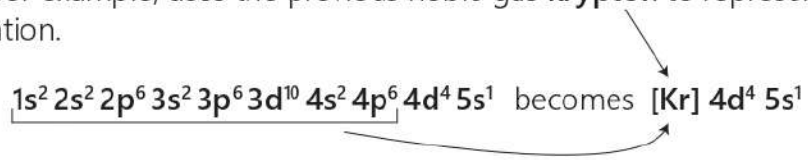
Electron Configuration Chart

Writing out the full electron configuration for elements, particularly those with many electrons, can be long and cumbersome. The condensed form simplifies this by using a previous noble gas on the periodic table to represent a large chunk of the electron configuration.

The element **niobium**, for example, uses the previous noble gas **krypton** to represent the first chunk of its electron configuration.



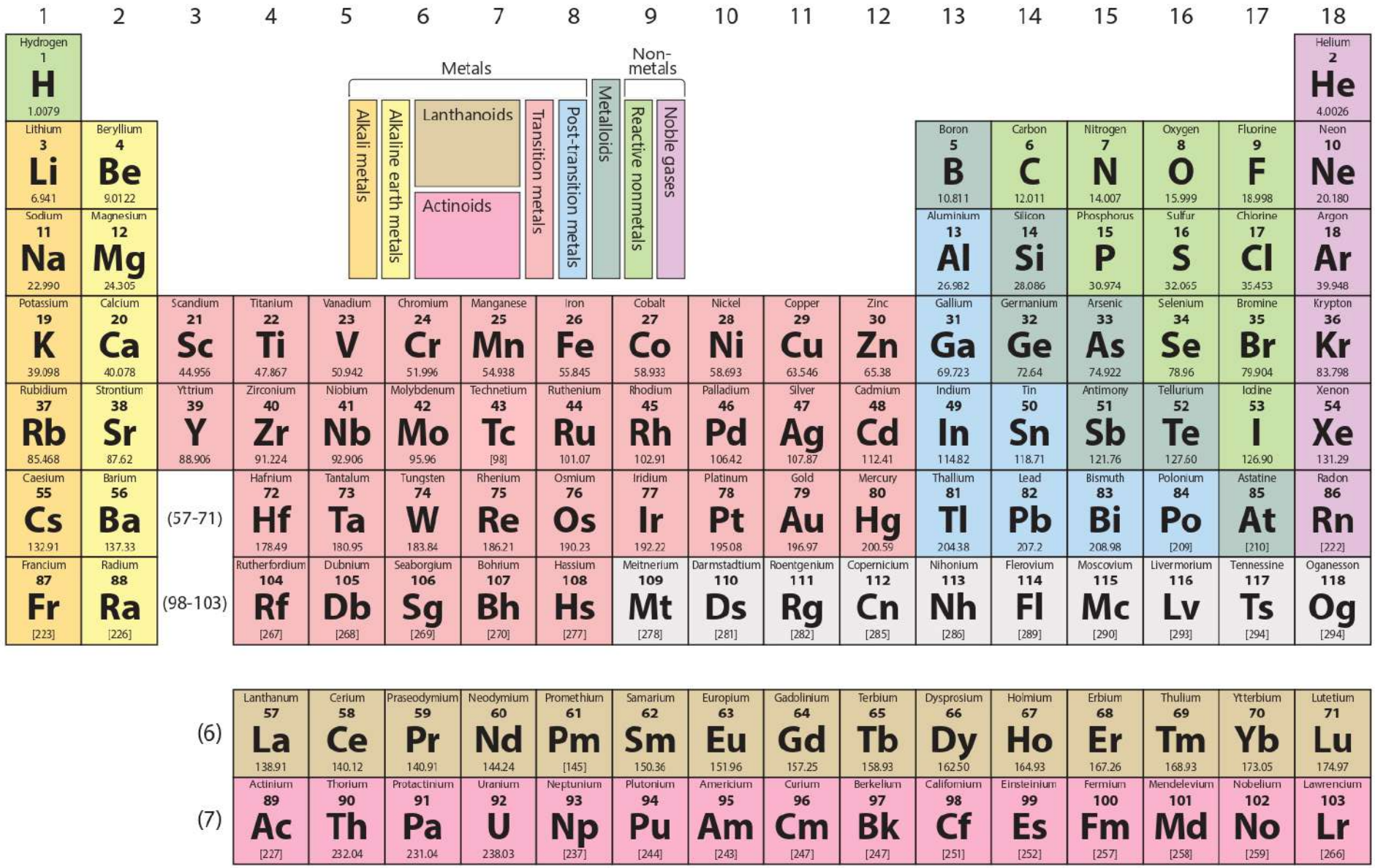
ATOMIC NUMBER	SYMBOL	ELEMENT	CONDENSED ELECTRON CONFIGURATION
1	H	Hydrogen	$1s^1$
2	He	Helium	$1s^2$
3	Li	Lithium	[He] $2s^1$
4	Be	Beryllium	[He] $2s^2$
5	B	Boron	[He] $2s^2 2p^1$
6	C	Carbon	[He] $2s^2 2p^2$
7	N	Nitrogen	[He] $2s^2 2p^3$
8	O	Oxygen	[He] $2s^2 2p^4$
9	F	Fluorine	[He] $2s^2 2p^5$
10	Ne	Neon	[He] $2s^2 2p^6$
11	Na	Sodium	[Ne] $3s^1$
12	Mg	Magnesium	[Ne] $3s^2$
13	Al	Aluminum	[Ne] $3s^2 3p^1$
14	Si	Silicon	[Ne] $3s^2 3p^2$
15	P	Phosphorus	[Ne] $3s^2 3p^3$
16	S	Sulfur	[Ne] $3s^2 3p^4$
17	Cl	Chlorine	[Ne] $3s^2 3p^5$
18	Ar	Argon	[Ne] $3s^2 3p^6$

19	K	Potassium	[Ar] $4s^1$
20	Ca	Calcium	[Ar] $4s^2$
21	Sc	Scandium	[Ar] $3d^1 4s^2$
22	Ti	Titanium	[Ar] $3d^2 4s^2$
23	V	Vanadium	[Ar] $3d^3 4s^2$
24	Cr	Chromium	[Ar] $3d^5 4s^1$
25	Mn	Manganese	[Ar] $3d^5 4s^2$
26	Fe	Iron	[Ar] $3d^6 4s^2$
27	Co	Cobalt	[Ar] $3d^7 4s^2$
28	Ni	Nickel	[Ar] $3d^8 4s^2$
29	Cu	Copper	[Ar] $3d^{10} 4s^1$
30	Zn	Zinc	[Ar] $3d^{10} 4s^2$
31	Ga	Gallium	[Ar] $3d^{10} 4s^2 4p^1$
32	Ge	Germanium	[Ar] $3d^{10} 4s^2 4p^2$
33	As	Arsenic	[Ar] $3d^{10} 4s^2 4p^3$
34	Se	Selenium	[Ar] $3d^{10} 4s^2 4p^4$
35	Br	Bromine	[Ar] $3d^{10} 4s^2 4p^5$
36	Kr	Krypton	[Ar] $3d^{10} 4s^2 4p^6$
37	Rb	Rubidium	[Kr] $5s^1$
38	Sr	Strontium	[Kr] $5s^2$
39	Y	Yttrium	[Kr] $4d^1 5s^2$
40	Zr	Zirconium	[Kr] $4d^2 5s^2$
41	Nb	Niobium	[Kr] $4d^4 5s^1$
42	Mo	Molybdenum	[Kr] $4d^5 5s^1$
43	Tc	Technetium	[Kr] $4d^5 5s^2$
44	Ru	Ruthenium	[Kr] $4d^7 5s^1$
45	Rh	Rhodium	[Kr] $4d^8 5s^1$

46	Pd	Palladium	[Kr] $4d^{10}$
47	Ag	Silver	[Kr] $4d^{10}5s^{1}$
48	Cd	Cadmium	[Kr] $4d^{10}5s^{2}$
49	In	Indium	[Kr] $4d^{10}5s^{2}5p^{1}$
50	Sn	Tin	[Kr] $4d^{10}5s^{2}5p^{2}$
51	Sb	Antimony	[Kr] $4d^{10}5s^{2}5p^{3}$
52	Te	Tellurium	[Kr] $4d^{10}5s^{2}5p^{4}$
53	I	Iodine	[Kr] $4d^{10}5s^{2}5p^{5}$
54	Xe	Xenon	[Kr] $4d^{10}5s^{2}5p^{6}$
55	Cs	Cesium	[Xe] $6s^{1}$
56	Ba	Barium	[Xe] $6s^{2}$
57	La	Lanthanum	[Xe] $5d^{1}6s^{2}$
58	Ce	Cerium	[Xe] $4f^{1}5d^{1}6s^{2}$
59	Pr	Praseodymium	[Xe] $4f^{3}6s^{2}$
60	Nd	Neodymium	[Xe] $4f^{4}6s^{2}$
61	Pm	Promethium	[Xe] $4f^{5}6s^{2}$
62	Sm	Samarium	[Xe] $4f^{6}6s^{2}$
63	Eu	Europium	[Xe] $4f^{7}6s^{2}$
64	Gd	Gadolinium	[Xe] $4f^{7}5d^{1}6s^{2}$
65	Tb	Terbium	[Xe] $4f^{9}6s^{2}$
66	Dy	Dysprosium	[Xe] $4f^{10}6s^{2}$
67	Ho	Holmium	[Xe] $4f^{11}6s^{2}$
68	Er	Erbium	[Xe] $4f^{12}6s^{2}$
69	Tm	Thulium	[Xe] $4f^{13}6s^{2}$
70	Yb	Ytterbium	[Xe] $4f^{14}6s^{2}$
71	Lu	Lutetium	[Xe] $4f^{14}5d^{1}6s^{2}$
72	Hf	Hafnium	[Xe] $4f^{14}5d^{2}6s^{2}$

73	Ta	Tantalum	[Xe] $4f^{14}5d^{3}6s^{2}$
74	W	Tungsten	[Xe] $4f^{14}5d^{4}6s^{2}$
75	Re	Rhenium	[Xe] $4f^{14}5d^{5}6s^{2}$
76	Os	Osmium	[Xe] $4f^{14}5d^{6}6s^{2}$
77	Ir	Iridium	[Xe] $4f^{14}5d^{7}6s^{2}$
78	Pt	Platinum	[Xe] $4f^{14}5d^{9}6s^{1}$
79	Au	Gold	[Xe] $4f^{14}5d^{10}6s^{1}$
80	Hg	Mercury	[Xe] $4f^{14}5d^{10}6s^{2}$
81	Tl	Thallium	[Xe] $4f^{14}5d^{10}6s^{2}6p^{1}$
82	Pb	Lead	[Xe] $4f^{14}5d^{10}6s^{2}6p^{2}$
83	Bi	Bismuth	[Xe] $4f^{14}5d^{10}6s^{2}6p^{3}$
84	Po	Polonium	[Xe] $4f^{14}5d^{10}6s^{2}6p^{4}$
85	At	Astatine	[Xe] $4f^{14}5d^{10}6s^{2}6p^{5}$
86	Rn	Radon	[Xe] $4f^{14}5d^{10}6s^{2}6p^{6}$
87	Fr	Francium	[Rn] $7s^{1}$
88	Ra	Radium	[Rn] $7s^{2}$
89	Ac	Actinium	[Rn] $6d^{1}7s^{2}$
90	Th	Thorium	[Rn] $6d^{2}7s^{2}$
91	Pa	Protactinium	[Rn] $5f^{2}6d^{1}7s^{2}$
92	U	Uranium	[Rn] $5f^{3}6d^{1}7s^{2}$
93	Np	Neptunium	[Rn] $5f^{4}6d^{1}7s^{2}$
94	Pu	Plutonium	[Rn] $5f^{6}7s^{2}$
95	Am	Americium	[Rn] $5f^{7}7s^{2}$
96	Cm	Curium	[Rn] $5f^{7}6d^{1}7s^{2}$
97	Bk	Berkelium	[Rn] $5f^{9}7s^{2}$
98	Cf	Californium	[Rn] $5f^{10}7s^{2}$
99	Es	Einsteinium	[Rn] $5f^{11}7s^{2}$

100	Fm	Fermium	[Rn] $5f^{12}7s^2$
101	Md	Mendelevium	[Rn] $5f^{13}7s^2$
102	No	Nobelium	[Rn] $5f^{14}7s^2$
103	Lr	Lawrencium	[Rn] $5f^{14}7s^27p^1$
104	Rf	Rutherfordium	[Rn] $5f^{14}6d^27s^2$
105	Db	Dubnium	[Rn] $5f^{14}6d^37s^2$
106	Sg	Seaborgium	[Rn] $5f^{14}6d^47s^2$
107	Bh	Bohrium	[Rn] $5f^{14}6d^57s^2$
108	Hs	Hassium	[Rn] $5f^{14}6d^67s^2$
109	Mt	Meitnerium	[Rn] $5f^{14}6d^77s^2$
110	Ds	Darmstadtium	[Rn] $5f^{14}6d^87s^2$
111	Rg	Roentgenium	[Rn] $5f^{14}6d^97s^2$
112	Cn	Copernicium	[Rn] $5f^{14}6d^{10}7s^2$
113	Nh	Nihonium	[Rn] $5f^{14}6d^{10}7s^27p^1$
114	Fl	Flerovium	[Rn] $5f^{14}6d^{10}7s^27p^2$
115	Mc	Moscovium	[Rn] $5f^{14}6d^{10}7s^27p^3$
116	Lv	Livermorium	[Rn] $5f^{14}6d^{10}7s^27p^4$
117	Ts	Tennessine	[Rn] $5f^{14}6d^{10}7s^27p^5$
118	Og	Oganesson	[Rn] $5f^{14}6d^{10}7s^27p^6$


Metals
Non-metals
Alkali metals
Alkaline earth metals
Lanthanoids
Actinoids
Transition metals
Post-transition metals
Metalloids
Reactive nonmetals
Noble gases
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
1 Hydrogen 1 H 1.0079
2 Helium 2 He 4.0026
2 Lithium 3 Li 6.941
2 Beryllium 4 Be 9.0122
2 Boron 5 B 10.811
2 Carbon 6 C 12.011
2 Nitrogen 7 N 14.007
2 Oxygen 8 O 15.999
2 Fluorine 9 F 18.998
2 Neon 10 Ne 20.180
3 Sodium 11 Na 22.990
3 Magnesium 12 Mg 24.305
3 Aluminium 13 Al 26.982
3 Silicon 14 Si 28.086
3 Phosphorus 15 P 30.974
3 Sulfur 16 S 32.065
3 Chlorine 17 Cl 35.453
3 Argon 18 Ar 39.948
4 Potassium 19 K 39.098
4 Calcium 20 Ca 40.078
4 Scandium 21 Sc 44.956
4 Titanium 22 Ti 47.867
4 Vanadium 23 V 50.942
4 Chromium 24 Cr 51.996
4 Manganese 25 Mn 54.938
4 Iron 26 Fe 55.845
4 Cobalt 27 Co 58.933
4 Nickel 28 Ni 58.693
4 Copper 29 Cu 63.546
4 Zinc 30 Zn 65.38
4 Gallium 31 Ga 69.723
4 Germanium 32 Ge 72.64
4 Arsenic 33 As 74.922
4 Selenium 34 Se 78.96
4 Bromine 35 Br 79.904
4 Krypton 36 Kr 83.798
5 Rubidium 37 Rb 85.468
5 Strontium 38 Sr 87.62
5 Yttrium 39 Y 88.906
5 Zirconium 40 Zr 91.224
5 Niobium 41 Nb 92.906
5 Molybdenum 42 Mo 95.96
5 Technetium 43 Tc [98]
5 Ruthenium 44 Ru 101.07
5 Rhodium 45 Rh 102.91
5 Palladium 46 Pd 106.42
5 Silver 47 Ag 107.87
5 Cadmium 48 Cd 112.41
5 Indium 49 In 114.82
5 Tin 50 Sn 118.71
5 Antimony 51 Sb 121.76
5 Tellurium 52 Te 127.60
5 Iodine 53 I 126.90
5 Xenon 54 Xe 131.29
6 Caesium 55 Cs 132.91
6 Barium 56 Ba 137.33
6 (57-71)
6 Hafnium 72 Hf 178.49
6 Tantalum 73 Ta 180.95
6 Tungsten 74 W 183.84
6 Rhenium 75 Re 186.21
6 Osmium 76 Os 190.23
6 Iridium 77 Ir 192.22
6 Platinum 78 Pt 195.08
6 Gold 79 Au 196.97
6 Mercury 80 Hg 200.59
6 Thallium 81 Tl 204.38
6 Lead 82 Pb 207.2
6 Bismuth 83 Bi 208.98
6 Polonium 84 Po [209]
6 Astatine 85 At [210]
6 Radon 86 Rn [222]
7 Francium 87 Fr [223]
7 Radium 88 Ra [226]
7 (98-103)
7 Rutherfordium 104 Rf [267]
7 Dubnium 105 Db [268]
7 Seaborgium 106 Sg [269]
7 Bohrium 107 Bh [270]
7 Hassium 108 Hs [277]
7 Meitnerium 109 Mt [278]
7 Darmstadtium 110 Ds [281]
7 Roentgenium 111 Rg [282]
7 Copernicium 112 Cn [285]
7 Nihonium 113 Nh [285]
7 Flerovium 114 Fl [289]
7 Moscovium 115 Mc [290]
7 Livermorium 116 Lv [293]
7 Tennessine 117 Ts [294]
7 Oganesson 118 Og [294]
(6) Lanthanum 57 La 138.91
(6) Cerium 58 Ce 140.12
(6) Praseodymium 59 Pr 140.91
(6) Neodymium 60 Nd 144.24
(6) Promethium 61 Pm [145]
(6) Samarium 62 Sm 150.36
(6) Europium 63 Eu 151.96
(6) Gadolinium 64 Gd 157.25
(6) Terbium 65 Tb 158.93
(6) Dysprosium 66 Dy 162.50
(6) Holmium 67 Ho 164.93
(6) Erbium 68 Er 167.26
(6) Thulium 69 Tm 168.93
(6) Ytterbium 70 Yb 173.05
(6) Lutetium 71 Lu 174.97
(7) Actinium 89 Ac [227]
(7) Thorium 90 Th 232.04
(7) Protactinium 91 Pa 231.04
(7) Uranium 92 U 238.03
(7) Neptunium 93 Np [237]
(7) Plutonium 94 Pu [244]
(7) Americium 95 Am [243]
(7) Curium 96 Cm [247]
(7) Berkelium 97 Bk [247]
(7) Californium 98 Cf [251]
(7) Einsteinium 99 Es [252]
(7) Fermium 100 Fm [257]
(7) Mendelevium 101 Md [258]
(7) Nobelium 102 No [259]
(7) Lawrencium 103 Lr [266]

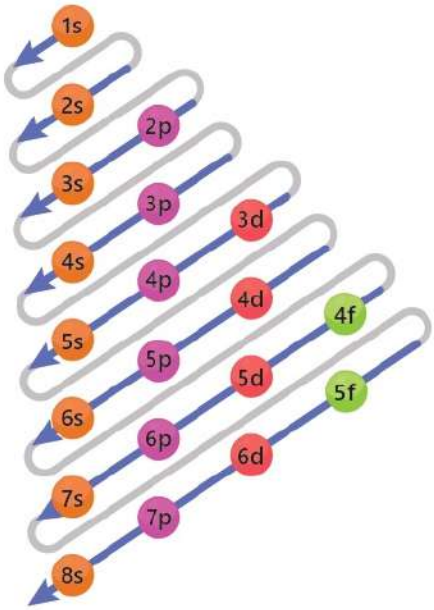
Related Rules and Principles

AUFBAU PRINCIPLE

The Aufbau principle states that an electron occupies orbitals in order from lowest energy to highest.

This order is not just based on distance from the nucleus but also on the energy levels of the orbitals, influenced by both their size and shape.

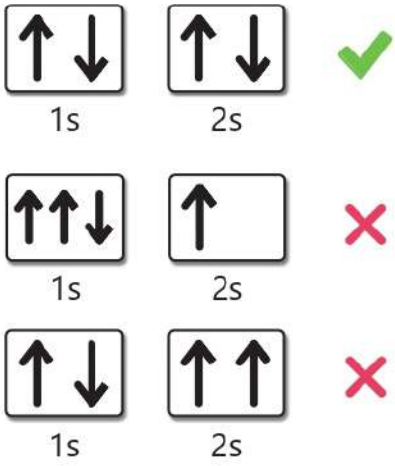
The Aufbau principle helps explain why certain elements behave similarly and is crucial for predicting an element's chemical properties.



PAULI EXCLUSION PRINCIPLE

This principle states that no two electrons in the same atom can have identical values for all four of their quantum numbers. In other words:

1. No more than two electrons can occupy the same orbital
2. Two electrons in the same orbital must have opposite spins



HUND'S FIRST RULE

Hund's first rule states:

1. Every orbital in a sublevel is singly occupied before any orbital is doubly occupied
2. All of the electrons in singly occupied orbitals have the same spin