The third element, lithium (Z = 3), obviously has the ground state configuration $1s^2\ 2s$. This is written in the table as [He] 2*s*, where [He] indicates the He configuration, i.e., $1s^2$. This notation is used to indicate all inert gas configurations, e.g., [Ne], [Ar] etc.. Beryllium (Z = 4) has the closed subshell configuration $1s^2\ 2s^2$.

In the elements from boron (Z = 5) to neon (Z = 10), the electrons fill the 2*p* subshell progressively as shown in the table. The 2*p* subshell closes at neon which has the configuration [He] $2s^2\ 2p^6$.

From sodium (Z = 11) to argon (Z = 18) the normally expected filling process continues. At potassium (Z = 19) the first departure from the expected ordering according to lowest value of *n* occurs. The last electrons in potassium and calcium (Z = 20) go into the 4*s* rather than the 3*d* subshell.

The filling of the 3*d* subshell starts with scandium (Z = 21), which has the configuration [Ar] $4s^2\ 3d$, and ends with zinc (Z = 30). There is an anomaly at chromium (Z = 24) which has only one 4*s* electron, the configuration $4s3d^5$ being energetically more favourable than $4s^23d^4$. We have already mentioned that the 4*s* and 3*d* levels are very close in energy and their ordering may vary from element to element. In manganese (Z = 25) the last electron goes into the 4*s* level which was left unoccupied in chromium.

A similar situation develops at copper (Z = 29) and zinc (Z = 30) which have the configurations [Ar] $4s\ 3d^{10}$ and [Ar] $4s^2\ 3d^{10}$, respectively.

The rest of the table can be analyzed in a similar manner. The filling of the levels is generally systematic except for some irregularities at certain places.

Table 14.2 also gives the ionization energies and the lowest spectral terms for the elements for ready reference.

Table 14.2 Electronic Configurations, Spectral Terms and Ionization Energies of the Atoms in their Ground States

Atomic number Z	*Element*		*Electronic configuration*	*Spectral term*	*Ionization energy (eV)*
1	H	Hydrogen	1s	$^2S_{1/2}$	13.60
2	He	Helium	$1s^2$	$^1S_0$	24.59
3	Li	Lithium	[He]2*s*	$^2S_{1/2}$	5.39
4	Be	Beryllium	[He]$2s^2$	$^1S_0$	9.32
5	B	Boron	[He]$2s^22p$	$^2P_{1/2}$	8.30
6	C	Carbon	[He]$2s^22p^2$	$^3P_0$	11.26
7	N	Nitrogen	[He]$2s^22p^3$	$^4S_{3/2}$	14.53
8	O	Oxygen	[He]$2s^22p^4$	$^3P_2$	13.62
9	F	Fluorine	[He]$2s^22p^5$	$^2P_{3/2}$	17.42
10	Ne	Neon	[He]$2s^22p^6$	$^1S_0$	21.56
11	Na	Sodium	[Ne]3*s*	$^2S_{1/2}$	5.14
12	Mg	Magnesium	[Ne]$3s^2$	$^1S_0$	7.65
13	Al	Aluminium	[Ne]$3s^23p$	$^2P_{1/2}$	5.99
14	Si	Silicon	[Ne]$3s^23p^2$	$^3P_0$	8.15

(*Cont.*)

Table 14.2 Cont.

Atomic number Z	Element		Electronic configuration	Spectral term	Ionization energy (eV)
15	P	Phosphorus	[Ne]$3s^2 3p^3$	$^4S_{3/2}$	10.49
16	S	Sulphur	[Ne]$3s^2 3p^4$	$^3P_2$	10.36
17	Cl	Chlorine	[Ne]$3s^2 3p^5$	$^2P_{3/2}$	12.97
18	Ar	Argon	[Ne]$3s^2 3p^6$	$^1S_0$	15.76
19	K	Potassium	[Ar]$4s$	$^2S_{1/2}$	4.34
20	Ca	Calcium	[Ar]$4s^2$	$^1S_0$	6.11
21	Sc	Scandium	[Ar]$4s^2 3d$	$^2D_{3/2}$	6.54
22	Ti	Titanium	[Ar]$4s^2 3d^2$	$^3F_2$	6.82
23	V	Vanadium	[Ar]$4s^2 3d^3$	$^4F_{3/2}$	6.74
24	Cr	Chromium	[Ar]$4s 3d^5$	$^7S_3$	6.77
25	Mn	Manganese	[Ar]$4s^2 3d^5$	$^6S_{5/2}$	7.44
26	Fe	Iron	[Ar]$4s^2 3d^6$	$^5D_4$	7.87
27	Co	Cobalt	[Ar]$4s^2 3d^7$	$^4F_{9/2}$	7.86
28	Ni	Nickel	[Ar]$4s^2 3d^8$	$^3F_4$	7.64
29	Cu	Copper	[Ar]$4s 3d^{10}$	$^2S_{1/2}$	7.73
30	Zn	Zinc	[Ar]$4s^2 3d^{10}$	$^1S_0$	9.39
31	Ga	Gallium	[Ar]$4s^2 3d^{10} 4p$	$^2P_{1/2}$	6.00
32	Ge	Germanium	[Ar]$4s^2 3d^{10} 4p^2$	$^3P_0$	7.90
33	As	Arsenic	[Ar]$4s^2 3d^{10} 4p^3$	$^4S_{3/2}$	9.81
34	Se	Selenium	[Ar]$4s^2 3d^{10} 4p^4$	$^3P_2$	9.75
35	Br	Bromine	[Ar]$4s^2 3d^{10} 4p^5$	$^2P_{3/2}$	11.81
36	Kr	Krypton	[Ar]$4s^2 3d^{10} 4p^6$	$^1S_0$	14.00
37	Rb	Rubidium	[Kr]$5s$	$^2S_{1/2}$	4.18
38	Sr	Strontium	[Kr]$5s^2$	$^1S_0$	5.70
39	Y	Yttrium	[Kr]$5s^2 4d$	$^2D_{3/2}$	6.38
40	Zr	Zirconium	[Kr]$5s^2 4d^2$	$^3F_2$	6.84
41	Nb	Niobium	[Kr]$5s\, 4d^4$	$^6D_{1/2}$	6.88
42	Mo	Molybdenum	[Kr]$5s\, 4d^5$	$^7S_3$	7.10
43	Tc	Technetium	[Kr]$5s^2\, 4d^5$	$^6S_{5/2}$	7.28
44	Ru	Ruthenium	[Kr]$5s\, 4d^7$	$^5F_5$	7.37
45	Rh	Rhodium	[Kr]$5s\, 4d^8$	$^4F_{9/2}$	7.46
46	Pd	Palladium	[Kr]$4d^{10}$	$^1S_0$	8.34
47	Ag	Silver	[Kr]$5s\, 4d^{10}$	$^2S_{1/2}$	7.58
48	Cd	Cadmium	[Kr]$5s^2 4d^{10}$	$^1S_0$	8.99
49	In	Indium	[Kr]$5s^2 4d^{10} 5p$	$^2P_{1/2}$	5.79
50	Sn	Tin	[Kr]$5s^2 4d^{10} 5p^2$	$^3P_0$	7.34
51	Sb	Antimony	[Kr]$5s^2 4d^{10} 5p^3$	$^4S_{3/2}$	8.64
52	Te	Tellurium	[Kr]$5s^2 4d^{10} 5p^4$	$^3P_2$	9.01
53	I	Iodine	[Kr]$5s^2 4d^{10} 5p^5$	$^2P_{3/2}$	10.45
54	Xe	Xenon	[Kr]$5s^2 4d^{10} 5p^6$	$^1S_0$	12.13
55	Cs	Caesium	[Xe]$6s$	$^2S_{1/2}$	3.89
56	Ba	Barium	[Xe]$6s^2$	$^1S_0$	5.21
57	La	Lanthanum	[Xe]$6s^2 5d$	$^2D_{3/2}$	5.58
58	Ce	Cerium	[Xe]$6s^2 4f 5d$	$^1G_4$	5.47
59	Pr	Praseodymium	[Xe]$6s^2 4f^3$	$^4I_{9/2}$	5.42

(*Cont.*)

Table 14.2 Cont.

Atomic number Z	Element		Electronic configuration	Spectral term	Ionization energy (eV)
60	Nd	Neodymium	$[Xe]6s^2 4f^4$	$^5I_4$	5.49
61	Pm	Promethium	$[Xe]6s^2 4f^5$	$^6H_{5/2}$	5.55
62	Sm	Samarium	$[Xe]6s^2 4f^6$	$^7F_0$	5.63
63	Eu	Europium	$[Xe]6s^2 4f^7$	$^8S_{7/2}$	5.67
64	Gd	Gadolinium	$[Xe]6s^2 4f^7 5d$	$^9D_2$	6.14
65	Tb	Terbium	$[Xe]6s^2 4f^9$	$^6H_{15/2}$	5.85
66	Dy	Dysprosium	$[Xe]6s^2 4f^{10}$	$^5I_8$	5.93
67	Ho	Holmium	$[Xe]6s^2 4f^{11}$	$^4I_{15/2}$	6.02
68	Er	Erbium	$[Xe]6s^2 4f^{12}$	$^3H_6$	6.10
69	Tm	Thulium	$[Xe]6s^2 4f^{13}$	$^2F_{7/2}$	6.18
70	Yb	Ytterbium	$[Xe]6s^2 4f^{14}$	$^1S_0$	6.25
71	Lu	Lutetium	$[Xe]6s^2 4f^{14} 5d$	$^2D_{3/2}$	5.43
72	Hf	Hafnium	$[Xe]6s^2 4f^{14} 5d^2$	$^3F_2$	7.0
73	Ta	Tantalum	$[Xe]6s^2 4f^{14} 5d^3$	$^4F_{3/2}$	7.89
74	W	Tungsten	$[Xe]6s^2 4f^{14} 5d^4$	$^5D_0$	7.98
75	Re	Rhenium	$[Xe]6s^2 4f^{14} 5d^5$	$^6S_{5/2}$	7.88
76	Os	Osmium	$[Xe]6s^2 4f^{14} 5d^6$	$^5D_4$	8.7
77	Ir	Iridium	$[Xe]6s^2 4f^{14} 5d^7$	$^4F_{9/2}$	9.1
78	Pt	Platinum	$[Xe]6s\,4f^{14} 5d^9$	$^3D_3$	9.0
79	Au	Gold	$[Xe]6s\,4f^{14} 5d^{10}$	$^2S_{1/2}$	9.23
80	Hg	Mercury	$[Xe]6s^2 4f^{14} 5d^{10}$	$^1S_0$	10.44
81	Tl	Thallium	$[Xe]6s^2 4f^{14} 5d^{10} 6p$	$^2P_{1/2}$	6.11
82	Pb	Lead	$[Xe]6s^2 4f^{14} 5d^{10} 6p^2$	$^3P_0$	7.42
83	Bi	Bismuth	$[Xe]6s^2 4f^{14} 5d^{10} 6p^3$	$^4S_{3/2}$	7.29
84	Po	Polonium	$[Xe]6s^2 4f^{14} 5d^{10} 6p^4$	$^3P_2$	8.42
85	At	Astatine	$[Xe]6s^2 4f^{14} 5d^{10} 6p^5$	$^2P_{3/2}$	9.5
86	Rn	Radon	$[Xe]6s^2 4f^{14} 5d^{10} 6p^6$	$^1S_0$	10.75
87	Fr	Francium	$[Rn]7s$	$^2S_{1/2}$	4.0
88	Ra	Radium	$[Rn]7s^2$	$^1S_0$	5.28
89	Ac	Actinium	$[Rn]7s^2 6d$	$^2D_{3/2}$	6.9
90	Th	Thorium	$[Rn]7s^2 6d^2$	$^3F_2$	
91	Pa	Protactinium	$[Rn]7s^2 5f^2 6d$	$^4K_{11/2}$	
92	U	Uranium	$[Rn]7s^2 5f^3 6d$	$^5L_6$	4.0
93	Np	Neptunium	$[Rn]7s^2 5f^4 6d$	$^6L_{11/2}$	
94	Pu	Plutonium	$[Rn]7s^2 5f^6$	$^7F_0$	5.8
95	Am	Americium	$[Rn]7s^2 5f^7$	$^8S_{7/2}$	6.0
96	Cm	Curium	$[Rn]7s^2 5f^7 6d$	$^9D_2$	
97	Bk	Berkelium	$[Rn]7s^2 5f^8 6d$	$^8H_{17/2}$	
98	Cf	Californium	$[Rn]7s^2 5f^{10}$	$^5I_8$	
99	Es	Einsteinium	$[Rn]7s^2 5f^{11}$	$^4I_{15/2}$	
100	Fm	Fermium	$[Rn]7s^2 5f^{12}$	$^3H_6$	
101	Md	Mendelevium	$[Rn]7s^2 5f^{13}$	$^2F_{7/2}$	
102	No	Nobelium	$[Rn]7s^2 5f^{14}$	$^1S_0$	
103	Lw	Lawrencium	$[Rn]7s^2 5f^{14} 6d$	$^2D_{3/2}$	