.59	[NI]	$2p^3\ ^2D_{3/2} - 2p^3\ ^2P_{1/2}$	0.529-1	C	M83
10603.43	SiI	$4s\ ^3P_1 - 4p\ ^3P_2$		R	
10627.65	SiI	$4p\ ^1P_1 - 4d\ ^3P_2$		R	
10689.72	SiI	$4p\ ^3D_1 - 4d\ ^3F_2$		R	
10691.25	CI	$3s\ ^3P_2 - 3p\ ^3D_3$		R	
10819.8	[SI]	$3p^4\ ^3P_2 - 3p^4\ ^1D_2$	0.278-1	C	M83
10829.09	HeI	$2s\ ^3S_1 - 2p\ ^3P_0$	1.020+7	R	T87
10830.25	HeI	$2s\ ^3S_1 - 2p\ ^3P_1$	1.020+7	R	T87
10830.34	HeI	$2s\ ^3S_1 - 2p\ ^3P_2$	1.020+7	R	T87
10938.10	HI-P <sub><math>\gamma</math></sub>	$3d^2D - 6f^2F$	7.780+5	R	S77
10994.0	[SiII]	$3p^2\ ^1D_2 - 3p^2\ ^1S_0$	1.140+0	C	M83
11305.8	[SI]	$3p^4\ ^3P_1 - 3p^4\ ^1D_2$	8.160-3	C	M83
11540.1	[SI]	$3p^4\ ^3P_0 - 3p^4\ ^1D_2$	3.840-6	C	M83
11626.42	HeII	$5-7$	5.180+6	R	R80
12818.08	HI-P <sub><math>\beta</math></sub>	$3d^2D - 5f^2F$	2.200+6	R	S77
18636.78	HeII	$5-6$	1.630+7	R	R80
18751.02	HI-P <sub><math>\alpha</math></sub>	$3d^2D - 4f^2F$	8.990+6	R	S77

Table 25 (Continuation)

$\lambda, \text{\AA}$	Ion	Transition	$A, \text{s}^{-1}$	Ex.M.	Ref
20581.30	He I	$2s^1 S_0 - 2p^1 P_1$	1.970+6	R	T87
4.49 $\mu\text{m}$	[MgIV]	$2p^5 \ ^2 P_{3/2} - 2p^5 \ ^2 P_{1/2}$	0.199+0	C	M83
5.34	[FeII]	$^6 D_{9/2} - ^4 F_{9/2}$	4.170-5	C	NS88
5.61	[MgV]	$2p^4 \ ^3 P_2 - 2p^4 \ ^3 P_1$	0.127+0	C	M83
6.62	[NiIII]	$^2 P_{1/2} - ^2 P_{3/2}$		C	
6.98	[ArII]	$3p^5 \ ^2 P_{1/2} - 3p^5 \ ^2 P_{3/2}$	5.270-2	C	M83
7.90	[ArV]	$3p^2 \ ^3 P_2 - 3p^2 \ ^3 P_1$	0.272-1	C	KL80
8.99	[ArIII]	$3p^4 \ ^3 P_1 - 3p^4 \ ^3 P_2$	0.308-1	C	M83
10.52	[SIV]	$3p \ ^2 P_{3/2} - 3p \ ^2 P_{1/2}$	7.730-3	C	M83
11.76	[ClIV]	$3p^2 \ ^3 P_1 - 3p^2 \ ^3 P_2$	8.250-3	C	KL80
12.8	[NeII]	$2p^5 \ ^2 P_{1/2} - 2p^5 \ ^2 P_{3/2}$	8.550-3	C	M83
13.10	[ArV]	$3p^2 \ ^3 P_1 - 3p^2 \ ^3 P_0$	7.990-3	C	KL80
13.5	[MgV]	$2p^4 \ ^3 P_1 - 2p^4 \ ^3 P_0$	0.217-1	C	M83
14.3	[NeV]	$2p^2 \ ^3 P_2 - 2p^2 \ ^3 P_1$	4.590-3	C	M83
15.6	[NeIII]	$2p^4 \ ^3 P_1 - 2p^4 \ ^3 P_2$	5.970-3	C	M83
18.7	[SIII]	$3p^2 \ ^3 P_2 - 3p^2 \ ^3 P_1$	2.070-3	C	KL80
20.30	[ClIV]	$3p^2 \ ^3 P_0 - 3p^2 \ ^3 P_1$	2.160-3	C	KL80
21.83	[ArIII]	$3p^4 \ ^3 P_0 - 3p^4 \ ^3 P_1$	5.170-3	C	M83
22.9	[FeIII]	$^5 D_3 - ^5 D_4$		C	
24.3	[NeV]	$2p^2 \ ^3 P_1 - 2p^2 \ ^3 P_0$	1.280-3	C	M83
25.91	[OIV]	$2p^2 \ P_{3/2} - 2p^2 \ P_{1/2}$	5.200-4	C	M83
25.98	[FeII]	$4s(^6 D_{7/2} - ^6 D_{9/2})$	2.130-3	C	NS88
32.59	[OIII]	$2p^2 \ ^3 P_0 - 2p^2 \ ^3 P_2$	3.020-11	C	M83
33.0	[FeIII]	$a^5 D_3 - a^5 D_2$		C	
33.5	[SIII]	$3p^2 \ ^3 P_1 - 3p^2 \ ^3 P_0$	4.720-4	C	KL80
34.81	[SiIII]	$3p^2 \ P_{1/2} - 3p^2 \ P_{3/2}$	2.170-4	C	M83
35.3	[FeII]	$3d^6 4s(^6 D_{5/2} - ^6 D_{7/2})$		C	
36.1	[NeIII]	$2p^4 \ ^3 P_0 - 2p^4 \ ^3 P_1$	1.150-3	C	M83
36.33	[FeV]	$a^5 D_1 - a^5 D_2$		C	
51.69	[OIII]	$2p^2 \ ^3 P_2 - 2p^2 \ ^3 P_1$	9.760-5	C	M83
57.3	[NIII]	$2p^3 \ P_{3/2} - 2p^3 \ P_{1/2}$	4.770-5	C	M83
63.17	[OI]	$2p^4 \ ^3 P_1 - 2p^4 \ ^3 P_2$	8.920-5	C	M83
70.35	[FeV]	$a^5 D_0 - a^5 D_1$		C	
88.16	[OIII]	$2p^2 \ ^3 P_1 - 2p^2 \ ^3 P_0$	2.620-5	C	M83
121.8	[NII]	$2p^2 \ ^3 P_1 - 2p^2 \ ^3 P_2$	7.460-6	C	M83
145.48	[OI]	$2p^4 \ ^3 P_0 - 2p^4 \ ^3 P_1$	1.740-5	C	M83
157.6	[CII]	$2p^2 \ P_{3/2} - 2p^2 \ P_{1/2}$	2.290-6	C	M83
205.3	[NII]	$2p^2 \ ^3 P_0 - 2p^2 \ ^3 P_1$	2.080-6	C	M83
370.3	[CI]	$2p^2 \ ^3 P_1 - 2p^2 \ ^3 P_2$	2.650-7	C	M83
609.6	[CI]	$2p^2 \ ^3 P_0 - 2p^2 \ ^3 P_1$	7.930-8	C	M83

Comments:

We used the following abbreviations for the line generation mechanisms:

- R - Radiative recombination,
- D - Dielectronic recombination,
- B - Bowen mechanism,
- C - Collision excitation,
- Ch- Charge transfer excitation,
- Au- Auger excitation,
- NF- Nonresonance fluorescence,
- Ph- Photoionization mechanism.

References

- B85 – Bogdanovich et al. (1985)
- G68 – Garstang (1968)
- KL80 – Kafatos & Lynch (1980)
- Kh81, Kh93 – Kholtygin (1981, 1993)
- M83 – Mendoza (1983)
- NS84, NS88 – Nussbaumer & Storey (1984, 1988)
- R80 – Reader et al. (1980)
- T87 – Theodosiou (1987)
- E84 – Egikyan (1984)
- Gr90 – Gruzdev (1990)
- M91 – Morton (1991)
- S77 – Sobelman (1977)

Table 26a

Relative intensities of the Balmer lines  $I(n-2)/I(4-2)$  in the scale  $I(H_\beta)=100$

$T_e, K:$		5000			10000			20000		
$n \setminus n_e :$	$10^2$	$10^4$	$10^6$	$10^2$	$10^4$	$10^6$	$10^2$	$10^4$	$10^6$	
3	303	300	291	286	285	281	274	273	272	
4	100	100	100	100	100	100	100	100	100	
5	45.8	46.1	46.5	46.8	47.0	47.1	47.6	47.6	47.6	
6	25.2	25.2	25.8	25.9	26.0	26.2	26.4	26.4	26.6	
7	15.4	15.5	15.8	15.9	15.9	16.3	16.3	16.3	16.4	
8	10.2	10.2	10.9	10.5	10.5	11.0	10.7	10.7	11.0	
9	7.10	7.14	7.94	7.31	7.34	7.83	7.46	7.46	7.76	
10	5.16	5.20	6.11	5.30	5.33	5.88	5.40	5.40	5.74	
11	3.87	3.92	4.90	3.98	4.00	4.57	4.04	4.05	4.37	

Table 26b

Relative intensities of the Paschen lines  $I(n-3)/I(n-2)$



$T_e, K$		5000			10000			20000		
$n \setminus n_e, \text{cm}^{-3}$		$10^2$	$10^4$	$10^6$	$10^2$	$10^4$	$10^6$	$10^2$	$10^4$	$10^6$
5		0.401	0.395	0.376	0.348	0.346	0.336	0.305	0.304	0.300
10		0.379	0.376	0.345	0.347	0.346	0.326	0.318	0.317	0.304
15		0.374	0.365	0.316	0.346	0.340	0.313	0.320	0.315	0.307
20		0.372	0.346	0.308	0.346	0.328	0.308	0.320	0.310	0.307
25		0.368	0.327	0.307	0.344	0.320	0.307	0.319	0.309	0.307
30		0.362	0.315	0.307	0.339	0.313	0.307	0.315	0.309	0.307
35		0.354	0.310	0.307	0.333	0.310	0.307	0.311	0.308	0.307
40		0.343	0.308	0.307	0.327	0.308	0.307	0.309	0.307	0.307

Table 27

Relative intensities of the HeI lines ( $T_e$  in K and  $n_e$  in  $\text{cm}^{-3}$ )Triplet line intensities  $I(\lambda)/I(4471)$  in the scale  $I(\lambda 4471)=100$  (*Case A*)

$T_e$ :	5000		10000			20000	
$\lambda \setminus n_e$ :	$10^2$	$10^4$	$10^2$	$10^4$	$10^6$	$10^2$	$10^4$
5876	302	301	276	276	273	258	258
4026	45.8	45.9	47.4	47.4	47.6	48.7	48.7
3820	25.1	25.1	26.4	26.4	26.5	27.4	27.4
4026	24.4	24.3	33.0	32.8	32.5	47.8	47.7
10830	398	396	442	442	441	502	501
3889	189	190	226	226	227	279	279
3187	74.8	74.7	91.6	91.7	92.0	116	116

Singlet line intensities  $I(\lambda)/I(4471)$  in the scale  $I(\lambda 4471)=100$  (*Case B*)

$T_e$ :	5000		10000			20000	
$\lambda \setminus n_e$ :	$10^2$	$10^4$	$10^2$	$10^4$	$10^6$	$10^2$	$10^4$
6678	86.7	86.7	79.1	79.1	78.0	73.1	73.1
4922	27.6	27.6	27.4	27.4	27.4	27.1	27.1
5016	51.2	51.2	58.8	58.8	59.0	68.9	68.9
6965	19.9	19.9	23.4	23.4	23.5	27.9	27.9

Table 28

Relative intensities of the HeII lines  $I(n - n')/I(3 - 4)$  for  $n=2, 3, 4$  and  $5$   
in the scale  $I(\lambda 4686)=100$  ( $T_e$  in K and  $n_e$  in  $\text{cm}^{-3}$ )

$T_e :$		5000		10000		20000	
$\lambda$	$n_e :$	0	0	$10^4$	$10^6$	0	$10^4$
$n=2$							
1640		560	625	660	681	714	745
1215		154	189	201	213	234	246
1085		66	84.1	90.4	98.1	106	113
1025		35.6	45.6	49.1	51.9	58.3	61.8
992		21.8	27.8	30.0	31.9	35.8	37.9
$n=3$							
3204		35.5	39.8	40.3	42.5	43.8	45.2
2734		17.3	20.1	20.5	21.1	23.2	23.9
2512		10.0	12.0	12.2	12.7	14.0	14.4
2386		6.48	7.77	8.0	8.3	9.18	9.5
2307		4.46	5.38	5.6	5.8	6.39	6.6
$n=4$							
10124		29.5	27.4	26.5	27.1	25.6	24.9
6560		13.1	13.4	13.7	13.6	13.5	13.7
5412		6.78	7.34	8.0	7.8	7.79	8.2
4859		4.52	4.69	5.1	4.9	5.06	5.3
4542		2.80	3.15	3.5	3.3	3.45	3.6
$n=5$							
18500		10.8	9.55	9.43	8.9	8.56	8.4
11626		5.47	5.39	5.4	5.1	5.13	5.0
9345		3.20	3.31	3.4	3.2	3.27	3.2

Table 29

Relative intensities of the C, N, O ions recombination lines

		$T_e, K :$			
		10000		20000	
Ion	$\lambda, \text{\AA}$	<i>A</i>	<i>B</i>	<i>A</i>	<i>B</i>
CII	1760	4.1	4.2	4.4	4.4
	2748	0.4	1.7	0.4	1.8
	2838	2.5	2.5	2.7	2.7
	3921*	0.2	0.9	0.2	1.0
	4267*	1.0	1.0	1.0	1.0
	5891	0.1	0.4	0.1	0.4
	7236	0.2	1.2	0.2	1.3
	CIII	1256	2.11	1.12	2.02
1532		0.29	0.07	0.24	0.06
1620		1.23	1.54	1.04	1.44
1923		4.00	0.93	3.20	0.80
2010		1.73	0.81	1.64	0.86
2163		0.62	0.14	0.50	0.12
3609		0.09	0.12	0.08	0.11
3884		0.26	0.06	0.22	0.05
4056		0.11	0.02	0.09	0.02
4070*		0.85	0.19		
4122		0.03	0.006	0.02	0.006
4156*		0.17	0.04	0.15	0.04
4187*		0.33	0.07	0.25	0.06
4516		0.12	0.04	0.12	0.06
4650*		1.00	1.00	1.00	1.00
5696		0.007	0.002	0.006	0.001
8196		0.19	0.04	0.14	0.04
8664		0.12	0.03	0.09	0.02
9713	0.002	0.47	0.002	0.45	
11988	0.03	0.02	0.03	0.02	
NIII	3306	0.03	0.00	0.03	0.00
	4003	7.3	0.05	7.1	0.05
	4097*	17.2	0.40	20.0	0.44
	4379*	9.1	0.05	10.0	0.06
	4544	1.4	0.01	1.6	0.01
	4616	0.3	0.002	0.2	0.001
	4640*	1.0	1.0	1.0	1.0
	4903	100	0.7	1.5	0.04
	9412	1.0	0.03	2.0	0.05

Table 29 (Continuation)

		$T_e, K :$			
		10000		20000	
Ion	$\lambda, \text{\AA}$	$A$	$B$	$A$	$B$
NIV	1036*	3.7	1.16	3.2	1.04
	2318*	0.41	0.12	0.34	0.10
	2647*	0.72	0.22	0.60	0.17
	3078*	0.20	0.06	0.16	0.05
	3478*	1.0	1.0	1.0	1.0
	4057	0.003	0.001	0.003	0.001
	7115	0.001	0.42	0.001	0.36
OV	2787*	1.0	1.0	1.0	1.0
	3114	0.002	0.000	0.002	0.000
	5113	0.000	0.05	0.000	0.04
	5343	0.000	0.38	0.000	0.33
	7432	0.004	0.002	0.004	0.002

Comments: \* - this line is definitely present in the spectra of nebula,  
 $A, B$  - Menzel cases  $A$  and  $B$

Table 30

Parameters of the analytical approximation Eq(4.6) of the effective dielectronic recombination coefficients for lines of the ions of C, N, O, Ne, Mg, Al and Si

$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$	
CI										
*	1140.1	$D - D$	*	0.0000	0.4616	0.0000	0.0000	1.0136	0.10	0.168
CII										
	8797.3	$D - F$	*	0.0000	0.0859	0.0000	0.0000	0.4749	0.10	0.053
	6579.3	$S - P$		0.0619	-0.1724	0.1524	-0.0055	1.6026	0.30	0.007
	5113.4	$P - D$	*	0.0000	0.3787	0.0000	0.0000	3.6080	0.15	0.010
	4961.1	$P - P$	*	0.0000	0.0273	0.0000	0.0000	0.7948	0.10	0.012
	4619.1	$F - G$	*	-0.0004	0.9778	0.0002	0.0000	3.5887	0.15	0.027
	4267.2	$D - F$		0.8583	-1.9394	1.1805	-0.0323	5.6506	0.60	0.000
*	4142.4	$D - P$	*	0.0000	0.1297	0.0000	0.0000	2.3123	0.10	0.013
	3165.7	$F - G$	*	0.0001	0.3373	0.0000	0.0000	5.0189	0.20	0.002
	1335.3	$P - D$		1.5568	3.9044	2.6807	-0.0123	0.5834	0.10	4.536
	1167.5	$S - P$	*	0.0000	0.2038	0.0000	0.0000	0.7948	0.10	0.092
	1092.5	$P - P$	*	0.0000	0.7724	0.0001	0.0000	0.7948	0.10	0.349
	1036.8	$P - S$		0.4879	0.1712	1.3281	-0.0308	0.9202	0.10	0.780
*	971.1	$D - F$	*	-0.0003	6.4693	0.0006	-0.0001	7.4627	0.25	0.004
*	952.5	$P - D$	*	-0.0003	3.3894	0.0003	0.0000	5.7634	0.20	0.011
	946.1	$S - P$	*	0.0001	1.4276	0.0001	0.0000	0.7949	0.10	0.645
	799.8	$D - F$	*	-0.0001	6.8606	0.0002	0.0000	0.4749	0.10	4.267
CIII										
*	14382.5	$H - I$		0.0291	-0.1855	0.3267	-0.0338	4.6059	0.20	0.001
	13986.1	$F - G$		0.0263	-0.0947	0.1296	-0.0109	3.7460	0.30	0.001
*	13717.4	$H - I$		0.0859	-0.5480	0.9649	-0.0997	4.6058	0.20	0.004
*	13579.6	$G - H$		0.1094	-0.2675	0.1883	-0.0090	2.0379	0.40	0.003
	9700.4	$D - F$		0.0002	0.0060	0.0004	0.0000	0.3000	0.10	0.005
	8664.6	$F - G$		0.0886	-0.2722	0.2362	-0.0138	2.0358	0.35	0.005
	8340.8	$D - F$		0.0116	0.1716	0.0132	-0.0005	0.3184	0.10	0.001
*	8315.1	$F - G$	*	0.0000	0.3579	0.0001	0.0000	5.3545	0.20	0.002
*	8226.2	$G - H$	*	0.0001	0.3041	0.0000	0.0000	5.3518	0.20	0.001
	8196.5	$G - H$		0.3807	-1.1942	1.0595	-0.0718	2.3905	0.40	0.016

Table 30 (Continuation)

$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$
8196.5	$G - H$		0.1278	-0.4040	0.3619	-0.0250	2.4353	0.40	0.005
* 8189.1	$H - I$	*	0.0005	0.5632	0.0001	0.0000	5.3503	0.20	0.003
7597.8	$F - G$		0.0287	-0.1106	0.1235	-0.0069	1.7323	0.30	0.006
6740.3	$P - D$		0.0207	-0.0509	0.0782	-0.0023	0.5355	0.10	0.027
5826.2	$D - F$		0.0018	0.0078	0.0026	0.0000	0.4390	0.10	0.008
5305.3	$F - G$		0.0298	-0.1075	0.1472	-0.0124	3.7460	0.30	0.001
5263.1	$P - S$		0.0008	0.0046	0.0017	-0.0001	0.4000	0.10	0.005
* 5133.4	$G - H$		0.1048	-0.2563	0.1805	-0.0086	2.0382	0.40	0.003
* 4717.9	$D - F$	*	0.0000	0.2144	0.0000	0.0000	3.6259	0.15	0.006
4662.4	$P - P$		0.0019	0.0063	0.0042	-0.0002	0.4188	0.10	0.008
4648.8	$S - P$		0.1151	-0.1057	0.3451	-0.0113	0.4817	0.10	0.212
* 4593.2	$D - F$	*	0.0005	0.6813	0.0001	0.0000	3.6254	0.15	0.018
* 4542.7	$F - G$	*	0.0000	0.0064	0.0000	0.0000	0.2711	0.10	0.005
* 4429.2	$G - H$	*	0.0000	0.4335	0.0001	0.0000	3.5947	0.15	0.012
4395.3	$D - F$	*	0.0000	0.0074	0.0000	0.0000	0.3643	0.10	0.005
* 4371.1	$F - G$	*	0.0000	0.3019	0.0000	0.0000	3.6551	0.15	0.008
* 4330.0	$G - H$	*	0.0005	1.3291	0.0000	0.0000	3.5934	0.15	0.037
4325.5	$P - D$		0.0013	0.0060	0.0021	-0.0001	0.4500	0.10	0.006
* 4300.8	$P - D$	*	0.0000	0.2610	0.0000	0.0000	3.6685	0.15	0.007
4187.0	$F - G$		0.1051	-0.4050	0.4552	-0.0261	1.7717	0.30	0.022
4158.7	$D - F$		0.0116	-0.0223	0.0367	-0.0009	0.4847	0.10	0.015
4069.4	$F - G$		0.2862	-1.1021	1.2297	-0.0691	1.7324	0.30	0.061
* 3927.4	$F - G$	*	0.0003	0.5449	0.0000	0.0000	3.6034	0.15	0.015
3887.1	$D - F$		0.0177	-0.0341	0.0559	-0.0013	0.4847	0.10	0.024
* 3602.6	$D - F$	*	0.0000	0.2012	0.0000	0.0000	3.3809	0.15	0.007
* 3414.9	$F - G$	*	0.0000	0.0060	0.0000	0.0000	0.2711	0.10	0.005
* 3385.2	$F - G$	*	0.0000	0.0554	0.0000	0.0000	0.3472	0.10	0.039
* 2512.2	$F - G$	*	0.0000	0.5505	0.0000	0.0000	0.3472	0.10	0.389
* 2440.0	$F - G$	*	0.0000	0.1694	0.0000	0.0000	0.2711	0.10	0.129
2296.9	$P - D$		0.8743	3.8841	1.4779	-0.0483	0.4521	0.10	3.937
* 2296.1	$P - D$	*	0.0000	0.4000	0.0000	0.0000	0.5770	0.10	0.225
* 2200.4	$P - D$	*	0.0000	0.5229	0.0000	0.0000	0.4931	0.10	0.319
2162.9	$D - F$		0.0396	-0.0138	0.1125	0.0029	0.5586	0.10	0.081
* 2114.3	$F - G$	*	0.0000	0.3575	0.0000	0.0000	0.3472	0.10	0.253
* 2017.4	$P - D$	*	0.0000	0.8108	0.0000	0.0000	0.4931	0.10	0.495
* 1923.3	$D - D$	*	0.0000	0.3165	0.0000	0.0000	0.4931	0.10	0.193
1923.1	$D - F$		0.2666	-0.3774	0.7627	0.0310	0.6278	0.10	0.365
* 1828.0	$F - G$	*	-0.0001	3.8078	-0.0002	0.0000	0.2711	0.10	2.903
1796.8	$D - F$	*	0.0000	0.2882	0.0000	0.0000	0.3643	0.10	0.200

Table 30 (Continuation)

$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$	
*	1777.9	$F - D$	*	0.0000	0.1239	0.0000	0.0000	0.4931	0.10	0.076
*	1701.6	$P - P$	*	0.0000	0.1853	0.0000	0.0000	0.3240	0.10	0.134
*	1633.6	$S - P$	*	0.0000	0.2130	0.0000	0.0000	0.3240	0.10	0.154
	1620.3	$P - D$		0.0243	0.0381	0.0513	-0.0017	0.4200	0.10	0.074
	1577.1	$D - F$		0.2336	3.4440	0.2656	-0.0109	0.3185	0.10	2.860
	1548.9	$D - F$	*	0.0000	0.2776	0.0000	0.0000	0.3643	0.10	0.193
*	1516.3	$F - G$	*	0.0000	0.1069	0.0000	0.0000	0.3472	0.10	0.076
*	1491.2	$D - P$	*	0.0000	0.3415	0.0000	0.0000	0.3240	0.10	0.247
*	1480.4	$F - D$	*	0.0000	0.1479	0.0000	0.0000	0.5770	0.10	0.083
*	1478.1	$F - D$	*	0.0000	0.4007	0.0000	0.0000	0.4931	0.10	0.245
	1381.7	$D - F$		0.0128	0.0598	0.0227	-0.0012	0.4327	0.10	0.061
	1296.3	$D - F$		0.1194	-0.2296	0.3770	-0.0090	0.4847	0.10	0.159
	1247.4	$P - S$		-0.0001	0.8535	0.5001	-0.0341	0.6671	0.10	0.677
	1175.7	$P - P$		0.3864	3.1446	1.1348	-0.0611	0.4130	0.10	3.047
	977.0	$S - P$		0.8323	5.1970	2.5875	-0.0812	0.4437	0.10	5.477
	574.3	$P - D$		0.0980	0.1127	0.2229	0.0007	0.4990	0.10	0.264
	538.2	$P - S$		0.1342	-0.1435	0.4201	-0.0134	0.4903	0.10	0.243
	511.5	$D - F$		0.0589	0.2539	0.0849	-0.0015	0.4390	0.10	0.255
	493.5	$P - P$		0.1009	0.5483	0.2102	-0.0138	0.5706	0.10	0.478
	492.6	$D - F$		0.0728	0.3386	0.1285	-0.0069	0.4327	0.10	0.346
	483.7	$P - P$		0.0718	0.3649	0.1455	-0.0090	0.5733	0.10	0.323
*	476.0	$S - P$	*	0.0000	1.1418	0.0000	0.0000	0.9157	0.10	0.457
	459.6	$P - D$		0.9723	2.2972	1.8844	-0.0286	0.3893	0.10	3.473
	450.7	$P - D$		0.0000	0.2904	0.0481	-0.0036	0.3764	0.10	0.230
	433.3	$P - D$		0.0453	0.1992	0.0720	-0.0020	0.4534	0.10	0.200
	411.7	$D - F$	*	0.0001	4.3059	0.0000	0.0000	0.3643	0.10	2.991
*	398.4	$P - P$	*	0.0001	2.6254	0.0002	0.0000	0.3240	0.10	1.899
	371.7	$P - D$		0.1225	0.1922	0.2586	-0.0088	0.4200	0.10	0.371
NI										
	10594.8	$F - G$	*	0.0000	0.0135	0.0000	0.0000	0.4078	0.10	0.009
	9048.1	$D - F$		0.0000	0.0190	0.0024	-0.0003	0.3710	0.10	0.015
	8180.4	$D - D$		0.0000	0.0064	0.0003	0.0000	0.3500	0.10	0.005
	1000.2	$D - D$	*	0.0000	0.0395	0.0000	0.0000	0.2727	0.10	0.030
*	994.2	$D - F$	*	0.0000	0.0721	0.0000	0.0000	0.3594	0.10	0.050
*	980.7	$D - D$	*	0.0000	0.4728	0.0000	0.0000	0.5591	0.10	0.270



Table 30 (Continuation)

$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$
NII									
5679.6	$P - D$		0.0234	-0.0852	0.0927	-0.0056	2.3686	0.30	0.002
* 5495.1	$D - F$	*	0.0000	0.0781	0.0000	0.0000	1.1623	0.10	0.024
5004.4	$D - F$		0.0704	-0.1990	0.1603	-0.0099	3.3831	0.40	0.001
* 4724.1	$S - P$	*	0.0000	0.0186	0.0000	0.0000	0.7718	0.10	0.009
1085.1	$P - D$		0.0005	0.8561	2.3770	-0.1017	0.8595	0.10	1.326
916.3	$P - P$		0.0143	-0.2447	1.1821	0.0132	0.8461	0.10	0.414
* 646.4	$D - F$	*	0.0009	2.2631	0.0000	0.0000	1.1627	0.10	0.708
NIII									
6938.2	$D - F$	*	0.0000	0.2206	0.0000	0.0000	0.7295	0.10	0.106
5334.7	$S - P$	*	0.0000	0.1260	0.0000	0.0000	0.9211	0.10	0.050
* 4507.5	$D - F$	*	0.0005	0.8446	0.0000	0.0000	4.0119	0.15	0.015
* 4477.8	$G - H$	*	0.0004	1.0155	0.0001	0.0000	4.0085	0.15	0.018
4373.6	$F - G$	*	0.0000	0.9660	0.0001	0.0000	4.0183	0.15	0.017
4199.6	$P - D$		0.0149	0.0226	0.0304	-0.0002	0.8516	0.10	0.029
4099.4	$S - P$		0.0000	0.0194	0.0280	-0.0010	0.8274	0.10	0.020
4001.8	$D - F$		0.0023	0.0256	0.0027	0.0000	0.8500	0.10	0.013
* 3429.0	$D - P$	*	0.0000	0.1420	0.0000	0.0000	2.8512	0.10	0.008
2197.8	$F - G$	*	0.0000	0.2454	0.0001	0.0000	0.7958	0.10	0.111
2188.1	$P - D$	*	-0.0001	1.7355	-0.0001	0.0000	0.8199	0.10	0.764
2064.3	$F - G$	*	0.0001	4.2360	0.0014	-0.0001	0.7958	0.10	1.912
1885.1	$D - F$		0.4468	-0.8007	0.3715	0.0369	3.0634	0.45	0.003
1857.2	$D - D$	*	0.0000	0.3940	0.0000	0.0000	0.8200	0.10	0.174
1498.3	$D - F$	*	0.0000	0.9684	0.0000	0.0000	0.7295	0.10	0.467
991.0	$P - D$		2.8315	12.9695	16.8995	-0.5167	0.8162	0.10	14.229
979.9	$D - D$		0.1764	-0.4582	0.6309	0.0215	1.0251	0.10	0.133
782.9	$D - F$	*	0.0014	6.8449	0.0000	0.0000	1.7651	0.10	1.172
764.0	$P - S$		1.1769	3.6750	3.8084	-0.1470	0.9780	0.10	3.202
685.7	$P - P$		0.5940	-0.4426	4.3937	-0.3217	0.9795	0.10	1.586
472.3	$S - P$		-0.0545	1.1395	0.1343	-0.0013	0.7456	0.10	0.578
418.8	$D - F$		0.4465	3.5875	0.5445	-0.0132	0.8626	0.10	1.927
411.3	$P - P$	*	0.0000	1.3202	-0.0001	0.0000	0.9211	0.10	0.526
391.3	$P - P$	*	0.0022	9.8112	0.0001	0.0000	2.7078	0.10	0.654
387.4	$S - P$	*	-0.0002	5.2820	-0.0002	0.0000	0.9211	0.10	2.103
374.4	$P - D$		0.0961	-1.1219	4.6102	-0.4746	0.8564	0.10	1.321
348.7	$D - F$	*	-0.0004	15.4012	-0.0006	0.0001	0.7295	0.10	7.425

Table 30 (Continuation)

$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$
340.2	$D - F$	*	0.0045	18.4734	-0.0004	0.0001	1.7651	0.10	3.163
323.3	$D - F$	*	0.0341	32.2696	-0.0123	0.0018	3.9830	0.15	0.602
311.6	$P - D$		0.2238	0.3397	0.4567	-0.0033	0.8515	0.10	0.434
NIV									
9203.0	$D - F$		0.0111	-0.1354	0.4831	-0.0482	0.5315	0.10	0.183
* 7850.8	$F - G$		0.0097	0.0216	0.0354	0.0009	1.5444	0.10	0.014
* 7760.0	$G - H$	*	0.0000	0.5947	-0.0001	0.0000	6.4512	0.25	0.001
* 7742.0	$H - I$	*	-0.0001	0.5524	0.0000	0.0000	6.4494	0.25	0.001
* 7740.8	$I - J$	*	-0.0002	0.8844	-0.0004	0.0000	6.4485	0.25	0.001
7703.2	$H - I$		0.0783	-0.2678	0.2577	-0.0190	3.3144	0.35	0.002
7703.2	$H - I$		0.2348	-0.8031	0.7726	-0.0569	3.3133	0.35	0.005
7582.3	$G - H$		0.1075	-0.3417	0.3133	-0.0219	3.0892	0.35	0.003
7581.7	$G - H$		0.0404	-0.1053	0.0858	-0.0048	2.5490	0.30	0.001
5209.1	$P - D$		0.0000	0.0043	0.0195	-0.0018	0.4783	0.20	0.014
4803.6	$F - G$		0.0202	-0.0542	0.0678	-0.0040	1.8505	0.15	0.005
* 4757.2	$G - H$	*	0.0000	0.3191	0.0000	0.0000	4.5945	0.15	0.003
* 4745.2	$D - F$	*	0.0003	0.5548	0.0000	0.0000	4.6121	0.15	0.006
* 4708.1	$F - G$	*	0.0000	0.3688	0.0000	0.0000	4.5974	0.15	0.004
4707.4	$F - G$		0.0814	-0.2208	0.2735	-0.0166	1.8703	0.15	0.018
* 4705.7	$F - G$	*	0.0025	1.1065	0.0002	0.0000	4.5996	0.15	0.011
* 4680.1	$H - I$	*	0.0000	0.5669	-0.0001	0.0000	4.5904	0.15	0.006
* 4676.2	$H - I$	*	-0.0001	1.7011	0.0004	-0.0001	4.5902	0.15	0.017
* 4640.1	$G - H$	*	0.0010	0.9578	-0.0001	0.0000	4.5926	0.15	0.010
4606.4	$G - H$		0.2266	-1.0525	1.4037	-0.1084	2.6627	0.25	0.033
4606.2	$G - H$		0.0951	-0.3764	0.4486	-0.0331	2.4572	0.25	0.011
4512.8	$P - S$		0.0002	0.0054	0.0129	-0.0011	0.5497	0.20	0.010
* 4289.9	$D - F$		0.0154	-0.0448	0.0594	-0.0039	1.6851	0.20	0.005
* 4124.4	$F - G$	*	0.0000	0.3355	0.0000	0.0000	4.6276	0.15	0.003
* 4073.5	$F - G$	*	0.0004	0.5100	-0.0001	0.0000	4.5780	0.15	0.005
3480.9	$S - P$		0.0045	-0.0291	0.6366	-0.0515	0.1742	0.10	0.471
3459.1	$P - P$		-0.0001	0.0048	0.0060	-0.0004	0.2000	0.10	0.008
3200.9	$S - P$	*	0.0000	0.0110	0.0000	0.0000	0.2391	0.10	0.009
3078.3	$F - G$		0.0405	0.0627	0.0874	-0.0040	1.6451	0.10	0.036
3004.1	$P - S$		-0.0005	0.0186	0.0007	0.0000	0.2062	0.10	0.015
2664.4	$P - P$	*	0.0000	0.1852	0.0000	0.0000	0.2391	0.10	0.146
2646.4	$F - G$		0.3066	0.6885	0.7846	-0.0310	1.6158	0.10	0.348
* 2630.2	$D - F$	*	0.0001	0.6841	0.0000	0.0000	1.5424	0.10	0.146

Table 30 (Continuation)

$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$
* 2602.6	$G - H$	*	0.0002	1.1617	-0.0001	0.0000	1.5171	0.10	0.255
* 2574.6	$D - F$	*	0.0001	2.1507	0.0003	0.0000	1.5406	0.10	0.461
* 2550.6	$G - H$	*	-0.0001	3.5429	0.0002	0.0000	1.5142	0.10	0.779
2457.1	$D - P$	*	0.0000	0.1785	0.0000	0.0000	0.2391	0.10	0.141
2430.8	$P - S$		-0.0019	0.0709	0.0026	-0.0001	0.2062	0.10	0.058
* 2418.8	$P - D$	*	0.0002	0.8460	0.0001	0.0000	1.5806	0.10	0.174
2318.1	$D - F$		0.0054	-0.0820	0.3300	-0.0360	0.6469	0.10	0.114
* 2234.7	$F - G$	*	0.0001	1.1331	0.0000	0.0000	1.5707	0.10	0.236
* 2190.2	$F - G$	*	0.0002	1.8069	-0.0001	0.0000	1.4918	0.10	0.407
* 2159.5	$D - F$	*	0.0000	0.5740	0.0000	0.0000	1.0459	0.10	0.202
2080.3	$F - G$		0.1309	0.2038	0.2829	-0.0129	1.6449	0.10	0.117
1718.6	$P - D$		0.0751	-1.3414	6.4456	-0.6185	0.3433	0.10	3.236
1699.8	$F - G$		0.1002	0.2187	0.2544	-0.0103	1.6169	0.10	0.112
1325.3	$D - F$		0.0667	-0.8159	2.9104	-0.2907	0.5315	0.10	1.099
* 1279.7	$D - F$		0.0025	-0.0455	0.2315	-0.0235	0.5303	0.10	0.097
1271.6	$P - D$		0.0036	-0.0444	0.2866	-0.0275	0.1932	0.10	0.180
* 1260.3	$D - F$	*	0.0000	0.8144	0.0000	0.0000	1.0459	0.10	0.286
* 1255.8	$F - G$		-0.0014	1.1562	0.3338	-0.0313	1.4122	0.10	0.355
* 1239.8	$F - G$	*	0.0002	1.2463	0.0000	0.0000	1.4918	0.10	0.280
* 1233.8	$G - H$	*	0.0000	1.0352	0.0001	0.0000	1.5142	0.10	0.228
* 1231.0	$G - F$	*	0.0001	0.8813	0.0001	0.0000	1.5406	0.10	0.189
* 1230.4	$F - D$	*	0.0002	0.6921	0.0000	0.0000	1.5806	0.10	0.143
* 1228.4	$P - D$	*	0.0000	0.6558	0.0001	0.0000	0.7942	0.10	0.296
1225.5	$P - S$		0.0016	-0.0276	0.1766	-0.0156	0.1317	0.10	0.118
1223.8	$S - P$	*	0.0000	0.3810	0.0000	0.0000	0.2391	0.10	0.300
1222.3	$S - P$	*	0.0000	0.1345	0.0000	0.0000	0.5296	0.10	0.079
* 1221.3	$D - P$	*	0.0000	0.4580	0.0000	0.0000	1.4106	0.10	0.112
* 1173.6	$P - D$		-0.0128	0.9919	0.1844	-0.0155	1.4480	0.20	0.270
* 1102.4	$F - G$		-0.0032	0.4261	0.0453	-0.0024	1.1909	0.10	0.105
1036.2	$D - F$		0.0466	-0.6226	2.3090	-0.1996	0.6230	0.10	0.822
* 993.2	$F - G$		-0.0013	1.3770	0.3981	-0.0374	1.4124	0.10	0.423
955.3	$P - S$		0.0349	-0.2307	1.5474	-0.1407	0.5544	0.10	0.696
* 952.9	$D - F$		0.0081	-0.1496	0.7610	-0.0774	0.5303	0.10	0.319
923.2	$P - P$		0.1057	-0.3719	4.7527	-0.4378	0.2552	0.10	3.137
765.1	$S - P$		0.1051	-1.9051	10.2062	-0.9291	0.3490	0.10	5.274
756.6	$P - P$	*	0.0000	0.2633	0.0000	0.0000	0.2391	0.10	0.207
* 715.7	$F - G$	*	0.0009	3.2627	-0.0002	0.0000	1.4919	0.10	0.734
704.8	$D - P$	*	0.0000	0.2364	0.0000	0.0000	0.2391	0.10	0.186
* 678.0	$D - F$	*	0.0001	1.9513	0.0001	0.0000	1.0459	0.10	0.686

Table 30 (Continuation)

$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$
322.6	$P - S$		0.0063	-0.1200	0.9206	-0.0779	0.0798	0.10	0.673
297.7	$P - P$		0.0427	-0.4023	1.3341	-0.1392	0.4279	0.10	0.545
283.5	$P - D$		0.1599	-1.8302	6.3083	-0.5637	0.5187	0.10	2.425
239.6	$P - D$		0.0238	-0.2925	1.8886	-0.1810	0.1931	0.10	1.186
234.2	$P - P$		-0.0031	0.1646	0.2047	-0.0151	0.1978	0.10	0.288
* 225.3	$D - F$	*	-0.0001	7.3142	-0.0009	0.0001	1.1402	0.10	2.338
221.8	$P - P$	*	0.0000	0.7356	0.0000	0.0000	0.2391	0.10	0.579
* 217.9	$P - P$	*	0.0004	3.5092	-0.0003	0.0001	1.4107	0.10	0.856
209.4	$P - S$		-0.0049	0.1832	0.0068	-0.0002	0.2062	0.10	0.150
177.6	$P - D$	*	0.0000	1.5341	0.0001	0.0000	0.7942	0.10	0.693
OI									
27639.7	$S - P$		0.1953	-0.7805	0.8492	-0.0759	13.2470	0.50	0.000
18022.8	$D - F$		0.0971	-0.8743	1.6447	-0.1593	14.3535	0.50	0.000
11298.9	$P - S$		0.2147	-0.9024	1.0281	-0.0820	12.9529	0.50	0.000
9263.6	$P - D$		1.3752	-0.0677	3.8878	-0.4719	15.3842	0.50	0.000
7949.5	$D - F$	*	0.0000	0.0400	0.0000	0.0000	0.5587	0.10	0.023
7773.3	$S - P$		1.0991	-1.9677	5.9828	-0.6378	14.1284	0.45	0.000
* 6318.6	$D - P$	*	0.0000	0.0280	0.0000	0.0000	1.0257	0.10	0.010
OII									
* 25393.1	$F - G$	*	0.0000	0.0040	0.0000	0.0000	0.2971	0.10	0.003
* 11945.6	$F - G$		-0.0001	0.0072	0.0015	-0.0002	0.3500	0.10	0.006
* 9377.4	$P - D$	*	0.0000	0.0063	0.0000	0.0000	0.3616	0.10	0.004
* 8883.3	$D - F$	*	0.0000	0.0056	0.0000	0.0000	0.3475	0.10	0.004
* 8771.8	$F - G$	*	0.0000	0.0161	0.0000	0.0000	0.3456	0.10	0.011
4651.4	$P - D$		0.1037	-0.2657	0.2045	-0.0029	3.0303	0.35	0.002
4593.2	$D - F$		0.0000	0.0080	0.0059	-0.0006	0.3499	0.10	0.009
4349.8	$D - D$		0.0000	0.0048	0.0075	-0.0005	0.3000	0.10	0.009
4341.1	$P - P$		0.0376	-0.0999	0.0783	-0.0003	2.8346	0.30	0.001
4188.0	$F - G$		-0.0001	0.0154	0.0079	-0.0008	0.3498	0.10	0.016
4074.8	$D - F$		0.0923	-0.1817	0.1002	-0.0007	4.2197	0.50	0.000
* 3800.2	$D - F$	*	0.0000	0.1009	0.0000	0.0000	2.2340	0.10	0.011
* 3077.8	$P - D$	*	0.0000	0.0099	0.0000	0.0000	0.3616	0.10	0.007
* 3017.9	$D - F$	*	0.0000	0.0082	0.0000	0.0000	0.3475	0.10	0.006
* 3009.0	$D - D$	*	0.0000	0.0076	0.0000	0.0000	0.3616	0.10	0.005
* 386.3	$D - F$	*	0.0000	0.4461	0.0000	0.0000	0.2804	0.10	0.337

Table 30 (Continuation)

$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$
* 385.7	$D - D$	*	0.0000	0.3115	0.0000	0.0000	0.3318	0.10	0.224
OIII									
* 4587.1	$F - G$	*	0.0000	0.2800	0.0000	0.0000	4.6381	0.15	0.003
* 3881.6	$D - F$	*	0.0000	0.1304	0.0000	0.0000	0.9941	0.10	0.048
* 3763.1	$P - D$	*	0.0000	0.0746	0.0000	0.0000	1.6189	0.10	0.015
3762.3	$P - D$		0.0053	-0.0983	0.4693	0.0054	0.5684	0.10	0.216
3326.6	$P - S$		0.0090	0.0107	0.0226	-0.0004	0.7877	0.10	0.019
3265.9	$D - F$		0.0001	0.9493	0.1777	0.0623	1.2049	0.10	0.356
* 3191.9	$F - G$	*	0.0000	0.0723	0.0000	0.0000	1.8883	0.10	0.011
* 3176.1	$F - G$	*	0.0000	0.2069	0.0000	0.0000	1.3144	0.10	0.056
3041.6	$P - P$		0.0139	-0.0463	0.0950	-0.0013	1.1799	0.10	0.019
* 2092.0	$D - F$	*	0.0001	0.7959	0.0000	0.0000	1.5025	0.10	0.177
* 1947.2	$F - G$	*	0.0000	1.1393	0.0002	0.0000	1.3915	0.10	0.283
* 1924.2	$P - D$	*	0.0000	0.5098	0.0001	0.0000	1.3217	0.10	0.136
834.5	$P - D$		-0.0092	16.2803	6.0953	-0.3399	1.2980	0.15	6.015
703.4	$P - P$		0.0646	-1.0379	5.4702	-0.3506	0.6221	0.10	2.226
599.6	$D - D$		0.0002	1.4709	1.2954	-0.0807	1.5493	0.10	0.570
* 541.6	$P - P$	*	0.0002	2.4329	0.0001	0.0000	1.2893	0.10	0.670
374.1	$P - P$		-0.0005	1.8930	1.0691	-0.0524	1.1337	0.15	0.936
320.7	$P - D$	*	-0.0001	3.8598	0.0000	0.0000	1.5798	0.10	0.795
300.5	$D - F$	*	0.0003	13.1930	0.0015	-0.0002	1.3900	0.10	3.286
299.3	$D - D$	*	-0.0001	6.0914	0.0000	0.0000	1.5798	0.10	1.255
OIV									
9225.1	$P - D$		0.0001	0.0009	0.0005	0.0000	0.1500	0.10	0.001
* 8723.6	$P - D$	*	0.0000	0.0335	0.0000	0.0000	0.9214	0.10	0.013
* 6099.6	$D - F$	*	0.0000	0.0283	0.0000	0.0000	1.0719	0.10	0.010
* 4541.3	$F - G$	*	0.0011	0.6456	0.0000	0.0000	4.8635	0.20	0.005
* 4491.5	$D - F$	*	0.0003	0.6584	0.0000	0.0000	4.8271	0.15	0.005
4034.0	$D - F$	*	0.0000	0.0702	0.0000	0.0000	0.0719	0.10	0.065
* 3799.3	$P - P$	*	0.0000	0.0189	0.0000	0.0000	0.3721	0.10	0.013
* 3794.0	$D - F$	*	0.0000	0.1226	0.0000	0.0000	2.5050	0.10	0.010
* 3720.8	$D - P$	*	0.0000	0.1250	0.0000	0.0000	0.3721	0.10	0.086
* 3553.8	$G - F$	*	0.0000	0.0045	0.0000	0.0000	0.0719	0.10	0.004
3549.1	$D - F$	*	0.0000	0.0012	0.0000	0.0000	0.0719	0.10	0.001
3490.9	$P - D$		0.0033	0.0082	0.0069	0.0003	0.1785	0.10	0.016

Table 30 (Continuation)

$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$
3409.1	$P - D$		0.0004	0.0001	0.0016	0.0002	0.2052	0.10	0.002
3350.7	$P - D$		0.0012	-0.0001	0.0091	-0.0002	0.1795	0.10	0.008
3066.1	$S - P$		0.0230	0.0016	0.0859	0.0015	0.2149	0.10	0.090
* 3037.9	$G - F$	*	0.0000	1.5217	0.0000	0.0000	0.7085	0.10	0.749
3027.9	$P - D$	*	0.0000	0.0918	0.0000	0.0000	0.9214	0.10	0.037
3024.3	$P - D$		0.0002	0.0005	0.0005	0.0000	0.2000	0.15	0.001
* 3003.0	$F - G$	*	0.0007	0.5561	0.0000	0.0000	4.8630	0.10	0.004
2907.1	$F - D$	*	0.0000	0.2918	0.0000	0.0000	0.9214	0.10	0.116
2772.5	$D - F$	*	0.0000	0.6734	-0.0001	0.0000	1.6944	0.10	0.124
* 2637.7	$P - D$	*	0.0000	1.1338	-0.0002	0.0000	1.6242	0.10	0.223
* 2620.0	$D - F$	*	0.0000	1.0784	0.0000	0.0000	1.0719	0.10	0.369
* 2511.2	$D - F$	*	0.0002	2.8067	-0.0001	0.0000	1.7471	0.10	0.489
2486.3	$D - F$	*	0.0000	0.3204	0.0000	0.0000	0.0719	0.10	0.298
* 2363.6	$D - P$	*	0.0000	0.2168	0.0000	0.0000	0.3721	0.10	0.149
* 1936.1	$P - P$	*	0.0000	0.1495	0.0000	0.0000	0.3721	0.10	0.103
* 1785.9	$D - F$	*	0.0000	0.5212	0.0000	0.0000	1.0719	0.10	0.178
1515.5	$P - D$		0.0008	0.0086	0.0048	0.0000	0.1501	0.10	0.012
1355.1	$F - D$		0.0016	0.0209	0.0111	0.0001	0.1392	0.10	0.029
1341.8	$P - D$		0.0734	-0.7096	2.5557	-0.1364	0.3106	0.10	1.307
* 1296.4	$P - P$	*	0.0000	0.2047	0.0000	0.0000	0.3721	0.10	0.141
1289.4	$D - F$	*	0.0000	1.1066	0.0001	0.0000	0.0719	0.10	1.030
1212.9	$P - D$		0.0309	-0.3064	0.8385	-0.0813	0.5422	0.10	0.280
* 1102.0	$P - D$	*	0.0018	5.6429	8.0008	-0.0001	6.9210	0.25	0.006
1079.9	$P - D$		0.0027	-0.0002	0.0195	-0.0005	0.1795	0.10	0.018
1067.8	$D - F$		0.0935	-0.1253	0.2148	0.0392	0.8956	0.15	0.091
1060.0	$P - D$		0.0103	0.0256	0.0214	0.0011	0.1784	0.10	0.049
1046.0	$P - S$		0.0404	-0.2108	0.3873	-0.0250	0.6667	0.10	0.099
* 1006.7	$F - G$	*	0.0161	12.4488	0.0002	0.0000	7.5667	0.25	0.006
922.7	$P - P$		0.7799	-3.0453	4.4113	-0.2320	1.0333	0.20	0.681
* 844.4	$F - G$	*	-0.0001	3.3684	0.0001	0.0000	0.7085	0.10	1.659
789.4	$P - D$		4.7096	-7.7314	39.5926	-1.4842	0.2109	0.10	28.415
779.9	$D - D$		0.4003	-3.8675	13.9290	-0.7433	0.3108	0.10	7.124
* 745.8	$S - P$	*	0.0000	0.5476	0.0000	0.0000	0.3721	0.10	0.377
* 713.0	$D - F$	*	0.0041	6.5679	-0.0013	0.0002	2.5057	0.10	0.536
703.9	$D - F$	*	0.0000	0.5760	0.0000	0.0000	0.0719	0.10	0.536
636.5	$P - D$		0.1084	0.2681	0.2245	0.0112	0.1785	0.10	0.512
617.0	$D - P$		1.7032	-6.6508	9.6338	-0.5066	1.0333	0.20	1.487
609.4	$P - S$		0.4193	-1.9258	5.0398	-0.0611	0.4046	0.10	2.317
554.4	$P - P$		0.9392	-0.7450	8.8543	-0.2444	0.4542	0.10	5.590

Table 30 (Continuation)

$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$
487.0	$D - F$	*	0.0000	0.3641	0.0000	0.0000	0.0719	0.10	0.339
442.8	$S - P$		0.0228	0.0016	0.0852	0.0015	0.2149	0.10	0.090
379.8	$D - P$		0.1502	0.0108	0.5603	0.0096	0.2149	0.10	0.590
342.3	$D - D$		0.0096	0.0238	0.0199	0.0010	0.1785	0.10	0.045
306.7	$D - P$		0.0046	-0.0187	0.3118	-0.0071	0.0888	0.10	0.266
303.5	$D - D$		0.0043	0.0573	0.0305	0.0003	0.1392	0.10	0.080
289.9	$D - D$		0.0113	0.0019	0.2579	-0.0234	0.1676	0.10	0.209
* 288.5	$P - D$	*	0.0000	3.7916	-0.0007	0.0001	1.6242	0.10	0.747
285.8	$S - P$		0.0521	-0.4336	1.0532	0.0448	0.5153	0.10	0.428
279.8	$P - S$		0.0999	-0.2634	0.4500	0.0242	0.3298	0.10	0.223
* 276.1	$P - D$	*	0.0124	18.7191	0.0017	-0.0002	3.8567	0.15	0.396
* 273.5	$P - D$	*	-0.0018	25.0077	0.0020	-0.0002	4.3545	0.15	0.321
267.0	$D - D$		0.1622	-1.1147	2.2783	-0.1975	0.7623	0.15	0.526
* 265.5	$D - F$	*	-0.0001	16.4077	0.0006	-0.0001	1.0719	0.10	5.617
260.5	$D - F$		0.0005	2.2010	2.6463	-0.1639	0.6095	0.15	2.546
* 258.6	$D - F$	*	0.0060	6.1638	-0.0005	0.0001	2.5060	0.10	0.503
* 252.5	$D - D$	*	0.0128	20.5521	0.0011	-0.0001	3.8567	0.15	0.435
* 250.3	$D - D$	*	-0.0023	31.5306	0.0025	-0.0003	4.3545	0.15	0.405
238.5	$P - D$		0.2115	0.0327	0.5626	0.0832	0.2035	0.10	0.653
* 224.1	$P - P$	*	0.0000	3.2339	0.0001	0.0000	0.3721	0.10	2.222
* 216.2	$S - P$	*	0.0000	0.5602	0.0000	0.0000	0.3721	0.10	0.386
213.0	$D - F$		-0.0657	1.4583	0.2876	0.0223	0.6524	0.10	0.887
* 211.3	$S - P$	*	0.0022	5.2042	0.0232	-0.0015	1.9159	0.10	0.770
207.2	$P - D$		0.1477	-0.0102	1.0783	-0.0272	0.1795	0.10	0.993
203.0	$P - S$		0.0846	0.2543	0.3268	-0.0198	0.4614	0.10	0.407
200.8	$D - F$	*	0.0001	10.4614	0.0006	-0.0001	0.0719	0.10	0.736
196.4	$D - F$	*	0.0031	19.1580	-0.0023	0.0004	1.6946	0.10	3.519
* 188.2	$D - F$	*	-0.0032	32.3813	-0.0036	0.0005	4.8979	0.15	0.242
* 184.2	$D - F$	*	-0.0017	29.1270	0.0040	-0.0006	6.5238	0.20	0.043
182.8	$P - D$		0.1135	0.2808	0.2350	0.0117	0.1785	0.10	0.536
171.1	$P - D$		0.0174	0.2317	0.1234	0.0014	0.1392	0.10	0.325
158.6	$P - D$	*	0.0012	7.8984	0.0004	0.0000	0.9216	0.10	3.143
OV									
6487.5	$D - F$		-0.0765	4.1680	1.2966	-0.1261	2.8234	0.15	0.313
5875.5	$G - H$		0.0274	-0.0918	0.1266	-0.0106	3.3189	0.15	0.002
* 5023.2	$G - H$	*	-0.0001	0.5197	0.0000	0.0000	5.8621	0.20	0.001
* 5006.9	$D - F$	*	0.0000	0.4687	0.0000	0.0000	5.8758	0.20	0.001

Table 30 (Continuation)

$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$
* 4982.4	$F - G$	*	0.0008	0.8823	0.0001	0.0000	5.8662	0.20	0.003
4981.4	$F - G$		0.0221	-0.0957	0.1292	-0.0117	3.5562	0.20	0.001
* 4961.4	$G - H$	*	0.0012	1.4623	0.0001	0.0000	5.8616	0.20	0.004
* 4961.4	$G - H$	*	0.0009	0.5036	-0.0002	0.0000	5.8627	0.20	0.001
* 4958.7	$H - I$	*	0.0000	0.4494	0.0000	0.0000	5.8588	0.20	0.001
* 4953.3	$H - I$	*	0.0011	1.3491	-0.0006	0.0001	5.8599	0.20	0.004
* 4952.5	$I - J$	*	0.0000	2.1583	-0.0001	0.0000	5.8576	0.20	0.006
* 4952.5	$I - J$	*	0.0004	0.7195	0.0001	0.0000	5.8581	0.20	0.002
* 4944.7	$I - H$	*	0.0000	0.3643	0.0000	0.0000	5.8621	0.20	0.001
4930.3	$H - I$		0.0407	-0.2476	0.4153	-0.0419	3.9910	0.20	0.003
4930.3	$H - I$		0.1223	-0.7431	1.2467	-0.1257	3.9913	0.20	0.009
* 4924.2	$G - H$	*	0.0007	0.7699	0.0001	0.0000	5.8606	0.20	0.002
4498.2	$G - H$		0.0226	-0.0754	0.1040	-0.0087	3.3188	0.15	0.002
* 4493.9	$F - G$	*	0.0005	0.4192	-0.0001	0.0000	5.8498	0.20	0.001
4462.6	$G - H$		0.0457	-0.1671	0.2516	-0.0184	3.2313	0.10	0.004
* 3236.6	$P - P$	*	0.0000	0.1399	0.0000	0.0000	1.9093	0.10	0.021
3164.3	$F - G$		0.0160	0.1955	0.0529	-0.0039	2.9938	0.10	0.013
* 3129.6	$P - D$	*	0.0000	0.1965	0.0000	0.0000	3.0685	0.10	0.009
* 3083.8	$D - F$	*	0.0001	0.4411	0.0000	0.0000	2.9807	0.10	0.022
* 3077.9	$D - P$	*	0.0000	0.1517	0.0000	0.0000	1.9094	0.10	0.022
* 3031.3	$G - H$	*	0.0002	0.7817	0.0000	0.0000	2.9583	0.10	0.041
* 3023.6	$D - F$	*	0.0009	1.3603	0.0001	0.0000	2.9790	0.10	0.069
* 3016.6	$F - G$	*	0.0000	0.5112	0.0000	0.0000	2.9986	0.10	0.025
* 3005.2	$F - G$	*	0.0002	0.9032	0.0002	0.0000	2.9618	0.10	0.047
* 3003.8	$F - G$	*	0.0009	2.7109	0.0000	0.0001	2.9619	0.10	0.140
* 2993.3	$H - I$	*	0.0007	1.3851	-0.0001	0.0000	2.9537	0.10	0.072
* 2991.3	$H - I$	*	0.0035	4.1590	0.0002	-0.0001	2.9540	0.10	0.217
* 2974.6	$G - H$	*	0.0000	2.3453	-0.0001	0.0000	2.9549	0.10	0.122
2941.4	$G - H$		0.3768	2.0972	0.8634	-0.0657	3.0325	0.10	0.158
2941.4	$G - H$		0.1258	0.6993	0.2887	-0.0220	3.0326	0.10	0.053
2784.0	$S - P$		0.0075	-0.1040	0.5878	-0.0604	1.8618	0.10	0.067
* 2696.3	$F - G$	*	0.0009	1.2340	-0.0001	0.0000	2.9394	0.10	0.065
* 1660.8	$G - H$		0.1433	2.3447	0.1964	-0.0148	2.9947	0.10	0.134
1643.7	$F - G$		0.4277	2.2318	1.0820	-0.0818	3.0315	0.10	0.177
* 1629.2	$D - F$		0.1100	1.9840	0.1615	-0.0121	2.9944	0.10	0.112
* 1524.4	$G - H$		0.0751	1.2396	0.1036	-0.0078	2.9944	0.10	0.071
1371.3	$P - D$		0.1526	-2.1819	12.1631	-1.1983	2.0811	0.10	1.115
1085.8	$D - F$		-0.0859	5.0151	1.5551	-0.1513	2.8250	0.15	0.376
* 1071.6	$G - H$	*	0.0003	1.3349	0.0000	0.0000	2.9583	0.10	0.069



Table 30 (Continuation)

$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$	
*	1067.9	$G - H$	*	0.0000	4.0933	-0.0001	0.0000	2.9549	0.10	0.213
*	1055.1	$D - F$	*	0.0012	1.7375	0.0001	0.0000	2.9791	0.10	0.088
	1040.6	$F - G$		0.1517	0.8702	0.3453	-0.0262	3.0318	0.10	0.065
*	1037.4	$F - G$	*	0.0004	2.3306	-0.0002	0.0000	2.9389	0.10	0.123
*	1032.5	$H - I$	*	0.0011	1.5181	-0.0002	0.0000	2.9540	0.10	0.079
*	1031.9	$H - G$	*	0.0012	1.3021	-0.0001	0.0000	2.9625	0.10	0.067
	1020.0	$F - G$		0.0011	1.9488	0.1513	-0.0122	2.9376	0.10	0.111
*	943.7	$D - F$	*	0.0001	1.1447	0.0000	0.0000	2.6478	0.10	0.081
	774.5	$P - S$		0.0308	-0.3144	2.7102	-0.2657	2.0844	0.10	0.269
	760.4	$P - P$		0.0565	-1.0006	9.1628	-0.9287	1.7646	0.10	1.248
	681.3	$D - F$		0.5482	4.2072	1.6253	-0.1233	3.0007	0.15	0.311
	629.7	$S - P$		0.2120	-3.1260	19.1353	-1.8583	2.0594	0.10	1.832
	202.3	$P - P$		0.0577	-0.7299	3.0596	-0.3423	1.9926	0.10	0.279
	192.9	$P - D$		0.1384	-2.1966	9.3514	-1.0249	2.1022	0.10	0.766
	168.0	$P - D$		0.0839	-1.2048	5.8036	-0.6387	1.8941	0.10	0.608
*	141.3	$D - F$	*	-0.0005	11.8982	-0.0002	0.0000	3.0188	0.10	0.581
NeIII										
*	13625.8	$F - G$	*	0.0000	0.0145	0.0000	0.0000	0.0711	0.10	0.014
*	13577.7	$F - F$	*	0.0000	0.0112	0.0000	0.0000	0.0424	0.10	0.011
*	13430.0	$F - G$	*	0.0001	0.0215	0.0033	-0.0003	0.0541	0.10	0.023
*	13083.7	$D - F$	*	0.0000	0.0250	0.0000	0.0000	0.0424	0.10	0.024
*	12546.8	$D - D$	*	0.0000	0.0172	0.0000	0.0000	0.0895	0.10	0.016
*	12211.1	$P - D$	*	0.0000	0.0085	0.0000	0.0000	0.0895	0.10	0.008
*	6454.4	$F - F$		0.0000	0.0477	0.0169	-0.0015	0.2234	0.10	0.050
*	6441.1	$F - G$		0.0000	0.0753	0.0253	-0.0023	0.2323	0.10	0.078
*	6329.0	$F - G$		0.0000	0.0728	0.0325	-0.0032	0.2049	0.10	0.083
*	6253.4	$G - F$		-0.0001	0.0086	0.0052	-0.0006	0.0499	0.10	0.012
*	6191.8	$D - F$		0.0000	0.1072	0.0380	-0.0034	0.2233	0.10	0.113
*	4797.4	$I - G$	*	0.0000	0.0054	0.0008	-0.0001	0.0541	0.10	0.006
*	4797.4	$G - F$	*	0.0000	0.0078	0.0000	0.0000	0.0424	0.10	0.007
*	4687.6	$D - F$	*	0.0000	0.0440	0.0000	0.0000	0.2475	0.10	0.034
*	4535.1	$F - G$	*	0.0000	0.0820	0.0000	0.0000	0.2565	0.10	0.063
*	4416.9	$D - F$	*	0.0000	0.0523	0.0000	0.0000	0.2532	0.10	0.041
*	4349.6	$P - P$	*	0.0000	0.0419	0.0000	0.0000	0.2502	0.10	0.033
*	4348.9	$P - D$	*	0.0000	0.0899	0.0000	0.0000	0.2508	0.10	0.070
*	4332.9	$S - P$	*	0.0000	0.0396	0.0000	0.0000	0.2502	0.10	0.031
*	4063.9	$G - I$	*	0.0000	0.1139	0.0000	0.0000	0.2551	0.10	0.088

Table 30 (Continuation)

$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$
* 4032.1	$G - G$	*	0.0000	0.0462	0.0000	0.0000	0.2502	0.10	0.036
* 4027.1	$G - I$	*	0.0000	0.0776	0.0007	-0.0001	0.2547	0.10	0.061
* 4013.6	$D - F$	*	0.0000	0.0548	0.0000	0.0000	0.2475	0.10	0.043
* 3985.8	$F - F$	*	0.0000	0.0489	0.0000	0.0000	0.2475	0.10	0.038
* 3982.8	$F - G$	*	0.0000	0.2303	0.0000	0.0000	0.2502	0.10	0.179
2823.9	$P - D$		0.0726	0.6307	0.1468	-0.0036	0.1612	0.10	0.720
2782.2	$D - D$		0.0000	0.5976	0.1945	0.0033	0.1727	0.10	0.669
2612.4	$D - F$		0.0000	0.7904	0.2577	0.0154	0.1695	0.10	0.898
* 2538.9	$D - F$		0.0000	0.3747	0.1072	0.0013	0.2012	0.10	0.395
* 2270.7	$F - G$		0.0000	0.3024	0.0715	-0.0024	0.2377	0.10	0.293
2264.5	$F - F$		0.0000	0.2206	0.0685	-0.0024	0.2020	0.10	0.234
2214.2	$F - G$		0.0000	0.3833	0.0970	0.0039	0.2225	0.10	0.388
2150.7	$D - F$		0.0000	0.5284	0.1641	-0.0058	0.2019	0.10	0.561
* 2127.7	$P - D$	*	0.0000	0.2288	0.0000	0.0000	0.0960	0.10	0.208
* 1994.3	$F - G$	*	0.0000	0.5395	0.0001	0.0000	0.1046	0.10	0.486
* 1937.9	$D - D$	*	0.0000	0.1217	0.0000	0.0000	0.0895	0.10	0.111
* 1920.6	$D - F$	*	0.0000	0.3395	0.0000	0.0000	0.1027	0.10	0.306
* 1916.8	$D - F$		0.1519	1.4169	0.2218	-0.0067	0.1600	0.10	1.520
* 1901.2	$P - D$	*	0.0000	0.7709	-0.0001	0.0000	0.0895	0.10	0.705
* 1881.9	$F - G$	*	0.0000	1.6523	0.0000	0.0000	0.0992	0.10	1.496
* 1240.3	$F - G$	*	0.0000	0.6013	0.0000	0.0000	0.2501	0.10	0.468
489.6	$P - P$		0.0001	1.1526	-0.0645	0.3080	0.1153	0.10	1.244
487.2	$P - D$		0.0795	0.6903	0.1608	-0.0040	0.1612	0.10	0.789
283.4	$P - D$		0.0001	1.5517	0.6174	0.0542	0.1567	0.10	1.901
267.3	$P - P$		-0.0342	0.6163	0.2502	0.0007	0.0017	0.10	0.832
* 227.7	$D - F$		0.0528	0.4933	0.0716	-0.0017	0.1652	0.10	0.522
* 217.5	$S - P$	*	0.0002	2.6149	0.0004	-0.0001	0.1590	0.10	2.231
* 216.4	$P - P$		0.0632	0.5891	0.0828	-0.0028	0.1510	0.10	0.630
* 204.2	$D - P$	*	0.0000	1.0020	-0.0001	0.0000	0.1675	0.10	0.847
* 203.9	$D - D$	*	-0.0001	2.6427	0.0000	0.0000	0.2568	0.10	2.044
* 203.8	$D - F$	*	-0.0003	4.1059	-0.0002	0.0000	0.2828	0.10	3.094
* 194.3	$P - D$	*	-0.0001	2.9725	-0.0002	0.0000	0.0895	0.10	2.718
* 194.1	$P - P$	*	-0.0006	3.7682	-0.0004	0.0001	0.1620	0.10	3.204
Ne IV									
* 14740.9	$G - F$	*	0.0000	0.0059	0.0000	0.0000	0.0377	0.10	0.006
* 4927.9	$G - F$	*	0.0000	0.0057	0.0000	0.0000	0.0377	0.10	0.005
* 2341.5	$P - D$		0.0504	2.1346	0.1934	0.0854	0.1963	0.10	2.025

Table 30 (Continuation)

$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$
2197.3	$P - P$		0.0168	0.4174	0.0209	0.0084	0.2123	0.10	0.375
* 1955.7	$D - F$	*	0.0000	0.1915	0.0000	0.0000	0.1632	0.10	0.163
* 1924.5	$D - F$		0.0001	1.6034	0.1353	0.0327	0.1776	0.10	1.483
* 1884.8	$P - D$		0.0004	1.4190	0.0310	0.0142	0.1805	0.10	1.223
* 1790.2	$D - D$		-0.0001	0.5402	0.0118	0.0054	0.1801	0.10	0.465
542.8	$S - P$		1.0096	1.7831	5.9186	0.0374	0.3308	0.10	6.285
* 482.7	$D - F$	*	0.0000	1.3626	0.0000	0.0000	0.1632	0.10	1.157
* 473.8	$F - F$	*	0.0000	1.4170	0.0000	0.0000	0.1632	0.10	1.204
293.6	$P - P$		0.0442	1.0990	0.0551	0.0222	0.2123	0.10	0.987
208.6	$S - P$		0.0653	2.5781	0.2454	0.1076	0.1984	0.10	2.457
* 166.3	$P - P$	*	-0.0003	2.2490	-0.0001	0.0000	0.2306	0.10	1.786
NeV									
* 2141.8	$P - D$		0.0185	-0.3307	1.6479	-0.1446	-0.0837	0.10	1.295
* 1970.9	$D - F$		0.0009	7.1793	2.0464	-0.1008	0.7266	0.15	4.413
* 666.0	$F - G$	*	-0.0025	6.9245	0.0009	-0.0001	0.5398	0.10	4.035
571.0	$P - D$		0.0684	15.0815	11.7144	-0.3123	0.1580	0.10	22.671
482.2	$P - P$		-0.0089	9.1893	8.2286	-0.2473	0.1961	0.10	14.106
* 416.2	$D - D$		-0.0887	15.6785	3.1163	-0.0989	0.4225	0.10	12.195
* 143.2	$D - F$		0.0709	8.0229	0.0576	0.0235	0.5439	0.10	4.745
* 133.0	$D - F$	*	-0.0012	8.4732	-0.0006	0.0001	0.3684	0.10	5.861
* 122.9	$P - D$	*	0.0000	5.0572	-0.0006	0.0001	0.1384	0.10	4.403
* 122.6	$P - S$	*	0.0001	4.5451	-0.0004	0.0001	0.4137	0.10	3.005
* 118.3	$D - F$	*	0.0001	1.9793	0.0000	0.0000	0.0758	0.10	1.835
* 118.2	$D - D$	*	0.0002	10.0646	-0.0005	0.0001	0.1384	0.10	8.764
NeVI									
* 26845.5	$P - D$	*	0.0000	0.0089	0.0000	0.0000	0.0291	0.10	0.009
* 22830.0	$S - P$	*	0.0000	0.0071	0.0000	0.0000	0.0765	0.10	0.007
* 20832.0	$D - D$	*	0.0000	0.0062	0.0000	0.0000	0.0291	0.10	0.006
* 15502.0	$P - D$	*	0.0000	0.0212	0.0000	0.0000	0.1137	0.10	0.019
* 9261.0	$P - P$		0.0020	0.0141	0.0024	0.0001	0.1093	0.10	0.017
* 5416.8	$P - D$		0.0087	-0.0132	0.0343	-0.0021	0.2037	0.10	0.023
* 5247.9	$P - S$		0.0034	0.0073	0.0088	-0.0005	0.1856	0.10	0.016
* 3111.1	$D - F$		0.0102	-0.0274	0.0446	-0.0013	0.2547	0.10	0.020
* 2556.3	$D - F$		0.7076	-1.9884	3.0536	-0.0101	0.2791	0.10	1.333
* 2273.4	$P - D$		1.1576	1.2542	5.2039	-0.0659	0.1593	0.10	6.438

Table 30 (Continuation)

$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$
* 2195.6	$D - D$	*	0.0000	0.0447	0.0000	0.0000	0.0291	0.10	0.043
* 2179.8	$D - P$	*	0.0000	0.2197	0.0000	0.0000	0.0765	0.10	0.204
* 2136.5	$F - D$	*	0.0000	0.2989	0.0000	0.0000	0.0291	0.10	0.290
* 2135.3	$D - F$	*	0.0004	3.0805	0.0035	0.0001	0.3453	0.10	2.184
* 2133.2	$F - D$	*	0.0000	0.1390	0.0000	0.0000	0.1137	0.10	0.124
* 2104.4	$P - D$	*	0.0000	1.5887	0.0001	0.0000	0.4227	0.10	1.041
* 2081.7	$G - I$	*	0.0439	1.2607	0.0233	-0.0008	0.3949	0.10	0.894
* 2073.8	$I - J$	*	0.0001	1.2209	0.0004	0.0000	0.3609	0.10	0.851
* 2072.1	$F - G$	*	0.1830	1.2443	0.2218	-0.0068	0.4368	0.10	1.061
* 2071.5	$F - G$	*	-0.0003	3.0796	0.0012	0.0000	0.3839	0.10	2.098
* 1949.6	$D - F$	*	0.0000	2.2160	0.0001	0.0000	0.2711	0.10	1.690
* 1933.6	$P - D$	*	-0.0001	2.9390	-0.0002	0.0000	0.3693	0.10	2.031
* 1911.8	$D - D$	*	0.0000	0.5504	0.0000	0.0000	0.3693	0.10	0.380
* 1909.2	$P - S$		0.0636	4.1603	0.7689	-0.0185	0.0993	0.10	4.504
* 1815.8	$D - D$	*	0.0000	0.2206	0.0000	0.0000	0.1137	0.10	0.197
* 1777.6	$P - D$	*	-0.0002	1.3931	0.0000	0.0000	0.0289	0.10	1.353
* 1767.2	$P - P$	*	0.0000	0.4055	0.0000	0.0000	0.0765	0.10	0.376
* 1751.3	$D - F$	*	0.0000	0.9615	-0.0001	0.0000	0.4055	0.10	0.641
* 1739.5	$S - P$	*	0.0000	0.5624	0.0000	0.0000	0.0765	0.10	0.521
* 1712.1	$D - D$	*	0.0000	0.3994	0.0000	0.0000	0.0290	0.10	0.388
* 1686.6	$P - D$	*	0.0000	0.5327	-0.0001	0.0000	0.1137	0.10	0.475
* 1623.7	$P - P$		-0.3295	10.5177	2.1247	-0.0311	0.0006	0.10	12.274
* 1188.0	$P - S$		-0.0049	0.1045	0.0095	0.0017	0.0044	0.10	0.110
* 1157.3	$D - P$		0.0294	0.2077	0.0357	0.0016	0.1093	0.10	0.246
* 1149.8	$G - I$		0.0425	0.6826	0.0338	-0.0011	0.4050	0.10	0.505
* 1141.2	$F - D$		0.0045	0.0520	0.0028	0.0052	0.0849	0.10	0.059
* 1141.1	$P - D$		-0.0205	0.5738	0.0466	0.0000	0.2866	0.10	0.450
* 1043.8	$P - D$		-0.0026	0.0549	0.0062	0.0000	-0.0070	0.10	0.059
* 1043.1	$D - F$		-0.0031	0.0700	0.0068	-0.0002	-0.0380	0.10	0.076
* 1022.8	$G - I$		0.0321	0.5155	0.0255	-0.0008	0.4050	0.10	0.382
* 831.0	$P - P$		0.0359	0.2534	0.0436	0.0020	0.1093	0.10	0.300
* 745.4	$F - D$	*	0.0000	0.2572	0.0000	0.0000	0.0291	0.10	0.250
* 734.8	$F - G$	*	-0.0006	5.5159	0.0021	0.0000	0.3839	0.10	3.758
* 702.1	$D - F$	*	0.0000	3.7977	0.0001	0.0000	0.2711	0.10	2.896
* 695.9	$P - D$	*	-0.0002	5.6743	-0.0003	0.0001	0.3693	0.10	3.922
* 654.5	$P - D$	*	-0.0002	2.5295	0.0000	0.0000	0.0290	0.10	2.457
* 653.1	$P - P$	*	0.0000	0.7390	0.0000	0.0000	0.0765	0.10	0.685
* 639.8	$P - D$	*	-0.0001	1.4214	-0.0002	0.0000	0.1137	0.10	1.268
* 633.4	$S - P$	*	0.0000	1.4323	0.0000	0.0000	0.0765	0.10	1.327

Table 30 (Continuation)

$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$	
*	632.4	$D - D$	*	-0.0002	1.0291	0.0000	0.0000	0.0289	0.10	1.000
*	622.0	$P - D$	*	-0.0002	1.0101	0.0000	0.0000	0.0289	0.10	0.981
*	580.0	$D - D$	*	0.0000	0.2658	0.0000	0.0000	0.0291	0.10	0.258
	561.4	$P - D$		-0.2533	97.6182	29.2031	7.5539	0.2735	0.10	102.028
*	554.4	$P - P$	*	0.0000	5.4871	-0.0003	0.0000	0.5727	0.10	3.095
	553.8	$D - D$		0.9183	1.0476	2.6567	3.9920	0.3542	0.10	6.045
*	544.4	$F - D$		0.7035	-2.1526	2.6324	-0.0832	0.4318	0.15	0.714
*	543.0	$P - S$		0.1356	0.2891	0.3468	-0.0209	0.1856	0.10	0.623
*	474.4	$P - P$	*	0.0000	6.6601	-0.0003	0.0001	0.5727	0.10	3.756
*	464.5	$D - P$	*	-0.0024	8.1686	-0.0004	0.0001	0.5724	0.10	4.607
*	445.1	$P - S$		2.2651	0.4577	17.0656	2.0497	0.1979	0.10	17.917
	440.5	$D - P$		0.6570	-0.1444	3.5553	0.9494	0.3583	0.10	3.506
	434.8	$P - S$		1.0266	6.6458	2.6769	0.4527	0.4353	0.10	6.990
	401.7	$P - P$		6.5154	4.6515	19.1526	2.2099	0.2697	0.10	24.840
*	355.8	$P - D$		0.5696	-0.8623	2.2383	-0.1390	0.2037	0.10	1.474
*	355.1	$P - S$		0.1960	0.4182	0.5015	-0.0302	0.1856	0.10	0.902
*	312.8	$P - D$	*	-0.0002	4.1359	0.0003	0.0000	0.4227	0.10	2.710
*	306.6	$F - G$	*	0.0001	9.1484	0.0035	0.0000	0.3840	0.10	6.234
*	290.6	$P - D$	*	-0.0004	13.3780	-0.0007	0.0001	0.3693	0.10	9.246
*	289.6	$D - F$	*	0.0001	9.0101	0.0003	-0.0001	0.2711	0.10	6.871
*	286.4	$D - D$	*	-0.0001	2.7522	-0.0001	0.0000	0.3693	0.10	1.902
*	269.7	$D - D$	*	-0.0001	1.7400	-0.0002	0.0000	0.1136	0.10	1.553
*	268.3	$D - F$	*	-0.0001	8.2744	-0.0007	0.0001	0.4055	0.10	5.516
*	264.8	$P - D$	*	-0.0027	8.7713	-0.0001	0.0000	0.0288	0.10	8.520
*	264.6	$P - P$	*	0.0001	2.8478	-0.0001	0.0000	0.0766	0.10	2.638
*	262.6	$P - D$		0.0181	0.2081	0.0113	0.0209	0.0849	0.10	0.237
*	261.2	$P - P$		0.1090	0.7695	0.1325	0.0060	0.1093	0.10	0.912
*	258.3	$S - P$	*	-0.0011	3.7846	-0.0001	0.0000	0.0763	0.10	3.505
*	253.0	$D - D$	*	-0.0004	3.0182	0.0000	0.0000	0.0289	0.10	2.932
*	252.0	$P - D$	*	-0.0009	4.1133	-0.0005	0.0001	0.1135	0.10	3.671
*	176.5	$S - P$		-0.0246	0.8196	0.1640	-0.0022	0.0027	0.10	0.954
*	146.7	$P - D$		0.2299	2.2531	0.2757	0.0274	0.3368	0.10	1.989
*	137.5	$S - P$		0.3079	4.1347	0.5582	0.0796	0.4264	0.10	3.317
*	137.1	$P - P$		4.0592	14.6438	13.5656	-0.4131	0.1407	0.10	27.674
*	132.9	$D - D$		0.7423	7.2838	0.8907	0.0885	0.3368	0.10	6.430
*	129.5	$D - F$		1.6659	11.9733	1.8272	0.2808	0.4282	0.10	10.262
*	127.7	$S - P$		1.1055	-1.8401	2.6588	0.3543	0.2564	0.10	1.763
*	126.4	$S - P$		1.0652	0.8708	1.9413	0.0579	0.1750	0.10	3.303
*	121.7	$P - D$		-0.0085	1.8480	1.3390	0.0020	0.1185	0.10	2.825

Table 30 (Continuation)

	$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$
*	120.9	$P - P$		-0.0024	10.8948	2.7003	-0.1399	0.2625	0.10	10.347
	113.9	$P - P$		0.4141	4.2564	0.7776	0.0431	0.1863	0.10	4.558
*	113.1	$P - D$		0.3108	1.2993	0.4324	0.0146	0.3681	0.10	1.424
*	110.6	$P - D$		0.0162	7.7973	2.3068	0.0739	0.2497	0.10	7.942
*	105.5	$S - P$	*	0.0034	15.7035	-0.0008	0.0001	0.5729	0.10	8.857
*	104.5	$P - D$		-0.0226	5.2957	1.1728	0.0450	0.5063	0.10	3.858
*	104.0	$P - P$		0.0028	3.3531	2.3489	0.0931	0.4597	0.10	3.661
*	103.9	$D - F$		0.8717	4.3566	1.1836	0.0133	0.4552	0.10	4.076
*	101.7	$S - P$	*	-0.0268	211.7048	-0.0066	0.0009	5.6164	0.15	0.770
*	100.8	$P - P$		-0.0002	1.7886	0.7584	-0.0617	0.3235	0.15	1.798
*	97.5	$P - D$	*	-0.0022	14.1459	-0.0017	0.0003	0.1135	0.10	12.625
*	97.5	$P - D$		0.0048	0.6658	0.6030	0.0471	0.1175	0.10	1.174
*	97.3	$P - P$		0.0127	3.7185	1.0611	0.0292	0.2921	0.10	3.600
*	95.2	$D - F$		-0.1107	2.4409	0.3237	-0.0004	0.2955	0.10	1.975
*	91.2	$D - D$	*	-0.0012	10.0202	-0.0012	0.0002	0.1136	0.10	8.942
*	91.0	$D - F$	*	-0.0032	83.0573	-0.0046	0.0010	0.4054	0.10	55.371
*	89.4	$P - P$		0.2071	0.4369	0.5181	-0.0163	0.2262	0.10	0.914
*	85.6	$P - D$	*	-0.0035	103.8713	-0.0364	0.0054	0.0291	0.10	100.859
*	85.5	$P - P$	*	0.0028	33.9198	-0.0009	0.0001	0.0766	0.10	31.420
NeVII										
*	4375.7	$D - F$		-0.0985	6.6857	1.0389	-0.0598	2.7506	0.15	0.483
*	3890.6	$K - L$	*	-0.0012	4.7193	-0.0010	0.0001	6.5103	0.20	0.007
*	3883.6	$J - K$		0.3340	-1.8561	2.8070	-0.2700	4.4467	0.25	0.012
*	3880.4	$J - K$	*	0.0009	4.0951	0.0001	0.0000	6.5035	0.20	0.006
	973.3	$P - D$		0.3882	-6.9111	33.3715	-3.6104	1.9030	0.10	3.465
	561.6	$P - P$		0.6753	-11.9880	58.6325	-6.4317	1.7846	0.10	6.864
	465.2	$S - P$		-0.1572	38.0673	36.5808	-3.5998	2.4232	0.15	6.284
*	106.1	$P - D$		0.3255	50.4158	9.5826	-0.6318	2.7553	0.15	3.796
MgI										
*	73889.7	$G - H$		-0.0039	2.8850	0.0007	0.0000	4.7002	0.15	0.026
*	38584.6	$F - G$		0.0449	-0.3457	0.7112	-0.0722	3.0453	0.20	0.016
*	38584.6	$F - G$		0.0027	4.3474	0.4176	-0.0506	4.5253	0.20	0.051
	33191.5	$D - F$		0.0003	1.0490	0.0813	-0.0095	4.4843	0.25	0.013
*	25380.2	$F - G$		0.0235	-0.2232	0.5930	-0.0692	3.4488	0.15	0.010
	15026.7	$S - P$		0.0001	0.6847	0.1866	-0.0210	3.0106	0.10	0.042

Table 30 (Continuation)

$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$
14879.1	$D - F$		0.0258	5.7319	1.0514	-0.1184	4.2611	0.25	0.094
12084.2	$D - F$		0.0692	-0.5212	1.0643	-0.1129	2.8427	0.20	0.029
10811.4	$D - F$		0.0004	1.3958	0.1078	-0.0126	4.4844	0.25	0.017
8806.6	$P - D$		0.1259	-0.6903	1.1785	-0.0960	2.0651	0.15	0.066
5176.7	$P - S$		0.0000	0.1658	0.5114	-0.0569	2.1817	0.10	0.070
3834.4	$P - D$		0.1283	-1.2733	4.6334	-0.4728	2.7691	0.10	0.189
3094.4	$P - D$		0.0367	-0.3357	1.2721	-0.1456	3.0682	0.10	0.038
Al I									
3089.1	$P - D$		0.0744	-0.2889	0.3467	-0.0191	2.1198	0.25	0.014
3058.1	$P - P$	*	0.0000	0.7295	-0.0001	0.0000	1.9328	0.10	0.106
* 1876.9	$P - D$	*	0.0003	1.1728	-0.0001	0.0000	0.7304	0.10	0.565
1766.1	$P - P$	*	-0.0061	1.9676	0.0003	0.0000	1.2079	0.10	0.586
Al II									
* 30770.3	$H - I$		0.0025	2.3374	0.0250	-0.0030	6.4483	0.20	0.004
* 30770.3	$H - I$		0.0249	7.0436	0.0538	-0.0061	6.4518	0.20	0.011
* 30230.6	$G - H$		0.1207	-0.6941	1.1275	-0.1127	4.5391	0.20	0.005
23623.0	$D - P$		0.0703	-0.2925	0.3573	-0.0257	1.9300	0.25	0.016
* 18269.9	$G - H$		0.3516	-2.5821	5.1388	-0.5435	4.5701	0.25	0.024
* 18269.9	$G - H$		0.1943	-1.0111	1.4329	-0.1330	4.0130	0.30	0.009
17779.2	$S - P$		0.1187	-0.4938	0.6031	-0.0434	1.9300	0.25	0.027
16263.7	$F - G$		0.1901	-0.8555	1.0693	-0.0940	3.6770	0.35	0.008
* 11471.3	$G - H$		0.1152	-0.6626	1.0764	-0.1076	4.5391	0.20	0.005
10093.1	$D - P$		0.0679	0.1508	0.3309	-0.0113	0.9868	0.10	0.201
9331.9	$F - G$		0.4271	-1.6475	1.8194	-0.1412	3.0970	0.30	0.021
9289.4	$F - G$		0.9003	-4.3736	5.8042	-0.4776	3.4290	0.30	0.060
8358.2	$D - F$		0.4042	-1.3235	1.2535	-0.0742	2.2203	0.30	0.028
* 7271.3	$D - P$	*	0.0000	0.0177	0.0000	0.0000	0.1692	0.10	0.015
7049.2	$S - P$		0.1750	0.3882	0.8526	-0.0291	0.9868	0.10	0.517
6237.4	$P - D$		0.1329	-0.5974	0.7937	-0.0400	1.7245	0.20	0.052
6182.6	$F - G$		0.2468	-1.1106	1.3881	-0.1220	3.6770	0.35	0.010
5859.7	$D - F$		0.1889	-0.6182	0.5981	-0.0324	2.2041	0.30	0.015
* 5228.1	$D - P$	*	0.0000	0.0143	0.0000	0.0000	0.1692	0.10	0.012
5145.2	$F - G$		0.0998	-0.4961	0.6743	-0.0603	4.1118	0.30	0.004
4663.1	$D - P$		0.0025	-0.0476	0.2648	-0.0201	0.0861	0.10	0.183
3900.7	$P - D$		0.1931	-1.1764	3.1451	-0.1611	0.4004	0.10	1.341

Table 30 (Continuation)

$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$
3586.9	$D - F$		1.5156	-5.4947	6.0201	-0.3498	2.2296	0.30	0.182
* 3539.6	$D - P$	*	0.0000	0.0157	0.0000	0.0000	0.1692	0.10	0.013
* 3221.7	$D - F$	*	0.0018	1.0715	0.0001	0.0000	3.5009	0.15	0.032
2816.2	$P - S$		0.0277	0.1892	0.0500	-0.0007	0.2429	0.10	0.209
1860.3	$P - S$		0.2511	0.2248	1.0554	-0.0188	1.0095	0.10	0.551
* 1733.5	$S - P$	*	0.0000	0.2278	0.0000	0.0000	0.1692	0.10	0.192
1723.2	$P - D$		2.3605	-6.2188	6.3081	-0.2098	1.4623	0.20	0.519
1670.8	$S - P$		0.3800	-1.4654	3.8451	-0.1094	0.3581	0.10	1.853
* 1480.2	$D - P$	*	0.0000	0.1003	0.0000	0.0000	0.1692	0.10	0.085
* 1281.6	$D - F$	*	0.0011	4.5198	-0.0001	0.0000	1.6757	0.10	0.846
SiI									
* 1486.2	$P - P$	*	0.0000	0.5032	0.0000	0.0000	0.2150	0.10	0.406
SiII									
13087.1	$D - D$	*	0.0000	0.0028	0.0000	0.0000	0.0250	0.10	0.003
10239.9	$D - P$	*	0.0000	0.0333	0.0000	0.0000	0.3306	0.10	0.024
9000.9	$P - P$	*	0.0000	0.0268	0.0000	0.0000	0.0897	0.10	0.025
6685.3	$P - D$	*	0.0000	0.1129	0.0000	0.0000	0.0250	0.10	0.110
6355.1	$S - P$		0.3053	-0.9342	0.9443	-0.0540	0.7417	0.20	0.125
5853.9	$P - P$	*	0.0000	0.2133	0.0000	0.0000	0.3306	0.10	0.153
5681.2	$F - D$	*	0.0000	0.1094	0.0000	0.0000	0.0250	0.10	0.107
5601.6	$P - S$	*	0.0000	0.0679	0.0000	0.0000	0.4413	0.10	0.044
5219.4	$P - D$	*	0.0019	0.2475	0.0001	0.0000	1.2544	0.10	0.071
5197.9	$D - F$	*	0.0004	0.9363	0.0001	0.0000	2.7927	0.10	0.057
4192.7	$D - P$	*	0.0000	0.0814	0.0000	0.0000	0.0894	0.10	0.074
4075.7	$D - P$		0.0007	0.0018	0.0039	-0.0003	0.1784	0.10	0.005
3995.2	$F - G$	*	0.0420	1.4203	0.0033	-0.0004	3.5961	0.15	0.040
3858.1	$D - P$		0.2886	-0.8830	0.8925	-0.0510	0.7417	0.20	0.118
3474.7	$P - P$	*	0.0000	0.0115	0.0000	0.0000	0.0891	0.10	0.011
* 3165.1	$D - F$	*	0.0016	2.0587	0.0000	0.0000	3.4712	0.15	0.064
* 3025.5	$P - D$	*	0.0002	1.2798	0.0000	0.0000	3.7123	0.15	0.031
1944.9	$P - P$	*	0.0000	0.0705	0.0000	0.0000	0.0895	0.10	0.064
1869.7	$D - D$		0.0724	-0.1614	0.2842	-0.0043	0.3030	0.10	0.141
1814.0	$P - D$		0.7512	-2.9732	4.1373	-0.2040	0.5606	0.15	0.977
1531.2	$P - S$		0.2128	-1.0704	1.8562	-0.1382	0.5235	0.15	0.510
1350.3	$P - P$		0.0012	0.2908	0.0509	-0.0063	0.1302	0.10	0.296



Table 30 (Continuation)

$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$
1263.3	$P - D$		1.2378	-5.0297	5.9419	-0.4477	1.4003	0.25	0.420
1194.1	$P - P$		0.5954	-2.3035	3.5048	-0.1816	1.3998	0.25	0.398
SiIII									
13644.4	$H - I$		0.1265	-0.8241	1.4772	-0.1537	5.6521	0.20	0.002
13642.6	$H - I$		0.3800	-2.4732	4.4279	-0.4606	5.6500	0.20	0.007
13395.8	$G - H$		0.4768	-1.1841	0.8376	-0.0386	3.0607	0.40	0.004
11339.9	$S - P$		0.0450	-0.2170	0.3664	-0.0272	0.8267	0.15	0.073
8266.3	$P - D$		0.2716	-0.8315	0.8409	-0.0463	1.0614	0.20	0.081
8191.1	$F - G$		0.4698	-1.4238	1.2271	-0.0805	3.1211	0.40	0.008
8103.5	$G - H$		1.6682	-5.3113	4.7586	-0.3220	3.4159	0.40	0.026
8102.8	$G - H$		0.5480	-1.7034	1.4744	-0.0921	3.2546	0.40	0.009
7464.5	$D - P$		0.1144	-0.5518	0.9317	-0.0691	0.8267	0.15	0.186
5707.5	$F - D$		0.0900	-0.2757	0.2788	-0.0153	1.0613	0.20	0.027
5472.8	$P - D$		0.0002	0.0327	0.0061	-0.0001	0.4000	0.10	0.026
5113.9	$F - G$		0.2220	-0.5918	0.4389	-0.0206	3.0733	0.45	0.002
5091.5	$G - H$		0.4564	-1.1333	0.8016	-0.0369	3.0606	0.40	0.004
4822.1	$F - G$		0.8599	-2.9089	2.8067	-0.1346	2.3510	0.35	0.059
4560.1	$S - P$		-0.0025	1.2046	0.6437	-0.0162	0.4221	0.10	1.200
4338.5	$S - P$		-0.0008	0.0054	0.0829	-0.0050	0.0298	0.10	0.080
* 4229.8	$G - H$	*	-0.0001	1.2661	-0.0003	0.0000	4.6099	0.15	0.013
* 4212.5	$D - F$	*	0.0000	0.0383	0.0000	0.0000	0.3889	0.10	0.026
* 4179.2	$D - D$	*	0.0000	0.0225	0.0000	0.0000	0.2470	0.10	0.018
3924.5	$F - G$		0.4774	-1.7240	1.7647	-0.0783	2.4288	0.30	0.039
* 3883.3	$P - D$	*	0.0000	0.3459	0.0000	0.0000	0.5279	0.10	0.204
3801.3	$P - D$		0.0627	2.5957	1.1673	-0.0418	0.4485	0.10	2.416
* 3644.1	$S - P$	*	0.0000	0.1912	0.0000	0.0000	0.8731	0.10	0.080
3590.4	$P - D$		0.0000	0.0898	0.1304	-0.0103	0.2192	0.10	0.169
* 3583.3	$D - F$	*	0.0000	0.7158	0.0000	0.0000	0.3889	0.10	0.485
* 3552.3	$P - P$	*	0.0000	0.1779	0.0000	0.0000	0.8731	0.10	0.074
3487.0	$D - F$		0.1264	-0.3660	0.3507	-0.0128	1.5101	0.25	0.022
* 3463.4	$D - D$	*	0.0000	0.1175	0.0000	0.0000	0.5279	0.10	0.069
* 3450.7	$P - D$	*	0.0000	0.1640	0.0000	0.0000	0.2470	0.10	0.128
3253.8	$F - D$		0.0193	-0.0148	0.0352	0.0065	0.5862	0.10	0.026
3237.8	$P - S$		0.0037	-0.0583	0.2653	-0.0269	0.4523	0.10	0.117
3200.0	$F - G$		0.8311	-2.8114	2.7127	-0.1300	2.3510	0.35	0.057
3089.8	$D - P$		-0.0008	2.1244	1.1338	-0.0286	0.4239	0.10	2.113
* 3071.5	$D - F$	*	0.0000	0.1558	0.0000	0.0000	0.3889	0.10	0.106

Table 30 (Continuation)

$\lambda, \text{\AA}$	$L - L'$	$A$	$a$	$b$	$c$	$d$	$f$	$t_l$	$Y$
* 3056.1	$D - F$	*	0.0000	0.2353	0.0000	0.0000	1.5119	0.10	0.052
2541.8	$P - D$		0.0292	-0.4171	2.6108	-0.0531	0.2087	0.10	1.761
1842.6	$D - P$		-0.0022	0.0159	0.2447	-0.0149	0.0298	0.10	0.236
1782.0	$D - F$		-0.0001	1.5277	2.3834	0.0558	0.6350	0.10	2.102
* 1713.2	$P - F$	*	-0.0002	1.7253	-0.0002	0.0000	0.8174	0.10	0.762
1500.9	$D - F$		0.0701	-1.1675	5.4084	-0.4030	0.3860	0.10	2.657
* 1480.9	$D - D$	*	0.0000	0.5570	0.0001	0.0000	0.2470	0.10	0.435
* 1449.8	$F - G$	*	-0.0001	7.4809	0.0000	0.0000	1.2092	0.10	2.233
1435.9	$P - D$		0.0012	0.5137	0.0959	-0.0008	0.3974	0.10	0.410
* 1403.6	$D - F$	*	0.0000	1.7133	-0.0001	0.0000	0.3889	0.10	1.161
* 1398.6	$D - F$	*	0.0001	1.3631	0.0002	0.0000	0.9197	0.10	0.544
* 1384.9	$D - D$	*	0.0001	1.8000	0.0000	0.0000	0.5279	0.10	1.062
* 1302.8	$F - F$	*	0.0004	3.4080	-0.0004	0.0001	0.8174	0.10	1.505
1298.9	$P - P$		-0.0003	0.1836	2.6554	-0.0518	0.5271	0.10	1.645
1210.5	$D - F$		0.2954	0.5299	0.8371	0.0426	1.0134	0.10	0.619
1207.5	$D - D$		0.0129	-0.2262	1.0662	-0.0959	0.1456	0.10	0.654
1206.5	$P - D$		0.0154	-0.0858	0.6481	0.1265	0.3126	0.10	0.515
1206.5	$S - P$		0.1152	-0.3082	4.4734	0.0207	0.2981	0.10	3.192
1143.1	$P - P$		0.3069	0.2054	1.5713	-0.0313	0.8580	0.10	0.870
1111.6	$P - D$		0.0842	-1.7568	10.2865	-0.1147	0.1059	0.10	7.645
996.1	$P - S$		0.1799	0.9786	1.0052	-0.0099	0.5044	0.10	1.301

Comments: an asterisk in the column 1 indicates that  $\lambda$  is uncertain. It means that it is derived entirely from calculated term energies or that the experimental data were incomplete or very uncertain for one of the two terms,

an asterisk in the column 4 indicates that the upper state is an autoionizing state,

the value  $t_l$  in the column 10 is chosen such that the maximum error in the fit is less than 10 %,

$Y$  in the last column is the value  $\alpha_{\text{eff}}(\lambda)$  at  $T_e = 10^4 \text{ K}$  in units of  $10^{-12} \text{ cm}^3 \text{ s}^{-1}$ .

Table 31

The values of total and partial effective recombination coefficients ( $\alpha_{ki}^R = \alpha_{ki}^{\text{eff}} + \alpha_{ki}^{\text{di}}$ ) in units  $10^{-14}\text{cm}^3\text{s}^{-1}$

Ion	$\lambda, \text{\AA}$	Case	$T_e = 10^4\text{K}$			$T_e = 2 \cdot 10^4\text{K}$		
			$\alpha_{ki}^{\text{eff}}$	$\alpha_{ki}^{\text{di}}$	$\alpha_{ki}^R$	$\alpha_{ki}^{\text{eff}}$	$\alpha_{ki}^{\text{di}}$	$\alpha_{ki}^R$
CII	3921	B	21.2		21.2	13.1		13.1
	4267	A,B	23.6	0.02	23.6	14.3	1.51	15.8
	7231	B	28.3		28.3	18.7		18.7
CIII	4070	A,B	20.8	6.1	26.9	10.8	18.2	29.0
	4156	A,B	4.4	1.6	6.0	2.4	1.5	3.9
	4187	A,B	8.2	2.2	10.4	4.2	6.6	10.8
	4650	A,B	28.0	63.3	91.3	18.5	36.0	54.5
CIV	4658	A,B	85.0		85.0	43.7		43.7
	7726	A,B	98.9		98.9	43.6		43.6
NII	4624	B	8.4		8.4	5.0		5.0
	4795	B	4.8		4.8	2.6		2.6
	5005	A,B	23.7	0.1	23.8	13.6	0.8	14.4
	5679	A,B	17.1	0.2	17.3	11.2	1.0	12.2
NIII	4003	A,B	2.3	1.3	3.6	1.5	0.7	2.2
	4097	A,B	42.7	2.0	44.7	30.6	1.7	32.3
	4379	A,B	5.4		5.4	3.1		3.1
NIV	4640	B	107.0	100.2	207.2	70.0	109.3	179.3
	3078	A	12.5	3.6	16.1	6.5	3.8	10.3
	3478	A	70.8	47.1	117.9	46.5	33.7	80.2
	4606	A	101.5	3.3	104.8	44.6	13.4	58.0
	7703	A	66.8	0.7	67.5	27.8	5.7	33.5
OII	4075	A	18.9	0.01	18.9	9.4	0.3	9.7
	4089	A	8.4		8.4	3.8		3.8
	4119	A	9.4		9.4	4.7		4.7
	4349	A,B	20.0	0.1	20.1	10.6	0.6	11.2
	4649	A,B	36.3	0.2	36.5	19.1	1.4	20.5
OIII	3133	B	13.9		13.9	7.4		7.4
	3266	A,B	63.4	35.6	99.0	33.9	30.1	64.0
	3340	B	4.4	1.9	6.3	2.5	1.4	3.9
	3430	B	8.7		8.7	4.6		4.6
	3715	B	25.5		25.5	13.7		13.7
	3760	A,B	43.2	21.6	64.8	24.1	23.0	47.1
OIV	3412	B	21.3	65.1	86.4	11.6	49.4	61.0
	4632	A,B	101.5		101.5	44.6		44.6
OV	4930	A,B	142.2	1.2	143.4	61.5	8.4	69.9
	5113	B	39.3		39.3	26.4		26.4

Table 32

Fit parameter values to the function  $X(T_e) = \chi_0 \left( T_e / 10^4 \right)^\eta$

Ion	$\lambda, \text{\AA}$	Case	Photorecom.		Ph. and Di.-recom.	
			$\chi_0$	$\eta$	$\chi_0$	$\eta$
CII	3921	B	0.116	-0.23	0.116	-0.23
	4267	A,B	0.113	-0.19	0.113	-0.34
	7231	B	0.160	-0.32	0.160	-0.32
CIII	4070	A,B	0.122	0.03	0.095	-1.03
	4156	A,B	0.591	-0.04	0.433	-0.29
	4187	A,B	0.319	0.05	0.252	-0.97
	4650	A,B	0.104	-0.32	0.032	-0.17
CIV	4658	A,B	0.034	0.04	0.034	0.04
	7726	A,B	0.049	0.26	0.049	0.26
NII	4624	B	0.344	-0.17	0.344	-0.17
	4795	B	0.624	-0.03	0.624	-0.03
	5005	A,B	0.132	-0.12	0.132	-0.19
	5679	A,B	0.208	-0.31	0.205	-0.41
NIII	4003	A	1.090	-0.30	0.695	-0.21
	4097	A	0.060	-0.44	0.057	-0.45
	4379	A	0.507	-0.12	0.507	-0.12
	4640	B	0.027	-0.30	0.014	-0.71
NIV	3078	A	0.154	0.03	0.120	-0.27
	3478	A	0.031	-0.31	0.018	-0.36
	4606	A	0.028	0.27	0.028	-0.06
	7703	A	0.072	0.35	0.071	0.09
OII	4075	A	0.135	0.09	0.135	0.05
	4089	A	0.304	0.23	0.304	0.29
	4119	A	0.274	0.08	0.274	0.08
	4349	A,B	0.136	0.00	0.135	-0.07
	4649	A,B	0.080	0.01	0.080	-0.08
OIII	3133	B	0.141	-0.01	0.141	-0.01
	3265	A,B	0.032	-0.01	0.021	-0.29
	3340	B	0.475	-0.10	0.332	-0.23
	3430	B	0.247	0.00	0.247	0.00
	3715	B	0.091	-0.02	0.091	-0.02
	3760	A,B	0.054	-0.08	0.036	-0.46
OIV	3412	B	0.100	-0.04	0.025	-0.41
	4632	A,B	0.028	0.27	0.029	0.27
OV	4930	A,B	0.022	0.29	0.022	0.12
	5113	B	0.081	-0.34	0.081	-0.34

Table 33

Parameters  $\chi$ ,  $A_{\lambda i}$  and  $d$  connecting the ultraviolet line intensities with the relative abundance of the ion

Ion	$\lambda$ , Å	Transition	$\chi(J, J')$	$T_e$ , K	$A_{\lambda i}$	$d$
CII]	2329	$2s^2 2p^2 P - 2s 2p^2 4P$	5.33	10000	2.57-7	2.69
CIII]	1906 1909	$2s^2 1S - 2s 2p^3 P^o$	6.50	10000	1.112-7	3.276
CIV	1548 1550	$2s^2 S_{1/2} - 2p^2 P_{1/2, 3/2}$	8.00	13000	2.04-8	4.032
NIII]	1747 1754	$2s^2 2p^2 P - 2s 2p^2 4P$	7.08	10000	2.99-7	3.568
NIV]	1487	$2s^2 1S_o - 2s 2p^3 P^o_1$	8.34	15000	1.064-7	4.203
NV	1239 1243	$2s^2 S - 2p^2 P^o$	10.0	15000	2.17-8	5.04
OIII]	1661 1666	$2s^2 2p^2 3P - 2s 2p^3 5S_2$	7.45	10000	7.29-7	3.75
OIV]	1403 1409	$2s^2 2p^2 P^o - 2s 2p^2 4P$	8.82	15000	3.88-7	4.45
OV]	1218	$2s^2 1S - 2s 2p^3 P^o$	10.18	15000	1.056-7	5.13
OVI	1032 1038	$2s^2 S - 2p^2 P^o$	11.97	15000	2.41-8	6.03
MgII	2800	$3s^2 S - 3p^2 P^o$	4.43	10000	1.98-8	2.22
SiIII	1892	$3s^1 S - 3s 3p^3 P^o$	6.55	10000	2.04-8	3.301
SiVI	1391	$3s^2 S - 3p^2 P^o$	8.86	15000	9.62-9	4.465

Table 34

Coefficients of emission in continuum (in units  $10^{-40}\text{erg cm}^3/\text{s Hz}$ , Eq. (4.13))

$\lambda, \text{\AA}$	$\nu \cdot 10^{-14}$	$T_e$ $\gamma_{\text{H}}$	= $\gamma_{2q}$	5000K $\gamma_{\text{HeI}}$	$\gamma_{\text{HeII}}$
1000.0	29.9790	0.000	0.000		0.000
1200.0	24.9830	0.000	0.000		0.017
1300.0	23.0610	0.000	9.122		0.106
1400.0	21.4140	0.000	13.391		0.509
1500.0	19.9860	0.001	14.974		1.988
1600.0	18.7370	0.003	15.411	0.228	6.539
1800.0	16.6550	0.023	14.951	0.925	47.489
2051.0	14.6170	0.159	13.711	3.510	329.556
2053.0	14.6030	0.161	13.700	3.549	0.340
2200.0	13.6270	0.408	12.921	6.283	0.863
2400.1	12.4910	1.199	11.892	12.104	2.548
2599.4	11.5330	2.970	10.970	19.442	6.343
2600.8	11.5270	2.987	10.964	5.048	6.379
2725.4	11.0000	4.917	10.442	12.553	10.531
2855.2	10.5000	7.884	9.912	19.675	16.937
2997.9	10.0000	12.633	9.382	26.796	27.229
3121.4	9.6044	18.334	8.956	32.430	39.633
3122.0	9.6026	18.365	8.954	27.667	39.700
3331.0	9.0000	32.354	8.301	53.754	70.282
3421.4	8.7623	40.435	8.044	64.044	88.022
3422.0	8.7607	40.496	8.042	7.223	88.155
3527.0	8.5000	51.698	7.757	9.832	112.818
3642.0	8.2315	66.459	7.460	12.519	145.422
3648.0	8.2180	0.327	7.445	12.654	5.320
3679.2	8.1483	0.349	7.368	13.352	5.685
3679.9	8.1467	0.350	7.367	0.406	5.694
4000.0	7.4948	0.649	6.646	0.759	10.576
4282.8	7.0000	1.038	6.091	1.363	16.912
4499.9	6.6622	1.429	5.710	1.775	23.292
4996.5	6.0000 <sup>126</sup>	2.670	4.967	4.278	43.577

Table 34 (Continuation)

$\lambda, \text{\AA}$	$\nu \cdot 10^{-14}$	$T_e = 5000\text{K}$			
		$\gamma_{\text{H}}$	$\gamma_{2q}$	$\gamma_{\text{HeI}}$	$\gamma_{\text{HeII}}$
5096.0	5.8829	2.982	4.838	4.721	48.673
5450.8	5.5000	4.277	4.415	6.169	69.850
5695.8	5.2634	5.342	4.153	7.063	87.285
5700.0	5.2595	5.361	4.149	7.096	14.175
5995.9	5.0000	6.839	3.862	9.411	18.124
6633.8	4.5192	10.723	3.356	13.699	28.556
6635.8	4.5178	10.736	3.355	12.413	28.594
6999.9	4.2828	13.366	3.110	15.378	35.693
7438.7	4.0302	16.901	2.846	18.565	45.284
7441.1	4.0289	16.921	2.845	18.036	45.339
7848.0	3.8200	20.532	2.627	20.926	55.182
7850.4	3.8188	20.555	2.626	14.142	55.244
8193.3	3.6590	23.821	2.463	16.043	64.187
8196.2	3.6577	23.850	2.462	8.038	64.266
8196.7	3.6575	23.854	2.462	8.040	64.278
8198.5	3.6567	23.872	2.461	5.516	64.326
8207.0	3.6529	23.956	2.457	5.534	64.556
8209.0	3.6520	3.418	2.456	5.538	21.786
8265.4	3.6271	3.499	2.433	5.655	22.305
8268.1	3.6259	3.503	2.432	3.400	22.330
8499.9	3.5270	3.845	2.338	3.846	24.517
9000.1	3.3310	4.624	2.152	4.729	29.498
9500.0	3.1557	5.450	1.986	5.519	34.796
10000.1	2.9979	6.319	1.836	6.230	40.364

Table 34 (Continuation)

$\lambda, \text{\AA}$	$\nu \cdot 10^{-14}$	$T_e = 10000\text{K}$			
		$\gamma_{\text{H}}$	$\gamma_{2q}$	$\gamma_{\text{HeI}}$	$\gamma_{\text{HeII}}$
1000.0	29.9790	0.001	0.000	0.046	0.082
1200.0	24.9830	0.009	0.000	0.079	0.880
1300.0	23.0610	0.023	5.611	0.126	2.196
1400.0	21.4140	0.051	8.236	0.210	4.800
1500.0	19.9860	0.100	9.210	0.400	9.448
1600.0	18.7370	0.181	9.478	0.869	17.069
1800.0	16.6550	0.486	9.196	1.650	45.649
2051.0	14.6170	1.272	8.433	3.895	119.142
2053.0	14.6030	1.280	8.426	3.926	2.996
2200.0	13.6270	2.026	7.947	6.087	4.760
2400.1	12.4910	3.453	7.314	9.014	8.150
2599.4	11.5330	5.404	6.747	11.861	12.817
2600.8	11.5270	5.419	6.743	7.156	12.853
2725.4	11.0000	6.928	6.423	9.976	16.480
2855.2	10.5000	8.740	6.096	12.651	20.857
2997.9	10.0000	11.020	5.770	15.326	26.387
3121.4	9.6044	13.231	5.508	17.443	31.775
3122.0	9.6026	13.242	5.507	15.873	31.802
3331.0	9.0000	17.477	5.106	20.976	42.181
3421.4	8.7623	19.490	4.947	22.989	47.142
3422.0	8.7607	19.505	4.946	4.321	47.177
3527.0	8.5000	21.976	4.771	4.902	53.289
3642.0	8.2315	24.841	4.588	5.501	60.400
3648.0	8.2180	1.387	4.579	5.532	10.742
3679.2	8.1483	1.434	4.532	5.687	11.102
3679.9	8.1467	1.435	4.531	1.450	11.110
4000.0	7.4948	1.950	4.088	2.070	15.107
4282.8	7.0000	2.461	3.746	2.807	19.067
4499.9	6.6622	2.883	3.512	3.310	22.344
4996.5	6.0000	3.929	3.055	4.943	30.465



Table 34 (Continuation)

$\lambda, \text{\AA}$	$\nu \cdot 10^{-14}$	$T_e = 10000\text{K}$			
		$\gamma_{\text{H}}$	$\gamma_{2q}$	$\gamma_{\text{HeI}}$	$\gamma_{\text{HeII}}$
5096.0	5.8829	4.150	2.975	5.231	32.177
5450.8	5.5000	4.959	2.715	6.176	38.463
5695.8	5.2634	5.534	2.554	6.795	42.934
5700.0	5.2595	5.544	2.552	6.771	17.101
5995.9	5.0000	6.252	2.375	7.583	19.321
6633.8	4.5192	7.801	2.064	9.086	24.210
6635.8	4.5178	7.806	2.063	8.661	24.226
6999.9	4.2828	8.693	1.913	9.391	27.042
7438.7	4.0302	9.754	1.751	10.176	30.426
7441.1	4.0289	9.760	1.750	10.000	30.445
7848.0	3.8200	10.729	1.616	10.607	33.555
7850.4	3.8188	10.735	1.615	8.081	33.574
8193.3	3.6590	11.537	1.515	8.497	36.161
8196.2	3.6577	11.544	1.514	5.880	36.183
8196.7	3.6575	11.545	1.514	5.880	36.186
8198.5	3.6567	11.549	1.514	5.041	36.200
8207.0	3.6529	11.569	1.511	5.048	36.263
8209.0	3.6520	4.317	1.511	5.050	21.162
8265.4	3.6271	4.368	1.496	5.098	21.411
8268.1	3.6259	4.371	1.496	4.360	21.423
8499.9	3.5270	4.578	1.438	4.596	22.443
9000.1	3.3310	5.020	1.324	5.065	24.609
9500.0	3.1557	5.449	1.221	5.483	26.718
10000.1	2.9979	5.867	1.129	5.860	28.766

Table 34 (Continuation)

$\lambda, \text{\AA}$	$\nu \cdot 10^{-14}$	$T_e = 15000\text{K}$			
		$\gamma_{\text{H}}$	$\gamma_{2q}$	$\gamma_{\text{HeI}}$	$\gamma_{\text{HeII}}$
1000.0	29.9790	0.016	0.000	0.212	0.546
1200.0	24.9830	0.080	0.000	0.366	2.655
1300.0	23.0610	0.147	4.212	0.488	4.869
1400.0	21.4140	0.248	6.182	0.690	8.181
1500.0	19.9860	0.389	6.913	0.990	12.817
1600.0	18.7370	0.576	7.115	1.509	18.966
1800.0	16.6550	1.107	6.903	2.375	36.369
2051.0	14.6170	2.093	6.330	4.281	68.548
2053.0	14.6030	2.102	6.325	4.304	5.382
2200.0	13.6270	2.848	5.965	5.891	7.317
2400.1	12.4910	4.049	5.490	7.702	10.454
2599.4	11.5330	5.441	5.065	9.195	14.112
2600.8	11.5270	5.451	5.062	6.608	14.139
2725.4	11.0000	6.408	4.821	8.038	16.670
2855.2	10.5000	7.467	4.576	9.395	19.484
2997.9	10.0000	8.695	4.331	10.753	22.766
3121.4	9.6044	9.804	4.135	11.826	25.743
3122.0	9.6026	9.809	4.134	10.961	25.757
3331.0	9.0000	11.766	3.833	13.048	31.045
3421.4	8.7623	12.636	3.714	13.870	33.411
3422.0	8.7607	12.642	3.713	3.645	33.428
3527.0	8.5000	13.667	3.581	3.957	36.227
3642.0	8.2315	14.805	3.444	4.279	39.350
3648.0	8.2180	2.028	3.437	4.295	12.304
3679.2	8.1483	2.073	3.402	4.376	12.575
3679.9	8.1467	2.074	3.401	2.052	12.582
4000.0	7.4948	2.544	3.068	2.620	15.430
4282.8	7.0000	2.969	2.812	3.217	18.007
4499.9	6.6622	3.298	2.636	3.625	20.005
4996.5	6.0000	4.052	2.293	4.706	24.571

Table 34 (Continuation)

$\lambda, \text{\AA}$	$\nu \cdot 10^{-14}$	$T_e = 15000\text{K}$			
		$\gamma_{\text{H}}$	$\gamma_{2q}$	$\gamma_{\text{HeI}}$	$\gamma_{\text{HeII}}$
5096.0	5.8829	4.202	2.233	4.898	25.478
5450.8	5.5000	4.730	2.038	5.523	28.676
5695.8	5.2634	5.088	1.917	5.909	30.842
5700.0	5.2595	5.094	1.915	5.916	16.784
5995.9	5.0000	5.517	1.783	6.355	18.206
6633.8	4.5192	6.390	1.550	7.168	21.159
6635.8	4.5178	6.393	1.549	6.935	21.169
6999.9	4.2828	6.867	1.436	7.291	22.778
7438.7	4.0302	7.412	1.314	7.673	24.641
7441.1	4.0289	7.415	1.313	7.575	24.651
7848.0	3.8200	7.896	1.213	7.854	26.302
7850.4	3.8188	7.899	1.212	6.435	26.312
8193.3	3.6590	8.285	1.137	6.644	27.648
8196.2	3.6577	8.289	1.137	5.205	27.659
8196.7	3.6575	8.289	1.137	5.205	27.660
8198.5	3.6567	8.291	1.136	4.740	27.667
8207.0	3.6529	8.301	1.134	4.746	27.700
8209.0	3.6520	4.355	1.134	4.747	19.483
8265.4	3.6271	4.389	1.123	4.783	19.637
8268.1	3.6259	4.391	1.123	4.380	19.644
8499.9	3.5270	4.531	1.079	4.534	20.267
9000.1	3.3310	4.821	0.994	4.838	21.560
9500.0	3.1557	5.097	0.917	5.110	22.784
10000.1	2.9979	5.358	0.848	5.355	23.945

Table 34 (Continuation)

$\lambda, \text{\AA}$	$\nu \cdot 10^{-14}$	$T_e = 20000\text{K}$			
		$\gamma_{\text{H}}$	$\gamma_{2q}$	$\gamma_{\text{HeI}}$	$\gamma_{\text{HeII}}$
1000.0	29.9790	0.067	0.000	0.378	1.299
1200.0	24.9830	0.218	0.000	0.653	4.236
1300.0	23.0610	0.344	3.383	0.860	6.664
1400.0	21.4140	0.507	4.966	1.170	9.817
1500.0	19.9860	0.710	5.552	1.580	13.724
1600.0	18.7370	0.952	5.714	2.150	18.382
1800.0	16.6550	1.551	5.544	3.100	29.860
2051.0	14.6170	2.494	5.084	4.667	47.852
2053.0	14.6030	2.502	5.080	4.682	6.845
2200.0	13.6270	3.137	4.791	5.695	8.612
2400.1	12.4910	4.077	4.410	6.769	11.243
2599.4	11.5330	5.078	4.068	7.577	14.068
2600.8	11.5270	5.085	4.066	5.915	14.087
2725.4	11.0000	5.734	3.872	6.760	15.931
2855.2	10.5000	6.424	3.675	7.562	17.898
2997.9	10.0000	7.192	3.479	8.363	20.102
3121.4	9.6044	7.861	3.321	8.998	22.032
3122.0	9.6026	7.864	3.320	8.441	22.041
3331.0	9.0000	8.997	3.078	9.529	25.334
3421.4	8.7623	9.484	2.983	9.958	26.760
3422.0	8.7607	9.487	2.982	3.370	26.769
3527.0	8.5000	10.050	2.876	3.583	28.423
3642.0	8.2315	10.661	2.766	3.801	30.229
3648.0	8.2180	2.359	2.761	3.812	12.658
3679.2	8.1483	2.398	2.732	3.869	12.867
3679.9	8.1467	2.399	2.732	2.370	12.871
4000.0	7.4948	2.797	2.464	2.350	14.998
4282.8	7.0000	3.141	2.258	3.331	16.838
4499.9	6.6622	3.400	2.117	3.660	18.219
4996.5	6.0000	3.969	1.842	4.436	21.253

Table 34 (Continuation)

$\lambda, \text{\AA}$	$\nu \cdot 10^{-14}$	$T_e = 20000\text{K}$			
		$\gamma_{\text{H}}$	$\gamma_{2q}$	$\gamma_{\text{HeI}}$	$\gamma_{\text{HeII}}$
5096.0	5.8829	4.079	1.794	4.573	21.838
5450.8	5.5000	4.459	1.637	5.022	23.861
5695.8	5.2634	4.711	1.540	5.300	25.200
5700.0	5.2595	4.715	1.538	5.304	16.070
5995.9	5.0000	5.007	1.432	5.586	17.086
6633.8	4.5192	5.594	1.245	6.109	19.137
6635.8	4.5178	5.596	1.244	5.960	19.144
6999.9	4.2828	5.906	1.153	6.176	20.233
7438.7	4.0302	6.257	1.055	6.409	21.471
7441.1	4.0289	6.258	1.055	6.350	21.477
7848.0	3.8200	6.563	0.974	6.519	22.557
7850.4	3.8188	6.565	0.974	5.590	22.563
8193.3	3.6590	6.807	0.913	5.729	23.425
8196.2	3.6577	6.809	0.913	4.810	23.432
8196.7	3.6575	6.809	0.913	4.810	23.433
8198.5	3.6567	6.810	0.913	4.500	23.437
8207.0	3.6529	6.816	0.911	4.505	23.458
8209.0	3.6520	4.254	0.911	4.506	18.123
8265.4	3.6271	4.280	0.902	4.539	18.231
8268.1	3.6259	4.281	0.902	4.270	18.237
8499.9	3.5270	4.385	0.867	4.382	18.675
9000.1	3.3310	4.599	0.798	4.604	19.576
9500.0	3.1557	4.800	0.736	4.802	20.418
10000.1	2.9979	4.988	0.681	4.980	21.209