

Hartree-Fock implementation using a Laguerre-based wavefunction for the ground-state and correlation energies of two-electron atoms

Article (Supplemental Material)

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SUPPLEMENTARY MATERIAL

Hartree-Fock implementation using a Laguerre-based wavefunction for the ground-state and correlation energies of two-electron atoms

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I. HF ENERGY CONVERGENCE DATA, $Z = Z_C^{FC}, 1, Z_C^{HF}, 2 \dots 18$

TABLE I: Convergence of the ground state energy with increasing basis set size for the Hartree Fock (HF) implementations. Electronic energies in a.u. $Z_C^{FC} = 0.911\ 028\ 224\ 077\ 255\ 73$ and $Z_C^{HF} = 1.031\ 177\ 528$.

No. Terms	Z_C^{FC}	H ⁻	Z_C^{HF}	He	Li ⁺
1	-0.358 236 035 017	-0.472 656 249 999	-0.516 497 389 252	-2.847 656 249 999	-7.222 656 249 999
5	-0.373 875 367 890	-0.487 916 197 476	-0.531 652 979 306	-2.861 679 675 254	-7.236 414 652 730
7	-0.373 904 790 600	-0.487 929 420 478	-0.531 663 343 091	-2.861 679 763 443	-7.236 414 822 293
10	-0.373 906 162 092	-0.487 929 700 699	-0.531 663 518 346	-2.861 679 993 922	-7.236 415 200 781
15	-0.373 906 223 491	-0.487 929 733 497	-0.531 663 546 028	-2.861 679 995 609	-7.236 415 201 451
17	-0.373 906 226 807	-0.487 929 734 257	-0.531 663 546 953	-2.861 679 995 612	-7.236 415 201 452
20	-0.373 906 227 545	-0.487 929 734 369	-0.531 663 547 020	-2.861 679 995 612	-7.236 415 201 452

TABLE II: Convergence of the ground state energy with increasing basis set size for the Hartree Fock (HF) implementations. Electronic energies in a.u.

No. Terms	Be ²⁺	B ³⁺	C ⁴⁺	N ⁵⁺	O ⁶⁺
1	-13.597 656 249 999 999	-21.972 656 249 999 999	-32.347 656 249 999 999	-44.722 656 249 999 999	-59.097 656 249 999 999
5	-13.611 298 630 035 416	-21.986 233 481 104 705	-32.361 191 752 998 586	-44.736 162 737 745 367	-59.111 141 392 734 125 071
7	-13.611 299 039 644 192	-21.986 234 065 967 765	-32.361 192 464 386 683	-44.736 163 542 837 029	-59.111 142 269 062 051 700
10	-13.611 299 430 190 333	-21.986 234 466 493 603	-32.361 192 875 437 538	-44.736 163 964 691 319	-59.111 142 701 680 970 929
15	-13.611 299 430 618 882	-21.986 234 466 824 211	-32.361 192 875 717 922	-44.736 163 964 942 404	-59.111 142 701 913 598 647
17	-13.611 299 430 619 108	-21.986 234 466 824 344	-32.361 192 875 718 015	-44.736 163 964 942 476	-59.111 142 701 913 658 340
20	-13.611 299 430 619 111	-21.986 234 466 824 346	-32.361 192 875 718 016	-44.736 163 964 942 477	-59.111 142 701 913 658 996

TABLE III: Convergence of the ground state energy with increasing basis set size for the Hartree Fock (HF) implementations. Electronic energies in a.u.

No. Terms	F ⁷⁺			Ne ⁸⁺			Na ⁹⁺			Mg ¹⁰⁺			Al ¹¹⁺														
1	-75.472	656	249	999	999	999	-93.847	656	249	999	999	999	-114.222	656	249	999	999	999	-160.972	656	249	999	999				
5	-75.486	125	031	172	340	291	-93.861	112	090	073	102	901	-114.236	101	598	258	079	-136.611	092	920	454	676	-160.986	085	623	617	767
7	-75.486	125	962	883	168	723	-93.861	113	065	647	049	849	-114.236	102	609	105	195	-136.611	093	960	025	489	-160.986	086	686	822	068
10	-75.486	126	406	040	023	423	-93.861	113	519	019	125	766	-114.236	103	072	327	331	-136.611	094	432	719	935	-160.986	087	168	614	771
15	-75.486	126	406	260	463	382	-93.861	113	519	231	297	922	-114.236	103	072	533	832	-136.611	094	432	922	564	-160.986	087	168	814	816
17	-75.486	126	406	260	515	053	-93.861	113	519	231	344	075	-114.236	103	072	533	874	-136.611	094	432	922	603	-160.986	087	168	814	853
20	-75.486	126	406	260	515	678	-93.861	113	519	231	344	697	-114.236	103	072	533	875	-136.611	094	432	922	604	-160.986	087	168	814	854

TABLE IV: Convergence of the ground state energy with increasing basis set size for the Hartree Fock (HF) implementations. Electronic energies in a.u.

No. Terms	Si ¹²⁺	P ¹³⁺	S ¹⁴⁺	Cl ¹⁵⁺	Ar ¹⁶⁺
1	-187.347 656 249 999 999	-215.722 656 249 999 999	-246.097 656 249 999 999	-278.472 656 249 999 999	-312.847 656 249 999 999
5	-187.361 079 402 387 501 706	-215.736 074 035 256 961	-246.111 069 357 636 948	-278.486 065 244 676 984	-312.861 061 599 954 332
7	-187.361 080 485 203 287 374	-215.736 075 134 460 314	-246.111 070 470 611 033	-278.486 066 369 274 148	-312.861 062 734 394 675
10	-187.361 080 975 732 496 603	-215.736 075 633 380 852	-246.111 070 977 596 087	-278.486 066 884 015 664	-312.861 063 256 602 976
15	-187.361 080 975 930 910 815	-215.736 075 633 578 353	-246.111 070 977 793 227	-278.486 066 884 212 876	-312.861 063 256 800 601
17	-187.361 080 975 930 946 039	-215.736 075 633 578 387	-246.111 070 977 793 260	-278.486 066 884 212 907	-312.861 063 256 800 632
20	-187.361 080 975 930 946 755	-215.736 075 633 578 388	-246.111 070 977 793 261	-278.486 066 884 212 908	-312.861 063 256 800 633

II. HF WAVEFUNCTION COEFFICIENTS (32 DIGITS)

TABLE V: Coefficients for the 20-term Hartree-Fock wavefunction for the critical nuclear charge system, $Z_C^{FC} = 0.911\ 028\ 224\ 077\ 255\ 73$; $A = 1.538\ 931\ 848\ 111\ 260\ 827\ 123\ 435\ 023\ 684\ 1$.

Z_C^{FC}	
Term	Coefficient
L(0, $A r_1$)	0.319 530 790 412 458 434 944 726 111 993 81
L(1, $A r_1$)	-0.991 927 063 747 523 863 706 965 066 275 99 $\times 10^{-2}$
L(2, $A r_1$)	0.204 486 962 370 727 482 901 541 682 102 89 $\times 10^{-1}$
L(3, $A r_1$)	-0.312 274 691 896 952 800 959 302 951 476 47 $\times 10^{-2}$
L(4, $A r_1$)	0.293 007 731 805 735 080 721 036 686 677 77 $\times 10^{-2}$
L(5, $A r_1$)	-0.890 968 700 289 542 849 125 124 986 462 78 $\times 10^{-3}$
L(6, $A r_1$)	0.547 458 786 845 026 467 315 117 590 352 76 $\times 10^{-3}$
L(7, $A r_1$)	-0.263 838 939 331 530 755 058 193 652 443 76 $\times 10^{-3}$
L(8, $A r_1$)	0.114 389 168 688 555 655 589 677 524 010 45 $\times 10^{-3}$
L(9, $A r_1$)	-0.819 654 100 942 739 873 924 946 550 339 15 $\times 10^{-4}$
L(10, $A r_1$)	0.244 795 700 507 104 238 644 602 001 508 56 $\times 10^{-4}$
L(11, $A r_1$)	-0.266 218 889 097 547 984 859 611 527 347 82 $\times 10^{-4}$
L(12, $A r_1$)	0.488 561 151 801 401 890 722 580 955 376 25 $\times 10^{-5}$
L(13, $A r_1$)	-0.897 022 584 157 529 049 081 269 457 096 64 $\times 10^{-5}$
L(14, $A r_1$)	0.740 797 449 246 132 712 391 123 279 434 31 $\times 10^{-6}$
L(15, $A r_1$)	-0.308 790 247 112 550 393 305 961 932 122 65 $\times 10^{-5}$
L(16, $A r_1$)	0.630 294 401 947 644 002 984 731 087 098 72 $\times 10^{-8}$
L(17, $A r_1$)	-0.104 433 069 319 548 757 587 286 572 480 64 $\times 10^{-5}$
L(18, $A r_1$)	-0.404 552 694 578 208 355 060 412 178 757 13 $\times 10^{-7}$
L(19, $A r_1$)	-0.300 249 006 931 662 245 738 241 179 661 92 $\times 10^{-6}$

TABLE VI: Coefficients for the 20-term Hartree-Fock wavefunction for H^- .
 $A=1.966\ 221\ 680\ 513\ 194\ 094\ 708\ 543\ 676\ 580\ 5$

H^-	
Term	Coefficient
L(0, Ar_1)	0.408 748 786 103 265 300 553 173 346 934 37
L(1, Ar_1)	$-0.373\ 592\ 095\ 204\ 363\ 833\ 899\ 914\ 448\ 938\ 51 \times 10^{-1}$
L(2, Ar_1)	$0.261\ 212\ 171\ 512\ 222\ 185\ 114\ 504\ 353\ 426\ 53 \times 10^{-1}$
L(3, Ar_1)	$-0.688\ 034\ 301\ 951\ 407\ 407\ 071\ 569\ 327\ 179\ 27 \times 10^{-2}$
L(4, Ar_1)	$0.364\ 422\ 187\ 033\ 625\ 519\ 788\ 015\ 745\ 192\ 24 \times 10^{-2}$
L(5, Ar_1)	$-0.144\ 042\ 864\ 810\ 974\ 119\ 975\ 464\ 021\ 674\ 32 \times 10^{-2}$
L(6, Ar_1)	$0.639\ 283\ 133\ 284\ 785\ 327\ 217\ 222\ 373\ 375\ 14 \times 10^{-3}$
L(7, Ar_1)	$-0.328\ 304\ 601\ 185\ 909\ 874\ 083\ 269\ 152\ 776\ 75 \times 10^{-3}$
L(8, Ar_1)	$0.122\ 482\ 874\ 869\ 464\ 585\ 453\ 001\ 100\ 977\ 83 \times 10^{-3}$
L(9, Ar_1)	$-0.798\ 460\ 106\ 665\ 175\ 441\ 627\ 947\ 581\ 768\ 87 \times 10^{-4}$
L(10, Ar_1)	$0.238\ 669\ 856\ 590\ 200\ 998\ 259\ 138\ 406\ 848\ 16 \times 10^{-4}$
L(11, Ar_1)	$-0.205\ 286\ 190\ 165\ 554\ 749\ 360\ 750\ 915\ 441\ 69 \times 10^{-4}$
L(12, Ar_1)	$0.441\ 737\ 116\ 892\ 279\ 778\ 199\ 861\ 007\ 461\ 10 \times 10^{-5}$
L(13, Ar_1)	$-0.554\ 648\ 596\ 449\ 290\ 471\ 687\ 262\ 220\ 341\ 05 \times 10^{-5}$
L(14, Ar_1)	$0.683\ 282\ 072\ 723\ 002\ 456\ 870\ 975\ 054\ 058\ 34 \times 10^{-6}$
L(15, Ar_1)	$-0.155\ 840\ 491\ 631\ 176\ 049\ 671\ 507\ 381\ 432\ 91 \times 10^{-5}$
L(16, Ar_1)	$0.523\ 415\ 687\ 037\ 928\ 087\ 774\ 554\ 548\ 772\ 55 \times 10^{-7}$
L(17, Ar_1)	$-0.440\ 605\ 230\ 869\ 969\ 929\ 316\ 338\ 089\ 782\ 32 \times 10^{-6}$
L(18, Ar_1)	$-0.118\ 856\ 925\ 805\ 728\ 454\ 391\ 451\ 249\ 653\ 19 \times 10^{-7}$
L(19, Ar_1)	$-0.109\ 439\ 954\ 560\ 411\ 330\ 970\ 194\ 951\ 690\ 50 \times 10^{-6}$

TABLE VII: Coefficients for the 20-term Hartree-Fock wavefunction for the critical nuclear charge system, $Z_C^{HF} = 1.031\ 177\ 528$; $A = 2.102\ 578\ 153\ 549\ 737\ 501\ 662\ 429\ 764\ 354\ 4$.

Z_C^{HF}	
Term	Coefficient
L(0, $A r_1$)	0.439 817 790 254 778 398 160 130 819 293 32
L(1, $A r_1$)	$-0.463\ 611\ 019\ 180\ 504\ 945\ 671\ 137\ 099\ 824\ 08 \times 10^{-1}$
L(2, $A r_1$)	$0.283\ 532\ 229\ 583\ 193\ 071\ 131\ 609\ 415\ 767\ 48 \times 10^{-1}$
L(3, $A r_1$)	$-0.800\ 341\ 845\ 634\ 980\ 804\ 153\ 625\ 209\ 192\ 20 \times 10^{-2}$
L(4, $A r_1$)	$0.391\ 855\ 717\ 083\ 602\ 716\ 535\ 341\ 012\ 753\ 81 \times 10^{-2}$
L(5, $A r_1$)	$-0.158\ 343\ 543\ 646\ 637\ 000\ 645\ 077\ 439\ 916\ 81 \times 10^{-2}$
L(6, $A r_1$)	$0.671\ 639\ 897\ 385\ 808\ 327\ 446\ 541\ 788\ 576\ 80 \times 10^{-3}$
L(7, $A r_1$)	$-0.341\ 182\ 320\ 680\ 073\ 415\ 200\ 205\ 513\ 350\ 77 \times 10^{-3}$
L(8, $A r_1$)	$0.124\ 796\ 980\ 624\ 352\ 886\ 903\ 894\ 276\ 625\ 67 \times 10^{-3}$
L(9, $A r_1$)	$-0.783\ 852\ 117\ 703\ 519\ 046\ 086\ 431\ 878\ 713\ 32 \times 10^{-4}$
L(10, $A r_1$)	$0.235\ 183\ 282\ 255\ 327\ 334\ 597\ 836\ 191\ 544\ 33 \times 10^{-4}$
L(11, $A r_1$)	$-0.190\ 346\ 911\ 451\ 716\ 080\ 749\ 711\ 274\ 044\ 84 \times 10^{-4}$
L(12, $A r_1$)	$0.421\ 804\ 043\ 765\ 014\ 094\ 657\ 700\ 893\ 397\ 17 \times 10^{-5}$
L(13, $A r_1$)	$-0.486\ 349\ 217\ 443\ 029\ 514\ 003\ 014\ 264\ 560\ 33 \times 10^{-5}$
L(14, $A r_1$)	$0.639\ 931\ 500\ 634\ 764\ 148\ 580\ 080\ 754\ 059\ 79 \times 10^{-6}$
L(15, $A r_1$)	$-0.129\ 626\ 124\ 187\ 760\ 739\ 862\ 226\ 370\ 661\ 83 \times 10^{-5}$
L(16, $A r_1$)	$0.524\ 703\ 388\ 411\ 412\ 465\ 903\ 688\ 165\ 429\ 26 \times 10^{-7}$
L(17, $A r_1$)	$-0.349\ 426\ 878\ 475\ 727\ 960\ 317\ 841\ 219\ 106\ 20 \times 10^{-6}$
L(18, $A r_1$)	$-0.846\ 073\ 949\ 122\ 272\ 527\ 974\ 165\ 255\ 149\ 09 \times 10^{-8}$
L(19, $A r_1$)	$-0.833\ 838\ 243\ 403\ 200\ 951\ 704\ 113\ 790\ 873\ 81 \times 10^{-7}$

TABLE VIII: Coefficients for the 20-term Hartree-Fock wavefunction for the Helium atom, He.
 $A=5.581\,838\,558\,742\,063\,150\,341\,451\,412\,277\,0$

He	
Term	Coefficient
L(0, $A r_1$)	1.592 986 348 147 179 388 555 164 056 614 6
L(1, $A r_1$)	-0.335 099 828 443 415 308 482 560 216 871 77
L(2, $A r_1$)	0.109 270 405 335 665 060 311 603 209 912 61
L(3, $A r_1$)	-0.341 339 182 671 154 435 864 847 583 582 50 $\times 10^{-1}$
L(4, $A r_1$)	0.107 918 796 425 801 080 085 592 204 572 64 $\times 10^{-1}$
L(5, $A r_1$)	-0.372 420 359 427 708 818 774 281 463 617 43 $\times 10^{-2}$
L(6, $A r_1$)	0.113 798 867 617 001 563 618 539 057 049 64 $\times 10^{-2}$
L(7, $A r_1$)	-0.425 093 295 103 237 015 213 057 620 409 03 $\times 10^{-3}$
L(8, $A r_1$)	0.120 865 546 071 441 611 524 181 252 208 41 $\times 10^{-3}$
L(9, $A r_1$)	-0.506 866 331 658 666 805 389 626 621 419 07 $\times 10^{-4}$
L(10, $A r_1$)	0.124 010 803 754 103 510 281 620 789 910 63 $\times 10^{-4}$
L(11, $A r_1$)	-0.638 435 417 513 208 883 050 710 167 701 58 $\times 10^{-5}$
L(12, $A r_1$)	0.113 911 876 757 299 827 437 052 521 317 05 $\times 10^{-5}$
L(13, $A r_1$)	-0.863 069 336 987 805 804 992 869 182 012 42 $\times 10^{-6}$
L(14, $A r_1$)	0.731 146 657 888 653 920 092 536 343 753 00 $\times 10^{-7}$
L(15, $A r_1$)	-0.125 239 701 312 271 285 170 812 083 769 77 $\times 10^{-6}$
L(16, $A r_1$)	-0.202 142 892 424 477 451 064 447 305 151 53 $\times 10^{-8}$
L(17, $A r_1$)	-0.184 496 489 858 410 056 316 185 056 460 57 $\times 10^{-7}$
L(18, $A r_1$)	-0.138 455 047 253 331 015 959 839 610 730 49 $\times 10^{-8}$
L(19, $A r_1$)	-0.225 003 591 227 658 080 362 004 989 574 88 $\times 10^{-8}$

TABLE IX: Coefficients for the 20-term Hartree-Fock wavefunction for the Lithium ion, Li^+ .
 $A=9.029\ 713\ 069\ 168\ 782\ 990\ 481\ 560\ 037\ 470\ 4$

Li^+	
Term	Coefficient
$L(0,Ar_1)$	3.181 254 459 862 959 675 928 541 575 144 6
$L(1,Ar_1)$	-0.735 213 498 123 722 526 888 538 596 112 97
$L(2,Ar_1)$	0.219 497 469 830 558 240 067 857 357 925 23
$L(3,Ar_1)$	-0.652 966 354 877 639 427 807 799 839 608 92 $\times 10^{-1}$
$L(4,Ar_1)$	0.191 234 142 566 875 628 250 341 513 270 93 $\times 10^{-1}$
$L(5,Ar_1)$	-0.604 417 255 947 272 796 367 538 096 699 80 $\times 10^{-2}$
$L(6,Ar_1)$	0.173 298 699 772 672 686 547 727 596 555 23 $\times 10^{-2}$
$L(7,Ar_1)$	-0.575 481 583 187 267 935 501 661 098 304 67 $\times 10^{-3}$
$L(8,Ar_1)$	0.157 411 985 426 736 789 826 908 407 489 38 $\times 10^{-3}$
$L(9,Ar_1)$	-0.564 571 087 915 219 204 598 656 249 843 87 $\times 10^{-4}$
$L(10,Ar_1)$	0.139 570 078 776 934 003 730 301 135 802 79 $\times 10^{-4}$
$L(11,Ar_1)$	-0.576 444 788 183 271 270 142 123 998 685 78 $\times 10^{-5}$
$L(12,Ar_1)$	0.116 025 691 677 061 425 380 690 015 388 56 $\times 10^{-5}$
$L(13,Ar_1)$	-0.618 763 321 826 151 263 591 018 384 852 98 $\times 10^{-6}$
$L(14,Ar_1)$	0.844 862 927 168 177 497 487 725 506 746 50 $\times 10^{-7}$
$L(15,Ar_1)$	-0.685 093 162 071 781 275 552 402 914 396 49 $\times 10^{-7}$
$L(16,Ar_1)$	0.548 563 051 574 898 501 101 854 694 076 97 $\times 10^{-8}$
$L(17,Ar_1)$	-0.691 354 603 288 729 365 970 002 116 593 89 $\times 10^{-8}$
$L(18,Ar_1)$	0.753 233 790 126 721 434 592 366 585 194 95 $\times 10^{-9}$
$L(19,Ar_1)$	-0.431 677 890 618 985 989 447 874 086 078 02 $\times 10^{-9}$

TABLE X: Coefficients for the 20-term Hartree-Fock wavefunction for Be^{2+} .
 $A=12.742\,932\,905\,780\,314\,127\,774\,412\,695\,848$

Be^{2+}	
Term	Coefficient
$L(0,Ar_1)$	5.138 478 261 010 630 073 099 044 803 303 4
$L(1,Ar_1)$	-1.285 632 612 520 870 277 507 576 142 030 1
$L(2,Ar_1)$	0.380 266 754 245 698 494 895 054 711 243 92
$L(3,Ar_1)$	-0.113 744 858 095 673 435 219 101 251 309 29
$L(4,Ar_1)$	0.334 483 983 844 603 424 859 378 623 597 96 $\times 10^{-1}$
$L(5,Ar_1)$	-0.103 662 793 453 486 556 942 253 914 024 93 $\times 10^{-1}$
$L(6,Ar_1)$	0.303 177 593 535 327 980 606 923 178 796 87 $\times 10^{-2}$
$L(7,Ar_1)$	-0.961 398 065 061 562 903 330 304 852 995 97 $\times 10^{-3}$
$L(8,Ar_1)$	0.276 788 411 858 984 183 181 283 286 778 50 $\times 10^{-3}$
$L(9,Ar_1)$	-0.904 907 080 458 414 508 597 642 067 690 52 $\times 10^{-4}$
$L(10,Ar_1)$	0.251 963 049 631 628 810 369 358 004 097 80 $\times 10^{-4}$
$L(11,Ar_1)$	-0.864 753 633 226 862 948 466 514 410 895 33 $\times 10^{-5}$
$L(12,Ar_1)$	0.227 289 470 292 891 551 106 328 803 728 02 $\times 10^{-5}$
$L(13,Ar_1)$	-0.836 418 401 353 281 609 650 854 506 438 31 $\times 10^{-6}$
$L(14,Ar_1)$	0.204 909 206 442 860 298 500 709 458 856 61 $\times 10^{-6}$
$L(15,Ar_1)$	-0.796 661 000 220 572 099 614 695 151 856 96 $\times 10^{-7}$
$L(16,Ar_1)$	0.198 550 124 180 672 955 677 090 593 928 58 $\times 10^{-7}$
$L(17,Ar_1)$	-0.666 982 879 819 820 449 106 401 375 068 17 $\times 10^{-8}$
$L(18,Ar_1)$	0.237 331 933 505 627 276 360 039 620 803 85 $\times 10^{-8}$
$L(19,Ar_1)$	-0.413 005 933 576 713 548 920 215 356 601 75 $\times 10^{-9}$

TABLE XI: Coefficients for the 20-term Hartree-Fock wavefunction for B^{3+} .
 $A=16.361\ 146\ 434\ 512\ 837\ 019\ 274\ 896\ 603\ 967$

B^{3+}	
Term	Coefficient
$L(0,Ar_1)$	7.367 842 450 991 950 121 061 940 754 947 5
$L(1,Ar_1)$	-1.903 422 363 209 819 925 827 276 505 787 2
$L(2,Ar_1)$	0.558 071 232 413 481 054 330 622 369 280 92
$L(3,Ar_1)$	-0.165 744 191 470 613 574 436 666 194 680 80
$L(4,Ar_1)$	0.484 643 272 062 433 679 131 083 535 457 89 $\times 10^{-1}$
$L(5,Ar_1)$	-0.147 686 633 678 103 890 508 340 632 837 74 $\times 10^{-1}$
$L(6,Ar_1)$	0.431 036 167 963 117 178 631 233 188 681 72 $\times 10^{-2}$
$L(7,Ar_1)$	-0.133 308 879 929 776 055 332 578 419 373 62 $\times 10^{-2}$
$L(8,Ar_1)$	0.385 942 663 808 958 006 838 735 070 068 32 $\times 10^{-3}$
$L(9,Ar_1)$	-0.121 552 595 528 167 583 342 259 048 391 85 $\times 10^{-3}$
$L(10,Ar_1)$	0.345 631 268 465 649 245 238 057 541 610 36 $\times 10^{-4}$
$L(11,Ar_1)$	-0.111 840 400 002 205 073 253 748 669 531 28 $\times 10^{-4}$
$L(12,Ar_1)$	0.308 940 090 596 104 862 467 966 445 011 45 $\times 10^{-5}$
$L(13,Ar_1)$	-0.103 347 277 540 672 243 804 836 792 443 01 $\times 10^{-5}$
$L(14,Ar_1)$	0.278 504 546 184 157 037 109 349 161 875 34 $\times 10^{-6}$
$L(15,Ar_1)$	-0.935 440 768 684 124 950 796 088 215 555 11 $\times 10^{-7}$
$L(16,Ar_1)$	0.266 870 401 675 502 314 009 878 699 904 43 $\times 10^{-7}$
$L(17,Ar_1)$	-0.758 054 091 897 506 744 258 102 409 704 50 $\times 10^{-8}$
$L(18,Ar_1)$	0.292 652 118 355 557 592 722 397 967 603 96 $\times 10^{-8}$
$L(19,Ar_1)$	-0.528 646 486 506 692 696 114 338 317 768 94 $\times 10^{-9}$

TABLE XII: Coefficients for the 20-term Hartree-Fock wavefunction for C^{4+} .
 $A=19.955\ 542\ 847\ 357\ 254\ 173\ 202\ 377\ 159\ 793$

C^{4+}	
Term	Coefficient
$L(0,Ar_1)$	-9.845 233 298 994 372 199 157 681 491 060 3
$L(1,Ar_1)$	2.589 835 469 682 587 808 117 086 546 311 1
$L(2,Ar_1)$	-0.754 510 822 814 286 831 815 744 440 350 11
$L(3,Ar_1)$	0.222 575 629 329 016 850 807 814 386 822 33
$L(4,Ar_1)$	-0.647 471 337 107 150 181 968 489 360 519 42 $\times 10^{-1}$
$L(5,Ar_1)$	0.194 910 756 149 547 192 093 257 027 672 88 $\times 10^{-1}$
$L(6,Ar_1)$	-0.566 721 017 146 606 500 332 725 056 576 20 $\times 10^{-2}$
$L(7,Ar_1)$	0.172 441 920 956 283 134 830 788 683 067 64 $\times 10^{-2}$
$L(8,Ar_1)$	-0.499 021 069 293 092 560 057 298 858 396 26 $\times 10^{-3}$
$L(9,Ar_1)$	0.153 735 457 724 997 073 137 098 897 149 20 $\times 10^{-3}$
$L(10,Ar_1)$	-0.439 895 660 083 497 332 122 625 015 339 32 $\times 10^{-4}$
$L(11,Ar_1)$	0.137 922 601 461 648 752 401 846 288 162 07 $\times 10^{-4}$
$L(12,Ar_1)$	-0.387 866 762 396 757 882 503 752 712 357 41 $\times 10^{-5}$
$L(13,Ar_1)$	0.123 933 366 002 103 099 352 469 038 060 82 $\times 10^{-5}$
$L(14,Ar_1)$	-0.345 269 829 878 584 139 549 322 956 200 95 $\times 10^{-6}$
$L(15,Ar_1)$	0.109 201 094 250 668 504 950 440 984 638 30 $\times 10^{-6}$
$L(16,Ar_1)$	-0.323 033 082 266 574 462 829 417 840 047 34 $\times 10^{-7}$
$L(17,Ar_1)$	0.880 434 319 429 065 700 572 907 264 730 78 $\times 10^{-8}$
$L(18,Ar_1)$	-0.332 549 979 152 215 069 932 952 869 399 13 $\times 10^{-8}$
$L(19,Ar_1)$	0.667 500 211 923 232 933 421 228 561 390 94 $\times 10^{-9}$

TABLE XIII: Coefficients for the 20-term Hartree-Fock wavefunction for N^{5+} .
 $A=23.539\ 181\ 744\ 757\ 669\ 317\ 526\ 579\ 881\ 473$

N^{5+}	
Term	Coefficient
$L(0,Ar_1)$	-12.548 796 023 455 117 344 122 582 685 707
$L(1,Ar_1)$	3.339 763 669 820 612 900 481 184 849 586 0
$L(2,Ar_1)$	-0.968 395 457 093 720 341 104 253 389 372 07
$L(3,Ar_1)$	0.284 081 058 888 638 270 892 466 107 973 23
$L(4,Ar_1)$	-0.822 951 515 817 501 609 551 952 941 899 16 $\times 10^{-1}$
$L(5,Ar_1)$	0.245 494 041 672 459 893 509 879 950 955 92 $\times 10^{-1}$
$L(6,Ar_1)$	-0.711 282 718 338 138 812 884 693 234 068 62 $\times 10^{-2}$
$L(7,Ar_1)$	0.213 951 097 938 621 243 595 889 099 659 09 $\times 10^{-2}$
$L(8,Ar_1)$	-0.618 062 321 843 543 148 828 521 034 524 22 $\times 10^{-3}$
$L(9,Ar_1)$	0.187 608 693 997 058 981 496 196 664 752 26 $\times 10^{-3}$
$L(10,Ar_1)$	-0.537 826 125 549 535 158 405 071 043 057 97 $\times 10^{-4}$
$L(11,Ar_1)$	0.165 292 952 096 631 630 647 646 543 281 86 $\times 10^{-4}$
$L(12,Ar_1)$	-0.468 482 384 604 663 584 769 911 158 522 07 $\times 10^{-5}$
$L(13,Ar_1)$	0.145 702 820 174 363 877 939 234 323 399 41 $\times 10^{-5}$
$L(14,Ar_1)$	-0.411 751 723 351 044 867 653 765 741 612 72 $\times 10^{-6}$
$L(15,Ar_1)$	0.126 235 621 421 607 501 555 980 883 645 88 $\times 10^{-6}$
$L(16,Ar_1)$	-0.376 949 314 573 666 463 049 245 974 727 26 $\times 10^{-7}$
$L(17,Ar_1)$	0.101 911 947 212 135 743 812 554 324 146 94 $\times 10^{-7}$
$L(18,Ar_1)$	-0.369 822 540 033 181 993 189 338 570 303 27 $\times 10^{-8}$
$L(19,Ar_1)$	0.815 727 554 243 856 973 092 565 926 526 26 $\times 10^{-9}$

TABLE XIV: Coefficients for the 20-term Hartree-Fock wavefunction for O^{6+} .
 $A=27.116\ 026\ 573\ 138\ 986\ 635\ 766\ 935\ 048\ 422$

O^{6+}	
Term	Coefficient
L(0, $A r_1$)	15.461 098 939 070 142 806 929 868 645 071
L(1, $A r_1$)	-4.148 347 900 966 029 782 281 131 240 235 0
L(2, $A r_1$)	1.198 415 377 596 299 120 604 788 449 462 9
L(3, $A r_1$)	-0.349 949 383 024 926 191 025 658 459 615 72
L(4, $A r_1$)	0.101 032 595 411 836 792 987 223 370 990 63
L(5, $A r_1$)	-0.299 274 222 935 706 702 951 983 528 387 45 $\times 10^{-1}$
L(6, $A r_1$)	0.864 438 424 990 373 898 644 997 604 523 43 $\times 10^{-2}$
L(7, $A r_1$)	-0.257 785 067 401 741 625 116 434 250 071 29 $\times 10^{-2}$
L(8, $A r_1$)	0.743 184 571 979 597 995 052 081 535 448 30 $\times 10^{-3}$
L(9, $A r_1$)	-0.223 183 975 898 131 038 722 518 823 728 64 $\times 10^{-3}$
L(10, $A r_1$)	0.639 913 058 129 944 390 593 718 286 754 52 $\times 10^{-4}$
L(11, $A r_1$)	-0.193 960 916 942 228 493 134 436 480 532 36 $\times 10^{-4}$
L(12, $A r_1$)	0.551 711 895 765 577 226 082 541 743 567 33 $\times 10^{-5}$
L(13, $A r_1$)	-0.168 566 487 463 158 898 160 155 244 058 73 $\times 10^{-5}$
L(14, $A r_1$)	0.479 509 267 886 033 275 923 358 921 379 59 $\times 10^{-6}$
L(15, $A r_1$)	-0.144 329 055 817 258 809 397 208 794 661 08 $\times 10^{-6}$
L(16, $A r_1$)	0.431 063 860 588 504 292 062 970 155 869 05 $\times 10^{-7}$
L(17, $A r_1$)	-0.116 797 432 655 275 011 445 543 256 846 12 $\times 10^{-7}$
L(18, $A r_1$)	0.407 341 012 034 872 809 950 828 525 493 68 $\times 10^{-8}$
L(19, $A r_1$)	-0.968 870 327 726 319 348 185 337 958 384 25 $\times 10^{-9}$

TABLE XV: Coefficients for the 20-term Hartree-Fock wavefunction for F^{7+}

. A=30.687 730 337 947 467 028 654 802 088 190	
F^{7+}	
Term	Coefficient
L(0, Ar_1)	-18.568 070 181 593 922 323 791 092 795 985
L(1, Ar_1)	5.011 492 175 606 249 964 400 689 128 780 0
L(2, Ar_1)	-1.443 428 549 217 941 563 390 835 230 664 3
L(3, Ar_1)	0.419 883 232 188 846 910 123 908 320 413 04
L(4, Ar_1)	-0.120 879 692 097 864 095 779 290 139 170 07
L(5, Ar_1)	0.356 047 618 572 981 059 603 733 539 190 99 $\times 10^{-1}$
L(6, Ar_1)	-0.102 568 014 071 786 387 526 066 035 898 92 $\times 10^{-1}$
L(7, Ar_1)	0.303 809 290 125 418 243 389 045 021 125 62 $\times 10^{-2}$
L(8, Ar_1)	-0.874 114 278 442 136 568 287 307 192 633 92 $\times 10^{-3}$
L(9, Ar_1)	0.260 367 846 102 750 119 080 525 870 454 29 $\times 10^{-3}$
L(10, Ar_1)	-0.746 084 561 623 476 569 953 063 138 702 52 $\times 10^{-4}$
L(11, Ar_1)	0.223 840 135 769 182 083 406 233 246 163 59 $\times 10^{-4}$
L(12, Ar_1)	-0.637 693 053 829 203 558 979 398 435 613 96 $\times 10^{-5}$
L(13, Ar_1)	0.192 400 844 718 447 763 985 338 338 833 62 $\times 10^{-5}$
L(14, Ar_1)	-0.548 949 294 272 053 306 422 490 833 055 68 $\times 10^{-6}$
L(15, Ar_1)	0.163 269 853 172 839 484 105 548 764 611 14 $\times 10^{-6}$
L(16, Ar_1)	-0.486 100 752 105 016 864 384 503 338 128 18 $\times 10^{-7}$
L(17, Ar_1)	0.132 396 210 119 947 596 685 550 341 734 44 $\times 10^{-7}$
L(18, Ar_1)	-0.445 841 282 453 595 037 785 995 664 346 94 $\times 10^{-8}$
L(19, Ar_1)	0.112 514 422 258 346 506 445 500 381 533 43 $\times 10^{-8}$

TABLE XVI: Coefficients for the 20-term Hartree-Fock wavefunction for Ne^{8+} .
A=34.255 180 359 638 157 743 450 277 068 075

Ne^{8+}	
Term	Coefficient
L(0, $A r_1$)	-21.858 100 328 093 564 072 321 794 752 616
L(1, $A r_1$)	5.925 778 817 472 687 028 943 007 970 495 6
L(2, $A r_1$)	-1.702 472 339 740 787 489 163 662 830 725 2
L(3, $A r_1$)	0.493 624 084 752 163 824 215 448 149 024 65
L(4, $A r_1$)	-0.141 765 289 830 325 778 792 983 364 755 53
L(5, $A r_1$)	0.415 624 779 423 237 870 411 542 082 416 87 $\times 10^{-1}$
L(6, $A r_1$)	-0.119 450 580 197 929 696 162 046 521 742 33 $\times 10^{-1}$
L(7, $A r_1$)	0.351 885 923 308 847 058 074 609 583 481 87 $\times 10^{-2}$
L(8, $A r_1$)	-0.101 051 625 120 283 465 469 015 866 128 45 $\times 10^{-2}$
L(9, $A r_1$)	0.299 055 462 132 371 516 549 270 517 453 48 $\times 10^{-3}$
L(10, $A r_1$)	-0.856 143 021 547 533 114 111 498 389 305 28 $\times 10^{-4}$
L(11, $A r_1$)	0.254 838 166 471 456 268 034 029 194 704 73 $\times 10^{-4}$
L(12, $A r_1$)	-0.726 358 269 070 162 874 402 346 947 196 13 $\times 10^{-5}$
L(13, $A r_1$)	0.217 101 790 820 213 537 587 357 849 064 53 $\times 10^{-5}$
L(14, $A r_1$)	-0.620 149 460 616 339 318 125 458 656 011 66 $\times 10^{-6}$
L(15, $A r_1$)	0.182 918 734 471 804 202 219 414 832 929 03 $\times 10^{-6}$
L(16, $A r_1$)	-0.542 278 326 921 942 295 487 929 681 213 22 $\times 10^{-7}$
L(17, $A r_1$)	0.148 541 756 106 212 533 625 777 413 129 75 $\times 10^{-7}$
L(18, $A r_1$)	-0.485 481 798 009 915 230 858 719 034 671 77 $\times 10^{-8}$
L(19, $A r_1$)	0.128 376 628 068 081 978 156 376 947 443 70 $\times 10^{-8}$

TABLE XVII: Coefficients for the 20-term Hartree-Fock wavefunction for Na^{9+} .
 $A=37.818\,946\,108\,463\,433\,967\,395\,233\,142\,163$

Na^{9+}	
Term	Coefficient
$L(0,Ar_1)$	$-25.321\,416\,747\,313\,879\,585\,931\,516\,032\,997$
$L(1,Ar_1)$	$6.888\,327\,194\,973\,143\,550\,457\,833\,406\,378\,5$
$L(2,Ar_1)$	$-1.974\,733\,240\,018\,542\,209\,651\,685\,713\,485\,0$
$L(3,Ar_1)$	$0.570\,950\,567\,485\,904\,404\,005\,801\,800\,523\,52$
$L(4,Ar_1)$	$-0.163\,627\,927\,741\,987\,773\,823\,733\,418\,705\,24$
$L(5,Ar_1)$	$0.477\,839\,513\,618\,669\,067\,263\,423\,787\,664\,18 \times 10^{-1}$
$L(6,Ar_1)$	$-0.137\,046\,589\,343\,045\,120\,439\,888\,927\,651\,46 \times 10^{-1}$
$L(7,Ar_1)$	$0.401\,890\,585\,574\,007\,124\,388\,076\,340\,030\,81 \times 10^{-2}$
$L(8,Ar_1)$	$-0.115\,207\,176\,014\,011\,662\,338\,830\,098\,882\,42 \times 10^{-2}$
$L(9,Ar_1)$	$0.339\,150\,744\,318\,929\,203\,772\,060\,348\,092\,82 \times 10^{-3}$
$L(10,Ar_1)$	$-0.969\,875\,067\,811\,750\,816\,632\,777\,310\,213\,42 \times 10^{-4}$
$L(11,Ar_1)$	$0.286\,873\,291\,405\,127\,899\,333\,145\,557\,080\,72 \times 10^{-4}$
$L(12,Ar_1)$	$-0.817\,587\,263\,167\,451\,595\,583\,682\,361\,323\,45 \times 10^{-5}$
$L(13,Ar_1)$	$0.242\,587\,126\,364\,453\,577\,291\,474\,845\,667\,94 \times 10^{-5}$
$L(14,Ar_1)$	$-0.693\,081\,847\,094\,817\,913\,466\,629\,975\,694\,77 \times 10^{-6}$
$L(15,Ar_1)$	$0.203\,180\,503\,497\,551\,599\,837\,627\,967\,859\,11 \times 10^{-6}$
$L(16,Ar_1)$	$-0.599\,642\,869\,175\,934\,253\,656\,339\,215\,241\,39 \times 10^{-7}$
$L(17,Ar_1)$	$0.165\,134\,716\,916\,312\,896\,803\,891\,675\,798\,07 \times 10^{-7}$
$L(18,Ar_1)$	$-0.526\,248\,032\,428\,080\,981\,122\,192\,947\,820\,86 \times 10^{-8}$
$L(19,Ar_1)$	$0.144\,436\,622\,294\,702\,289\,582\,385\,380\,542\,44 \times 10^{-8}$

TABLE XVIII: Coefficients for the 20-term Hartree-Fock wavefunction for Mg^{10+} .
 $A=41.379\ 436\ 278\ 138\ 089\ 954\ 159\ 308\ 383\ 702$

Mg^{10+}	
Term	Coefficient
$L(0,Ar_1)$	-28.949 651 188 019 149 598 098 892 099 912
$L(1,Ar_1)$	7.896 675 584 674 460 767 994 074 202 418 3
$L(2,Ar_1)$	-2.259 516 013 552 381 138 919 801 523 237 8
$L(3,Ar_1)$	0.651 672 251 626 077 782 104 656 608 840 66
$L(4,Ar_1)$	-0.186 414 568 469 602 866 642 091 209 769 61
$L(5,Ar_1)$	0.542 547 410 316 383 751 383 547 544 166 23 $\times 10^{-1}$
$L(6,Ar_1)$	-0.155 316 636 575 621 313 454 017 467 994 83 $\times 10^{-1}$
$L(7,Ar_1)$	0.453 714 116 495 336 974 883 429 025 298 70 $\times 10^{-2}$
$L(8,Ar_1)$	-0.129 849 449 307 146 033 716 672 780 036 74 $\times 10^{-2}$
$L(9,Ar_1)$	0.380 569 332 911 959 730 816 139 548 910 79 $\times 10^{-3}$
$L(10,Ar_1)$	-0.108 708 003 507 056 557 416 592 253 604 26 $\times 10^{-3}$
$L(11,Ar_1)$	0.319 875 739 900 759 707 008 057 675 521 38 $\times 10^{-4}$
$L(12,Ar_1)$	-0.911 251 714 581 300 705 777 310 990 208 63 $\times 10^{-5}$
$L(13,Ar_1)$	0.268 791 582 761 681 925 769 959 895 082 89 $\times 10^{-5}$
$L(14,Ar_1)$	-0.767 683 768 033 052 507 873 102 151 017 87 $\times 10^{-6}$
$L(15,Ar_1)$	0.223 986 873 430 920 038 128 830 816 165 78 $\times 10^{-6}$
$L(16,Ar_1)$	-0.658 177 121 732 027 016 001 131 964 990 35 $\times 10^{-7}$
$L(17,Ar_1)$	0.182 111 099 667 650 500 727 286 170 823 15 $\times 10^{-7}$
$L(18,Ar_1)$	-0.568 074 488 419 576 985 628 529 337 778 59 $\times 10^{-8}$
$L(19,Ar_1)$	0.160 675 103 142 394 731 959 725 216 668 41 $\times 10^{-8}$

TABLE XIX: Coefficients for the 20-term Hartree-Fock wavefunction for Al^{11+} .
 $A=44.936\,964\,386\,059\,095\,203\,207\,464\,248\,807$

Al^{11+}	
Term	Coefficient
$L(0,Ar_1)$	$-25.321\,416\,747\,313\,879\,585\,931\,516\,032\,997$
$L(1,Ar_1)$	$6.888\,327\,194\,973\,143\,550\,457\,833\,406\,378\,5$
$L(2,Ar_1)$	$-1.974\,733\,240\,018\,542\,209\,651\,685\,713\,485\,0$
$L(3,Ar_1)$	$0.570\,950\,567\,485\,904\,404\,005\,801\,800\,523\,52$
$L(4,Ar_1)$	$-0.163\,627\,927\,741\,987\,773\,823\,733\,418\,705\,24$
$L(5,Ar_1)$	$0.477\,839\,513\,618\,669\,067\,263\,423\,787\,664\,18 \times 10^{-1}$
$L(6,Ar_1)$	$-0.137\,046\,589\,343\,045\,120\,439\,888\,927\,651\,46 \times 10^{-1}$
$L(7,Ar_1)$	$0.401\,890\,585\,574\,007\,124\,388\,076\,340\,030\,81 \times 10^{-2}$
$L(8,Ar_1)$	$-0.115\,207\,176\,014\,011\,662\,338\,830\,098\,882\,42 \times 10^{-2}$
$L(9,Ar_1)$	$0.339\,150\,744\,318\,929\,203\,772\,060\,348\,092\,82 \times 10^{-3}$
$L(10,Ar_1)$	$-0.969\,875\,067\,811\,750\,816\,632\,777\,310\,213\,42 \times 10^{-4}$
$L(11,Ar_1)$	$0.286\,873\,291\,405\,127\,899\,333\,145\,557\,080\,72 \times 10^{-4}$
$L(12,Ar_1)$	$-0.817\,587\,263\,167\,451\,595\,583\,682\,361\,323\,45 \times 10^{-5}$
$L(13,Ar_1)$	$0.242\,587\,126\,364\,453\,577\,291\,474\,845\,667\,94 \times 10^{-5}$
$L(14,Ar_1)$	$-0.693\,081\,847\,094\,817\,913\,466\,629\,975\,694\,77 \times 10^{-6}$
$L(15,Ar_1)$	$0.203\,180\,503\,497\,551\,599\,837\,627\,967\,859\,11 \times 10^{-6}$
$L(16,Ar_1)$	$-0.599\,642\,869\,175\,934\,253\,656\,339\,215\,241\,39 \times 10^{-7}$
$L(17,Ar_1)$	$0.165\,134\,716\,916\,312\,896\,803\,891\,675\,798\,07 \times 10^{-7}$
$L(18,Ar_1)$	$-0.526\,248\,032\,428\,080\,981\,122\,192\,947\,820\,86 \times 10^{-8}$
$L(19,Ar_1)$	$0.144\,436\,622\,294\,702\,289\,582\,385\,380\,542\,44 \times 10^{-8}$

TABLE XX: Coefficients for the 20-term Hartree-Fock wavefunction for Si^{12+} .
 $A=48.491\,782\,189\,978\,830\,516\,281\,507\,184\,295$

Si^{12+}	
Term	Coefficient
$L(0,Ar_1)$	-28.949 651 188 019 149 598 098 892 099 912
$L(1,Ar_1)$	7.896 675 584 674 460 767 994 074 202 418 3
$L(2,Ar_1)$	-2.259 516 013 552 381 138 919 801 523 237 8
$L(3,Ar_1)$	0.651 672 251 626 077 782 104 656 608 840 66
$L(4,Ar_1)$	-0.186 414 568 469 602 866 642 091 209 769 61
$L(5,Ar_1)$	0.542 547 410 316 383 751 383 547 544 166 23 $\times 10^{-1}$
$L(6,Ar_1)$	-0.155 316 636 575 621 313 454 017 467 994 83 $\times 10^{-1}$
$L(7,Ar_1)$	0.453 714 116 495 336 974 883 429 025 298 70 $\times 10^{-2}$
$L(8,Ar_1)$	-0.129 849 449 307 146 033 716 672 780 036 74 $\times 10^{-2}$
$L(9,Ar_1)$	0.380 569 332 911 959 730 816 139 548 910 79 $\times 10^{-3}$
$L(10,Ar_1)$	-0.108 708 003 507 056 557 416 592 253 604 26 $\times 10^{-3}$
$L(11,Ar_1)$	0.319 875 739 900 759 707 008 057 675 521 38 $\times 10^{-4}$
$L(12,Ar_1)$	-0.911 251 714 581 300 705 777 310 990 208 63 $\times 10^{-5}$
$L(13,Ar_1)$	0.268 791 582 761 681 925 769 959 895 082 89 $\times 10^{-5}$
$L(14,Ar_1)$	-0.767 683 768 033 052 507 873 102 151 017 87 $\times 10^{-6}$
$L(15,Ar_1)$	0.223 986 873 430 920 038 128 830 816 165 78 $\times 10^{-6}$
$L(16,Ar_1)$	-0.658 177 121 732 027 016 001 131 964 990 35 $\times 10^{-7}$
$L(17,Ar_1)$	0.182 111 099 667 650 500 727 286 170 823 15 $\times 10^{-7}$
$L(18,Ar_1)$	-0.568 074 488 419 576 985 628 529 337 778 59 $\times 10^{-8}$
$L(19,Ar_1)$	0.160 675 103 142 394 731 959 725 216 668 41 $\times 10^{-8}$

TABLE XXI: Coefficients for the 20-term Hartree-Fock wavefunction for P^{13+} .
 $A=52.044\,096\,824\,733\,857\,896\,265\,301\,003\,795$

P^{13+}	
Term	Coefficient
$L(0,Ar_1)$	-32.735 534 751 018 556 311 059 601 469 355
$L(1,Ar_1)$	8.948 691 920 505 440 440 827 391 511 786 8
$L(2,Ar_1)$	-2.556 218 997 237 334 841 895 707 657 626 6
$L(3,Ar_1)$	0.735 623 729 946 248 066 473 942 709 978 77
$L(4,Ar_1)$	-0.210 079 090 861 765 271 038 808 815 593 25
$L(5,Ar_1)$	0.609 622 434 381 875 365 484 590 992 076 50 $\times 10^{-1}$
$L(6,Ar_1)$	-0.174 226 176 956 380 548 726 615 379 220 42 $\times 10^{-1}$
$L(7,Ar_1)$	0.507 260 878 565 643 002 273 629 026 481 44 $\times 10^{-2}$
$L(8,Ar_1)$	-0.144 953 037 976 489 827 255 838 793 338 98 $\times 10^{-2}$
$L(9,Ar_1)$	0.423 237 540 890 514 551 836 578 518 229 61 $\times 10^{-3}$
$L(10,Ar_1)$	-0.120 757 591 491 508 362 926 587 252 691 53 $\times 10^{-3}$
$L(11,Ar_1)$	0.353 785 856 401 731 447 420 534 594 073 97 $\times 10^{-4}$
$L(12,Ar_1)$	-0.100 722 869 757 098 207 585 997 409 899 54 $\times 10^{-4}$
$L(13,Ar_1)$	0.295 662 159 362 409 348 780 925 907 764 66 $\times 10^{-5}$
$L(14,Ar_1)$	-0.843 882 619 170 553 654 581 218 120 568 34 $\times 10^{-6}$
$L(15,Ar_1)$	0.245 286 480 141 000 882 355 688 425 568 17 $\times 10^{-6}$
$L(16,Ar_1)$	-0.717 839 980 366 540 766 025 105 788 999 50 $\times 10^{-7}$
$L(17,Ar_1)$	0.199 426 729 216 124 224 117 895 839 474 22 $\times 10^{-7}$
$L(18,Ar_1)$	-0.610 884 676 385 814 661 736 549 235 720 19 $\times 10^{-8}$
$L(19,Ar_1)$	0.177 080 648 950 003 614 558 064 739 374 52 $\times 10^{-8}$

TABLE XXII: Coefficients for the 20-term Hartree-Fock wavefunction for S^{14+} . A=55.594 081 349 999 748 774 449 467 667 271

S^{14+}	
Term	Coefficient
L(0, $A r_1$)	-36.672 677 523 610 783 013 736 803 062 317
L(1, $A r_1$)	10.042 507 983 876 986 941 675 893 012 661
L(2, $A r_1$)	-2.864 315 598 768 448 277 392 447 851 859 4
L(3, $A r_1$)	0.822 659 928 441 231 955 263 602 021 013 79
L(4, $A r_1$)	-0.234 581 038 054 038 093 172 476 446 286 35
L(5, $A r_1$)	0.678 953 817 790 612 425 513 936 569 730 42 $\times 10^{-1}$
L(6, $A r_1$)	-0.193 744 779 881 045 260 181 093 913 615 27 $\times 10^{-1}$
L(7, $A r_1$)	0.562 446 733 433 975 474 289 843 557 532 91 $\times 10^{-2}$
L(8, $A r_1$)	-0.160 495 418 785 033 670 784 463 450 584 84 $\times 10^{-2}$
L(9, $A r_1$)	0.467 090 804 034 095 673 864 212 002 235 89 $\times 10^{-3}$
L(10, $A r_1$)	-0.133 119 950 343 943 735 046 256 863 639 04 $\times 10^{-3}$
L(11, $A r_1$)	0.388 552 242 935 589 654 487 560 859 563 01 $\times 10^{-4}$
L(12, $A r_1$)	-0.110 540 484 981 128 479 566 993 981 549 68 $\times 10^{-4}$
L(13, $A r_1$)	0.323 154 916 948 010 424 135 809 078 026 23 $\times 10^{-5}$
L(14, $A r_1$)	-0.921 605 677 438 188 500 676 299 266 003 51 $\times 10^{-6}$
L(15, $A r_1$)	0.267 039 187 517 604 742 529 512 896 076 92 $\times 10^{-6}$
L(16, $A r_1$)	-0.778 582 753 517 235 842 475 704 847 769 46 $\times 10^{-7}$
L(17, $A r_1$)	0.217 049 347 003 822 633 188 169 101 660 67 $\times 10^{-7}$
L(18, $A r_1$)	-0.654 604 864 734 681 871 348 398 313 103 20 $\times 10^{-8}$
L(19, $A r_1$)	0.193 645 603 421 689 931 597 032 156 891 59 $\times 10^{-8}$

TABLE XXIII: Coefficients for the 20-term Hartree-Fock wavefunction for Cl^{15+} . $A=$
59.141 885 214 911 497 966 008 396 597 406

Cl^{15+}	
Term	Coefficient
$L(0,Ar_1)$	-40.755 404 706 676 768 082 455 805 553 109
$L(1,Ar_1)$	11.176 469 420 950 459 635 082 885 909 912
$L(2,Ar_1)$	-3.183 339 972 371 237 394 573 592 266 528 2
$L(3,Ar_1)$	0.912 652 310 029 359 461 842 089 244 429 80
$L(4,Ar_1)$	-0.259 884 565 079 678 681 531 117 166 832 27
$L(5,Ar_1)$	0.750 443 282 598 373 816 794 097 803 776 39 $\times 10^{-1}$
$L(6,Ar_1)$	-0.213 845 402 230 616 254 429 252 036 706 36 $\times 10^{-1}$
$L(7,Ar_1)$	0.619 196 985 538 507 768 509 481 551 555 59 $\times 10^{-2}$
$L(8,Ar_1)$	-0.176 456 487 060 568 271 455 009 218 572 55 $\times 10^{-2}$
$L(9,Ar_1)$	0.512 071 983 210 340 625 641 247 720 288 31 $\times 10^{-3}$
$L(10,Ar_1)$	-0.145 780 400 147 949 486 326 288 479 409 98 $\times 10^{-3}$
$L(11,Ar_1)$	0.424 129 973 498 651 766 715 163 488 474 22 $\times 10^{-4}$
$L(12,Ar_1)$	-0.120 567 637 625 518 760 298 919 671 074 94 $\times 10^{-4}$
$L(13,Ar_1)$	0.351 232 539 146 106 542 700 302 170 027 15 $\times 10^{-5}$
$L(14,Ar_1)$	-0.100 078 319 928 023 298 153 046 862 702 37 $\times 10^{-5}$
$L(15,Ar_1)$	0.289 212 437 944 389 043 938 368 777 031 50 $\times 10^{-6}$
$L(16,Ar_1)$	-0.840 355 361 187 612 371 784 609 621 232 90 $\times 10^{-7}$
$L(17,Ar_1)$	0.234 954 082 533 585 648 808 718 685 923 87 $\times 10^{-7}$
$L(18,Ar_1)$	-0.699 167 761 824 947 735 982 358 706 750 90 $\times 10^{-8}$
$L(19,Ar_1)$	0.210 363 925 105 509 964 170 500 080 397 16 $\times 10^{-8}$

TABLE XXIV: Coefficients for the 20-term Hartree-Fock wavefunction for Ar^{16+} . A=62.687 637 750 610 885 097 219 518 715 941

Ar^{16+}	
Term	Coefficient
L(0, $A r_1$)	-44.978 632 319 529 997 241 916 776 174 787
L(1, $A r_1$)	12.349 097 700 021 795 671 793 320 023 152
L(2, $A r_1$)	-3.512 876 072 965 265 383 553 904 803 882 6
L(3, $A r_1$)	1.005 485 924 000 801 246 626 446 894 396 2
L(4, $A r_1$)	-0.285 957 612 500 160 441 141 584 289 822 46
L(5, $A r_1$)	0.824 002 819 023 339 953 824 380 519 858 30 $\times 10^{-1}$
L(6, $A r_1$)	-0.234 503 792 429 945 735 116 688 441 101 97 $\times 10^{-1}$
L(7, $A r_1$)	0.677 444 689 238 559 763 378 989 253 816 43 $\times 10^{-2}$
L(8, $A r_1$)	-0.192 818 145 982 334 223 292 992 107 227 66 $\times 10^{-2}$
L(9, $A r_1$)	0.558 129 966 204 502 521 086 667 441 793 55 $\times 10^{-3}$
L(10, $A r_1$)	-0.158 725 647 094 391 482 220 570 111 302 52 $\times 10^{-3}$
L(11, $A r_1$)	0.460 479 213 809 218 876 245 608 651 191 98 $\times 10^{-4}$
L(12, $A r_1$)	-0.130 794 807 500 283 213 765 021 903 171 65 $\times 10^{-4}$
L(13, $A r_1$)	0.379 862 639 084 925 837 125 480 504 566 53 $\times 10^{-5}$
L(14, $A r_1$)	-0.108 134 929 319 710 106 830 661 771 665 00 $\times 10^{-5}$
L(15, $A r_1$)	0.311 778 952 589 296 891 954 771 580 262 33 $\times 10^{-6}$
L(16, $A r_1$)	-0.903 108 806 342 949 965 174 201 597 126 75 $\times 10^{-7}$
L(17, $A r_1$)	0.253 120 835 517 895 531 553 072 496 623 67 $\times 10^{-7}$
L(18, $A r_1$)	-0.744 512 970 194 694 691 406 522 296 754 61 $\times 10^{-8}$
L(19, $A r_1$)	0.227 230 216 154 213 941 718 691 518 928 38 $\times 10^{-8}$